CONSULTANCY SERVICES FOR THE PREPARATION OF THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA), ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) AND THE RESETTLEMENT ACTION PLAN (RAP) FOR THE CONSTRUCTION OF THE CHIPATA DRY PORT AND THE CHIPATA BY PASS ROAD (RDA/CS/L5/010/017)

FINAL ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT (ESIS) REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

Submitted to RDA/EIB/ZEMA

Prepared by:
Zenith Consulting Company Limited

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Road Development Agency (RDA)


Quality Assurance Statement

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EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

This document is the Final Report of the Environmental and Social Impact Assessment (ESIA) Report for the proposed Chipata Dry Port and Chipata Bypass Road in Chipata City in Eastern Province of Zambia by the Road Development Agency (RDA). In 2011, GRZ signed a financial agreement with EIB for the rehabilitation of the T4 road from Luangwa to Mwami border. The financial agreement included a grant of euro 7million for the development of a dry port and associated facilities in Chipata. The financing agreement sets a precondition that GRZ should obtain all necessary environmental clearance and decision letter from ZEMA prior to the disbursement of the grant amount.

As part of the application for funds and to meet regulatory requirements, the Road Development Agency (RDA) has procured the preparation of a Project Design and the Environmental Social Impact Assessment (ESIA) including the Resettlement Action Plan (RAP) for the Project. This draft ESIA is being published and disclosed for comment as part of the process for finalizing and gaining regulatory approval and financing of the Project. Following the comment Period, the ESIA will be updated to reflect comments made by stakeholders and information will be provided regarding how comments have been addressed. The final version of the ESIA will be made publically available.

LEGAL AND POLICY REQUIREMENTS FOR THE ESIA

The Zambia EIA Regulations under Part II Clause 7 (2) (a) stipulates that, developers of large projects that fall within the second schedule of the EIA regulations prepare a “Scoping Report” which should be submitted to the Zambia Environmental Management Agency (ZEMA) for scrutiny and approval before a detailed study for a project is carried out. Furthermore, the Second Schedule of the Regulations, under Item 1 and 2 on Urban Development subsection (d) and Transportation subsection (d) and (a) respectively, specifies that “all structural with a floor area of 10,000 square meters and the construction of new roads and major improvements over 10km in length” must be subjected to a full EIA process. Based on these, the proposed Chipata Dry port and the Bypass qualifies for an ESIA since the Dry Port floor area will be more than 10,000m² while the Bypass will be more than 10km in length.

Similarly, the EIBs environmental screening guidelines, projects involving infrastructure development are subject to the EIA requirements of Directive 85/337/EEC. The proposed Chipata Dry Port and the Bypass road fall under Annex II of the EIA Directive. According to the EU requirements, projects that fall under Annex II are not always required to be subjected to an EIA. However, the EU requirements also directs that projects should be examined on a case by case, and/or by reference to thresholds or criteria whether a project under Annex II should be subject to an EIA or not.

The proposed Chipata Dry Port falls under “Construction of railways and intermodal transshipment facilities, and of intermodal terminals” (projects not included in Annex I). However, given other consideration such as the location of the proposed dry port close to high density locality of Magazine Compound, it is justifiable that the project is subjected to a full EIA process in order to adequately plan for the anticipated project impacts.

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In addition, the principles and standards enshrined in the EIB Statement of the Environmental and Social Principles and Standards requires that all the projects being financed by the bank are acceptable in environmental and social terms by applying appropriate safeguards to all its operations.

Other than the above legislations, the following are other legislations that have been considered in the report:

- The Environmental Management (Licensing) Regulations, 2013;
- The Lands Act, 1995 (CAP 292, CAP 289, CAP 288);
- The Land and Land Acquisition Act of 2011;
- Agriculture Lands Act of 1960;
- The Plant Variety and Seeds Act, Cap 236 and the Pests and Diseases Act (Cap 233);
- The Biosafety Act No. 10 of 2007;
- Urban and Regional Planning Act No. 3 of 2015;
- Local Government Act, Cap 281 of 1995;
- The Zambia Wildlife Act, Act Number 14 of 2015;
- The Forest Act, Act Number 4 of 2015;
- The National Heritage Conservation Act (CAP 173);
- The Public Health Act, Chapter 295 of the Laws of Zambia;
- The Employment Act No. 15 of 2015 and Minimum Wages Act of 2006;
- Workers’ Compensation Act;
- The Occupational Health and Safety Act;

SUMMARY DESCRIPTION OF THE PROJECT INCLUDING PROJECT RATIONALE

As a landlocked country, Zambia is at a distinct disadvantage to other national economies that have direct sovereign access to the sea. While the country has extensive mineral resources and is endowed with fertile agricultural land with a stable government which is dedicated to transform the country into a vibrant economic entity, the country’s lack of sovereign access to the sea possess a serious obstacle that impede the vision of transforming the country into a vibrant economic entity.

This inadequacy of the existing transport and logistics infrastructures in the country as well as the lack of sovereign access to the sea make the cost of transport to be over three times higher than in most developed countries. For landlocked countries in the region such as Zambia, transport can make up a third of the price of certain key goods. High transport costs and delays in transit times not only impact on international trade but can, in extreme cases, reduce economic growth.

It is with this background that Zambia has embarked on establishing a network of key Dry Ports to address or improve the issue of how its trade is mobilized so that it can employ the most efficient forms of transport and related services to ensure the greatest possible economic growth from international trade.

A dry port is “an inland intermodal terminal directly connected to the sea by road or rail and operates as a center for the transshipment of sea cargo to inland destinations”. In addition to their role in cargo transshipment, dry ports may also include facilities for storage and consolidation of goods, maintenance for road or rail cargo carriers and customs clearance services.
Currently, the country has three major access outlets to the sea: (i) through the port of Dar-es-Salam in Tanzania; (ii) through the Port of Durban in South Africa; and (iii) through the port Nacala in Mozambique. However, the sea access route to the Nacala port is not as active as the other two.

The Nacala Corridor\(^3\) is an important route to access international markets for import and export of goods not only for the Zambian Eastern Province and the region beyond. The development of a Dry Port Facility in Chipata in Eastern Province as part of the development of the Nacala Corridor will contribute significantly to the expected improved effectiveness of the railway and port concessions under the Nacala Corridor agreement and decrease the high transport cost experienced by Zambian importers and exporters.

The proposed Chipata Dry Port will therefore: (i) relieve competition for storage and customs space at the Nacala Port itself; (ii) speed the flow of cargo between ships and major land transportation networks, creating a more central distribution point; and (iii) improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested Nacala Port.

As mentioned above, there are two major components of the project:

1. **Chipata Dry Port**

   The proposed Dry Port is located on the southern outskirts of Chipata Town and comprises 12 hectares of undeveloped land adjacent to the Chipata Railway Station within 62 hectares of land belonging to the Zambian Railway Authority. The location is approximately 5 kilometers by road from Chipata town centre and 22 kilometers (west along the Great East Road T4) from the Mwami Zambia - Malawi border post.

   The Dry Port will be designed as a common user facility with public authority status, equipped with fixed installations and offering handling and temporary storage services for any type of goods carried under customs transit by any applicable mode of transport, placed under customs control and with customs and other agencies competent to clear goods for domestic use, warehousing, temporary admissions, re-export, temporary storage for onward transit and outright exports.

   Two technical options are considered: (i) parallel to the existing railway line and (ii) perpendicular to the existing railway line.

   The Chipata Dry Port facility will contain\(^4\)
   1) Internal Roads (Main Access road, minor road 1, minor road 2, minor road 3, and minor road 4)
   2) Office Complex for 24 offices;
   3) Driver Ablution for 60 people;
   4) Weighbridge (one road and one rail);
   5) Fuel Station to handle 50 trucks per day with a 6m high and 30m diameter;
   6) General Warehouse (6,100m\(^2\));
   7) Import Warehouse (300m\(^2\));
   8) LCL (300m\(^2\));
   9) Full Containers area (4,000m\(^2\));

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\(^3\) The Nacala corridor traverses, and therefore involves, 3 countries: Zambia, member of COMESA and SADC, Malawi, member of COMESA and Mozambique, member of SADC.

\(^4\) Technical Options Analysis Report, October 2011, Bergstan, LuxConsult, SuperGroup Consortium
The settings out coordinates for the various facilities of the dry port are provided below:

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2. The Chipata Bypass Road

The designs for the proposed bypass road were not ready at the time of the ESIA process as the ESIA process and its approval by ZEMA is a prerequisite for GRZ to access the Euro 7million loan from EIB. Once these funds are secured, RDA will engage a consulting firm to do the design for the bypass road and consequently engage the contractor to construct the bypass road. However, preliminary information provided by the planning unit at RDA indicates that the proposed bypass will be a paved road and will be designed for heavy traffic vehicles. It will basically be of the same standard as the main T4 road. The bypass road is expected to have a road reserve of 36m and will be treated as an urban road.

The preliminary route of the Bypass however is expected to start at Musekera Junction and will run in the south easterly direction, passing through undeveloped land mainly used for subsistence farming and between the Chipata mountain on the northern side and the Appolo dam on the southern side before it joins the Zambia Railways land where the Dry port is proposed to be constructed.

After the dry port, the bypass road will continue in the south easterly direction where it will pass close to Chipata Prison on the southwest of the prison and through the prison farm after crossing Luntembwa stream.

After the prison farm, the proposed bypass road will cross the Chipata-Chadiza Road and will continue in the southeasterly direction passing between the Luntembwa Dam I on the north side and the new plots on the south side before it rejoins the T4 Road just after the Lutembwa Bridge near SOS.

The coordinates of the preliminary route of the bypass road are provided in the Table below with PI-01 been the starting point at Musekera Junction and PI-12 the end point at Luntembwa Bridge on the T4 Road near SOS village.

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OBJECTIVES THE PROJECT
The following are the major functions that the proposed Chipata Dry Port will serve:

- Cargo processing which will include storage, consolidation/deconsolidation and handling of cargoes;
- Information processing which would include functions such as defining cargo inventory, notification of vessel and cargo arrival and departure and cargo customs clearance; and
- Security provision for rail wagons, road vehicles and cargo while in dry port.

Once functional and operational, the proposed Chipata Dry Port will lead to an increased number of trucks transporting cargo to and from the dry port to various destinations in the country. This therefore requires the construction of a Bypass road to both deviate heavy trucks off the T4 road in the Chipata urban section of the T4 road but also to act as the main road to the Dry Port.

The proposed Bypass road will therefore serve three main functions:

- Decongesting the T4 road in Chipata town by deviating commercial vehicles into the bypass;
- To act as the access road to the dry port; and
- To complete the route to Nacala.

PROJECT PROPONENT
The Road Development Agency (RDA) on behalf of the Republic of Zambia (GRZ) is the project proponent.

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Particulars of Shareholders/Directors
Road Development Agency (RDA) representing the Government of Zambia.

Track Record
RDA is the executing arm of Government on all primary and secondary road projects. RDA is responsible for the construction and maintenance of all public roads in Zambia and therefore has experience to manage the rehabilitation of the proposed project road.

Capital Project Investment
The total investment cost for the construction of the Chipata Dry Port and the Chipata Bypass Road is in the region of 7 million Euros.
Proposed Project Implementation Date & Duration of the Construction Phase
The project is expected to be implemented immediately the necessary approvals are received from ZEMA and the finances are secured from the EIB. The project approval by ZEMA is a pre-condition for the EIB to finance the project. It is estimated that the construction period will be for a length of 3 years for both the dry port and the bypass road.

OUTLINE OF PROJECT ACTIVITIES
Since the proposed project include detailed engineering design and Environmental and Social Impact Assessment, the project activities will be assumed to follow the project routines whereby there are Planning, Pre-construction activities, Construction activities and finally Operations and Maintenance activities.

1. Planning - Planning as it relates to consultation has already started and has included the undertaking of this Environmental Impact Assessment. This scoping phase of the planning process has involved extensive consultations with the adjacent communities and key stakeholders. The EIA process has also involved various meetings and discussions have been held to try and identify the best prevention measures to possible impacts.

2. Pre-Construction Phase - Detailed surveys and investigations activity involves road alignment and condition survey, detailed topographical survey, detailed soils and materials investigation, drainage structures. Furthermore, sites or sources for construction materials such as gravels and stones can be agreed to be the existing ones unless the existing sources are depleted. In case there will be need to opening new borrow pits, the contractor will have to make all necessary arrangement for land acquisition in accordance with the country laws. Environmental Impact Assessment includes identification of environmental and social impacts. The assessment also considers both positive and negative impacts of the project and proposes mitigation measures for the negative impacts.

3. Construction Phase - The construction project activities will be planned to flow such that conflicts with the environmental setting as well as the social and economic activities along the corridor are minimised. It is expected that upon project commencement, the Contractor will prepare a realistic project activities schedule to share the same with the Client and the Supervisor. The conceptual activities, however, will be as follows;
   a) Site Preparation - Construction process begins with the alignment surveying, pegging and clearing. This involves bush clearing, top soil stripping to be followed with earthworks. Bush clearing removes vegetation cover including grass, shrubs and young trees. Often, grown trees will also be removed and the Contractor is expected to maintain a record of the number, species and characteristics of the trees removed for compensation through planting.
   b) Earthworks - Earth moving is the removal of the overburden along the alignment to give way for filling with appropriate materials. This generates significant spoil earth materials to be disposed-off or reused elsewhere. The activities will involve moving fill materials (gravel) to fill and development of the base on which the road surface will be formed.
   c) Construction Camps Establishment - The Contractors will search for appropriate land to set up the construction camp sites to house among others the following: Main Camp Sites; Materials Holding and Batching plants; and Pre-cast yards.
   d) Materials Sourcing and Extraction - Mobilization of materials will be the main activities such as to include aggregate from the quarry sites, gravel from borrow areas and water from sources. Materials haulage, storage, batching and applications are major activities of the project.
e) **Pavement Laying**-This will be the development of the road pavement layers as per the design specifications.

f) **Rehabilitation and Restorations**-The Contractor will undertake the following restoration activities:
   - Landscaping and beautification of the project road corridor,
   - Rehabilitation of spoil disposal areas,
   - Restoration of borrow areas,
   - Rehabilitation of quarry site, and
   - Decommissioning of camp sites and clean-up.

### 4. Demobilization Phase

At this stage, when road works are finished all construction equipment such as bulldozers, concrete mixer, roller and the like will be shifted to another site or rather to storage place. Similarly, structures like construction camps, workshops, stores for different materials will also be dismantled, packed and transported to their appropriate place.

### STAKEHOLDER ENGAGEMENT & CONSULTATION

The Project will be prepared in line with both the national and EIB’s requirements for stakeholder engagement and public consultation. Therefore, the draft ESIA study will be disclosed to the public for which the comment period will last, ensuring that all stakeholders have an opportunity to express their views. Upon completion of the disclosure and comment period, the ESIA study will be updated to reflect the comments made by stakeholders, including explanations on how comments were taken into account in the updated study. The final decision on whether or not to grant consent for the Project will be made by ZEMA.

The stakeholder engagement process started at the earliest stage of project planning and will continue throughout the entire life of the Project. The SEP identifies the key project stakeholders and will be updated accordingly during the development of the Project. Stakeholder engagement regarding the Project is an on-going process involving the public disclosure of appropriate information so as to enable meaningful consultation with stakeholders and potentially affected parties, and includes procedures contained within the SEP so people can make comments or complaints.

During the development of the ESIA affected stakeholders were carefully identified as well as those interested in the Project, and their concerns, expectations and preferences were taken into consideration.

Attention was given to the identification of vulnerable stakeholders whose lives and well-being may be affected by the Project. Additionally, close interaction with the local communities was maintained in order to identify opportunities for improving social performance of the Project.

Key information about the Project has been disclosed through the scoping meeting held along the project corridor. RDA, who are the project proponent, will continue to involve stakeholders and will maintain good communication practices during the lifetime of the Project. According to this approach, the aims of information disclosure and project communications will be:

- Providing local communities with a schedule and information on activities that will be arranged, together with mechanisms for their feedback;
- To improve knowledge of what the Project involves, the stages of the Project and its expected performance;
Ensuring best practice in terms of environmental protection and health and safety for workers and contractors; and

To make available to the public a grievance procedure.

The project has also developed a Grievance Mechanism, which shall be implemented to ensure that RDA is responsive to any concerns and complaints particularly from affected stakeholders and communities.

BASELINE CONDITIONS

- **Rainfall**—The project site is located within the agro-ecological region II whose average annual rainfall is 900-1000mm. Most of the rain falls between October and April, with December and January as the wettest months.

- **Temperatures**—The ameliorating effects of altitude (1,200m to 1,400m in the project area), are most noticeably felt in cooler average temperatures, also partly resulting from wind flows from local temperature-induced pressure gradients. Mean annual temperature in the project area is 20.4°C with a seasonal average maximum temperature of 23.6°C (in October) and a season average minimum of 15.8°C in July. Absolute temperature maxima and minima in the project area are 42°C (in October) and 0°C (in June).

- **Evaporation**—The daily evaporation rate in the area ranges from 3 to 10mm. In the warmer months (September and October), evaporation reaches a peak of 13mm. The lowest evaporation rates occur in the month of February towards the end of the wet season (AMC, 2009).

- **Sunshine**—Mean annual hours of bright sunshine in the project area are 2,800, with a mean daily maximum of 9.5 hours in August and September and a mean daily minimum of 5.0 hours in February. The availability of sunshine hours is not a limiting factor to crop growth in any month.

- **Surface hydrology**—The project is located in the Luangwa catchment of the Zambezi River Basin. Chipata District is well drained and has four major streams draining into the Luangwa River such as Lutembwe, Msandile, Kasenengwa, and Rukuzye. There are 62 earth fill dams and weirs. The dams provide an important source of water to domestic animals and people during the dry season. The District has a wide range of water strike depths which average 25 metres. In some cases strike depths of 50 metres have been encountered.

- **Groundwater Resources**—The project area is underlain by relatively low-to-average yield aquifers. This is because the types of rocks underlying the area are largely non-porous and impermeable and thus are inherently not primary aquifers. Groundwater availability in these rocks is dependent on secondary properties.

- **Fauna and Protected Ecosystems**—The project area is not close to a National Park (NP) or Game Management Area (GMA). Although the project area is largely cleared of its original vegetation to support habitat for wildlife, there are pockets of forested areas especially as one moves inland. Strips of forested areas can also be seen in the Musekera area. It is possible that some animal species that are found in these forested areas occasionally find their way to the project area especially at night. Some community members reported that small species of animals of no economic importance such as rabbit (Poelagus marjorita) are occasionally spotted. Also reported are some reptiles and soil micro-invertebrates belonging to the Phyla Annelida, Mollusca and Arthropoda families are common place.

- **Endangered or Rare Species**—The project area does not possess any rare or endangered species. However, it is worth noting that on a wider scale human threats to mammalian life continue to increase with continued growth of human population which seeks more land for
food production, more space for settlement and even greater development to improve quality of life. The threat on the area is on the modification of the ecosystem by removal of certain habitats which are perceived to be of lower value compared to the envisaged developments. These threats are eminent for all-natural resources- inclusive of the above listed mammal species. Snaring of small animals like bush babies and rodents is common in the area. Most of the mammal species listed in this discussion are still under the threat of poaching by local people, principally for game meat.

- **Vegetation Types** - The vegetation of the area has been extensively modified for settlement, charcoal production and agricultural activities. Moreover, there are no protected forests, rare or endangered tree species. The vegetation is characterized by mainly herbaceous plants and grasses interspaced with regenerated miombo. The diversity of habitats and tree species is extremely low along this stretch with regenerating Miombo tree species being generally small (less than 6m in height).

- **Topography** - The area around the project sites consists of moderately flat wide crests and moderately incised river lines. Generally, the topography of the project site and surrounding areas is flat with altitude ranging between 1250 m amsl to 1350 m amsl above mean seal level.

- **Geology and Geomorphology** - The project area is covered by the Mozambique Belt which is part of the Pan-African Orogenic belt system. It is mainly formed by polymetamorphosed and complexly folded high-grade gneisses, charnockites, and granulites cut by granitic, synitic and basic intrusion. The main rock types include limestone, dolomite, conglomerate and granite.

- **Air Quality and Noise Levels** - As far as can be ascertained, there is no information regarding air quality in the project area, but it can be assumed that the quality of air in general is relatively good. Exhaust gasses from cars and trucks will be the main sources that affect air quality as well as major industries and dust during the dry and windy season. However, in view of the limited number of major industries and the relatively low traffic volumes within the Chipata City up to date the impact of this on-air quality can be considered low. This assertion may be compromised in areas close to the roads and unpaved areas where elevated exhaust and dust levels may exist.

- **Livelihoods and Poverty** - During the field survey, it was noted that the residents of the project area make their livelihoods in a variety of ways both in the formal and informal sector. Some of the businesses in the area include; Malls, banks, restaurants, apartments and letting businesses (real estate) just to mention a few. Others included the vast number of schools and educational institutions in the area that have employed locals. Some locals are also employed in the construction teams in the developments occurring in the area that were under construction during the field survey.

- **Crop Production** - The type of farming in the project areas is subsistence and is characterized by low external inputs, very little cash inflow, use of manual labor and bartering of the produce with other household items. The major cash crops grown are: maize, cotton, beans, groundnuts, and sorghum. Other crops grown on small scale include: soya beans, pigeon peas, cow peas, Bambara nuts, sweet potatoes, sugar cane and sunflower. Horticultural crops grown include: oranges, guavas, granadilla, pawpaw, lemons, mango, avocado, banana, pineapple, tangerines and coffee.

**SUMMARY PROJECT IMPACTS**

The main negative impacts of the project will arise from the need to acquire about 42Ha of aland for the construction of the Chipata Bypass Road, which will pass through private lands used for subsistence farming. Other impacts include:

- The permanent loss of acquired land and assets;
- The permanent loss of the productive potential of the acquired land and resources and, therefore, the loss of future food supplies and business;

MITIGATION
The other Key Issues and Mitigation include:
1. Impact Mitigation Measures at Design Stage
   The designs have been made to avoid as much as possible any settlements or commercial buildings thereby reducing displacement and resettlement. Where it was found to be difficult to avoid, appropriate design changes have been adopted to mitigate or reduce to a minimum any impacts arising from land acquisition and losses on investments and incomes.

2. Impact Mitigation Measures at Land Acquisition Stage
   Mitigation measures during land acquisition stage include:
   a) Ensuring that there are adequate consultations with the all stakeholders and Project Affected Persons (PAPs) at every stage of project implementation.
   b) Verifying land tenure and ownership for compensation purposes;
   c) Ensuring that displaced persons are informed about options and rights pertaining to resettlement, offered choices and alternatives;
   d) Providing prompt compensation at full replacement cost for loss of land, assets attributable directly to the project; offer support after displacement for a transition period based on a reasonable estimate of the time likely be needed to restore their livelihood and standards of living;
   e) Providing development assistance in addition to compensation measures;
   f) Computing the actual number of persons to be compensated and resettled;
   g) Conducting resettlement process and monitoring progress of resettled persons;
   h) Preparing and keeping reports on resettled persons;
   i) Development of a resettlement plan that adequately responds to community issues;
   j) Creating awareness on the project facts;
   k) Preparation of progress and monitoring reports and implementation of recommendations;
   l) Holding of PAP participation meeting at each of the major centres along the proposed road; and
   m) Conducting Information Education and Communication (IEC) amongst the community and the project staff.

3. Impact Mitigation Measures during Construction Stage
   Mitigation measures during road construction activities include:
   - Ensuring that relocation and resettlement of all displaced persons is implemented before demolition of PAP structures located within the road corridor;
   - HIV/Aids education awareness and provision of condoms at local and project level.

4. Assessment and management of environmental and social impacts and risks
   An environmental and social impact assessment (ESIA) has been undertaken for the project and various reports have been submitted to stakeholders such as ZEMA and EIB based on ZEMA environmental requirements. The ESIA describes the project activities; provides physical and environmental baseline information and summary socio-economic baseline information; identifies and assesses environmental and social risks and impacts during preparation, construction and operations phases; and proposes measures to mitigate adverse environmental and social risks and impacts.
The ESIA is supplemented by an Environmental and Social Management Plan (ESMP). The ESMP was prepared with the objectives to: describe management and mitigation commitments provided in the ESIA, describe additional mitigation measures consistent with good international industry practice and the Performance Standards, identify roles and responsibilities of the environmental and social manage organization of the Project, and communicate environmental and social requirements through the Project team.

The ESMP has also identified the standards for Project legal and regulatory compliance with GRZ laws and regulations; establishes an environmental and social management framework; identifies roles and responsibilities in the Project environmental and social management structure; provides management plans consistent with the Performance Standards and IFC EHS Guidelines (air emissions, noise and vibration, ecology, waste, water, erosion and sediment control, spill prevention and response, hazardous materials, raw materials, cultural heritage, community impacts); provides an environmental monitoring and quality supervision plan; and includes an environmental and social action plan.

Construction contractors will be required, as a condition of their contracts with RDA, to implement and comply with the ESMP, including preparing management plans consistent with the specific management plans provided in the ESMP. RDA will rely on Supervising Engineers for Project environmental and social supervision of RDA contractors’ environmental and social requirements, and RDA’s Environmental and Social Management Unit (ESMU) for monitoring and reporting on environmental and social performance. The construction supervision consultant has a daily on-site presence to supervise the execution or works by the contractors. The ESMU will be on site periodically to collect samples, data and information based on the requirements of the environmental monitoring and quality supervision plan provided in the ESMP.

To manage environmental and social risks during construction and operations, including land acquisition and resettlement, EIB has proposed to the GRZ a framework to structure EIB’s engagement in the Project. Under the proposed framework, EIB has requested GRZ assurance that construction and operation of the Project fully complies with EIB’s environmental and social and the IFC EHS Guidelines.

5. Pollution Prevention and Abatement

Risks and impacts are related to air emissions, soil erosion and runoff, surface and ground water quality, waste, hazardous materials, and spills. These risks and impacts are expected to be managed through Project design and mitigation measures provided in the ESMP, and to be implemented by RDA contractors.

Air emissions during construction are expected from fugitive dust to be generated from site clearance, demolition, material transportation and construction works; and gaseous emissions from operation of diesel powered asphalt plants, vehicles, equipment and machinery. Measures to mitigate air emissions are provided in the air emissions management plan, as part of the ESMP. These measures include: limiting vehicle speed; wet dust suppression; covering loads; minimizing material drop height; conducting regular maintenance of asphalt plants, vehicles, equipment and machinery; and ensuring diesel powered plants, vehicles, equipment and machinery are turned off when not in use. Periodic monitoring will be conducted, including some nearby sensitive receptors (e.g. schools, clinics, churches, markets), to ensure that ambient air quality meets IFC EHS Guideline values or construction activities do not further degrade existing ambient conditions.
Soil erosion and runoff risks and impacts to surface and ground water quality, flood risk, and slope and riverbank stability are expected to result from site clearance, sub-grading, excavating, embankments, road construction bridge and channel works, bridge and channel works, and surface runoff from operation of quarries and asphalt plants. Measures to mitigate these impacts are provided in the erosion and sediment management plan, ecology management plan, and raw materials plan, as part of the ESMP. These measures include: limiting clearance of vegetation and prompt re-vegetation of appropriate cleared areas; installing retaining walls, mud screens, and reinforcing embankments, as needed; maximum height limitations for material piling and storage; and programming works during the dry season and postponing works during storm events. Periodic monitoring will be conducted, including visual surveys of erosion and sediment control measures every 3 months in dry season and monthly in wet season, as well as a quarterly audit of quarry operations.

Risks and impacts to surface and ground water during construction are expected from site clearance, demolition and preparation; staging and storage areas; material extraction and quarry operations; sub-grading, excavating and embanking the road base; major culverts improvements; industrial wastewater from concrete mixers; sanitary wastewater from temporary worker camps; and spills. Baseline surface water and ground water quality were surveyed along the project road at 3 locations, analysing for temperature, pH, conductivity, dissolved oxygen, chemical oxygen demand, biological oxygen demand, total suspended solids, ammonia, nitrates and nitrites, phosphate, oil and grease, coliform and heavy metals. Baseline surface water quality was below WHO standards for dissolved oxygen, chemical oxygen demand, biological oxygen demand but coliform exceeded the WHO standards at all the three locations.

The ESIA assessed daily loading of sanitary wastewater on surface waters to exceed WHO standards for biological oxygen demand, total dissolved solids, total suspended solids and grease; industrial waste water, including discharge from concrete mixers, was assessed to exceed WHO standards for total suspended solids, pH and grease. Measures to avoid or mitigate risks and impacts are provided in the water resources management plan, as part of the ESMP. These measures include: implementation of erosion and sedimentation plan; use of settlement ponds and sediment traps; minimizing number of staging and storage areas and locate those areas at least 50m from waterways; using beaming or diversion isolation techniques during works in watercourses; minimizing materials extraction activities; appropriate storage of hazardous substances; spill and emergency response procedures; water use efficiency and application of wastewater treatment at concrete mixers; and use of portable or permanent sanitation facilities at temporary workers camps.

Waste generated by construction activities includes construction waste, domestic solid waste and hazardous waste. Construction waste is expected to include concrete, asphalt, gravel, stone, inert materials, wood, metals, plastics, insulation, packaging, plasterboard/gypsum, earth and topsoil and vegetation. Domestic solid waste is expected to include food waste, sanitary waste, card and paper, packaging, plastics, and textiles. Hazardous waste is expected to include used engine oil, oily rags and empty containers. The ESIA estimates domestic solid waste generation on the volume of 562kg per day. Measures to manage and reduce or mitigate wastes are provided in the waste management plan, as part of the ESMP. For construction wastes, these measures include: crushing and on-site reuse of inert materials; segregation of metals, wood, plastics for reprocessing; composting of plant matter; and disposal to designated licensed landfills. For domestic solid waste, these measures include: segregation of recyclable materials; collection in on-site bins and disposal to licensed landfills. For hazardous waste, these measures include: collection and storage for off-site re-processing. Contractors will be required to develop a waste inventory that details the different waste streams, classification,
quantities, storage requirements, and potential use, and treatment and disposal arrangements. Periodic audits will be conducted to ensure compliance with ZEMA requirements and EIB standards.

Hazardous materials including tar, diesel fuel, oil and grease will be transported, stored and used during construction. Measures to manage risks and impacts related to hazardous materials are provided in the hazardous material management plan, as part of the ESMP. These measures include: preparing a register including appropriate Material Data Safety Sheets; undertaking hazardous materials assessments, with results incorporated into the spill prevention and response plan; ensuring appropriate storage with control systems (bundling, automatic alarms and shut-off systems, secondary containment); labelling; securing storage areas; and providing appropriate training to workers. Periodic audits and inspections of hazardous materials transportation transfer and use procedures will be undertaken to ensure that measures comply with the spill prevention and response plan. Risk and impacts related to accidents and spills of hazardous material during construction will be managed according to the spill prevention and response plan, as part of the ESMP. These measures include requiring contractors, prior to engaging in construction activities, to undertake a spill risk assessment and identify measures to reduce associated risks. The spill risk assessment will be incorporated into contractors’ spill prevention and response plans that will include: a description of activity and operator information; notification requirements; spill response frameworks, strategies and equipment; procedures to mobilize external resources for responding to large spills; clean up strategies and handling instructions and treatment or disposal requirements; self-inspection, training, exercises, drills and logs; and security measures. An initial inspection of existing storage tanks will be conducted to identify potential non-conformances and a corrective action plan will be implemented should non-conformances be observed. Periodic inspections will be conducted on the integrity of storage tanks and bunds, location and contents of spill kits, and presence of spill prevention measures that will be recorded in an inspection log. In the event of a significant spill, sampling and monitoring of surface and ground water will be required to assess the need for remediation.

6. Community Health, Safety & Security
Risks and impacts are related to noise and vibration, traffic safety and community health and safety. These risks and impacts are expected to be managed through Project design and mitigation measures provided in the ESMP, and to be implemented by RDA contractors.

Noise and vibration during construction are expected from operation of quarries (blasting, grinding and hauling), vehicles, equipment and machinery (e.g. backhoe excavators, pavers, trucks, concrete mixing machines, pile drivers, concrete rollers, cranes, compressors and generators). Maximum noise levels for construction equipment and machinery assessed in the ESIA are expected to range from 74-106 dBA at a distance 15m from the source. Based on the analysis of the ESIA, construction equipment, machinery and works should be located at minimum from 60-320m from residential areas and 340-1,900m from the nearest sensitive receptors (e.g. schools and rural health centres), with pile drivers representing the most significant impact. Noise levels during construction are expected to exceed WHO standards and IFC EHS Guidelines near populated areas and nearest sensitive receptors. The ESIA identified and assessed vibration impacts related to operation of excavators, graders, trucks, compressors and hammers, finding impacts dissipating sufficiently to meet WHO standards 12m from the source for all equipment and machinery, except mechanical hammers, which dissipated sufficiently to meet WHO standards 16m from the source. Measures to reduce or mitigate risks and impacts are provided in the noise and vibration management plan, as part of the ESMP. These measures include: engagement with residents and owner of road side businesses; restricting construction works to daytime hours; installation of noise barriers; utilizing and regularly maintaining equipment and machinery that meets good international industry practice standards for
noise attenuation; ensuring that equipment and machinery is turned off when not in use; and fitting of all pneumatic tools with an air exhaust port silencer when used in close proximity to residences. Periodic monitoring of noise and vibration impacts will be conducted at locations where background samples were taken, as well as location of persistent noise complaints. Additional consideration will be made to monitor nearest sensitive receptors identified in the ESIA.

Accident risks to communities from construction-related traffic and disruptions to normal traffic patterns are expected. The ESIA has identified four locations near population centers where significant disruptions to traffic flow are expected to occur. Additional disruption is expected related to bridge construction, where temporary bridges adjacent to the existing bridges will be erected to accommodate traffic flow. Measures to promote traffic safety and mitigate traffic accident risks are provided in the community impact plan, as part of the ESMP. Contractors will be required to develop construction traffic management plans, including: identification and enforcement of haul routes, installation of appropriate barriers and signage, establishment of speed limits for construction-related vehicles, driver training, consulting and agreeing accident procedures with local emergency services such as the Road Traffic and Safety Agency (RTSA), adopting limits for trip duration and arranging driver rosters to avoid overtiredness. A procedure will be established for recording all construction related traffic accidents, and include accident investigation and corrective actions, as required.

Community exposure to health and safety hazards related to active construction works will be mitigated through the community impact plan, as part of the ESMP. Public access to construction and work areas will be restricted through use of security fencing and appropriate signage, presence of security personnel, and permit-to-enter site access controls. A procedure will be established for recording public health and safety incidents that includes procedures for recording of accidents, investigation and corrective actions, as required.

Unarmed security personnel will be employed by construction contractors to restrict public access to construction works, staging and storage areas, as well as to protect construction equipment and machinery when not in use.

7. Labour and Working Conditions
At peak construction, the construction contractors will employ approximately 700 workers. RDA will require receiving a Human Resources policy for contractors and all construction contractors consistent with the Zambian labour laws and ILO guidelines, reflecting transparent worker relations, terms and duration of employment, and a grievance mechanism, all based on the principle of non-discrimination.

Occupational health and safety ("OHS") measures provided in the ESMP include, requiring contractors to identify potential hazards and develop responses to eliminate sources of risks or minimize workers’ exposure to hazards. Residual risks that cannot be avoided will be managed through appropriate protective measures, including controlling the hazard at the source and providing appropriate personal protective equipment (e.g. hats, gloves, boots, vests). Contractors will be required to provide training to all workers on OHS aspects relevant to their daily work and emergencies. All occupational injuries, illnesses and fatalities will be documented, recorded and investigated. Access to first aid and medical assistance from trained and licensed professionals will be provided. A health and safety technical consultant will be contracted to establish and notify contractors of OHS procedures, periodically inspect and report on OHS performance of construction activities and promptly notify the resident engineer and RDA of non-conformances and recommend remedial measures.
Construction workers will be housed in rooms and homes to be constructed by contractors. Minimum requirements for these accommodations are provided in the ESMP.

8. Grievances Redress Mechanism
During the public consultations in the project area, there were concerns expressed that include adequate and timely compensation of affected persons, acquisition of land and resettlement of affected persons within the local area to avoid drastic change of environment and departure from ancestral land. Due to lack of title deeds in the project area, majority of the PAPs expressed fear that they may not receive appropriate compensation from the relevant Authorities.

In projects that require relocation and resettlement of people and loss of property and livelihood, grievance redress mechanisms are essential tools. These mechanisms allow the affected people to voice concerns about the compensation and resettlement process. RDA is hence expected to take corrective action to address these grievances in consultation with the PAPs and other stakeholders. Such mechanisms are fundamental to achieving transparency in the resettlement process.

During the resettlement process, all disputes will be referred to RDA’s ESMU who may handle the grievance straight away or refer it to the PAP committee who will be asked to provide recommendations as to how it is to be addressed. If deemed necessary by the PAP committee the case will be re-investigated and depending on the nature of the issue, referred to the Land Compensation Tribunal or Public Complaints Committee. The Project Affected Persons Committees will be established at the affected market or village level and will be moderated by the elected chairman. The PAPs will elect a committee of not more than five members amongst themselves including a Chairperson and a Secretary. The committees should at minimum have 20% women and 20% youth representative to make it gender sensitive. Like most communities in Zambia, the Tonga people resolve local disputes through a local mechanism where the complainant reports the matter to the village elder in-charge of his village. The leader listens and considers the elements of the matter and brings the warring parties together towards making them reach an agreement. If no agreement is achieved between the warring parties or the matter is beyond the mandate of the village elder, he escalates it to the higher offices of the assistant chief or the chief respectively. Therefore, consultation and grievance redress will be an ongoing process until proper resettlement is achieved.

ENVIRONMENTAL & SOCIAL MANAGEMENT & MONITORING
An Environmental and Social Management and Monitoring Plan (ESMMP) for project road has been prepared. The ESMMP describes the environmental and social mitigation and monitoring measures, the criteria for their successful implementation and the organizational measures to be implemented during the pre-construction, construction and operation of the Project. The ESMMP involves a long term and phased process which will need to be regularly reviewed and updated as the Project evolves to reflect any changes in the Project implementation and organization as well as in regulatory requirements.

The ESMMP details environmental and social measures for the construction and operation of the project road; including the requirement to establish and implement an Environmental and Social Management System and monitoring plan along with a number of specific Environmental and Social Management Plans, including a Dust Management Plan, Biodiversity Management Plan and Traffic Management Plan.
For each identified impact a monitoring protocol will be established that will define the objective of the monitoring, the description and timing of monitoring activities, the indicator to measure the effectiveness of the measure, and any thresholds to be taken into account. Monitoring reports will be required from the Contractor during the construction phases. These will be submitted to the relevant inspection authority. The monitoring plan is integrated within the ESMMP.

The goal of the ESMMP is to ensure that all necessary mitigation measures are carried out to counter any adverse environmental impacts, and that enhancement measures are used where feasible and practical. The ESMMP will allow for redesigning mitigation measures if from the monitoring it is observed that the mitigation measures are not working.

**COST OF IMPLEMENTING THE ESMP**

The cost for the implementation of the mitigation measures and compensation of affected assets as outlined in the tables for the Environmental and Social Management Plan (ESMP) and in the Resettlement Action Plan (RAP) Report is estimated at *Fifteen Million, Seven Hundred and Fifty Thousand Zambian Kwacha, (ZMW 15,750,000)*; broken down as follow:

1. Compensation for assets and properties *ZMW 11,520,000.*
2. Environmental & Social Mitigation *ZMW 4,230,000.*

**CONCLUSION**

The Proposed Chipata Dry Port and the Chipata Bypass Road is a viable project that will benefit the community by improving (i) relieve competition for storage and customs space at the Nacala Port itself; (ii) speed the flow of cargo between ships and major land transportation networks, creating a more central distribution point; and (iii) improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested Nacala Port.

The acquisition of land for the Chipata Bypass Road will create displacement of farming fields, loss of livelihood and some interference with resources and sensitive receptors during construction, however there are many short and long term benefits that will arise from the proposed project.

Where displacement or impact is unavoidable, appropriate mitigation measures will be put in place to reduce to a minimum or eliminate any undesirable effects of the project. Majority of project affected persons are subsistence farmers.

There was prior awareness and knowledge of the project from the initial RAP community sensitization and consultation exercise. After this study the project affected persons should all be continuously informed of the project progress and the timelines of the major activities like compensation after negotiation, compensation payment, relocation and resettlement.

The Chipata City Council and local communities in the proposed project area will fully support the project but requested to be fully informed on the plans and their concerns looked into. The communities also requested to be engaged in the planning and implementation at all levels so that they can be sure to get first-hand information and details regarding compensation and resettlement including timelines. There is also need to involve the chiefs of the areas where the road has affected households and pieces of land in order to verify the legal owners before compensation to avoid family feuds and mistrust.
RECOMMENDATIONS
1) The Proposed Chipata Dry Port and the Chipata Bypass Road is a viable project that will benefit the community by improving transportation of people and goods. However, the study has established that there will be need for land acquisition for the construction of the Chipata Bypass Road requiring compensation and resettlement.
2) RDA should ensure that all affected persons are consulted. The PAPs should be fully compensated in a timely manner. The identification and acquisition of land for resettlement should be done with due consideration of the wishes of the affected persons and support given after resettlement to ensure that the project does not leave them worse off.
3) All the project affected persons who will be displaced or relocated, should be informed in good time (given approximately 3 months to prepare them for relocation) and modalities of conducting resettlement counselling put in place.
4) The RAP will be modified in line with situations experienced when the actual resettlement begins. In particular the monitored indicators are discussed at least quarterly so that appropriate measures and readjustments can be made.
   Conduct sensitization meeting to restrain people from encroaching the road reserve.

DECLARATION OF AUTHENTICITY OF REPORT
I do hereby attest that the information presented in this Environmental and Social Impacts Statement (ESIS) Report concerning the proposed Chipata Dry Port and Chipata Bypass Road is correct and complete to the best of my knowledge. I disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

(Dickson Ndhlovu  
(Director Planning)
ROAD DEVELOPMENT AGENCY
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

NON TECHNICAL SUMMARY IN LOCAL LANGUAGE

NKHANI NDI NJIRA


ZOYENERA KUKHALA MALAMULO NDI MALAMULO KWA ESIA

Malamulo a EIA ku Zambia Pakati pa Gawo II Mutu 7 (2) (a) uma nena kuti, omwe amapanga mapulani akuluakulu omwe akutsatira ndondomeko yachikufalitsidwa ndi ndemanga a EIA akukonzeka "Report Scoping" zomwe ziyenera kuperekedwa ku Zambia Environmental Management Agency (ZEMA) kufufuza ndi kuvomereza musanaphunzire zambiri za polojekiti. Ndondomeko yachikufalitsidwa ndi ndemanga, pansi pa ndime 1 ndi 2 pa ndime ya (d) ndi Transportation ndime (d) ndi (a) mwachindunji, imatenthawuza kuti "nyumba zonse zokhala ndi mita zokwana 10,000 ndi zomangamanga Misewu yatsopano ndi kusintha kwakukulu kuposa 10km kutalika "ziyenera kukhalala ndi njira zonse za EIA. Pogwiritsa ntchito izi, malo otchedwa Chipata Dry port ndi a Bypass akuyenerera kuti athandizire ESIA chifukwa dera la Dry Port lidzakhala laposa 10,000m² pomwe Bypass idzakhala yoposa 10km kutalika.

Mofananamo, ma bungwe a EIB akutsogoleredwa poyang’anira zachilengedwe, ntchito zokhudzana ndi chitukuko cha chitukuko zokhala ndi zofuna za EIA za Directive 85/337 / EEC. Cholinga cha Chipata Dry Port ndi msewu wopita kumsewu chikugwera pansi pa Annex II ya Malamulo a EIA. Malingana ndi zofunikira za EU, ntchito zomwe zikugwiritsidwa ntchito pa Annex II siziyenera nthawi zonse kuti zikhala pansi pa EIA. Komabe, mayiko a EU akutsogolera kuti polojekitiyi iweruzidwe payekha, ndi / kapena potsata zofunikira kapena polojekiti ngati ntchito yomwe ili pansi pa Annex II iyenera kugonjetsedwa ndi EIA kapena ayi.

Chipata chotchedwa Chipata Dry Port chikugwera pansi pa "Kumanga zipangizo za sitimayi komanso zosungirako zamagalimoto," komanso "Mapulogalamu oyedetsera ntchito". Komabe, ataphantsidwa kulingalira kwina monga malo a phoko lo Uma louma pafupi ndi makina akuluakulu a Magazine Compound, ndi zomweka kuti polojekitiyi ikugwiritsidwa ntchito mokwiridwa pa EIA kuti ikonze bwinoo mokwiridwa zochitika za polojekiti.
Kuonjezera apo, mfundo ndi miyozo yomwe ikutsatiridwa mu ndondomeko ya EIB ya Malamulo ndi Zigawo za zachilengedwe ndizofunika kuti mapulojekiti onse omwe akugwiritsidwa ntchito ndi banki amavomerezedwa pamaganizo ndi chikhalidwe cha anthu pogwiritsira ntchito chitetezo choyenera kuntchito zake zonse.

Zina kusiyana ndi malamulo apamwambawa, awa ndi malamulo ena omwe aganiziridwa mu lipoti:
- Malamulo a Environmental Management (Licensing), 2013;
- The Lands Act, 1995 (CAP 292, CAP 289, CAP 288);
- Cholinga cha Land and Land Purchase Act 2011;
- Mchitidwe wa ulimi wa 1960;
- Cholinga cha mbewu zosiyanayi siyana ndi mbeu, Cap 236 ndi lamulo la tizirombo ndi matenda (Cap 233);
- Biosafety Act No. 10 wa 2007;
- Mchitidwe wokhala mumzinda wa Urban ndi Regional Planning No. 3 wa 2015;
- Chigawo cha boma, Cap 281 cha 1995;
- Zambia Zambia Wildlife Act, Act Number 14 ya 2015;
- The Forest Act, Act Number 4 ya 2015;
- National Act Conservation Act (CAP 173);
- Public Health Act, Chaputala 295 cha Malamulo a Zambia;
- Ntchito Yothonzizira Ogwira Ntchito;
- Ntchito ya Occupational Health and Safety Act;

ZOCHTITA ZOLINGALIRA ZA PROJECT YOPHUNZITSSA NTCHITO YOPHUNZITSIRA NTCHITO
Gombe louma ndi "malo abolera kumtunda kwa nyanya ndi msewupen kapena njanji ndipo amagwira ntchito ngati malo oyendetsa katundu wanyanja kupita kudziko lina". Kuphatikiza pa udindo wawo ku katundu wamtundu, madoko ouma angaphatikizepo malo osungirako katundu, kugwiritsidwa ntchito pamsewupen kapena oyendetsa sitima zapamsewupen ndi mautumiki ovomerezeka.

Pakalipano, the world has a major seaside: (i) through the Dar-es-Salam port in Tanzania; (ii) kudutsa ku Port of Durban ku South Africa; ndi (iii) kudutsa pa Doko Nacala ku Mozambique. Komabe, njira yopita ku nyanja ku doko la Nacala siili yogwira ntchito ngati awiri.

Nacala Corridor ndiyo njira yofunikira yopitsira misika yamayiko akunja kuitanitsa ndi kutumiza katundu kwa Zambian Eastern Province ndi dera lomwelo. Kukula kwa Dry Port yomwe ili ku Chipata ku Eastern Province monga gawo la chitukuko cha Nacala Corridor idzapindulitsa kwambiri kufunika kwa kayendetsedwe ka sitimayo ndi ma doko pansi pa mgwirizano wa Nacala Corridor ndikuchepetsa ndalama zogulitsa zogonjetsedwa ndi a Zambian ndi ogulitsa.
Cholinga cha Chipata Dry Port chidzakhala: (i) kuthetsa mpikisano wokhala ndi malo osungirako katundu ndi madera ku Nacala Port; (ii) kufulumira kuthamanga kwa katundu pakati pa sitima ndi mabungwe akuluakulu oyendetsa nthaka, kupanga malo ogawidwa kwambiri; ndipo (iii) kuyendetsa kayendetsedwe ka zogulitsidwa kunja ndi kutumizidwa kunja, kusunthira kukonza ndi kusungirako zinthu zam'kati mkati, kutali ndi Port of Nacala.

Monga tanena kale, pali zigawo zikuluzikulu ziwiri za polojeikitii:

1. Chipata Chomala Port
   Dera lotchedwa Dry Port likupezeka kumtunda kwakumidzi kwa Chipata Town ndipo ili ndi mahekitala 12 a nthaka yosakhazikika pafupi ndi Sittiya ya Sittiya ya Chipata mkati mwa mahekitala 62 a malo a Zambian Railway Authority. Malowa ali pafupifupi makilomita 5 kuchokera pamsewu kuchokera ku chipata cha mzinda wa Chipata ndi makilomita 22 (kumadzulo kumbali ya Great East Road T4) kuchokera ku Mwami Zambia - Malawi malire.

   Dry Port idzapangidwira ngati malo ogwiritsira ntchito omwe ali ndi udindo wa boma, wokhala ndi malo osungirako ntchito komanso opereka zosungirako zosungirako katundu wamtundu uliwonse wonyamula katundu pogwiritsa ntchito kayendetsedwe ka kayendedwe ka mayendedwe, ndi mabungwe ena omwe ali oyenerera kuthetsa katundu wogwiritsa ntchito pakhomo, kusungirako katundu, kusamalidwa kwa kanthawi, kabwezeretsanso, kusungirako kwa kanthawi koti pitirizani kupita komanso kutumiza kunja.

   Njira ziwiri zogwiritsira ntchito zamakono zimaganizidwa: (i) zofanana ndi sitima yomwe ilipo kale ndi (ii) zogwirizana ndi sitima yomwe ilipo.

Chipata Chosungiramo Chipata Chokhacho chidzakhala nacho
A. Gawo lamala lomwe liri ndi:
   - Chida Chosungira Zida;
   - Zosungiramo zipinda; ndi
   - Kusungirako katundu ndi kusungirako katundu.

B. Malo Amtundu Wosungirako / Zamadzimadzi Terminal ndi Ntchito Zowonjezera Zambiri, zopangidwa ndi:
   - Sittiya yapamtunda: kumadzulo ndi sitima ndi sitima
   - Malo ogwiritsira ntchito pamsewu: malo osungirako magalimoto, malo opititsa patso golo, kukonzanso malipiro, kusungunula komanso kutisitsimula
   - Ntchito zowonjezera zowonjezera: Msonkhano, kubwezeretsanso, sampuli, kusungirako zowonjezera
   - Otso golera othandizira ntchito

2. Chipata Bypass Road
   Zolinga za msewu wopitilirapo sizinakonzedwe panthawi ya ntchito ya ESIA monga momwe ntchito ya ESIA ndivomerezedwa ndi ZEMA ndizofunikira kuti GRZ ipeze ngongole ya Euro 7 miliyoni kuchokera ku EIB. Ndala ma izi zikadzatetezawo, RDA idzagwira ntchito yothe ndizira anthu kuti akonze njira yopita kumsewu ndipo athandizidwe kumanga...

Njira yoyamba ya Bypass komabe ikuyembekezeka kuyamba ku Musekera Junction ndipo idzayendetsa kumwera chakumadzulo, kudutsa m'madera osapangidwira makamaka omwe amagwiritsidwa nthito polima ulimi komanso pakati pa phiri la Chipata kumpoto ndi dera la Appolo kumbali ya kumwera. imayanjananso ndi dziko la Zambia Railways komwe kumalo opangidwa ndi Dry Dry akuyenera kumangidwanso.

Pambuyo pachitunda chowuma, msewu wopita kumtunda udzapitiliza kumadzulo chakumadzulo komwe udzadutsa pafupi ndi ndende ya Chipata kum'mwera chakumadzulo kwa ndende komanso kudutsa famu ya ndende atadutsa Lutembwa.

Pambuyo pa famu ya ndendeyo, msewu wopita kumtunda udzadutsa Chipata Chadiza ndipo udzapitiliza kulowera kum'mwera kwa dera la Lutembwa kumpoto ndi madera atsopano asanafike ku T4 Road atangotha kemene. Lutembwa Bridge pafupi ndi SOS.

Zogwirizanitsa za njira yoyamba yopita kumsewu zimaperekedwa mu ndandanda yomwe ili pansipa ndi PI-01 yomwe idayambira ku Musekera Junction ndi PI-12 mapeto ku Lutembwa Bridge pamsewu wa T4 pafupi ndi mudzi wa SOS.

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ZOLINGALIRA PROJECT
Zotsatirazi ndizo nthito zazikulu zomwe Chipata Dry Port yotchulidwayo idzachita:
- Kukonza katundu komwe kumaphatikizapo kusungirako, kugwirizanitsa / kukonzanso komanso kusamalira katundu;
- Kukonza mauthenga omwe angaphatikizapo nthito monga kufotokozera zogulitsa katundu, chidziwitso cha chotengera komanso katundu wa katundu ndi katundu wa katundu; ndi
- Kupereka chitetezo cha magalimoto oyendetsa njanji, magalimoto a pamsewu ndi katundu atakwera pokhoma.
Mukagwira ntchito komanso ntchito, chipata choyendetsera Chipata Chowopsa chidzatsogolera kuwonjezeka kwa magalimoto akunyamulira katunduyo kuchokera kumtunda wouna kupita ku malo osiyanasiyana m’dzikoli. Izi zimafuna kumanga msewu wopita kumsewu wopita kumsewu wopita ku T4 mumsewu wopita ku Chipata mumsewu wa T4 komanso kuti ukhale msewu wopita ku Dry Port.

Msewu womwe umakonzedweratuwu udzakwaniritsa ntchito zitatu izi:

- Kudula msewu wa T4 ku tawuni ya Chipata pochotsa magalimoto a zamalonda kulowera; Kukhala ngati njira yopita ku doko louma; ndi
- Kutsiriza njira yopita ku Nacala.

PROJECT WOPOSA
Bungwe la Development Development Agency (RDA) m’malo mwa Republic of Zambia (GRZ) ndilombikitsa polojekiti.
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

EIB kuti ipereke ndalama. Zikuoneka kuti nthawi yomangamanga idzakhala yaitali kwa zaka zitatu pa doko louma komanso msewu wopitirira.

NTCHITO ZOTI ZICHITIKE


NTCHITO ZOTI ZICHITIKE


e) Kuyala Paziyla-Izi zidzakhala kukumbidwa kwa zigawo za pamsewu pamsewu malinga ndi malingaliro apangidwe.

f) Kukonzekera ndi Kubwezeretsa-Womanga nyumba adzachita zinthu zotsatirazi:
   - Kukonzwa malo ndi kukongoletsa kolowera msetwu wa polojekiti,
   - Kukonzanso malo osokoneza katundu,
   - Kubwezeretsa malo obwereka,
   - Kukonzanso malo osungirako malo, komanso
   - Kutumidwa kwa malo a misasa ndikuyeretsa.

KUYANJANITSA KWA PAGULU

Ntchitoyi idzakonzedwa mogwirizana ndi zofunikira za dziko lone ndi EIB kwa anthu omwe akugwira nawo ntchito komanso kwunukira anthu. Choncho, kuyana kugwira phunziro la ESIA kudzawululidwa kwa anthu pa nthawi yomwe ndemanga idzatha, kuonetsetsa kuti onse ogwira ntchito ali ndi mwayi wofokozera maganizo awo. Pambuyo pofofokozera nthawi ndi ndemanga, phunziro la ESIA lidakonziza kuti liwone setse ndemanga zoperekedwa ndi ogwira ntchito, kuphatikizapo kufokozera momwe ndemanga zatchulidwira mu phunzirolo. Cholinga chomaliza chokhazikitsa kapena kupereka chithandizo kwa Project chidzapangidwa ndi ZEMA.


Anapatsidwa chidwi kuti adziwe anthu omwe ale pachiopsezo omwe moyo wawo ndi umoyo wawo ungakhudzidwe ndi Project. Kuphatikizano apo, kugwirizana kwambiri ndi anthu ammusimiziso kunasungidwa kuti tipeze mwayi wopititsa matsogolo ntchito za polojekiti.

Mfundo zazikulu zokhudzana ndi polojekiti yi zafotokozedwa pamsonkanowo womwe unachitikira pakhomo la polojekiti. RDA, omwe alimbikitsa polojekiti yi, idzapitirizabe kuphatikizapo ochita nawo ntchito ndipo idzasungu njira zabwino zoyankhulirana panthawi ya Project. Malinanga ndi njirai, zolinga zowunikira zadzidzidzi ndi Project communications zidzakhala:
   - Kupatsa anthu ammusimiziso ndondomeko ndi chidziwitso pa ntchito zomwe zidzakonzedwe, pamodzi ndi njira zowonjezera;
   - Kupititsa matsogolo chidziwitso chomwe polojekiti ikuphatikizapo, magawo a Project ndi ntchito yake yodalirika;
• Kuonetsetsa kuti njira zabwino zothandizira zachilengedwe ndi thanzi ndi chitetezo kwa ogwira ntcito ndi mikontrakitala; ndi
• Kupereka ndondomeko yodandaula kwa anthu.

Pulojekitiyi yakhazikitsanso Njira Yopweteketsa, yomwe idzayendetsedwa pofuna kuonetsetsa kuti RDA ikukhudzidwa ndi zodandaula ndi zodandaula makamaka makamaka ndi anthu omwe akukhudzidwa nawo komanso anthu omwe akukhala nawo.

ZOTSATIRA ZA PROJECT
Cholinga chachikulu cha polojekitiyi chidzayamba chifukwa cha kufunika kokhala ndi 42Ha ya aland pomanga Chipata Bypass Road, yomwe idzadutsa m'mayiko apadera omwe amagwiritsidwa ntcito polima ulimi. Zotsatira zina zimaphatikizapo:
• Kuwonongeka kosatha kwapezeka nthaka ndi katundu;
• Kuwonongeka kosatha kwa phindu lopindula la nthaka ndi chuma chomwe analandira ndipo, chotero, kutayika kwa chakudya chamsogolo ndi bizinesi;

KUTHETSA
1. Zina Zowunika ndi Kuyanjanitsa ndizo:
• Njira Zothetsera Mmene Zingakhazikitsire Pachilengedwe
• Zopangidwe zapangidwa kuti zisawonongeke momwe zingathere malo alionse kapena nyumba zamalonda potero kuchepetsa kusamuka ndi kukonzanso. Kumene kunapezeka kuti ndi kovuta kupewa, kusintha koyenera kukonzedwa kuti kuchepetse kapena kuchepetsa kuchepa kulikonse komwe kulipo chifukwa cha kupeza ndi kutayika kwa nthaka pazolowera ndalama ndi phindu.

2. Mmene Mungayankhire Mmene Mungayendetsere Padziko Lonse
Mchitidwe wochepetsetsa panthawi yogula malo ndi:
• Kutsimikizira kuti pali zokambirana zokwanira ndi onse ogwira nawo ntcito ndi Project Affected Persons (PAPs) pa gawo lililonsa la kukhazikitsidwa kwa polojekiti.
• Kutsimikizira kuti nthaka ikukhala ndi umwini chifukwa cha malipiro;
• Kuonetsetsa kuti anthu ogwida kwawo akudziwitsidwa za zosankha ndi ufulu wokhudzana ndi kukhazikitsidwa, kupatsidwa chisankho ndi njira zina;
• Kupereka malipiro ofulumizitsa pamalipirano yowonongeka kwa malo, katundu omwe amaperekedwa mwachindunji ku polojekitiyo; perekani chithandizo mutatha kusamuka kwa nthawi yopititsa patsogolo pgwiritsa ntcito nthawi yeniyeni yofunikira kuti abwezeretse moyo wawo ndi miyoyo yawo;
• Kupereka chithandizo cha chitukuko kuphatikizapo zowonongeka;
• Kulemba chiwerengero chenicheni cha anthu omwe ayenera kubwezeredwa ndi kukhazikitsidwa;
• Kuonetsetsa ndondomeko ya kukonzanso malo ndi kuyang’anira ndondomeko ya anthu osamangidwanso;
• Kuonetsetsa ndondomeko ya kukonzanso malo ndi kuyang’anira ndondomeko ya anthu osamangidwanso;
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• Kuonetsetsa ndondomeko ya kukonzanso malo ndi kuyang’anira ndondomeko ya anthu osamangidwanso;
• Kuonetsetsa ndondomeko ya kukonzanso malo ndi kuyang’anira ndondomeko ya anthu osamangidwanso;
ENVIROMENTAL AND SOCIAL IMPACT ASSESSMENT
FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA
BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA
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DEVELOPMENT AGENCY (RDA)

- Kukhazikitsa msonkhano wa PAP pa malo onse akuluaku pamsewu wopempyedwa; ndi
- Kuphunzitsa Maphunziro ndi Kuyankhulana (IEC) pakati pa anthu komanso anthu ogwira
ntchito.

3. Mmene Mungayambitsire Ntchito Panthawi Yomangamanga
Mchitidwe wochepetsetsa panthawi yomanga msewu umaphatikizapo;
- Kuonetsetsa kuti kusamutsidwa ndi kukhazikitsidwa kwa anthu onse ogwidwa kwawo
kumagwirisidwa ntchito asanawonongeke nyumba za PAP zomwe zili pamsewu;
- Kuzindikira za HIV / Aids komanso kuperekera makondomu kumidzi ndi kumidzi.

MALO OTSOGOLEREDWA NDI KUSAMALIRA & KUWUNIKA
Pulogalamu ya Environmental and Social Monitoring and Planing (ESMMP) ya polojekiti ya polojekiti
yakhazikitsidwa. The ESMMP imalongosola zolepheretsa zachilengedwe ndi zowonongeka ndi njira
zowunika, njira zoyenera kukhazikitsidwa bwino ndi ndondomeko zomwe bungwe likuyendetsa
polojekitiyi isanamangidwe, muma ndi kgwira ntchito. The ESMMP imaphatikizapo ndondomeko
ya nthawi yayitali yomwe idzafunikiranso kunang'anits Santo ndikusinthidwa pamene polojekitiyi
ikuyamba kusonyeza kusintha komwe polojekiti ikuyendetsera polojekiti komanso bungwe komanso
zofunikira.

Mfundo za ESMMP za chilengedwe ndi zachikhalidwe za polojekiti ndi zomangamanga;
kuphatikizapo lamulo lokhazikitsa ndi kukhazikitsa ndondomeko yoyendetsera zachilengedwe ndi
zachikhalidwe komanso ndondomeko yambiri yowonongeka kwa zachilengedwe, kuphatikizapo
ndondomeko yowonongeka kwa fumbi, ndondomeko ya kayendetsedwe ka zamoyo ndi njira
yowonongeka.

Zomwe zidzakhudzidwe ndi ndondomeko yoyendetsera polojekitiyi idzakhazikitsidwa zomwe
zidzatanthawuze cholinga cha kuuwunikira, kufotokozera ndi nthawi yowunika nthchito,
chiwonseterochi kuti chiyese momwe ntchito yoikuyendera, ndi malo alionse omwe angaganizidwe.
Mauthenga owonetsetsa adzafunikanso kwa ogwira ntchito pa nthawi yomanga. Izi zidzaperekedwa
kwa moyo ndi nthawi yowunika. Ndondomekoyi ikuphatikizidwa mkati mwa ESMMP.

Cholinga cha ESMMP ndikoonetsetsa kuti njira zonse zochepetsera zoyenera zikhazikitsidwa pofuna
kuthana ndi zovuta zonse zachilengedwe, komanso kuti njira zowonjezera zimagwirisidwa ntchito
pomwe zingatheke komanso zothandiza. The ESMMP idzalolereratu kukonzanso njira zowonongeka
ngati pakuwona kuti zowonongeka sizikugwira ntchito.

KUTSILIZA
Cholinga cha Chipata Dry Port ndi Chipata Bypass Road ndi ntchito yomwe ingathandize anthu
ammutzidwe mwa kuwongolera (i) kuthetsa mpikisano wokhala ndi malo osungirako katundu ndi malo
opezeka pa Nacala Port; (ii) kukulufire kuthamanga kwa katundu pakati pa sitima ndi mabungwe
akuluakulu oyendetsa nthaka, kupanga malo ogawidwa kwambiri; ndipo (iii) kuyendetsa
cayendetsedwe ka zogulitsidwa kunja ndi kutumizidwa kunja, kusunthira kukonza ndi kusungirako
zionthu zam'kati mkati, kutali ndi Port of Nacala.

Kupeza malo kwa Chipata Bypass Road kudzakhazikitsa malo osamalidwa, kutayika kwa moyo ndi
zosokoneza zina ndi zowonjezera zowonjezera panthawi yomanga, komabe pali phindu laling'ono
komanso lalitali lomwe lidzatuluka kuchokera ku polojekitiyi.

ESIS FINAL REPORT

XXX

June 2019
Kumalo komwe kulibe kapena kusokonekera sikungapezeke, njira zocheptsera zoyenera zidzakhazikitsidwe pofuna kuchepetsa kapena kuthetsa zotsatira zosafunika za polojekitiyo. Ambiri mwa anthu omwe athandizidwa ndi polojekiti ndi alimi ogwira nthito.

Panali chidziwitso chisanachitike komanso chidziwitso cha polojekitiyi kuchokera ku chidziwitso choyamba cha RAP kumudzi ndi zofunsira. Pambuyo pa phunziroli anthu omwe akukhudzidwa ndi polojekitiyo ayenera kudziwa zonse za polojekiti yomwe ikupita patsogolo komanso nthawi ya nthito zazikulu ngati malipiro pambuyo pa kukambirana, kubwezera malipiro, kusamutsidwa ndi kukhazikitsidwa.

Bungwe la City of Chipata ndi anthu amderalo m'dera lomwe akufuna kukonza polojekitiyi lidzawathandiza pulojoekitiyi koma adzalandira chidziwitso chokwanira pa zolinga zawo. Anthuwa adapempheranso kuti akonze ndikugwiritsidwa nthito pamagulu onse kuti atsimikize kuti athandizidwe ndi chithandizo choyamba chokhudzana ndi malipiro ndi kukhazikitsanso nthito. Pamafunikanso kuphatikiza mafumu a madera omwe msewu umakhudza mabanja ndi zidutswa za nthaka kuti athe kutsimikizira eni eni ake asanalandire chiwongoladzanganja kuti asamangokhalira kudana ndi mabanja awo.

MALANGIZO

- Chipata Dry Port ndi Chipata Bypass Road ndi nthito yomwe ingathandize anthu ammudzi mwa kuyendetsa kayendedwe ka anthu ndi katundu. Komabe, phunziroli lakazikitsidwa kuti padzakhala kusowa kwa malo okhalapo chifuwokwa cha zomangamanga Chipata Bypass Road yomwe ikufuna malipiro ndi kukhazikitsidwa.

- RDA ionetsetse kuti anthu onse okhudzidwa amafunisidwa. Ma PAP ayenera kulipidwa mokwanira panthaŵi yake. Kuzindikiritsa ndi kupeza nthaka yokonzanso nyumba kuyenera kukhazikitsidwa poganizira zofuna za anthu omwe athandizidwa ndi thandizo lomwe laperekedwa pambuyo pa kubwezeretsa polojekiti kuti asawonongeke.

- Nthito yonse yomwe ingakhudzidwe ndi anthu omwe adzasamuke kapena kusamukira, azidziwitidsidwa nthawi yawbino (apaterekedwa pafupi ndi miyezi itatu kuti awakonzekere) komanso njira zoyenera kukhazikitsa uphungu.

- Bungwe la RAP lidzasinthidwa mogwirizana ndi zomwe zinachitikira pamene kukhazikitsidwa kwenikweni kumayambira. Makamaka zizindikiro zomwe zimayang’aniridwa zimakambidwa mobwerezabweza pamtunda kuti zikhale zoyenera ndikukonzekera.

- Pangani msonkhano wothandiza kuti anthu asamayende mofulumira.
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<tr>
<td>RDA</td>
<td>Road Development Agency</td>
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<tr>
<td>ROADSIP</td>
<td>Road Sector Investment Programme</td>
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<td>RTSA</td>
<td>Road Transport Safety Agency</td>
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<td>SEP</td>
<td>Stakeholder Engagement Plan</td>
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<tr>
<td>SNP</td>
<td>Sixth National Development Plan</td>
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<tr>
<td>TOR</td>
<td>Terms of Reference</td>
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<tr>
<td>T4</td>
<td>Code/Designation for Great East Road from Lusaka to Mwami Border</td>
</tr>
<tr>
<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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<tr>
<td>ZEMA</td>
<td>Zambia Environmental Management Agency</td>
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<tr>
<td>ZMW</td>
<td>Zambian Kwacha</td>
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</table>
CHAPTER ONE
INTRODUCTION AND BACKGROUND

1.1. INTRODUCTION
This document is the Draft Report of the Environmental and Social Impact Assessment (ESIA) Report for the proposed Chipata Dry Port and Chipata Bypass Road in Chipata City in Eastern Province of Zambia by the Road Development Agency (RDA). In 2011, GRZ signed a financial agreement with EIB for the rehabilitation of the T4 road from Luangwa to Mwami border. The financial agreement included a grant of euro 7million for the development of a dry port and associated facilities in Chipata. The financing agreement sets a precondition that GRZ should obtain all necessary environmental clearance and decision letter from ZEMA prior to the disbursement of the grant amount.

As part of the application for funds and to meet regulatory requirements, the Road Development Agency (RDA) has procured the preparation of a Project Design and the Environmental Social Impact Assessment (ESIA) including the Resettlement Action Plan (RAP) for the Project. This draft ESIA is being published and disclosed for comment as part of the process for finalizing and gaining regulatory approval and financing of the Project. Following the comment Period, the ESIA will be updated to reflect comments made by stakeholders and information will be provided regarding how comments have been addressed. The final version of the ESIA will be made publically available.

1.2. LEGAL AND POLICY REQUIREMENTS FOR THE ESIA
The Zambia EIA Regulations under Part II Clause 7 (2) (a) stipulates that, developers of large projects that fall within the second schedule of the EIA regulations prepare a “Scoping Report” which should be submitted to the Zambia Environmental Management Agency (ZEMA) for scrutiny and approval before a detailed study for a project is carried out. Furthermore, the Second Schedule of the Regulations, under Item 1 and 2 on Urban Development subsection (d) and Transportation subsection (d) and (a) respectively, specifies that “all structural with a floor area of 10,000 square meters and the construction of new roads and major improvements over 10km in length” must be subjected to a full EIA process. Based on these, the proposed Chipata Dry port and the Bypass qualifies for an ESIA since the Dry Port floor area will be 14,500m² while the Bypass will be more than 10km in length.

Similarly, the EIBs environmental screening guidelines, projects involving infrastructure development are subject to the EIA requirements of Directive 85/337/EEC. The proposed Chipata Dry Port and the Bypass road fall under Annex II of the EIA Directive. According to the EU requirements, projects that fall under Annex II are not always required to be subjected to an EIA. However, the EU requirements also directs that projects should be examined on a case by case, and/or by reference to thresholds or criteria whether a project under Annex II should be subject to an EIA or not.

The factors to be considered when examining a project or setting thresholds or criteria on a national level are listed in Annex III and cover:
- The characteristics of the project such as size, pollution and nuisances, production of waste, use of natural resources;

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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

- The location of the project, with particular regard to environmental sensitivity of the area that will be affected by the project; including effect on existing land use, natural resources and the absorption capacity of the natural environment;
- The potential impact of the project, with particular regard to its geographical extent, trans-frontier nature, extent of impact, duration, frequency and reversibility.

The proposed Chipata Dry Port falls under “Construction of railways and intermodal transshipment facilities, and of intermodal terminals” (projects not included in Annex I). However, given other consideration such as the location of the proposed dry port close to high density locality of Magazine Compound, it is justifiable that the project is subjected to a full EIA process in order to adequately plan for the anticipated project impacts.

The construction of the Chipata Bypass Road on the other hand falls under the “construction of motorways and (express) roads is subject to the EIA requirements of Directive 85/337/EEC ".

In addition, the principles and standards enshrined in the EIB Statement of the Environmental and Social Principles and Standards requires that all the projects being financed by the bank are acceptable in environmental and social terms by applying appropriate safeguards to all its operations.

In line with Zambian EIA regulations on public participation in the EIA process and EIB requirements there must be public involvement in the ESIA procedure. This Scoping Report is therefore being prepared on behalf of the Road Development Agency (RDA) representing the Government of Zambia. It is being submitted to provide the EIBs (being the project financiers) and ZEMA (being the local agency responsible of environmental management) with the details of the activities carried out to date and to highlight the approach which shall be used during the detailed baselines studies.

1.3. SUMMARY DESCRIPTION OF THE PROJECT INCLUDING PROJECT RATIONALE
As a landlocked country, Zambia is at a distinct disadvantage to other national economies that have direct sovereign access to the sea. While the country has extensive mineral resources and is endowed with fertile agricultural land with a stable government which is dedicated to transform the country into a vibrant economic entity, the country’s lack of sovereign access to the sea possess a serious obstacle that impede the vision of transforming the country into a vibrant economic entity.

This inadequacy of the existing transport and logistics infrastructures in the country as well as the lack of sovereign access to the sea make the cost of transport to be over three times higher than in most developed countries. For landlocked countries in the region such as Zambia, transport can make up a third of the price of certain key goods. High transport costs and delays in transit times not only impact on international trade but cam, in extreme cases, reduce economic growth.

It is with this background that Zambia has embarked on establishing a network of key Dry Ports to address or improve the issue of how its trade is mobilized so that it can employ the most efficient forms of transport and related services to ensure the greatest possible economic growth from international trade.

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A dry port is “an inland intermodal terminal directly connected to the sea by road or rail and operates as a center for the transshipment of sea cargo to inland destinations”. In addition to their role in cargo transshipment, dry ports may also include facilities for storage and consolidation of goods, maintenance for road or rail cargo carriers and customs clearance services.

Currently, the country has three major access outlets to the sea: (i) through the port of Dar-es-Salam in Tanzania; (ii) through the Port of Durban in South Africa; and (iii) through the port Nacala in Mozambique. However, the sea access route to the Nacala port is not as active as the other two.

The Nacala Corridor is an important route to access international markets for import and export of goods not only for the Zambian Eastern Province and the region beyond. The development of a Dry Port Facility in Chipata in Eastern Province as part of the development of the Nacala Corridor will contribute significantly to the expected improved effectiveness of the railway and port concessions under the Nacala Corridor agreement and decrease the high transport cost experienced by Zambian importers and exporters.

The proposed Chipata Dry Port will therefore: (i) relieve competition for storage and customs space at the Nacala Port itself; (ii) speed the flow of cargo between ships and major land transportation networks, creating a more central distribution point; and (iii) improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested Nacala Port. As mentioned above, there are two major components of the project:

1. Chipata Dry Port

The proposed Dry Port is located on the southern outskirts of Chipata Town and comprises 12 hectares of undeveloped land adjacent to the Chipata Railway Station within 62 hectares of land belonging to the Zambian Railway Authority. The location is approximately 5 kilometers by road from Chipata town centre and 22 kilometers (west along the Great East Road T4) from the Mwami Zambia - Malawi border post. The Dry Port has been designed as a common user facility with public authority status, equipped with fixed installations and offering handling and temporary storage services for any type of goods carried under customs transit by any applicable mode of transport, placed under customs control and with customs and other agencies competent to clear goods for domestic use, warehousing, temporary admissions, re-export, temporary storage for onward transit and outright exports.

The Chipata Dry Port facility will contain:

a) **A Dry Goods Section** consisting of:
   - Container Transfer Facility;
   - Warehouse Facilities; and
   - Container Management and Storage.

b) **A Wet Goods Area / Liquid Terminal and further General Services**, consisting of:
   - Railhead: rail siding and rail weigh bridge
   - Facilities for road transporters: parking space, re-fuelling points, repair pay, ablution and refreshment
   - Value added services: Assembly, re-bagging, sampling, information processing
   - Forwarding and logistics service providers

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9 The Nacala corridor traverses, and therefore involves, 3 countries: Zambia, member of COMESA and SADC, Malawi, member of COMESA and Mozambique, member of SADC.

10 Technical Options Analysis Report, October 2011, Bergstan, LuxConsult, SuperGroup Consortium
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

ESIS FINAL REPORT
June 2019
2. The Chipata Bypass Road

The designs for the proposed bypass road were not ready at the time of the ESIA process as the ESIA process and its approval by ZEMA is a prerequisite for GRZ to access the Euro 7million loan from EIB. Once these funds are secured, RDA will engage a consulting firm to do the design for the bypass road and consequently engage the contractor to construct the bypass road. However, preliminary information provided by the planning unit at RDA indicates that the proposed bypass will be a paved road and will be designed for heavy traffic vehicles. It will basically be of the same standard as the main T4 road. The bypass road is expected to have a road reserve of 36m and will be treated as an urban road.

The preliminary route of the Bypass however is expected to start at Musekera Junction and will run in the south easterly direction, passing through undeveloped land mainly used for subsistence farming and between the Chipata mountain on the northern side and the Appolo dam on the southern side before it joins the Zambia Railways land where the Dry port is proposed to be constructed.

After the dry port, the bypass road will continue in the south easterly direction where it will pass close to Chipata Prison on the southwest of the prison and through the prison farm after crossing Luntembwa stream.

After the prison farm, the proposed bypass road will cross the Chipata-Chadiza Road and will continue in the southeasterly direction passing between the Luntembwa Dam I on the north side and the new plots on the south side before it rejoins the T4 Road just after the Lutembwa Bridge near SOS.

The coordinates of the preliminary route of the bypass road are provided in Table 1-1 below while the preliminary route is provided in Figure 1-1.

Table 1-1: Coordinates for the preliminary route of the proposed Chipata Bypass Road.

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Position</th>
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<td>E32 34 18.9</td>
<td>S13 39 37.4</td>
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<td>PI-02</td>
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<td>PI-12</td>
<td>E32 41 06.7</td>
<td>S13 40 47.1</td>
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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

Proposed Alignment for the Chipata Bypass Road
Since the proposed project includes detailed engineering design and Environmental and Social Impact Assessment, the project activities for the bypass road will be assumed to follow the project routines whereby there are Planning, Pre-construction activities, Construction activities and finally Operations and Maintenance activities.

1.4. OBJECTIVES THE PROJECT
The following are the major functions that the proposed Chipata Dry Port will serve:
- Cargo processing which will include storage, consolidation/deconsolidation and handling of cargoes;
- Information processing which would include functions such as defining cargo inventory, notification of vessel and cargo arrival and departure and cargo customs clearance; and
- Security provision for rail wagons, road vehicles and cargo while in dry port.

Once functional and operational, the proposed Chipata Dry Port will lead to an increased number of trucks transporting cargo to and from the dry port to various destinations in the country. This therefore requires the construction of a Bypass road to both deviate heavy trucks off the T4 road in the Chipata urban section of the T4 road but also to act as the main road to the Dry Port.

The proposed Bypass road will therefore serve three main functions:
- Decongesting the T4 road in Chipata town by deviating commercial vehicles into the bypass;
- To act as the access road to the dry port; and
- To complete the route to Nacala.

1.5. DETAILS OF THE PROJECT PROPONENT
The Road Development Agency (RDA) on behalf of the Republic of Zambia (GRZ) is the project proponent.

1.5.1. Contact Details of Applicant
The Director and Chief Executive Officer
Road Development Agency
Government/Fairley Road
P.O. BOX 50003
Ridgeway, Lsk, Zambia
Tel: (260)-211-253088/253002/253801
Fax +(260)-211-253404/251420
Email: rda_hq@roads.gov.zm

Contact Person
Gershom Chilukusha-Principal Environmental Officer
Phone No. 0977416210
Gchilukusha@roads.gov.zm

1.5.2. Track Record
RDA is the executing arm of Government on all primary and secondary road projects. RDA is responsible for the construction and maintenance of all public roads in Zambia and therefore has experience to manage the rehabilitation of the proposed project road.

1.5.3. Capital Project Investment
The total investment cost for the construction of the Chipata Dry Port and the Chipata Bypass Road is in the region of 7 million Euros.
1.5.4. Proposed Project Implementation Date & Duration of the Construction Phase

The project is expected to be implemented immediately the necessary approvals are received from ZEMA and the finances are secured from the EIB. The project approval by ZEMA is a precondition for the EIB to finance the project. It is estimated that the construction period will be for a length of 3 years for both the dry port and the bypass road.

1.6. PURPOSE OF THE ESIA

The purpose of the ESIA is to identify and assess the potential positive and adverse impacts that may arise from the proposed construction of the Chipata Dry Port and the Chipata Bypass Road on the physical and natural environment at the local (municipalities), regional (Eastern Province), national (Zambia) and transboundary levels, including an assessment of accidents and identification of safety provisions.

The Project activities that have been considered as part of the ESIA include those to be undertaken during the design, construction and operation of the Chipata Dry Port and the Chipata Bypass Road. Decommissioning of construction sites and temporary facilities is also considered within the scope of the assessment. However, decommissioning of the facilities has not been considered within the ESIA at this stage due to both limited information being available at this stage regarding the ceasing of operation of the facilities and given the intention that with maintenance the facilities will continue to operate beyond its design life. If the Chipata Dry Port and the Chipata Bypass Road ceases operation and needs to be decommissioned, relevant approvals will be sought and if required an ESIA will be prepared.

Identified impacts have been assessed considering the environmental and social baseline conditions analyzed for the study area and, where necessary and appropriate, mitigation measures to avoid, prevent, mitigate or compensate significantly adverse impacts and enhance beneficial impacts have been proposed. In this regard, a mitigation and monitoring plan to both monitor and evaluate the implementation of mitigation measures and the Project performance on environmental and social baseline conditions has been included as an integral part of the ESIA. Furthermore, the assessment determines the significance of residual effects remaining on the environment and community because of the Project following implementation of the mitigation measures.

The ESIA has been prepared in line with the ZEMA EIA requirements and with reference to EIB requirements and other international applicable standards, such as the International Finance Corporation (IFC) Environmental, Health & Safety (EHS) Guidelines for Roads (April 2007). The approach assessment and methodology for the ESIA is presented in Chapter 2.

The draft ESIA will be disclosed to the public. The comment Period will be 30 days, ensuring that all stakeholders have an opportunity to express their views. Upon completion of the comment Period, the ESIA Study will be updated to reflect the comments made by stakeholders and information will be provided about how comments have been addressed. In addition, these comments will be fed into the future work on the detailed design and construction of the Project. The final decision and version of the ESIA will be made publically available through ZEMA and RDA Offices.

1.7. EXPECTED AREA OF INFLUENCE (AOI)

The expected areas of influence have been identified in three bands as follows:

- Areas of full influence to be the 12Ha of land to be used for the construction of the dry port and the 36m for the road reserve for an estimated 13km of the bypass road;
- Areas of partial influence to include those areas falling under the catchment; and
- Areas of no influence to include those areas outside catchment area.
Geographically the study will be limited chiefly to the project site and neighbouring areas although effects on issues such as traffic, sources of raw materials and socio-economic effects may have implications further afield and these will be assessed in the ESIS.

The Environmental Management and Monitoring Plan (EMMP) will outline duties and responsibilities of the developer, contractor(s) and other relevant parties to serve as a management tool in the successful implementation of recommended mitigation measures and subsequent monitoring thereof during all project phases.

### 1.8. CONTENT OF THE ESIA

The ESIA has been structured to follow a commonly accepted impact assessment format and is reflective of the stages within the Zambian EIA procedure. The ESIA is organized into 15 chapters with the following content:

1) **Non-Technical Summary (NTS):** presents the Non-Technical Summary of the ESIA of the proposed Project.

2) **Chapter 1- Introduction:** provides general information about the Project, the legal & policy basis of the ESIA, the Project proponent and ESIA assessment team, and the purpose and content of the ESIA.

3) **Chapter 2 Assessment Methodology & Scoping Assessment:** defines the scope of the assessment based on the issues which have the potential to cause significant effects on the receiving environment and communities, and the opinions of stakeholders. Describes the methodology applied for the assessment of potential environmental and social impacts and the determination of the significance of residual effects.

4) **Chapter 3- Legal & Policy Requirements:** describes environmental and social policy, legislation and standards relevant to the Project, at both national and EIB levels, as well as multilateral agreements and conventions signed/ratified by the Republic of Zambia.

5) **Chapter 4-Project Description:** describes the technical specification of the Project and its background, need and objectives along with outlining the expected benefits from the Project, its area of influence and general settings, project components, construction activities, construction materials and their availability, schedule of works, potential beneficiaries; land take, the project phases and programme, and the proposed labour and workforce arrangements and facilities.

6) **Chapter 5- Project Alternatives:** This part of the ESIA Report consists of analysis of the various feasible alternatives of the project, including the "no project" option. The Chapter also describes the route alternatives considered and the selection of the final route. The second section presents a comparison of the potential alternatives based on a combination of; technical, economic, environmental and social criteria, as well as of public views and concerns and presents a viable or project option which is the optimal scenario case.

7) **Chapter 6-Baseline Environmental & Social Conditions:** describes baseline environmental and social conditions, focusing on sensitive issues and vulnerable groups.

8) **Chapter 7- Potential Environmental & Social Impacts:** describes the potential environmental and social impacts resulting from the proposed road project activities, including cumulative, synergy and transboundary impacts.

9) **Chapter 8- Environmental & Social Mitigation Measures and Residual Environmental & Social Effects:** presents the environmental and social mitigation measures proposed to avoid, prevent, mitigate and/or compensate the adverse impacts and enhance the beneficial impacts of the road Project. Describes the potential residual environmental and social effects remaining from the Project following the implementation of mitigation measures and presents the likely significance of these residual effects along with a summary of the likely significant residual environmental and social effects.
10) **Chapter 9-Environmental & Social Management & Monitoring Plan:** presents the proposed environmental and social management and monitoring program designed to evaluate the implementation and performance of the mitigation measures and the overall environmental and social performance of the Project.

11) **Chapter 10-Decommissioning and Rehabilitation Plan:** present the environmental management commitments associated with the Decommissioning and Closure Phase for the project and associated costs.

12) **Chapter 10- Analysis of Technical Insufficiency & Need for Update of the ESIA Study:** describes the various technical insufficiencies encountered during the ESIA development in terms of data availability (lack of data) and collection.

13) **Chapter 11-Summary of the public consultations and views expressed:** The section has a summary of how, when and which institutions were consulted, records of the consultations as well as views from such consultations.

14) **Chapter 12-Institutional capacities and strengthening needs:** This chapter has outlined the key institutions in the implementation of the ESIA provisions in the project, and their strengths in accomplishing such roles and requirements and what it costs for such requirements to be met.

15) **Chapter 13-Conclusion:** summarizes the key findings and conclusions of the assessment including the potential significant residual environmental and social effects.

16) **References:** This is a list of documents and literature sources in the study and writes up of the ESIA report.

17) **Annexes:** Lists of stakeholders consulted.
CHAPTER TWO

ASSESSMENT METHODOLOGY & SCOPING ASSESSMENT

This chapter describes the process, which was undertaken to produce the ESIS, ESMP and RAP Reports and presents the methodology used to assess the significance of impacts that may result from the design and implementation of the proposed Chipata Dry Port and the Chipata Bypass Road.

2.1. GENERAL APPROACH TO THE ASSESSMENT
The ESIA Methodology was based on extensive experience and knowledge of the:
• Environmental and Social Impact Assessment procedure in Zambia;
• International environmental and social policies and performance requirements (e.g. EIB);
• Environmental impact assessment techniques and methods (e.g. national and EIB Guidance on EIA procedures, Scoping Check Lists, Geographical Information Systems GIS), Environmental auditing questionnaires etc);
• National and EIB environmental and social legislation relevant to the Project, and the understanding of the important gaps existing between National & EIB legislation);
• Multilateral Conventions that Zambia has ratified, including those focused on transparent and open public disclosure processes; and
• Importance of public involvement at the earlier phases of project preparation to ensure open discussion and public participation in the decision-making process.

2.2. GENERAL APPROACH TO ESIA STUDIES
The aim of an Environmental & Social Impact Assessment (ESIA) is to identify the potential environmental and social impacts of a project and to evaluate mitigation and management measures to avoid, reduce or remediate potential impacts.

The Environmental and Social Impact Assessment (ESIA) process has incorporated several key steps as illustrated in Figure 2-1. The assessment process constituted a systematic approach to the evaluation of the proposed project in the context of the natural, regulatory and socio-economic environments in which development is proposed.

Each of the steps followed in the ESIA process has been described in turn in the following sections. However, key to understanding the process applied to minimizing the impact of this project has been the development of mitigation measures. All the potential impacts that will arise from this project have been identified and subjected to either standard recognized best practice mitigation measures or to impact specific, feasible and cost-effective mitigation. Any impacts that will remain after the application of mitigation measures are considered as residual impacts.

All residual environmental impacts have been assigned a level of impact of Low, Medium or High. High and Medium level environmental residual impacts are considered for compensation including offset mitigation measures. Residual social impacts designated High, Medium, Low or Beneficial. All levels of impact are considered for compensation including additional offset measures such as community investment since those that are considered low for a community may still have a high impact on individuals making the classification more complex.
2.3. CONSULTATION, PARTICIPATION AND DISCLOSURE

2.3.1. Overview
The process of stakeholder consultation and disclosure will be an on-going overarching requirement that has been applied to the entire ESIA process. Consultation is of critical importance in gaining insights into the key environmental and social issues, concerns of communities and other stakeholders, and in aiding the development of potential strategies for addressing project impacts. Both the project financiers (EIB & GRZ) and the project promoters (RDA) recognize the importance of stakeholder consultation, participation and disclosure during the lifetime of the proposed project.

Effective consultation with stakeholders is:
- Key to understanding the concerns and requirements of affected communities and ensuring their participation in the formulation and refinement of the project design; and
Effective disclosure, through the release of timely, accurate and comprehensive information to stakeholders. This is essential to ensure that the likely impacts (both positive and negative) are understood by stakeholders, and that they can provide feedback to the project.

The consultation and disclosure process has been both comprehensive and complex, and care was taken to capture and document stakeholder concerns.

Figure 2-2: Benefits of effective consultation and disclosure

2.3.2. Stakeholder identification
RDA through the consultant in consultation with the office of the District Administration together with the Chipata City Council collaborated and worked together to identify the key stakeholders who should be consulted at various stages of the project. This was done using a combination of previous project experience, knowledge of Zambian and the NGO community, and consultation with authorities, NGOs, academics, etc. This ensured that all the people who may be affected by or have an interest in the proposed Chipata Dry Port and the Chipata Bypass Road were given an opportunity to obtain information about the project and to express their opinions and concerns.
One of the major purposes of stakeholder’s identification and analysis was to provide an opportunity to involve and ensure participation of all groups of the society in the planning and implementation of a project depending on the stakeholders’ willingness and participation.

Stakeholders are defined as groups or individuals who will be or are likely to be directly or indirectly affected, positively or negatively, by the project at hand. Two main categories of stakeholder were defined; differentiating between those likely to be directly or indirectly affected, positively or negatively, (commonly referred to as project-affected people, households or communities) and those who might have an interest in the project or may influence the project.

Following this definition, the two principal groups of stakeholders in the proposed project were broadly categorized as follows:

a) **Affected groups**: People or entities to be directly affected by the project and were identified as potentially vulnerable to change and who needed to be engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measures.

b) **Affected parties** were persons located within the project defined area of operations but may be elsewhere (e.g. people who live outside of the project towns but have personal or business interests that may be directly affected by the development of the project). Affected parties included 2 sub-groups:

   - **Directly affected groups**: this included communities, groups and individuals likely to be displaced physically and economically by the project, including any vulnerable or marginalized groups or stakeholders;
   - **Indirectly affected groups**: which comprised residents, businesses, officials and administrators in project area who may be indirectly affected by employment opportunities; local community-based groups representing affected groups and/or other affected parties; politicians at national, regional, local levels; and employees, their representatives and contractors to the proposed project.

c) **Interested Parties**: other interested parties included people or entities that are interested in the Project and could affect the project in some way. This included residents in the project affected areas; national and international civil society, NGOs, CBOs or and faith-based organizations (FBOs); suppliers and service providers to the proposed project located elsewhere in Zambia or internationally; other on-going projects in the project areas or regions; the Government of Zambia, including government officials, permitting and regulating agencies at the national and regional levels; and local media, academics and other interest groups.

Therefore, the project stakeholders were categorized into several groups as indicated below in Table 2-1:
## Description of stakeholder group

<table>
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<tr>
<th>Stakeholder Group</th>
<th>Description of stakeholder group</th>
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<tbody>
<tr>
<td>1. Owners of land and buildings within the project footprint</td>
<td>✓ This group of stakeholders included all those who own land or other assets that will be permanently acquired for development of the Project either by voluntary acquisition or involuntary expropriation, and those whose land will be temporarily occupied during construction. This group will include PAPs with traditional or titled land where houses and shops or other structures such as churches have been built, or land currently used for crop farming. It also includes owners of private commercial and mixed residential/commercial property and sports facilities whose land may be affected. The RAP report will need to document all those whose land will be affected and measures will be proposed in terms of compensation.</td>
</tr>
<tr>
<td>2. Tenants and other occupiers of land and buildings within the project footprint</td>
<td>✓ Residential and commercial tenants and other occupiers of land/buildings that may be acquired or temporarily used for the Project. This group could include tenants with formal leases, those who occupy premises on a more informal basis and are therefore potentially more vulnerable, and possibly marginalised groups such as illegal squatters and homeless people using land and buildings along the project row.</td>
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<tr>
<td>3. Owners, occupiers and users of buildings near the project and businesses operating in the neighbouring areas</td>
<td>✓ This group will include occupiers of residential, business and other buildings and other businesses especially at trading centres, which could be adversely affected by disturbance during construction or by increased traffic during operation. Affected buildings might include homes and business premises with both formal and informal occupiers, but also potentially more vulnerable locations such as school, places of worship, shelters, health centres, etc.</td>
</tr>
<tr>
<td>4. Users of land and facilities within and adjacent to the project footprint</td>
<td>✓ This group might include people who use the land within and near the project for access and/or recreation whose activities may be disrupted by construction and/or operation of the project. It includes parents with small children using the playgrounds, People with disabilities and parents with young children (e.g. in prams and pushchairs) may be affected differently from the public.</td>
</tr>
<tr>
<td>5. Road users</td>
<td>✓ This group includes car travelers, truck drivers and other road users of the roads that might get closed during construction and whose travel may be disrupted.</td>
</tr>
<tr>
<td>6. The general public and business community</td>
<td>✓ Residents in the project area and indeed throughout Zambia could have views about the environmental and social impacts of the Project on the surrounding communities. Interests may relate to travel benefits, loss of green space, environmental, social or economic impacts, or business or professional interests.</td>
</tr>
<tr>
<td>7. Disadvantaged and marginalized people</td>
<td>✓ Within all the groups above there may be people who may have particular difficulties participating in the engagement process because of language, literacy, mobility, economic or other barriers. These groups will need to be identified by special arrangement such contact with the local leaders but may also be identified during the household questionnaire to be administered during the ESIA and RAP preparation.</td>
</tr>
<tr>
<td>STAKEHOLDER GROUP</td>
<td>DESCRIPTION OF STAKEHOLDER GROUP</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>8. Civic leaders</td>
<td>Politically the project areas are represented by a ward councilors and members of parliament who represents the people in their ward/constituencies. These leaders deals with local administrative matters and can represent and provide a link into the local community. Community leaders will need to be approached to assist in identifying vulnerable and disadvantaged groups in the local population who may not be able to access the stakeholder engagement process by conventional means. Other key figures in the community can include church leaders and school teachers.</td>
</tr>
<tr>
<td>9. National Government Organizations.</td>
<td>National government organizations (ministries, agencies, services) with regulatory functions relating to the Project (permitting or supervision) or providing infrastructure and services relevant to the project.</td>
</tr>
<tr>
<td>10. Provincial Government Organizations.</td>
<td>The Provincial Minister and functional departments within the provincial administration with responsibilities delegated from national government, relevant to the Project.</td>
</tr>
<tr>
<td>11. Central and Local Governments.</td>
<td>The District Commissioner (DC and departments of the local government in Lusaka City Councils and administrations within the city with responsibilities relevant to the Project.</td>
</tr>
<tr>
<td>12. Local, National and International environmental and sustainability NGOs.</td>
<td>Organizations with interests in the environmental and sustainability aspects of the project (pollution, waste, resources, biodiversity, birds etc) and cultural heritage issues, who aim to represent the views and interests of their members and/or the general public.</td>
</tr>
<tr>
<td>13. Local, national and international social NGOs.</td>
<td>Organizations with interests in the social, community, labour health and safety or other similar aspects of the Project who aim to represent the views and interests of their members and/or the general public. Social NGOs will include those representing the interests of vulnerable groups (e.g. disabled people, women, homeless etc.).</td>
</tr>
<tr>
<td>14. Business and professional associations.</td>
<td>Business and professional organizations with an interest in the project and its impacts who aim to represent the views and interests of their members. Also includes research and educational organizations with academic/professional interests in issues raised by the Project.</td>
</tr>
<tr>
<td>15. International financial institutions.</td>
<td>Multilateral, bilateral and private sector financial institutions providing project finance for construction of the Project. Engagement activities will be directed to all members of the lender group.</td>
</tr>
<tr>
<td>16. National and local TV and radio</td>
<td>Various national and local (where relevant) media outlets and organizations.</td>
</tr>
</tbody>
</table>
2.3.3. Briefing Materials and Messaging
Project Affected Communities (PACs) and other stakeholders need to and the ESIA/RAP process. The consultant developed information about the Project for use with various audiences. It included:
- Presentation of an overview of the Project during consultation with districts officials and other stakeholders;
- A question and answer (Q&A) sheet for use by ESIA personnel in response to questions commonly raised by stakeholders during ESIA and RAP consultations and related technical investigations (including baseline surveys).

2.3.4. Tracking Consultation and Data Management
Documentation of public consultation is important in ensuring that inputs are captured and fed into the project planning process and to maintain a record of issues raised by consultees.

The Consultant team established a stakeholder database that included details of key stakeholders; their participation in ESIA and RAP consultations and issues raised. The database allowed information to be assembled, collated and analysed, as and when required. The database also logged all meetings with stakeholders at national, regional and local levels to ensure effective tracking of the consultation process throughout the ESIA and later the land acquisition process.

For each stakeholder, the database included the following data:
1) Name;
2) Contact details;
3) Stakeholder group (e.g. government, NGO, PAC etc.);
4) Primary point of contact;
5) Primary interests in the project road and ESIA process;
6) Level of influence over the ESIA and Project development;
7) Nature of issue raised
8) Type of contact with the stakeholder (e.g. written communications, face-to-face meeting etc.); and
9) RDA/Consultant Team representative/s who primarily interact with the stakeholder.

The stakeholder database is a dynamic tool. It will be revised and updated throughout the ESIA process.

It should however be emphasized that data relating to consultation with individual households was recorded separately to protect the anonymity of individual respondents. This was done in line with international practice and helped to ensure that responses are truthful and more accurately reflect the opinions of the householders. The database will also be used as a tool to ensure that actions are followed up and completed during project implementation.

2.4. THE SCOPING PHASE
Having decided that an ESIA was required for the proposed Chipata Dry Port and Chipata Bypass Road, a Scoping Process was undertaken to identify key issues and developed the terms of reference for the ESIA, which was later approved by the Zambia Environmental Management Agency (ZEMA) as reflected in Appendix 1. At this stage, it was considered essential to identify the likely environmental and social impacts and to define the project’s area of influence. As part of this process, information
about the project and its likely effects were disseminated to local affected communities, national scientists, academic institutions, and NGOs, in addition to the authorities and regulatory bodies.

This was followed by consultations with representatives of these groups. The main purpose of these consultations was to focus the ESIA on issues of concern at the local level. The scoping led to a focused ESIA for a manageable number of important issues.

It was important for the successful completion of the ESIA that the scoping process was undertaken early and in an open manner involving appropriate disclosure and consultation with relevant stakeholders.

2.4.1. Objectives
The objectives of the scoping phase were to:
- Define the project in sufficient detail to allow the Scoping exercise to effectively and efficiently shape the environmental and social impact assessment;
- Review relevant policy, legal and administrative frameworks including corporate environmental policy and management system, relevant national and international legislation and guidelines and, reference to the environmental and social standards for the EIB;
- Identify key issues;
- Identify and confirm the stakeholders;
- Initiate disclosure and consultation with the stakeholders, identify and document their key concerns and obtain their agreement on the key issues to be addressed;
- Identify data gaps and agree with stakeholders any necessary fieldwork to fill these gaps;
- Where appropriate, to identify potential mitigation measures for further analysis; and
- Establish the work plan and Terms of Reference (TOR) for the remainder of the ESIA process, including a continuing programme of stakeholder disclosure and consultation.

2.4.2. Public Notification for Scoping
In line with the requirements of ZEMA, an advert for public meetings was run on the Breeze FM for a period of 14 days inviting the public to the scoping meetings. The advert for scoping meetings clearly stated the venues and times for the meetings and a contact person who was to be called by stakeholders for clarification.

In addition to these announcements on Breeze FM Radio, the consultant engaged the District Commissioner’s Office in Chipata and the RDA Regional Office and used these leaders to inform people in the project areas on the planned scoping meetings.

2.4.3. Scoping workshop and report
The aims of the workshop were to identify key stakeholders, including vulnerable groups, likely key stakeholder concerns; past and current relationships with stakeholders, and lessons learned from other RDA projects. Workshop participants also developed an initial consultation strategy and timetable and defined roles and responsibilities for consultation and disclosure.

The workshop set out to inform key stakeholders on the project scope, the ESIA and RAP activities, and the schedules. It also solicited feedback on key issues to be addressed during the ongoing consultation process.
A Scoping Report was produced summarizing the results of this initial phase and was made available to various stakeholders such as ZEMA, RDA and EIB, etc.

2.4.4. Information Disclosure
Information disclosure will be an ongoing process that started from the early stages of the ESIA and design of the project. Relevant information was shared among stakeholders in a timely, accessible and culturally appropriate manner throughout the ESIA and RAP process. Special attention was given to vulnerable or minority groups and their right to equitable representation and consideration for their rights, views and interests. RDA will continue to provide the following information to all identified stakeholders who are likely to be directly or indirectly affected by adverse environmental or social impacts from the project:

- the purpose, nature, scope, objectives and scale of the project;
- the duration of proposed project activities, roles and responsibilities of other stakeholders;
- any risks and potential adverse impacts with regard to the environment, land tenure changes (resettlement, land acquisition or expropriation, where necessary), occupational and community health, safety and security, and any other potential adverse impact on communities arising from the project;
- the rights endowed to affected population under the Lenders’ standards, the proposed mitigation and compensation plans and associated budget;
- the available grievance mechanisms;
- any added value and opportunities for benefit-sharing;
- the envisaged consultation process and opportunities and ways in which the public will be able to participate; and
- time and venue of any envisaged public meetings, and the process by which meetings are notified, summarized, and reported.

2.5. Detailed Legislative Review
The Legislation and Policy Framework review for this project is described in Chapter 3. This review addressed social and environmental policies and requirements at the following levels:

- Host Government Agreement,
- National Legislation;
- International legislation and guidelines relevant to the project;
- RDA corporate policy and management systems;
- Archaeology and Cultural Heritage;
- Biodiversity and Sensitive Areas; and
- Social Regulations.

The definition of relevant national and international standards and requirements has ensured that the project development has been assessed against all relevant existing environmental and social regulations and guidelines as well as the project proponent company’s environmental, social, ethical and business policies and standards.

2.6. Establishing Baseline Information for the ESIA Phase
The Scoping report identified several key issues and associated information gaps. To understand the potential impacts of the proposed project with respect to these issues, it was necessary to have a good understanding of the pre-project, or baseline, conditions. The key issues related to a range of environmental and socio-economic attributes including:

- Noise
• Air quality
• Traffic
• Ecology
• Soils
• Cultural heritage
• Contamination of land
• Landscape
• Water resources
• Employment
• Energy
• Land acquisition
• Infrastructure and resources
• Safety
• Community relations

A good understanding of the baseline for these attributes was achieved through two activities:
• Detailed review of all secondary resources (i.e. existing documentation and literature); and
• Undertaking primary (baseline) field studies to collect necessary supplementary data.

2.6.1. Environmental baseline information
A wide array of baseline environmental information applicable to the project was already available from other studies conducted in the project area. However, where data were lacking or out of date, additional environmental baseline data were collected. Environmental baseline data have been collected for the following main topics:
• Flora
• Fauna
• Archaeology
• Geology
• Soils
• Water resources
• Traffic
• Air quality
• Climate and Meteorology
• Noise
• Landscape
• Land Contamination

2.6.2. Socio-economic baseline information
A socio-economic survey was undertaken by local SIA consultants in all the project affected areas. Data was collected by the team using standard methodologies for the collection of qualitative and quantitative information. Semi-structured ‘qualitative’ interviews with individual householders or land users in the corridors was undertaken. In addition, socio-economic data was collected using a ‘quantitative’ questionnaire during interviews with household representatives. The quantitative questionnaires completed with each household covered the following main topics:
• Basic geography;
• Population and Demographics;
• Labour and livelihoods;
• Culture, local administration, decision making and planning;
• Infrastructure, resources and services; and
• Attitudes and perceptions.

In addition to household and community level data, the consultants also collected socio-economic data from Government officials in the ward centres, census data and economic data from CSO and international sources.

2.7. ENVIRONMENTAL AND SOCIAL HAZARD AND RISK ASSESSMENT

Environmental Hazard and Risk Assessment (EHRA) and Social Risk Assessment (SRA) are processes whereby the ESIA team can:
• Confirm its understanding of the project with the design engineers;
• Identify to the design engineer’s areas of potential environmental concern; and
• Jointly develop alternatives so that potential impacts can be avoided where possible, or proactively mitigated.

EHRA/SRAs meetings were conducted with key project engineers at RDA and HSE advisors including other key stakeholders. These meetings provided an opportunity to gather additional information on the project where necessary. Each meeting allowed input from all participants in the identification of potential environmental and social hazards associated with the project activities. In addition, possible alternatives and options were also evaluated.

The process considered each activity that will, or may, occur during the project including:
• Planned routine activities;
• Planned but non-routine activities; and
• Unplanned or accidental activities.

This process culminated in the development of a list of activities and the identification of aspects that may affect the environment or local communities. It is important to note that existing mitigation measures designed into the project were considered during these meetings.

2.8. ENVIRONMENTAL ASPECT AND IMPACT IDENTIFICATION

Once baseline information had been collated, predictions and modelling of potential changes resulting from the proposed Chipata Dry Port and Chipata Bypass Road were conducted. This was undertaken through identification of the projects aspects and impacts resulting from each activity during construction and operation.

2.8.1. Environmental aspect identification

The ISO’s standard for Environmental Management Systems (EMS), ISO 14001 defines an environmental aspect as:

‘An element of an organization’s activities, products or services that can interact with the environment.’

This definition was used in the identification of the proposed project’s environmental, legal and socio-economic aspects. To identify project aspects, all proposed activities were considered in terms of their direct or indirect potential to:
The aspects and impacts of the proposed Chipata Dry Port and Chipata Bypass Road were identified for each activity undertaken and have, in this ESIS report summarized under “Environmental Impacts and Mitigation”.

Impacts may be direct or indirect. Indirect impacts are often produced away from the project as the result of a complex pathway, for example the interruption to groundwater flow may result in vegetation dieback and damage at a remote wetland. In addition, impacts may be further divided into residual, cumulative and trans-boundary. These types of impact are discussed below. During the impact appraisal process, all types of potential impact will need to be identified and addressed.

It is important to note that some elements of the project are expected to occur at a distance from the ROW, for example, construction traffic, camps and construction yards are activities off the ROW and therefore, these have been discussed independently from the ROW units.

2.8.3. Social impact assessment

The evaluation of socio-economic impacts involves the assessment of both quantitative and qualitative data and the use of professional judgment. Quantitative data collected through national sources or local level interviews were assessed and analysed by traditional economic or sociological techniques. However, qualitative data collected using the same methodology was more open to interpretation. In
addition, what is a major impact to one person, one household or one community may be a minor impact to another according to specific personal circumstances. Hence, the results do not lend themselves easily to being ranked or assessed in exactly the same way as environmental data. As a result, the application of assessment language in the evaluation of results tend to be more qualitative in relation to the socioeconomic impacts than in the equivalent environmental sections.

Another difference is the use of the terms Issues and Impacts. Issues can be broadly defined as an element requiring consideration and assessment for which a policy or a specific mitigation strategy may need to be defined. Impacts are elements with a potential direct or indirect impact on a specific household, community or sector of a community. In this sense, the overall management of community relations is an issue, where the need to compensate a household for the removal of his fence would be described as an impact.

In assessing the scale of the issues and impacts, the following factors were taken into consideration:

- The likelihood of the impact;
- Changes to the assets that households depend upon for their livelihoods;
- The duration of this change: short-term disturbance (eg during construction only), long term (eg during operation period) or permanent;
- The manageability of the change and potential for it to lead to further changes beyond the control of the project;
- The ability of the affected people to adapt to changes and thus maintain livelihoods over the long-term; and
- The magnitude of the impact is then viewed from the perspective of those affected, by considering the perceived importance of the impact or perceived impacts in the eyes of communities.

Field survey data were used to help identify specific communities in which an aspect of the project, or potential impact, is likely to be particularly important or to have a particularly acute, or chronic, effect. Where these impacts are quantifiable statistical data have been provided.

2.8.4. Impacted groups
Socio-economic impacts apply and was assessed at the household and community levels. Different households will often be affected in different ways by the same impact. It is therefore necessary to assess variation in impacts between different households. For example, a poor household dependant upon natural resources over which it has no legal rights may not have access to compensation or may be ill equipped to use compensation money in an appropriate way. However, since most of the communities within the project area corridor have a similar economic profile, many of the impacts were assessed at the community level in order to develop further specific community level mitigation measures where appropriate.

Impacts, such as wealth creation or demographic change, were also assessed at a more macro level where appropriate in order to capture the cumulative impacts caused by the whole project as well as its individual parts.

2.8.5. Impact Assessment Significance Criteria
The adequate assessment and evaluation of the potential impacts and benefits that are associated with the proposed Project necessitated the development of a scientific methodology that helps to reduce the subjectivity involved in making such evaluations. A clearly defined methodology was used in order to
accurately determine the significance of the predicted impact on, or benefit to, the surrounding natural and/or social environment. For this the proposed Project was considered in the context of the area and the people that will be affected.

Nonetheless, an impact assessment will always contain a degree of subjectivity, as it is based on the value judgment of various specialists and EIA practitioners. The evaluation of significance is thus contingent upon values, professional judgement, and dependent upon the environmental and community context. Ultimately, impact significance will involve a process of determining the acceptability of a predicted impact to society.

The purpose of impact assessment was to identify and evaluate the likely significance of the potential impacts on identified receptors and resources according to defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise, reduce or compensate for any potential adverse environmental effects, and to report the significance of the residual impacts that remain following mitigation.

There are a number of ways that impacts may be described and quantified. An impact is essentially any change to a resource or receptor brought about by the presence of the proposed Project component or by the execution of a proposed Project related activity.

The nature of the Project may determine whether one needs to assess both routine and non-routine impacts. Non-routine impacts generally relate to accidents and could include oil/chemical/fuel spills, emergency venting of noxious gases, etc. In most cases, it would be sensible to have separate chapters for the assessment of routine and non-routine impacts.

The types of impacts and terminology used in the assessment are outlined in Table 2-3.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact nature</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>An impact that is considered to represent an improvement on the baseline or introduces a positive change.</td>
</tr>
<tr>
<td>Negative</td>
<td>An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.</td>
</tr>
<tr>
<td>Direct impact</td>
<td>Impacts that result from a direct interaction between a planned Project activity and the receiving environment/receptors (e.g. between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).</td>
</tr>
<tr>
<td>Indirect impact</td>
<td>Impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. in-migration for employment placing a demand on resources).</td>
</tr>
<tr>
<td>Cumulative impact</td>
<td>Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.</td>
</tr>
</tbody>
</table>

2.8.6. Assessing Significance

There is no single accepted definition of ‘significance’ and its determination is, therefore, somewhat subjective. However, it is generally accepted that significance is a function of the magnitude of the
impact and the **likelihood** of the impact occurring. It is widely accepted that Impact Magnitude (or Severity) is a function of the extent, duration and intensity of the impact.

The criteria used to determine significance are summarized in Table 2-4. These criteria (specifically Extent and Duration) was customized to suit the proposed project.

<table>
<thead>
<tr>
<th>Extent</th>
<th>Impact magnitude – the degree of change brought about in the environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-site</td>
<td>impacts that are limited to the site boundaries.</td>
</tr>
<tr>
<td>Local</td>
<td>impacts that affect an area in a radius of XX km around the site.</td>
</tr>
<tr>
<td>Regional</td>
<td>impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.</td>
</tr>
<tr>
<td>National</td>
<td>impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences.</td>
</tr>
<tr>
<td>Transboundary/International</td>
<td>impacts that affect internationally important resources such as areas protected by international conventions.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary</td>
<td>impacts are predicted to be of short duration and intermittent/occasional.</td>
</tr>
<tr>
<td>Short-term</td>
<td>impacts that are predicted to last only for the duration of the construction period.</td>
</tr>
<tr>
<td>Long-term</td>
<td>impacts that will continue for the life of the Project but ceases when the Project stops operating.</td>
</tr>
<tr>
<td>Permanent</td>
<td>impacts that cause a permanent change in the affected receptor or resource (eg. removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.</td>
</tr>
</tbody>
</table>
BIOPHYSICAL ENVIRONMENT: Intensity can be considered in terms of the sensitivity of the biodiversity receptor (i.e., habitats, species or communities).

- **Negligible** – the impact on the environment is not detectable. **Low** – the impact affects the environment in such a way that natural functions and processes are not affected.
- **Medium** – where the affected environment is altered but natural functions and processes continue, albeit in a modified way.
- **High** – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.

Where appropriate, national and/or international standards are to be used as a measure of the impact. Specialist studies should attempt to quantify the magnitude of impacts and outline the rationale used.

SOCIO-ECONOMIC ENVIRONMENT: Intensity can be considered in terms of the ability of Project affected people/communities to adapt to changes brought about by the Project.

- **Negligible** – there is no perceptible change to people’s livelihood **Low** - People/communities are able to adapt with relative ease and maintain pre-impact livelihoods.
- **Medium** - Able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
- **High** - Those affected will not be able to adapt to changes and continue to maintain-pre-impact livelihoods.

Impact likelihood – the likelihood that an impact will occur

<table>
<thead>
<tr>
<th>Likelihood</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlikely</td>
<td>The impact is unlikely to occur.</td>
</tr>
<tr>
<td>Likely</td>
<td>The impact is likely to occur under most conditions.</td>
</tr>
<tr>
<td>Definite</td>
<td>The impact will occur.</td>
</tr>
</tbody>
</table>

Once a rating is determined for magnitude and likelihood, the matrix in Table 2-5 was used to determine the impact significance.

Table 2-4: Example of Significance Rating Matrix for Positive and Negative Impacts

<table>
<thead>
<tr>
<th>MAGNITUDE</th>
<th>LIKELIHOOD</th>
<th>Unlikely</th>
<th>Likely</th>
<th>Definite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>Negligible</td>
<td>Negligible</td>
<td>Minor</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>Negligible</td>
<td>Minor</td>
<td>Minor</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>Minor</td>
<td>Moderate</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>Moderate</td>
<td>Major</td>
<td>Major</td>
<td></td>
</tr>
</tbody>
</table>

A colour scale for negative and positive ratings is given in Table 2-6.
Table 2-5: Colour Scale for Ratings

<table>
<thead>
<tr>
<th>Negative ratings</th>
<th>Positive ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>Negligible</td>
</tr>
<tr>
<td>Minor</td>
<td>Minor</td>
</tr>
<tr>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Major</td>
<td>Major</td>
</tr>
</tbody>
</table>

Table 2-7 outlines the various definitions for significance of an impact and is based on the significance rating matrix.

Table 2-6: Significance Definitions

<table>
<thead>
<tr>
<th>Significance definitions</th>
<th>An impact of minor significance is where the magnitude of the impact is low but the likelihood is high or where the magnitude is high, but the likelihood of occurrence is unlikely or likely.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor significance</td>
<td>An impact of minor significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.</td>
</tr>
<tr>
<td>Moderate significance</td>
<td>An impact of moderate significance is where the magnitude is medium to high and the likelihood of the impact occurring is likely or definite.</td>
</tr>
<tr>
<td></td>
<td>An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that “moderate” impacts have to be reduced to “minor” impacts, but that moderate impacts are being managed effectively and efficiently.</td>
</tr>
<tr>
<td>Major significance</td>
<td>An impact of major significance is where the magnitude of the impact is medium to high and the likelihood of the impact occurring is also likely or definite.</td>
</tr>
<tr>
<td></td>
<td>An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the EIA process is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.</td>
</tr>
</tbody>
</table>

Once the significance of the impact has been determined, it is important to qualify the degree of confidence in the assessment. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. Degree of confidence can be expressed as low, medium or high.

2.8.7. Mitigation of Potential Impacts
Mitigation measures are the actions or systems that are used, or that have been proposed, to manage or reduce a potential negative impact or enhance a positive impact.
For the identified impacts, the Project team worked with different stakeholders and RDA to in identifying suitable and practical mitigation measures that are implementable. Mitigation that can be incorporated into the Project design in order to avoid or reduce the negative impacts or enhance the positive impacts have been developed. A description of these mitigation measures have been included within the ESMP.

Mitigation will be an integral part of the project from conceptual design through to construction and operation. Mitigation measures are generally identified to avoid, minimise or remedy the adverse effects of impacts. They may also be used to enhance the positive benefits of the project, especially in relation to social issues. They are developed using professional judgment and experience within the legal, technical, political and economic constraints of the project and may involve policy changes, technical solutions or various forms of compensation. The project team, community and other stakeholders will be consulted to ensure that the mitigation measures are both practical and appropriate.

The approach taken to defining mitigation measures was based on a typical hierarchy of decisions and measures, as described in Box 2.1.

**Box 2.1 Mitigation Hierarchy**

<table>
<thead>
<tr>
<th>THE MITIGATION HIERARCHY FOR PLANNED PROJECT ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Avoid at Source; Reduce at Source</strong></td>
</tr>
<tr>
<td>Avoiding or reducing at source is essentially ‘designing’ the Project so that a feature causing an impact is designed out (eg a waste stream is eliminated) or altered (eg reduced waste volume). Often called minimisation.</td>
</tr>
<tr>
<td><strong>Abate on Site</strong></td>
</tr>
<tr>
<td>This involves adding something to the basic design to abate the impact - pollution controls fall within this category. Often called ‘end-of-pipe’.</td>
</tr>
<tr>
<td><strong>Abate at Receptor</strong></td>
</tr>
<tr>
<td>If an impact cannot be abated on-site then measures can be implemented off-site - an example of this would be to use the stand-by vessel to help control the level of interference with fishing activity.</td>
</tr>
<tr>
<td><strong>Repair or Remedy</strong></td>
</tr>
<tr>
<td>Some impacts involve unavoidable damage to a resource, eg land disturbance. Repair essentially involves restoration and reinstatement type measures, such as base camp closure.</td>
</tr>
<tr>
<td><strong>Compensate in Kind</strong></td>
</tr>
<tr>
<td>Where other mitigation approaches are not possible or fully effective, then compensation, in some Measure</td>
</tr>
</tbody>
</table>

Following assignment of mitigation measures, any impact that will remain will be termed a **residual impact**. Assessment of residual impacts is discussed in the following section.

**2.8.8. Residual Impacts**

Any impacts remaining after mitigation measures have been applied have been considered as residual impacts. Once the mitigation is applied, each impact is re-evaluated (assuming that the mitigation measure is effectively applied) and any remaining impact is rated once again using the process
outlined above. The result is a significance rating for the residual impact. The significance level of the residual impact will be assessed on the basis of:

- The severity/consequence of an impact; and
- The likelihood that the impact will occur.

The significance level is ranked on four levels: **High, Medium and Low, or Beneficial**. These rankings are used for both environmental and social residual impacts.

2.8.9. **Cumulative Impacts**
The December 1998 IFC “Procedure for Environmental and Social Review of Projects” states that that an environmental assessment should also address cumulative impacts. The objective of the cumulative impact assessment is to identify those environmental and/or socioeconomic aspects that may not on their own constitute a significant impact but when combined with impacts from past, present or reasonably foreseeable future activities associated with this and/or other projects, result in a larger and more significant impact(s). Examples of cumulative impacts include:

- The recurring loss of habitat in areas that are disturbed and re-disturbed over an extended period;
- Additional emissions as a processing plant is extended and expanded over a period of time;
- The ongoing development of employment opportunities and enhancement of local labour skills base as successive projects (related or unrelated) come on stream.

Cumulative impacts considered in the ESIA for the proposed Chipata Dry Port and Chipata Bypass Road relate to impacts due to the project itself and other similar projects in the project area.

2.8.10. **Transboundary Impacts**
The EIB’s environmental and social standards stipulate that transboundary impacts (eg impacts that cross the border of Zambia into neighbouring countries) should be considered during the ESIA process. The assessment of transboundary impacts for the proposed Chipata Dry Port and Chipata Bypass Road examined:

- Air emissions;
- Oil spill migration;
- Etc.

The significance of transboundary impacts identified was assessed broadly using the methodology described above.

2.8.11. **Management and Monitoring**
To assist in the management and implementation of the measures designed through the ESIA, and the monitoring of their effectiveness, Environmental and Socio-economic Management and Monitoring Plans have been developed. The plans described the management and monitoring strategies and present generic procedures for their implementation. Further, they identify the roles and responsibilities for implementation and for ensuring that monitoring is undertaken, that the results are analysed and any necessary amendments to practices are identified and implemented in a timely manner.

Monitoring during the construction and operational phases of the project, through the audit of impact predictions and mitigation measures, will ensure:

- That mitigation measures are implemented effectively;
- That mitigation measures are appropriate and if not, that they are amended, or additional measures designed and implemented;
- Compliance with international standards, guidelines and best practice, and RDA corporate policies, and international best practice;
- Assessment of cumulative and residual impacts, so that appropriate measures can be designed if necessary; and
- The perpetuation of the ESIA as an iterative process.
CHAPTER THREE

RELEVANT POLICY, LEGISLATIVE AND PLANNING FRAMEWORK

3.1. GENERAL POLICY AND GUIDELINES

The proposed Chipata Dry Port and the Chipata Bypass Road will be carried within the framework of Zambia’s environmental and other policies and legislation relevant to construction of intermodal transshipment facilities and of intermodal terminals and road. It will also be influenced at various stages in the project cycle by international environmental and social principles and standards and guidelines, and in particular the requirements of the EIB.

The National Policy on the Environment (2009) forms the point from which key elements of recent policy, legislation and regulatory documentation cascade. Environmental protection and pollution control legislation and regulation derive from the Environmental Protection and Pollution Control Act of 1990 and its regulatory material, and its revision as the Environmental Management Act of 2011.

The proposed Chipata Dry Port and the Chipata Bypass Road will be implemented in an area with multiple social and environmental problems, and therefore the project contractor(s) and the proponent will ensure that the mitigation measures to be provided in the ESIS are implemented in order to conserve the environment.

3.1.1. The Transport Policy 2002

The Zambian Government, through the Ministry of Transport and Communication published a Government Transport Policy in May 2002. In Chapter 7 (Maritime and inland Water Transport) under par.7.3 (Strategies) it states:

Based on the above policy objective, Government shall: -

- (f)…Facilitate the commercialization of selected harbours and dry port ports to enhance rapid movement of goods…..”
- (g)...encourage cross border marine traffic.”

Further to the Government Transport Policy, a policy directive “Guidelines for the Establishment of inland Dry Ports in Zambia” was published on the 5th of August 2008. These guidelines deal with all aspects of the establishment of dry ports, including the basic requirements as well as the “Model and Recommended Technical Approach and Methodology for the establishment of Dry Port in Zambia”.

The Guidelines also refer to transport corridors and the importance to link the Zambian economy to the transport corridors via inland dry ports.

In terms of the road sector, GRZ has embarked on a review of the National Transport Policy to evaluate whether ongoing road sector programmes and projects are fulfilling the national development objectives. From 2011, Government implemented a robust road development programme aimed at rehabilitating and upgrading the road infrastructure network countrywide which was guided by the National Transport Policy of 2002.
The rationale for reviewing the National Transport Policy is to reposition the transport sector to respond to emerging issues in the domestic and international environment. It is hoped that this will develop the transport sector holistically by undertaking an integrated approach that encompasses all transport modes in the development agenda.

The policy aims to facilitate sustainable growth and development of the transport sector, in order to ensure the provision of efficient, safe, gender and environmentally friendly, quality and adequate services, for the benefit of the people of Zambia. Implementation of the project will be in accordance with the requirements of the policy.

This highlights sustainable development as its core concept. NEP states that Zambia is committed to sustainable development in the short, medium and long-term. The NPE stresses the importance of Environmental Impact Assessment in the implementation of the Environmental National Action Plan. It asserts that although it is important to tackle immediate environmental problems, precautionary, anticipatory and preventive approaches, used in EIAs, are the most effective and economic measures in achieving environmentally sound development.

With specific regard to the transport sector, NPE in section 51 focuses on the following aspects:
- Improvement in mass transport systems to reduce fuel consumption, traffic congestion and pollution;
- Control and minimization of transport emission gases, noise, dust and particulates;
- Disaster/spill prevention and response plans and standards shall be formulated for transporting hazardous materials.

3.1.3. The Zambia Land Policy 2015
Land in Zambia is vested in the Republican President who holds it in trust for and on behalf of the people. The President may, through the Commissioner of Lands, alienate land to citizens or non-citizens. The vestment of land in the Presidential is one of the contentious clauses in the post-multiparty democratic dispensation. Therefore, the vision of the National Land Policy is to put in place, an efficient and effective land administration system that promotes security of tenure, equitable access and utilization of land for the sustainable development of the people of Zambia.

The current Law does not discriminate against anyone on the basis of gender. The Government has, however, recognised that women still lack access to land in comparison to their male counterparts. The reason for this lies in customary practises. That Land Act CAP184 of the Laws of Zambia recognises customary laws and it is recognised that this may further perpetuate the discriminatory practises. In this regard, the draft policy recommends that thirty percent (30%) of the land, which is to be demarcated and allocated, is to be set aside for women and other vulnerable groups.

The policy seeks to redress gender imbalances and other forms of discrimination in land tenure by providing an enabling environment for women, people with special needs and disadvantaged groups to own land.

Relevance: While the land for the construction of the Chipata Dry Port is owned by the Zambia Railways, which is a department within the Ministry of Transport and Communication and therefore issues of land acquisition does not arise, the Bypass road project will need to acquire land for the road alignment and may further need to
acquire land for contractors’ camp setting and material borrow areas which are likely to be outside the road reserves. The Land Policy provides for “full fair and prompt compensations” when land is acquired.

**Compliance:** The ESIA study has made recommendations on the steps that should be followed by RDA in acquiring land for the Bypass road. A Full Resettlement Action Plan (RAP) has therefore been prepared for the project to ensure that the project complies with the requirements of the Land Policy.

This policy demarcates and reserves in perpetuity for the benefit of the present and future inhabitants, sufficient forested land and land capable of afforestation, to ensure environmental stability and maintenance of the ecological balance including atmosphere equilibrium which is vital for sustenance of all life forms, human, animal and plant.

With regards to ESIA, the policy calls for environmental assessment of any investment which would convert forest land to other land use or may cause potential damage to forest environment.

**Relevance:** The two components of the project are identified as a relevant development activity under this policy and will definitely end up using forest products in form of timber for works. This will be especially the case for the Chipata Dry Port, which shall involve a lot of structural works.

**Compliance:** The requirements of protecting the urban trees even the forests outside the working areas alignment corridors will be observed. The developer will ensure compliance with any piece of legislation relevant to this project under this Policy. If any issues regarding forest management that directly affect the project area arise, RDA will closely liaise with the District Forest Office.

**3.1.5. The National Water Policy 2010**
The National Water Policy of 2010 aims to promote a sustainable water resources development with a view to facilitate an equitable provision of adequate quantity and quality of water for all competing groups of users at acceptable costs and ensuring security of supply under varying conditions. This entails establishing a well-defined institutional structure that will achieve the intended policy objectives.

Water policy issues particularly in water resources management underscore the disaster management from accidental pollution of water sources (Clause 4.8.4). The main objective is to protect against hazards associated with pollution of water sources.

**Relevance:** The construction of the Chipata Dry Port and the Chipata Bypass road, have if not executed with great care, potential to result into pollution but also high abstraction of water resources around the vicinity for various uses.

**Compliance:** This ESIS Report has identified mitigation measures aimed at preventing potential pollution of water sources in line with the Water Policy, and RDA through the contractors will need to strictly adhere to the recommendations made in the ESMP for the current project.

**3.1.6. Resettlement Policy 2010**
The Department of Resettlement, under the Office of the Vice President, has developed a Policy on resettlement that will provide guidance and co-ordination in all sectors on both development induced resettlement and resettlement necessitated through projects and natural disasters.
The National Resettlement Policy (NRP) aimed at helping to provide a mechanism for dealing with both voluntary and involuntary resettlements.

The NRP has set out Government objectives, principles and measures in dealing with resettlement as a strategy for rural development and as a response to internal population displacement.

The policy focuses on employment creation, access to public social services, increased food security, security of land tenure, stimulating economic growth in rural areas and compensation and resettlement assistance for internally displaced persons.

Relevance: While the land for the construction of the Chipata Dry Port is owned by the Zambia Railways, which is a department within the Ministry of Transport and Communication and therefore issues of land acquisition does not arise, the Bypass road project will need to acquire land for the road alignment and may further need to acquire land for contractors’ camp setting and material borrow areas which are likely to be outside the road reserves. The Resettlement Policy provides for “full fair and prompt compensations” when people are affected by developments such as the current project.

Compliance: A full Resettlement Action Plan (RAP) has been prepared in line with the Resettlement Policy.

This is a policy which provides for the framework, direction and general principles in the national response interventions in the prevention, care and support of those infected and affected by the epidemic and mitigation of its impact. The specific objectives of the policy are:

- Prevention of transmission of HIV/AIDS;
- HIV/AIDS Testing through voluntary testing with pre-and-post-test counselling;
- Care for people living with HIV/AIDS (PLHAs);
- To strengthen the role of all the sectors, public, private, NGOs, faith groups, PLHAs, CBOs and other specific groups to ensure that all stake holders are actively involved in HIV/AIDS work and to provide a framework for coordination and collaboration;
- Research on HIV/AIDS; and
- To create legal framework by enacting a law on HIV/AIDS with a view to establishing multi-sectoral response to HIV/AIDS and to address legal and ethical issues in HIV/AIDS and to revise the legal situation of families affected by HIV/AIDS in order to give them access to family property after the death of their parent(s).

Other objectives include:

- To monitor the efforts towards community mobilization for living positively with HIV/AIDS in order to cope with the impact of the epidemic while safeguarding the rights of those infected or affected directly by HIV/AIDS in the community;
- To identify human rights abuses in HIV/AIDS and to protect PLHAs and everyone else in society against all forms of discrimination and social injustice;
- To provide appropriate effective treatment for opportunistic infections at all levels of the health care system;
- To work closely with the Ministry of Home Affairs, NGOs and Faith Groups in the fight against drug substance abuse that increases the risk of HIV transmission; and
• To prohibit misleading advertisements of drugs and other products for HIV/AIDS prevention, treatment and care.

Relevance: During construction, some workers may be involved in casual sex which may lead to contraction or spreading the HIV/AIDS including STI/STD. The operation phase of the project will see an increase in the number of trucks at the dry port and some truck drivers will end up spending nights within Chipata town while they wait for clearance. If not sensitized, some of these may get involved in casual sex with consequences of contraction or spreading the HIV/AIDS including STI/STD.

Compliance: In order to contribute towards observing the objectives of the National Policy on HIV/AIDS, the project Contractor will have to have HIV/AIDS programme aimed at promoting awareness of HIV/AIDS among its service providers and its employees, despite that the HIV/AIDS knowledge is known to most of the people along the project road corridor.

3.1.8. The National Employment Policy
The policy aims at:
• Preparing the conducive environment for the unemployed to employ themselves by directing more resources to the self-employment sectors;
• Identifying potential areas for employment and to lay down strategies of how to utilise such areas in promoting employment in the country;
• To prepare a special procedure for coordination and developing sources of employment including creation of a body that will supervise implementation of the employment policy;
• Identify and elaborate on the status and roles of various stakeholders in promoting and sustaining employment;
• To strengthen (through removal of bottlenecks) the relationship between formal sector and that of self-employment;
• To develop the self-employment sector in rural areas so as to reduce the rate of migration to urban areas; and
• To ensure that activities initiated on self-employment act as a basis for development of the economy and are an inspiration for the culture of self-reliance, etc.

Compliance: In view of the Government efforts in development of National Employment Policy, the Project Proponent intends to supplement these efforts by providing some few employments during the project implementation. During this period, transfer of technology can be attained among those who will be employed and after their contract terms they can engage in self-employment activities in the informal sector, especially in construction sector with abundant wealth which has not been exploited significantly.

The key objective of this policy is to provide guidelines that will ensure that gender sensitive plans and strategies in all sectors and institutions are developed. While the policy aims at establishing strategies to eradicate poverty, it puts emphasis on gender quality and equal opportunity of both men and women to participate in development undertakings and to value the role-played by each member of the society.

Relevance: The proposed project will require the services of all genders and RDA has adopted the policy through provision of equal opportunities to both men and women in road construction works and related activities.
Compliance: The construction of the Chipata Dry Port and the Chipata Bypass Road shall also ensure that women will be adequately involved at all levels of project planning to implementation.

3.1.10. The Mineral Policy of Zambia

The mineral policy was specifically set for the mineral sector aimed to attract and enable the private sector to take the lead in exploration, mining development, mineral beneficiation and marketing. The policy identifies the role of public sector as to stimulate and guide private mining investment by administering, regulating and promoting the growth of the sector. The policy has put forward some objectives for the mineral sector as follows:

- To estimate exploration and mining development;
- To regulate and improve artisanal mining;
- To ensure that mining wealth supports sustainable economic and social development;
- To minimize or eliminate the adverse social and environmental impacts of mining development;
- To promote and facilitate mineral and mineral-based products marketing arrangement;
- To alleviate poverty especially for artisanal and small scale miners

With specific regard to the infrastructure development sector, section 3.3.8 of the policy stresses on the creation and maintaining of reliable social and economic infrastructure facilities, such as transport; water supply; power supply; communications; education and health services; and recreation are vital for the mineral sector’s development.

Moreover, section 3.3.12 of the Zambian mineral policy emphasises on the integration of environmental and social concerns into mineral development programmes as a means for sustainability of mining sector. As mineral extraction involves different complex processes which directly affect the environment, the policy was set to address all issues due mineral development with respect to the environment. Some of issues addressed are to: reduce or eliminate the adverse environmental effect of mining; improve health and safety conditions in mining areas; and address social issues affecting women, children and the local community.

Relevance: The proposed construction of the Chipata Dry Port and the Chipata Bypass Road will require construction materials such as gravel, aggregates and sand or which needs to abide with Mineral Policy in mining areas for gravel, stones, sand and alike.

Compliance: During the project implementation, all relevant permission required for gravel, stones and sand extractions will be obtained from the Mines Department in line with the Mineral Policy of Zambia.

3.2. ZAMBIAN ENVIRONMENTAL LEGISLATION

From 1990, Zambia’s environmental legislation was based on the Environmental Protection and Pollution Control (EPPCA) Act 12 of 1990, its associated regulatory frameworks contained in Statutory Instrument No. 28 of 1997 and the EPPCA of 1999 and on 15th April 2011, the EPPCA was repealed and replaced by the Environmental Management Act No. 12 (EMA) of 2011. This new Act was enacted with the main objective of continuing the existence of the Environmental Council of Zambia and renaming the institution the Zambia Environmental Management Agency (ZEMA). It sets out the framework and procedures for conducting of strategic environmental assessments of proposed policies, plans and programmes likely to have an impact on environmental management.
Part III, Section 29 of the EMA, and its regulatory framework determine the legal obligations for developers wishing to implement projects, and the procedures they are required to follow. Section 30 of the EMA – outlines the regulations relating to environmental assessments. These include among other requirements, provision of the categories of projects that are considered to have an effect on the environment; the procedural requirements for public hearings, strategic environmental assessments, environmental impact assessments and comprehensive mitigation plans; the information to be included in an environmental impact assessment.

Sections 3 to 7 of Statutory Instrument 28 of 1997 to the EPPCA – the Environmental Impact Assessment Regulations - set out the requirements and procedures for Environmental Project Briefs (EPB) and Environmental Impact Assessments (EIA) and remains in force under the new EMA.

Section 3 (1) of the regulations states that:
“a developer shall not implement a project for which a project brief or an environmental impact statement (EIS) is required under these regulations, unless the project brief or an environmental impact statement has been concluded in accordance with these regulations and ZEMA has issued a decision letter”.

Relevance: These Regulations are relevant to the current project since the length of the project road is more than 10km while the footprint of the dry port will be more than 10,000 square meter, and therefore, would require to be subjected to a full EIA.

Compliance: This ESIS Report has been prepared and submitted in compliance to the requirement of the EIA regulations. This EIS Report has presented a summary of the baseline studies conducted in the project area in line with the requirements of the EIA Regulations, and contains an Environmental and Social Management Plan (ESMP).

3.2.1. Specific Legislation Influencing this Project

3.2.1.1. Proposed Zambia Ports Authority Act of 2010
Zambia has not yet promulgated the required legislation to underpin a dry port as described above. However, legislation has been proposed to deal with this issue in the form of the proposed Zambia Ports Authority Act of 2010. The proposed act covers inland dry ports as it specifically refers to such ports in the definition of a “Port” in Part 1, Definitions Section 1. The proposed act also stipulates in section 58 (i) that: “(No) person may after the commencement of this Act, operate –a) A port terminal; or b) Port Facility, otherwise than in terms of a safety license issued by the Maritime and Inland Waterway Authority. The proposed act also provides for a “Maritime and Inland Waterway Authority” to oversee the process of establishing a dry port – especially under a concession11.

3.2.1.2. The Public Roads Act, CAP 12 of 2002
The Public Roads Act provides for the establishment of the Road Development Agency responsible for the planning, management and coordination of the road network in Zambia. Part III of this law prohibits road infringement by stipulating dimensions of road reserves within which no construction of any structure is allowed.

Part II of the Act and Clause 21 gives the width of any road or class of roads and states that: (2) Except as otherwise provided the width referred in subsection (1) shall be-
• For trunk road, one hundred meters

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• For a main road, sixty meters;
• For a district road, thirty six meters;
• For a branch road, thirty six meters;
• For an urban road, thirty six meters;
• For a park road, eighteen meters; or
• For any other class of road, eighteen meters.

Relevance: The proposed bypass road in Chipata will be an urban road which will require a road reserve of 36m. The project plans to relocate all structures and properties found within this proposed road reserve (i.e. 18m on both side of the center line).

Compliance: RDA has prepared a Full Resettlement Action Plan (RAP) which has captured all assets within the proposed road reserve so that owners of such assets can be compensated for the relocation of their properties outside the road reserve.

3.2.1.3. The Road Traffic Act No. 11 of 2002
The Road Traffic Act No. 11 of 2002 provides for the establishment of the Road Transport and Safety Agency (RTSA) and defines its functions. It also provides for a system of road safety and traffic management in Zambia.

Relevance to the Project: During the construction phase, the project is expected to be transporting materials and will be operating heavy construction machineries. This has potential to cause accidents hence traffic control measures have to be implemented in accordance with the provisions of the Act. During operation phase, over-speeding may increase as a result of the “new road fever” which may result in accidents and therefore measures will have to be implemented in line with the Act.

Compliance: The designs for the Chipata Bypass Road will include production of a Road Safety Report which is expected to highlight measures to be implemented in order to improve on issues of safety in line with the Act.

3.2.1.4. The Environmental Management (Licensing) Regulations (S.I No 112 of 2013
The Environmental Management (Licensing) Regulations is a consolidation of the following Regulations:

1) Air Pollution Control
These are guidelines set out to assess the quality of ambient air in order to safeguard the general health safety or welfare of persons, animal and plant life, or property affected by the workers, industrial or business activities undertaken by an operator.

Relevance: Vehicles and construction machinery’s tail pipe emissions are anticipated from the proposed Chipata Dry Port and the Chipata Bypass Road. However, these will be limited to a small number of construction vehicles and therefore no licensing requirement is immediately required.

Compliance: RDA through its contractors will ensure that the general health of its workers is safeguarded, particularly during the dust-generating construction phase and in confined spaces.

2) Waste Management (Regulations 10-15) of SI 112 (2013):
 Licensing of waste transporters and waste disposal sites; these regulations provide for ZEMA to regulate the transportation and disposal of waste.
**Relevance:** The proposed Chipata Dry Port and the Chipata Bypass Road will result in the generation of solid waste during the construction phase, the handling and disposal of which will be subject to these regulations and where the volume of household waste exceeds 45kg per week a license will be required.

**Compliance:** RDA through its contractors shall comply with requirements of these regulations by using services of a licensed company to dispose of solid waste and this will apply to the project area in total.

3) **The Hazardous Waste Management Part IV (Regulations 18-30) of SI 112 (2013):**
These regulations provide for the control of generation, collection, storage, transportation, pre-treatment, treatment, disposal, export, import and transboundary movement of hazardous waste as listed in Fifth Schedule or any waste specified in Sixth Schedule, if that waste exhibits characteristics found in the Seventh Schedule to these Regulations.

**Relevance:** The proposed Chipata Dry Port and the Chipata Bypass Road may generate certain types of waste during the construction phases the handling and disposal of which will be subject to these regulations: e.g. empty and chemical (e.g. termidan) containers, used oil / lubricants from the emergency maintenance of machinery; soiled materials from accidental spills.

**Compliance:** RDA through its contractors will comply with the requirements of these regulations during the storage, accumulation, collection, transportation, pre-treatment and disposal of waste resulting from the aforementioned materials.

4) **Noise Regulations**
This provision is made by the EMA for ZEMA to set up noise emission standards, procedures for noise measurement, application of appropriate noise abatement measures and advise on noise pollution abatement measures. Currently ZEMA is in the process of developing regulations and noise emission standards.

**Compliance:** The project should abide by international acceptable noise standards until Zambian standards are established, but no major sustained noise emissions are anticipated.

3.2.1.5. **The Zambia Wildlife Act, Act Number 14 of 2015**
This Acts provides for the winding up of the affairs of the Zambia Wildlife Authority and establishes the Department of National Parks and Wildlife in the Ministry responsible for tourism. The Act further:

- Provide for the establishment, control and management of National Parks, bird and wildlife sanctuaries and for the conservation and enhancement of wildlife eco-systems, biological diversity and objects of aesthetic, pre-historic, historical, geological, archaeological and scientific interest in National Parks; provide for the promotion of opportunities for the equitable and sustainable use of the special qualities of public wildlife estates;
- Provide for the establishment, control and co-management of Community Partnership Parks for the conservation and restoration of ecological structures for non-consumptive forms of recreation and environmental education; provide for the sustainable use of wildlife and the effective management of the wildlife habitat in Game Management Areas;
- Provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on Wetlands of International Importance especially as Waterfowl Habitat, the Convention on Biological Diversity, the Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora and other international instruments to which Zambia is party;
• Repeal the Zambia Wildlife Act, 1998; and provide for matters connected with, or incidental to, the foregoing.

Relevance: The ESIA assessment has given some indication that the sites proposed for the Chipata Dry Port and the Chipata Bypass Road are void of significant wildlife, especially mammals. This is particularly so because the sites are not located in/close to a National Park or Game Management Area (GMA). In addition, the area is located in areas that have undergone significant changes due to human activities and cannot support any wildlife.

Compliance: In addition, the consultant has made recommendations to the RDA and its contractors on how the agency can implement appropriate measures to promote and enhance conservation aims in general.

3.2.1.6. The Forest Act, Act Number 4 of 2015
The Act provides for the conservation and sustainable use of forests and trees, management of forest ecosystems and biological diversity, as well as providing protection to watersheds.

This Act deals with the protection of forests and forest products in forest reserves and the restrictions and prohibitions in forest reserves. Any contravention of the restrictions and prohibition is considered an offence under this act and subject to enforcement.

The law also requires licences or permits for certain activities undertaken within the national or local forest reserves, such as, among others, felling or removing trees, harvesting forest produce, entering a forest reserve for the purpose of tourism or camping, mining activities, occupation or residence within the reserve, cultivation, erecting any structures.

Relevance: The Chipata Dry Port and the Chipata Bypass Road do not fall within any protected national or local forest area. Therefore, this policy will not directly affect the project, but cognisance should be taken of the context of sustainable forest management and climate change mitigation in the draft Policy.

Compliance: The requirements of protecting the urban trees even the forests outside the project areas will be observed. The developer will ensure compliance with any piece of legislation relevant to this project under this Act. If any issues regarding forest management that directly affect the project area arise, RDA will closely liaise with the District Forest Officer.

3.2.1.7. The Water Resources Management Act No. 21 of 2011
The Water Resources Management Act of 2011 is recent legislation that repeals and replaces the Water Act, 1949. This Act among other requirements provides for the:

• The establishment of a Water Resources Management Authority that controls and manages water resources directly or through Catchment Councils and catchment management plans, and otherwise has responsibility for the management, development, conservation, protection and preservation of the water resource and ecosystems;
• Equitable, reasonable and sustainable utilization of the water resource;
• Constitution, functions and composition of catchment councils, sub-catchment councils and water user associations; and
• For international and regional cooperation in, and equitable and sustainable utilization of, shared water resources.

The Act also sets standards for receiving waters and effluent.
Relevance: It is anticipated that the proposed Chipata Dry Port and the Chipata Bypass will use water possibly drawn from existing water surface within the project area such as the Lutembwa and Chipata Dams

Compliance: The contractor and the proponent (RDA) will observe all the requirements including use of the abstracted water for construction activities and ensure that no pollution or mismanagement of the existing water resources and thus respect and maintain the existing system of water rights. In addition, RDA shall ensure that the contractor obtain necessary water rights permit from the Water Resource Management Authority (WARMA) as required by the act.

3.2.1.8. The National Heritage Conservation Act (CAP 173) of 1989
The Act provides for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, pre-historical, archaeological or scientific interest.

In part V Section 33. The Act requires that no person shall, without the written consent of the Commission
1) Alter, remove, destroy, damage, excavate or export as the case may be, from Zambia, any ancient heritage or relics or part of it, or
2) Disfigure, destroy, remove, alter or damage any national monument, memorial tablet, plague, seal or sign erected or affixed by the Commission

Relevance: Activities of the project during construction will involve digging, which may in the process lead to artefacts or objects of archaeological significance being unearthed.

Compliance: RDA will cease its operation in the event of any discoveries and will immediately inform NHCC and follow any instructions that may be issued by the Commission.

3.2.1.9. The Urban and Regional Planning Act of 2015:
This provides for development, planning and administration principles, standards and requirements for urban and regional planning processes and systems; provide for a framework for administering and managing urban and regional planning and establish a democratic, accountable, transparent, participatory and inclusive process that allows for involvement of communities, private sector, interest groups and other stakeholders in the planning, implementation and operation of human settlement development. To ensure sustainable urban and rural development by promoting environmental, social and economic sustainability in development initiatives and controls at all levels of urban and regional planning.

Relevance: The proposed Chipata Dry Port and the Chipata Bypass Road will all be constructed within the Chipata City Council jurisdiction and therefore the project developer are required to obtain land use change permits from the Chipata City Council. The Act is also relevant to the current project in that the contractor would need permission from authorities for construction camps and for sources of materials.

Compliance: RDA will obtain necessary approvals from the Chipata City Council in line with the Act. The consultant will during the Resettlement Action Plan (RAP) preparation, will engage various stakeholders such the Chipata City Council to ensure that the project does not lead to unplanned settlements and development. In addition, the activities of the proposed Chipata Dry Port and the Chipata Bypass Road will ensure observance of the requirements of land use planning and will abide to all such other development as it may be guided from time to time during the course of the project execution.
3.2.1.10. Local Government Act Amendment Act No.17 of 2016
Local Authorities are mandated under this Act to monitor the application of environmental regulations and to ensure control and protection of the environment in general. The local authority (Chipata City Council) has local responsibilities to ensure the proposed project meet acceptable environmental and social standards. These responsibilities are further emphasised by the EMA.

**Relevance:** Implementation and operation of the development is subject to the procedures laid out by the Chipata City Council.

**Compliance:** RDA and its contractors will adhere to all applicable by-laws. The Chipata City Council has significant responsibilities under the new Act to maintain environmental standards and regulations.

3.2.1.11. The Public Health Act, Chapter 295 of the Laws of Zambia
This act, as amended from time to time, has the objective of preventing and suppressing diseases and generally regulates all matters connected with public health in Zambia. This law may be read together with the Local Government Act, Cap 281 of the laws of Zambia.

The Public Health Act empowers a Council to prevent diseases and pollution dangerous to human health and to any water supply for domestic use.

**Relevance:** The Act is relevant in respect of disease outbreaks such as bilharzia, cholera etc, due to poor sanitation conditions.

**Compliance:** The developer will ensure the highest standards of hygiene at the site and all its operational areas and this will include proper disposal of waste, oils and sewage from workers compound in accordance with the Public Health Act.

The Employment Act is frequently up-dated and provides legislation relating to the employment of persons and makes provision for the engagement of persons on contracts of service and for the enforcement of contracts. It also makes provision for the protection of wages of employees.

The Employment Act has added a chapter on HIV and AIDS which compels employers to respond to HIV and AIDS in the workplace, recognising that HIV and AIDS is a disease that undermines production. The Act also makes it mandatory by law for companies to formulate comprehensive HIV/AIDS Workplace Policies.

The associated Employment of Young Persons and Children’s Act regulates the employment of young persons and children (see also Multilateral Agreements).

Other legislation that may be applicable with regards to regulations governing general employment is the Minimum Wages and Conditions of Employment Act (Cap. 276) specifically Statutory Instrument (SI) 57 of 2006. This governs wages and conditions of employment for the general worker. The Minimum Wages and Conditions of Employment Act apply to all employees (including casual workers) in Zambia.

**Relevance:** This Act is relevant to the project because the project will employ workers during construction phases of the project and this Act is the principal piece of legislature governing employment rights in Zambia.
Compliance: RDA through the contractors will be required to adhere to the provisions of the Employment Act and its HIV/AIDS provisions, and to minimum wage provisions, as they will actively engage employment of local people in the area.

3.2.1.13. Workers’ Compensation Act Chapter 271 of the Laws of Zambia, 1999
An Act to revise the law relating to the compensation of Workers for disabilities suffered or diseases contracted during the course of employment; to provide for the establishment and administration of a Fund for the compensation of workers disabled by accidents occurring, or diseases contracted in the course of employment; and to provide for matters connected with and incidental to the foregoing.

Relevance: This Act is relevant to the project because workers in general, especially construction workers will be at higher risk of having disabilities or contracting diseases due to the nature of their work environment.

Compliance: RDA shall ensure that the contractor and its management comply with regulations under this Act and shall ensure that the contractor is up to date with compliancy.

The Factories Act is being constantly up-dated and addresses all issues related to factory, or engineering construction activities involving more than 10 and 25 employees, respectively. The Act includes regulatory coverage on occupational and industry health and safety, HIV/AIDS programmes, electricity supply and operation and the management and use of hazardous industrial substances.

Relevance: The two contractors to work on the Chipata Dry Port and the Chipata Bypass Road will have crushing plants and mixing plants and the regulation may become applicable during construction.

Compliance: The ESIA Team has proposed measures in the ESMP and RDA shall ensure that contractors comply and implement the measures in line with the requirement of the act during construction.

3.2.1.15. The Occupational Health and Safety Act; 2010:
An Act to establish the Occupational Health and Safety Institute and provide for its functions; provide for the establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work; provide for the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work; provide for the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work; and provide for matters connected with, or incidental to, the foregoing.

This act sets provisions for the safety, health and welfare of persons at work in factories and other places of work. It is also meant to provide for the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with activities of persons at work; and to provide for connected matters.

Relevance: The proposed Chipata Dry Port and the Chipata Bypass Road will eventually be a place of work to be registered as per OSHA regulations that govern the places of work and observe all safety and health practices at work sites by its consultants, contractors and sub-contractors. In addition, this Act is relevant to the project because it provides for dissemination of information on occupational health and safety at the work place, and also provides for compensation of workers in case of accidents.

Compliance: The ESIS report contains safety measures aimed at enhancing the health, safety and welfare of all workers to be employed by the project.

The Act provides for the establishment of the HIV/AIDS/STI/TB Council whose functions include the coordination and provision of support to development, monitoring and evaluation of multi-sectoral response for the prevention and combating of the spread of HIV/AIDS/STI and TB in order to reduce the personal, social and economic impacts of HIV/AIDS/STIs and TB.

The Act provides for prevention, treatment, care, support and control of HIV and AIDS, for promotion of public health in relation to HIV and AIDS. HIV and AIDS education in workplace, the Act requires that every employer in consultation with the ministry shall establish and coordinate a workplace programme on HIV and AIDS for employees under his control and such a programme shall include provision of gender responsive HIV and AIDS education, distribution of condoms and support to people living with HIV and AIDS.

**Relevance:** This Act is relevant to the current project in that the construction workers may indulge in casual sex with risks of contracting STI/STDs.

**Compliance:** Project proponent will highly observe the requirement of this Act during project implementation.

3.3. MULTILATERAL AGREEMENTS

Zambia has ratified a number of multilateral Environmental Agreements (MEAs) and consequently has duties under those agreements. The most relevant MEAs to the proposed Chipata Dry Port and Chipata Bypass Road are:

1. **African Convention on the Conservation of Nature and Natural Resources (Algiers,1968), (Maputo, 2003):** The objective of the convention is to encourage individual and joint actions for the conservation, utilization and development of soil, water, flora and fauna for the present and future welfare of mankind. This must be done from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.

   **Relevance to the Project:** Soil protection, water protection and protection of flora and fauna is an obvious positive impact of the project. This explains the relevance of the convention to the project.

   **Compliance:** RDA and its management will comply with regulations under this convention.

2. **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):** the objective of this agreement is to ensure that international trade of wild flora and fauna does not endanger their existence. The convention is customized through the Zambia Wild Life Act No. 12 of 2015 and the implementing body is Zambia Wildlife Authority.

   **Relevance to the Project:** The project area of influence extends to green field sites which may be home to endangered flora and fauna species that require protection hence the relevance. The project will enhance the flora and fauna species.

   **Compliance:** RDA and its management will comply with regulations under this convention.

3. **Kyoto Protocol to the United Nations Framework Convention on Climate Change:** The aim is to further reduce greenhouse gases by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries.
Relevance to the Project: Greenhouse gases lead to climate change and there are worldwide campaigns especially for major investments to reduce emissions of greenhouse gases. Some measures include carbon footprint calculation and sequestration. Petroleum fuels shall be used at the proposed project during construction and land shall be cleared. These activities contribute to the overall carbon footprint for the area. This protocol is therefore relevant to the project.

Compliance: RDA and its management will comply with regulations under this convention.

4. Convention on Biological Diversity (CBD): The major aim of the CBD is to effect international cooperation in the conservation of biological diversity and to promote sustainable use of living natural resources worldwide. It also aims at bringing about sharing of the benefits arising from utilization of natural resources. A number of plans in this convention fall under the Departments of Agriculture, Forestry, Fisheries and National Parks and Wildlife Department.

Relevance to the Project: The proposed wildlife conservation measures in this report are also aimed at attaining requirements of the CBD, hence the relationship.

Compliance: RDA and its management will comply with regulations under this convention.

5. Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal: The objective is to control import and export of hazardous wastes. It also aims at ensuring that any transboundary movement and disposal of hazardous waste, when allowed, is strictly controlled and takes place in an environmentally sound and responsible manner.

Relevance to the Project: Used hydrocarbons shall be generated and disposed of and this shall be done in accordance with best environmental management practices. Through already customized laws such as the Hazardous Waste Management Regulations, provisions of the convention are applicable.

Compliance: RDA and its management will comply with regulations under this convention.

6. Convention on Migratory Species and the African –Eurasian Water Bird Agreement: Just like other migratory species, water birds cross several international borders during their migration, facing a wide range of threats. Without international cooperation, conservation efforts by one country can be meaningless if these birds are not protected in another country. Under this convention, a ‘flyway approach’ means that all threats water birds face during their journey are identified and addressed. Major threats include habitat destruction. To conserve these species, efforts such as The “African Eurasian Migratory Water bird Flyways” have been implemented.

Relevance to the Project: As already stated, the project area of influence includes green field areas, with possibilities of these protected birds flying to the site. Therefore, taking note of the provisions of this agreement is necessary.

Compliance: RDA and its management will comply with regulations under this convention.

7. The United Nations Framework Convention on Climate Change (UNFCCC): It was signed by Zambia in 1992. The objective is to achieve stabilization of greenhouse gas concentrations in the atmosphere. Zambia recognizes that the largest source of one of the main greenhouse gases, carbon dioxide, is from burning wood fuel and the use of coal and oil.
Relevance to the Project: The proposed project shall contribute to greenhouse gases although at a minimal rate. Observing best practices in reducing greenhouse gases is necessary to the project hence the relationship.

Compliance: RDA and its management will comply with regulations under this convention.

The above environmental laws, policy and regulations, as well as conventions and protocols, together provide the environmental legal framework which the consultant has reviewed in detail in order to advise the RDA on compliance requirements during project implementation.

3.4. EUROPEAN INVESTMENT BANK (EIB) ENVIRONMENTAL AND SOCIAL PRINCIPLES AND STANDARDS
All operations located in the EU, Candidate and potential Candidate countries, which are likely to have significant effects on the environment, human health and well-being and may interfere with human rights, will be subjected to an assessment according to the EU EIA Directive 2011/92/EU. These standards are applied to the current project in addition to the Zambian policy and legal frameworks as described above.

In conducting the environmental and social assessment of impacts of risks, the EIB has a set of Environmental and Social Standards, which must be applied to and satisfied. These standards set the policy context for the protection of the environment and human well-being. The following brief overview of the standards outlines RDA’s responsibilities in its application to EIB projects:

3.4.1. Assessment and management of environmental and social impacts and risks
This first standard underscores the importance of managing environmental and social impacts and risks throughout the life of an EIB project through the application of the precautionary principle. The standard’s requirements allow for the development of an effective environmental and social management and reporting system that is objective and encourages continual improvements and developments. The standard includes requirements for stakeholder engagement and disclosure throughout the life of the project.

Relevance: The proposed Chipata Dry Port and the Chipata Bypass Road requires a full environmental and social assessment in order to establish the level of impacts and risks the project will pose to surrounding communities.

Compliance: During the detailed studies for the baseline, the consultant through stakeholder consultation and professional investigations established all the potential impacts and risks the project is anticipated to have in the project area. In addition, an Environmental and Social Management Plan (ESMP) has been produced as part of the Environmental and Social Management System for the project.

3.4.2. Pollution prevention and abatement
This second standard is aimed at avoiding and minimizing pollution from EIB-supported operations. It outlines a project-level approach to resources efficiency and pollution prevention and control in line with the best available techniques and internationally disseminated.

Relevance: The proposed proposed Chipata Dry Port and the Chipata Bypass Road can be a source of emissions into air, water and soils, generation of waste, and potential sources of accidents, which make this EIB standard relevant.
Compliance: The consultant, has during the detailed studies identified all possible sources of pollution for the project and has developed appropriate preventive measures in order to prevent, reduce and as far as possible eliminate pollution that may arise from different project activities. This has involved establishing a general framework for the control of possible sources of pollution. For the emissions of atmospheric pollution, to water and soil, RDA will put in place adequate measures to prevent emissions to soil and groundwater and regularly monitor these measures so as to avoid leaks, spills, incidents or accidents occurring especially during the construction phase of the project. In addition, RDA through its consultant has developed measures aimed at preventing waste generation but also reducing its hazardousness to human health and the environment.

3.4.3. Biodiversity and ecosystems
The EIB acknowledges the intrinsic value of biodiversity and that its operations may have a potential impact on biodiversity and ecosystems. This standard outlines the approach and measures RDA has to take to protect and conserve all levels of biodiversity. The standard applies to all habitats whether or not previously disturbed or legally protected. It focuses on major threats and supports the sustainable use of renewable natural resources and the equitable sharing of benefits from the project’s use of natural resources.

Relevance: The sites proposed for the Chipata Dry Port and the Chipata Bypass Road have significantly undergone changes and have lost the vegetation cover due to human activities such as farming and settlements. Therefore, this standard may not be so much affected by the project, but cognisance should be taken of the context of sustainable forest management and climate change.

Compliance: The consultant has during the detailed studies, established the level of vegetation clearance likely to result from the project and has engage various stakeholders to formulate measures for prevention of unnecessary vegetation clearance. In addition, the consultant has made recommendations to the project so that the exploitation of natural resources required by the project does not result in the degradation of the environment and will not be at the expense of the communities who depend on the biodiversity and ecosystems of the project area.

3.4.4. Climate-related standards
EIB financing as a whole is aligned with EU climate policies, which should be taken into account at all stages of the project cycle, in particular regarding the assessment of the economic cost of greenhouse gas emissions and the climate vulnerability context. Specifically, project promoters must ensure that all projects comply with appropriate national and, where applicable, EU legal requirements, including multilateral agreements, related to climate change policy.

Relevance: Vehicle emissions containing greenhouse gasses will be generated both during road upgrade and eventual use. Quantities generated will depend on type, age and number of equipment used during construction, while operation-phase emissions will depend on traffic volume. These emissions would have a cumulative negative effect on local air quality and global climate change. Embodied carbon (EC) associated with construction of the road would also to some extent have climate change effects. EC refers to energy consumed and resultant carbon emissions associated with production of materials used in construction of the proposed road, including extraction and transport of raw materials.

3.4.5. Cultural heritage
Through its projects, the EIB recognizes the central role of cultural heritage within individual and collective identity, in supporting sustainable development and in promoting cultural diversity. Consistent with the applicable international conventions and declarations, this standard aims at the identification, management and protection of tangible and intangible cultural heritage that may be affected by project activities. It emphasizes the need for the implementation of a “chance-finding
procedure”, which outlines the actions to be taken if previously unknown cultural heritage is encountered.

**Relevance**: The relevance of this standard lies in the fact that the activities of the project during construction will involve excavation which may in the process lead to the discovery of artefacts or objects of archaeological significance.

**Compliance**: During the detailed studies, the ESIA consultant paid particular attention to the identification of any elements of cultural heritage that likely to be adversely affected by the project and assess the likelihood of any chance finds. The ESIA team worked with communities, government agencies and relevant stakeholders to identify, and manage places, objects and practices of cultural significance.

### 3.4.6. Involuntary resettlement

EIB projects sometimes necessitates land acquisition, expropriation and/or restrictions on land use resulting in the temporal or permanent resettlement of people from their original places of residence or their economic activities or subsistence practices. This standard is rooted in the respect and protection of rights to property and to adequate housing, and of the standard of living of all affected people and communities. It seeks to mitigate any adverse impacts arising from their loss of assets or restrictions on land use. It also aims to assist all affected persons to improve or at least restore their former livelihood and living standard and adequately compensate for incurred losses.

**Relevance**: This standard is relevant to the project in that the implementation of the of the proposed Chipata Dry Port and the Chipata Bypass Road will definitely lead to changes in land use and involuntary resettlement of people especially those located along the road alignment for the Chipata Bypass Road.

**Compliance**: The consultant has during the detailed study; carried out a census and a socio-economic baseline survey to establish the number of people to be displaced, livelihoods affected, and property to be compensated. The surveys took into account persons affected through anticipated cumulative impacts of the resettlement. In addition, detailed stakeholder consultation was carried out and these consultations involved a variety of stakeholders, including project-affected people, the promoter, community-based organisations (CBOs), non-governmental organisations (NGOs) and a multitude of governmental agencies, national and local, will continue as part of the Stakeholder Engagement and during the implementation and monitoring of the resettlement process. In addition, the ESIA team has recommended a grievance mechanism which will allow prompt addressing of specific concerns about compensation and relocation from the affected people and host communities and other directly involved entities.

### 3.4.7. Rights and interests of vulnerable groups

The EIB seeks to protect all vulnerable project affected individuals and groups, whilst seeking that these populations duly benefit from EIB operations. The standard requires that there is full respect for dignity, human rights, aspiration, cultures and customary livelihoods of vulnerable groups including indigenous peoples. It requires the free, prior and informed consent of affected indigenous groups.

**Relevance**: This standard is relevant to the current proposed Chipata Dry Port and the Chipata Bypass Road in that there are some individuals or groups who are likely to be less resilient to risks and adverse impacts than others. Preliminary findings also indicate that early pregnancies and early marriages may rise in communities due to construction workers who may be looked upon as “people with money” and may contribute to school dropout.
Compliance: The detailed surveys identified various vulnerable individuals likely to be affected by the project and a Stakeholder Engagement Plan (SEP) will be developed through which these vulnerable groups should be engaged during project implementation in order to take the necessary measures and to appropriately manage the risks and adverse impacts of the project on vulnerable individuals and groups, including on women and girls, minorities and indigenous peoples. In so doing, RDA will seek to avoid, minimise, or otherwise mitigate or remedy the exposure of vulnerable populations to project-related risks and adverse impacts. In addition, the ESIA team has identified all discriminatory practices, inequalities and other factors which contribute to vulnerability and make necessary recommendations on how the project can appropriately, strengthen the adaptive capacity of vulnerable individuals or groups by promoting inclusive development and benefit sharing.

3.4.8. Labour standards
Good labour practices and the use of appropriate codes of conduct are important to ensure the fair treatment, non-discrimination and equality of opportunity of workers. This standard aims at ensuring that promoters of EIB projects comply with the core labour standards of the International Labour Organisation and with national labour and employment laws. The standard also requires the establishment, maintenance and improvement of worker-management relationships.

Relevance: The Standard is relevant to the project in that both unskilled and skilled labour will be required during project implementation. Given that Zambia has a young population and given the poverty levels along the project area of influence, it is possible that child labour may become an issue during project implementation. Migration of labour may also be an issue and may lead to trafficking.

Compliance: The ESIA team engaged people in the project area of influence to understand how the project will comply, at a minimum, with the relevant national labour laws and how it will implement and operate the project in respect of the principles of the Core Labour standards outlined in the ILO Declaration on Fundamental Principles and Rights at Work. In addition, the ESIA Team sensitized community members on the importance of ensuring that they have employment contracts, independently of their type (e.g. direct employees, contractors, workers in the supply chain). The ESIA Team has also made recommendation on how RDA shall ensure that the contractor has an effective management system, which should cover the enforcement and compliance of labour standards, and the monitoring of the contractors.

3.4.9. Occupational and public health, safety and security
The EIB expects promoters to protect and secure public and occupational health, safety and security and promote the dignity of the affected community in relation to project-related activities, with particular attention to vulnerable groups. The standard also requires promoters to adhere to the international norms and relevant human rights principles when using security services.

Relevance: The relevance of this standard lies in the fact the activities of the project has potential to increase exposure to hazards, risks and negative impacts in terms of public health and safety. These may arise through or be amplified by project-related occurrences such as increased environmental pollution; elevated noise levels the spread of communicable diseases.

Compliance: The ESIA Team has identified all health and safety risks falling under this project and has proposed mitigation measures to adequately address the risks. In addition, the ESIA team developed satisfactory occupational and public health and safety management plans and systems, based on best international practice, and tailored to the construction sector.
3.4.10. Stakeholder engagement

The EIB actively promotes the right to access to information, as well as public consultation and participation. This standard promotes to uphold an open, transparent and accountable dialogue with all project affected communities and relevant stakeholders in an effective and appropriate manner. The value of public participation in the decision-making process is stressed throughout preparation, implementation and monitoring phases of a project. The right to access to remedy, including through grievance resolution, is actively required.

**Relevance:** This standard is relevant to the current project in that RDA is seeking to construct a bypass road in an area largely used for farming activities and this will have serious implications on various stakeholders located in the proposed road alignment. The views, interests, and concerns of the affected people, communities and other interested stakeholders needs therefore to be heard, understood, and taken into account throughout the project lifecycle.

**Compliance:** The project will continue to engage various stakeholders and will develop a Stakeholder Engagement Plans for future consultation. More stakeholder engagements have been planned for and will be carried out without discrimination, taking into account differences in risk exposure and the increased sensitivity and reduced resilience of vulnerable groups. Planned stakeholder engagement, including disclosure and dissemination of information, will be carried out in line with the principles of prior, informed and free engagement and informed participation, in order to lead to broad community support by the affected communities and longer-term sustainability of the project’s activities.

3.5. **ADMINISTRATIVE FRAMEWORK**

3.5.1. **Ministry of Housing and Infrastructure Development**

The Ministry of Works and Supply is responsible for overall policy formulation and monitoring of the public roads infrastructures. This Ministry oversees construction and civil engineering activities to the extent that they should not adversely affect the environment.

*The Ministry will play a role in ensuring the RAP guidelines are implemented through their representative in the RDA Board of Directors and would mainly be involved in supervision and ensuring compliance with policies of the transport sub-sector.*

3.5.2. **Ministry of Works and Supply**

The Government Valuation Department (GVD) is located in the Ministry of Works and Supply. GVD is responsible for the preparation of Valuation Reports upon request from a user Ministry or Institution such as RDA.

*The Valuation reports form a basis for the fair of project affected persons that may have their assets affected by the proposed project. Further GVD will be play a big role in the resolution of disputes relating to the valuation amounts as part of the grievance redress mechanism.*

3.5.3. **Road Development Agency (RDA).**

The proposed construction of the Chipata Dry Port and the Chipata Bypass Road will result in the removal of assets from the affected areas. Resettlement Action Plan (RAP) has been prepared for and submitted as a separate document.
The RAP will be implemented by RDA (Environmental and Social Management Unit-ESMU) in conjunction with the Chipata City Council and key implementation processes will involve mainly payment of compensation to affected people and monitoring and evaluation. RDA will mobilise the required funds and effect payments to the PAPs. It will also have the overall mandate of ensuring that the RAP is being smoothly implemented by coordinating with all relevant stakeholders. RDA will pay the affected PAPs before the commencement of civil works.

3.5.4. Chipata City Council
The local authority is responsible for local policy matters, economic development, resolving local conflicts and providing orderly leadership and democratic practices at the grass roots level in their respective areas. The system has facilitated mass participation in government affairs and awakened the rural population to their rights of citizenship and obligations particularly regarding involvement in development programs and projects.

The Chipata City Council will thus be helpful during the identification of rightful property owners and resolving compensation grievances.

3.5.5. Zambia Environmental Management Agency (ZEMA)
The ZEMA is empowered under the Environmental Management Act (EMA), No. 12 of 2011 to see to it that Zambia’s environment is protected adequately and is therefore safe to humans, animals and plants. The ZEMA also manages the EIA process and establishes the terms of reference for project assessments, review reports and conducts follow-up monitoring. It is a requirement under the EIA regulations that any road rehabilitation/construction project exceeding 10Km and construction of building with more than 10,000 square meters should undergo an EIA process before the commencement of civil works.

Upon the successful conclusion of the EIA ZEMA issues a Decision Letter to either approve or disapprove such a project and ZEMA will undertake compliance monitoring activities during the road construction phase to ensure that the EMA is being adhered to.
CHAPTER FOUR

TECHNICAL PROJECT DESCRIPTION

4.1. THE PROJECT

Zambia being a land locked country, has embarked on establishing a network of key Dry Ports to address or improve the issue of how its trade is mobilized so that it can employ the most efficient forms of transport and related services to ensure the greatest possible economic growth from international trade.

A dry port is “an inland intermodal terminal directly connected to the sea by road or rail and operates as a center for the transshipment of sea cargo to inland destinations”. In addition to their role in cargo transshipment, dry ports may also include facilities for storage and consolidation of goods, maintenance for road or rail cargo carriers and customs clearance services.

Currently, the country has three major access outlets to the sea: (i) through the port of Dar-es-Salam in Tanzania; (ii) through the Port of Durban in South Africa; and (iii) through the port Nacala in Mozambique. However, the sea access route to the Nacala port is not as active as the other two.

The Nacala Corridor is an important route to access international markets for import and export of goods not only for the Zambian Eastern Province and the region beyond. The development of a Dry Port Facility in Chipata in Eastern Province as part of the development of the Nacala Corridor will contribute significantly to the expected improved effectiveness of the railway and port concessions under the Nacala Corridor agreement and decrease the high transport cost experienced by Zambian importers and exporters.

The proposed Chipata Dry Port will therefore: (i) relieve competition for storage and customs space at the Nacala Port itself; (ii) speed the flow of cargo between ships and major land transportation networks, creating a more central distribution point; and (iii) improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested Nacala Port.

Access to the proposed Chipata Dry Port will be through the proposed Chipata Bypass Road which will be constructed as part of the overall project.

4.2. BRIEF DESCRIPTION OF THE LOCATION

The proposed Dry Port is located on the southern outskirts of Chipata Town and comprises 12 hectares of land adjacent to the Chipata Railway Station. Four possible locations were identified initially, and the pre-feasibility study decided on location 1 based on economic and environmental reasons was selected. The proposed location is approximately 5 kilometers by road from Chipata town centre and 22 kilometers (west along the Great East Road T4) from the Mwami Zambia - Malawi border post.

12 The Nacala corridor traverses, and therefore involves, 3 countries: Zambia, member of COMESA and SADC, Malawi, member of COMESA and Mozambique, member of SADC.
Currently the site is undeveloped and falls within the area of approximately 62 hectares under ownership of the Zambia Railways Authority. There are two access roads to the area: The Kalindawalo road, which comes from the town centre, passes via the golf club to the Railway station. This road traverses a high-density built-up area. The other road passes from the Railway station close to the prison area and links up with the Chadiza road and then onto the Great East Road near the newly built SOS village and then towards to the Mwami border with Malawi.

The proposed Dry Port site is located near the Chipata Railway Station. The inhabited areas nearest to the railway station are Magazine Compound, above and to the north of the railway station and the Prison Compound to the east of the station along the Kalindawalo Road.

For the location of the bypass road, the designs were not ready at the time of the ESIA process as the ESIA process and its approval by ZEMA is a prerequisite for GRZ to access the Euro 7million loan from EIB. Once these funds are secured, RDA will engage a consulting firm to do the design for the bypass road and consequently engage the contractor to construct the bypass road. However, preliminary information provided by the planning unit at RDA indicates that the proposed bypass will is expected to start at Musekera Junction and will run in the south easterly direction, passing through undeveloped land mainly used for subsistence farming and between the Chipata mountain on the northern side and the Appolo dam on the southern side before it joins the Zambia Railways land where the Dry port is proposed to be constructed.

After the dry port, the bypass road will continue in the south easterly direction where it will pass close to Chipata Prison on the southwest of the prison and through the prison farm after crossing Luntembwa stream.

After the prison farm, the proposed bypass road will cross the Chipata-Chadiza Road and will continue in the southeasterly direction passing between the Luntembwa Dam I on the north side and the new plots on the south side before it rejoins the T4 Road just after the Lutembwa Bridge near SOS.

The coordinates of the preliminary route of the bypass road are provided in Table 1-1 below while the preliminary route is provided in Figure 1-1.

Table 4-1: Coordinates for the preliminary route of the proposed Chipata Bypass Road.

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Figure 4-1 shows the location of the Chipata Dry Port and the Chipata Bypass Road.

Figure 4-1: Location Map of Chipata District for the Proposed Project
Figure 4-1: Google Image for the Location of the Chipata Dry Port at the existing Zambia Railways Station
Figure 4-2: Google Image for the preliminary alignment for the Chipata Bypass Road
4.3. PROJECT COMPONENTS AND TECHNICAL CHARACTERISTICS

4.3.1. Chipata Dry Port

The Dry Port will be designed as a common user facility with public authority status, equipped with fixed installations and offering handling and temporary storage services for any type of goods carried under customs transit by any applicable mode of transport, placed under customs control and with customs and other agencies competent to clear goods for domestic use, warehousing, temporary admissions, re-export, temporary storage for onward transit and outright exports.

Figure 4-1 below shows how the system will be functioning in general, the Dry Port being the meeting point for importers and exporters.

![Figure 4-1: Typical Dry Ports (inland terminals)](image)

The Dry port will be constructed on a 12 ha of land belonging to the Zambia Railways Systems (ZRS) and will be laid out parallel to the current railway line in a westerly direction. It will encompass a dry goods section, both in containerised and bulk format. The facility will contain minimal requirement which will include hardstanding concrete, railway siding for intermodal transfer and a first phase of warehouses to handle the market needs. The equipment in the facility during operation will include reach stackers, forklifts and trucks.

The Dry Port has been designed as a common user facility with public authority status, equipped with fixed installations and offering handling and temporary storage services for any type of goods carried under customs transit by any applicable mode of transport, placed under customs control and with customs and other agencies competent to clear goods for domestic use, warehousing, temporary admissions, re-export, temporary storage for onward transit and outright exports.

The Chipata Dry Port facility will contain:

1. Internal Roads (Main Access road, minor road 1, minor road 2, minor road 3, and minor road 4)
2. Office Complex for 24 offices;
3. Driver Ablution for 60 people;
4. Weighbridge (one road and one rail);

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13 Technical Options Analysis Report, October 2011, Bergstan, LuxConsult, SuperGroup Consortium
5) Fuel Station to handle 50 trucks per day with a 6m high and 30m diameter;
6) General Warehouse (6,100m²);
7) Import Warehouse (300m²);
8) LCL (300m²);
9) Full Containers area (4,000m²);
10) Brea Bulk Area (1,000m²);
11) Car park to handle small vehicles (3,200m²) and Trucking parking (2,000m²);
12) Gate House (150m²);
13) Liquid Discharge point;
14) Office/Fire Store;
15) Existing Platform
16) Empty Container Store (3,600m²);
17) Wastewater treatment works;
18) Groundwater Tank;
19) Water Tower;
20) Fuel Loading Facility;
21) Freight Office;
22) Generator.

The settings out coordinates for the various facilities of the dry port are provided below:

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There are three distinct areas in the proposed Chipata Dry Port. (i) In the south there will be the inspection area and transshipment of general cargo. (ii) In the central area there will be administrative services and (iii) to the north there will be the area dedicated to container handling and warehousing.

The entrance is located in the south-east and the exit is at the north-east. Both will connect to the proposed Chipata bypass road. Secondary access and egress (for emergencies / fire access) is proposed to the north-west.

Overall traffic movement and direction will only be from south (entry) to north (exit). However, two way traffic lanes have been included in most of the internal roads of the Chipata dry port. This is to allow the possibility for the Chipata dry port operator to modify traffic flow in different areas if the need arises. In addition lane width (2 lanes each 6 meters wide) is relevant to ensure easy movement of trucks and avoid congestion.

After entering, the Chipata dry port traffic will turn right to the weighbridge. The weighbridge approach road will be constructed to three lanes to allow room for a queuing system next to the main track because otherwise the tail back would be limited to two or three trucks. Access is also allowed from the transshipment area via the gyratory system of roads to allow trucks to be reweighed or visit the weighbridge after discharging goods elsewhere in the Chipata dry port.

The transshipment area occupies much of the south zone. It is designed so that a large area of the platform is covered which will allow work in inclement weather and help suppress noise that would otherwise affect multi-storied dwellings nearby. The inspection areas and manual inspection platforms (with room for 4 trucks) are located to the west side of the transshipment area. There is also a bonded warehouse and warehouse for dangerous goods.

At the centre of the site is the administrative area which consists of the administrative building, an adjacent building containing the canteen and toilets, and parking for staff vehicles.

To the north of dry port is the container zone. Containers will be transferred as necessary with an adjacent warehouse. At the northern end there is the preparation area for exports. It is divided into two parts. A part separated by a wall (NW corner) allows truck access to the warehouse preparing containers for export (including at night for oranges). It also allows a second possible access to the site (secondary entry) which is not intended for truck use (but for staff cars and emergencies).

Additional features such as; (i) provision of water supply system; (ii) sanitation and drainage facilities; (iii) the procurement modern cargo handling and lifting equipment; (iv) the procurement of generator sets to avoid interruptions to services; (v) expansion of the use of energy-efficient lighting, floodlighting, street lights all around the facility; (vi) traffic management measures to ease interface with local on-street traffic; and (vii) environmental and safety management measures will be put in place. The project will also undertake organizational developments to efficiently manage facility operations and ensure efficient operations.
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

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A summary of the design philosophy is presented in the following sections separated for Civil and Structural:

**4.3.1.1. Internal Road works**

Currently the roads on the site are dirt tracks leading from the main road to the other existing infrastructure. There are no tracks suitable for motor vehicles that extend further than those to and around the site. The Kalindawalo road is the main traffic artery linking the project area to the city centre and to T4 road.

The project proposes to construct internal roads, which will all be of a 6m carriageway built in 80mm segmental pavers on 4 engineering construction layers. These internal roads will be built to the similar loading standards using the same make up. The advantage of this approach is that the construction is simple requiring labor but no specialist machinery. Further segmental paving is easily maintained and repaired and deals with the significant turning and operational loads well. Signage and marking will be completed according to the operational requirements using the SADC guidelines.

Figure 4-7 shows the internal road and edges setting out at the Chipata Dry Port.
4.3.1.2. Rail works
The permanent way will comprise of the standard turn out geometry used in the marshalling yard configured on the 48KG rails and MK21Z type concrete sleepers. Signalization will be provided from the main line to allow controlled entry and exit from the open system.

4.3.1.3. Drainage
The natural topography will be harnessed to develop the surface drainage scheme and ensure that run off will not pond or limit operational activities. A 750 x 750 box culverts in reinforced concrete will be used to channel flows from site.

Figure 4-5: Drawings for Culverts to be used at the Chipata Dry Port
Figure 4-6: Rail Layout and Stormwater Drainage at the Chipata Dry Port
4.3.1.4. Water Reticulation

There is Eastern Water Sawerage Company (EWSC) water main in the area and this will supply the site with the required water demand. Storage tanks shall be provided to ensure a stable water supply. The total water requirements for Construction and Operational Phases are estimated to be 150l per person per day, which amounts to approximately 36m$^3$ per day.

The water will be provided via a ground tank to provide a strategic store to ensure that utilities interruptions do not limit the capacity of the site. The ground tank will have added benefit of providing a fire-fighting storage volume. From the ground tank a variable speed multi stage pumping facility to an elevated panel steel tank will provide the site with pressure for reticulation network of class 9 UPVC and HdPE pipes. A dedicated fire main will be used to serve the hydrant and building fire-fighting system.

The following water piped services have been designed and will be installed to service the proposed Chipata Dry Port facility:

- Domestic water system, (hot and cold water internally);
- Domestic water reticulation (externally);
- Alternative heating solution using air conditioner to heat water. No geysers will be provided in rooms;
- Grey water drainage system;
- Sanitary drainage system (internally);
- Sanitary drainage system (externally); and
- Potable Water storage facilities and pressure boosting plant and equipment.

The above mentioned services shall be designed on a rational basis to render the most appropriate, cost effective and fit for purpose systems. One of the main objectives of the rational design is to contribute towards sustainable development by means of utilising rainwater and grey water on site and especially that the site is located far from the Lukanga water and sewerage.

Pressure boosting pumps will provide and guarantee the necessary pressure to operate the water reticulation. The domestic potable water fixtures will feed from the 40,000 L water storage tank and will be used for human consumption purposes.

The selection of materials and plant shall be appropriate to suit the level of comfort required and shall be of a suitable quality to last for a design life span of between 20 and 25 years without major refurbishment during this period.

The proposed materials of pipes fittings and plant shall be of a high quality, durable and require low maintenance.

The following are the details of the water reticulation layout:

- All reticulation pipes 900 and above is class 9uPVC unless otherwise:
- All other pipe diameters less than 90mm are class 10 HDPE;
- All valves spigot and socket Ci gates valves shall be to SABs 664;
- Water lines to be offet by 1.5m from property boundary unless otherwise noted;
- The location and setting out of the ground and elevated storage tanks to be confirmed on site by engineer;
- Steel tanks be contructed from flanged 1.22m X 1.22m square galvanized pressed metal plates 4.5mm thick fro tanks up to 2 pannels high and 6.00mm thick for the lower panels for tanks 3 and 4 panels high. All steel to be hot dipped galvanized to SANs 763.
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
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4.3.1.5. Sanitary Drainage System
The drainage system shall be a 1-pipe system with 110mm common stacks for soil and waste water. The various types of fittings such as WCs, WHBs, Baths and Sinks, etc, shall all discharge into the 110mm diameter horizontal branch pipes by means of 110mm diameter branch pipes with "floor drains “ and in some cases, “stub stacks" and in some cases smaller diameter pipes all as shown on the drawings and details.

Floor outlets shall be installed in all bathrooms, toilets, kitchens, plant rooms, garbage disposal areas, water features, flower boxes and landscaped areas, etc, as shown on the drawings.

The contractor shall be responsible for the “construction engineering” of the works and for the secondary co-ordination on site. The piping, where possible and appropriate, shall be recessed in the walls.

4.3.1.6. Storm Water Management System
The rainwater system shall be a conventional gravity system, relying on cast-iron full-bore outlets and rain water down pipes (where necessary). The contractor shall also adhere to the manufacturer’s installation requirements. This system shall discharge into the non-potable cold water storage tanks or to the retention pond.

A suitable overflow pipe shall be provided for the storage tanks that connect to the bulk storm water pipe.

4.3.1.7. Source of Power Supply
The primary source of energy shall be electricity from the ZESCO supply grid and secondary or back-up will be a diesel generator.

4.3.1.8. Structural Facilities
The structural facilities will all be built with the following materials: all living areas to have ceiling fans; all windows to be aluminium/PVC sliding frames with mosquito gauze; all ceilings to be a minimum of 2.7m; all roofing to be at a 22 degree pitch; all roofing to be IBR IT-5 sheeting; all solid structures to be on steel re-enforced concrete foundations including slabs and typical masonry block work with solid external plaster finishes, and painted skim coat internal wall finishes; ceilings to be painted plaster board sheets; lighting to all be LED downlights or energy efficient equivalent where possible; all A/C units to be Inverter air conditioning units only where noted; all eaves to be breathable with mosquito gauze membrane; all external doors to be hardwood with three lever Union or equivalent quality; and kitchens to be constructed with 18mm MDF board with granite bench tops.

4.3.1.9. Sewage Treatment and Management
For preliminary selection, a Bio-filter Rotating Biological Contactor Package Plant has been proposed as the preferred sewage treatment plant for the proposed Chipata Dry Port. The requirements established for the sewage treatment plant include reliability and simple to operate and maintain, while producing a high quality effluent. The Bio-Filter rotary disc unit fulfils these pre-requisites and has a great ability for treating the domestic waste.

The Bio-Filter Rotating Biological Contactor (RBC) plant lay-out for the treatment of wastewater comprises of the following elements:
- Primary treatment, usually by means of a septic tank or primary settlement tank.
- Biological treatment of primary effluent by means of the Bio-Filter rotating disc units.
- Humus removal by means of a secondary settlement tank.
• Disinfection of final effluent by means of a chlorine contact tank.
• Phosphate removal where required.

The rotating disc process may be considered a high rate biological stage of a conventional sewage treatment plant (would replace the trickling filter). The disc unit is normally preceded and followed by sedimentation and clarification tanks of a design appropriate to the size of the plant.

In the Bio-Filter design, the biological stage takes the form of a series of closely spaced parallel flat self-cleaning discs manufactured from high density polyurethane which are mounted on a shaft at closely spaced intervals to form a unit rotor construction.

The rotor assembly is then submerged almost to shaft level in a trough through which the effluent is passed. The shaft is slowly rotated at approximately 4 r.p.m. in the direction of the effluent flow from the inlet to the outlet of the rotor. In the bottom half of the rotational cycle the bacteria on the discs absorb the “food” in the wastewater and during the top half of the cycle the bacteria on the discs absorb oxygen from the air, thereby sustaining the metabolic action of the biological process.

Biological growth similar to that found in percolating filters, grows on the surface of the discs. A living aerobic freely circulating bio-mass is also found in the plant trough and this also contributes to the biological treatment of the wastewater. The turbulence created in the flow through the plant by the rotors, keeps the bio-mass within the trough liquid in constant motion, and is eventually carried out with the treated effluent for subsequent settling in the humus tank.

Bio-degradable organic are therefore treated by both the intermittently submerged part of the bio-mass grown on the discs as well as the bio-mass present in the plant troughs. Depending on the loading of the plant, these wastes are transformed into harmless substances, oxidized, or merely absorbed by the plant.

Owing to the rotating action, contact between the waste and the microbial film is not limited to a single pass between adjacent surfaces; instead, wastes re-circulate rapidly many times over several quadrants of the discs before leaving the system. The sheared turbulence at the solid liquid interfaces is even better than that obtained by re-circulating high rate filtration or in the activated sludge process.

The oxygen required for oxidation within the plant is absorbed into the wet upper surface of the bio-mass growing on the discs during its passage through the air above the wastewater. Full oxygen absorption into the bio-mass is immediately achieved owing to the very large surface area of the bio-mass growing on the discs as well as the full partial pressure of oxygen within the open atmosphere over the plant.

The bio-mass’s increasing concentration of oxygen allows it to penetrate quickly to the deepest parts of the bio-mass, primarily by diffusion. The submersion of the rotating oxygen-saturated bio-mass which immediately follows causes part of the absorbed oxygen to be re-absorbed away from the bio-mass growing on the disc, into the free bio-mass in the trough. Therefore the introduction of oxygen into the plant process takes place not by the direct absorption of air into the waste water, but almost exclusively by the absorption of oxygen into the waste water via the wet surface of the bio-mass growing on the discs.
This absorption takes place in such quantities that despite the uptake of oxygen by both the disc bio-mass and that present in the troughs, over 4mg/l of oxygen is to be found in the wastewater leaving the disc stage.

A high concentration of active micro-organisms forms on the surface of the disc, producing a low food to micro-organism (F/M) ratio of 0,02-0,05 compared to the ratio of 0,3 achieved with the conventional activated sludge process. This low ratio enables the system to absorb shock loads.

As the micro-organisms are attached to the discs, cell loss during periods of light loading is eliminated without the problem of blocking, provided the discs are spaced far enough apart. Also during periods of high flow or under flash flood conditions the bio-mass cannot be washed out of the system as the micro-organisms are stuck to the disc filters.

Since the waste substances present in the plant are being constantly converted into harmless substances, the bio-mass both on the discs and in the troughs is being constantly added to, and the excess on the disc surfaces is removed on submersion into the waste water in the troughs and is carried out from the disc treatment stage by the flow of the waste water through the plant.

A sludge is therefore, produced which is removed from the treated water by sedimentation in clarifier which follows the disc treatment sage.

Disinfection by conventional methods is finally undertaken for effluent to comply with the standards as laid down in the Water Act in all respects.

![Figure 4-53: Becon Bio Filter RBC Unit Flow Diagram](image-url)
The advantages of the Bio-Filter RBC Treatment plant include the following aspects:

- Small Bio-Filter plants usually require no bar screens or detritus removal. This is a great advantage, as a full time attendant is usually required to rake the bar screens, and in addition, this significantly reduces on odours and does not attract flies.
- The plant is not affected by shock loads, as bacteria grown on the rotary disc units, cannot be washed out of the system by shock loads or flash floods, as opposed to activated sludge plants or extended aeration plants, where bacteria are suspended in the actual liquid and can therefore be washed out of the system, causing total system failure.
- The effect of sudden shock loadings on rotating disc plants has been extensively researched. Shock loadings of 400% of a plant’s design capacity over a period of 3 hours have resulted in a threefold increase in the reduction performance of the plant. This is evidence that the bio-mass of a rotating disc plant can absorb additional wastes from shock loadings over considerable periods of time and still achieve the design performance.
- Rotating disc plants are not affected in their operation when the influent falls to very low rates, or over periods or weeks or months when only part of the designed capacity is handled by the plant.
- When the normal load is re-applied, full capacity will be achieved almost immediately.
- Rotating disc plants are therefore, particularly suited for treating the wastewaters where the population is liable to fluctuate considerably.
- The Bio-Filter system operates satisfactory off septic tank effluent and can therefore be connected directly to existing septic tank systems.
- The Bio-Filter system needs desludging every 8-12 months and not daily as required with activated sludge plants. It is normal procedure that desludging is undertaken by the local authority and sludge carted away by vacuum tanker. Continuous sludge odours are therefore eliminated with this system.
- The Bio-Filter plant usually comprises of a number of disc rotors which are individually powered by separate drives. In the unlikely event of one drive becoming defective, the balance of the rotors will continue to operate thereby ensuring that the plant remains operational at all times.
- Bio-Filter rotors rotate at approximately 4 r.p.m. and extremely low power consumption is experienced in these plants. They are therefore most economical to operate.
- Due to the simplicity of the Bio-Filter plant, and due to the fact that the plant is self-compensating to flow variations, no full time attendant is required for this plant, thus running costs are therefore further reduced.
- As the plant operates at very low speed, the plant is noise free, and therefore creates no noise pollution.
- The proposed Bio-Filter plants accommodate standard RBC units, and are therefore modular. This means that additional units can be added to the plants at a later stage if required to extend the plants.
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4.3.2. Chipata Bypass Road

It is proposed that the bypass road will start at Musekera Junction and will run in the south easterly direction, passing through undeveloped land mainly used for subsistence farming and between the Chipata mountain on the northern side and the Appolo dam on the southern side before it joins the Zambia Railways land where the Dry port is proposed to be constructed. After the dry port, the bypass road will continue in the south easterly direction where it will pass close to Chipata Prison on the southwest of the prison and through the prison farm after crossing Luntembwa stream. After the prison farm, the proposed bypass road will cross the Chipata-Chadiza Road and will continue in the southeasterly direction passing between the Luntembwa Dam I on the north side and the new plots on the south side before it rejoins the T4 Road just after the Lutembwa Bridge near SOS.

As mentioned in Section 4.2, the designs for the proposed Chipata Bypass Road were not ready at the time of the ESIA process as the ESIA process and its approval by ZEMA is a prerequisite for GRZ to access the Euro 7million loan from EIB. Once these funds are secured, RDA will engage a consulting firm to do the design for the bypass road and consequently engage the contractor to construct the bypass road.

However, preliminary information provided by the planning unit at RDA indicate that the proposed Chipata Bypass Road will be an all-weather road with a hard surface pavement of double surface dressing. The paved roadway will consist of two layers above the sub-grade: the sub-base and base course. Each layer will be compacted by a roller before proceeding with the next layer. The pavement structure has been decided based on minimum practicable thicknesses, which will create a balanced pavement structure. The strength of the sub grade was determined using a Dynamic Cone Penetrometer (DCP), down to minimum depth of structural influence of the sub grade, as well as laboratory verification of CBR values.

The sub-grade is earth that has been graded to the desired elevation. The soil may need to be amended with stabilizing additives (e.g. lime, Portland cement, or fly ash) to provide adequate, uniform support to the overlying road structure.

The sub-base layer is designed to evenly spread the load of the pavement and the traffic to the ground below. A 200mm thick natural gravel base (Min. CBR 30% at 96% MDD modified AASHTO) has been proposed as the sub-base layer.

The base course is the strengthening layer of the pavement. The material used is similar to that of the sub-base, but with the addition of cement as a stabilizer, and strength enhancer. The base course will be 150mm thick (Min.UCS 1.5 MPa at 98% MDD modified AASHTO). The wearing course is the top layer which needs to be even to provide a smooth ride for cars and trucks. A double surface dressing will be used for the wearing course. The basic input materials used in double surface dressing construction are hot liquid bitumen and aggregates (crushed stone). 200mm thickness compaction / re-compaction above the roadway embankment have been considered for preparing the roadbed. Sealed shoulders are proposed for the entire road length. Cross Section with 8 m wide roadway made up of 2 x 3.25 m lanes and 2 x 1.0m shoulders.
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4.4. OUTLINE OF PROJECT ACTIVITIES

Since the proposed project include detailed engineering design and Environmental and Social Impact Assessment, the project activities will be assumed to follow the project routines whereby there are Planning, Pre-construction activities, Construction activities and finally Operations and Maintenance activities.

4.4.1. Planning

The major aspect of the project that requires lots of planning and consultation relates to the Bypass road. The other project aspects of the project require less stakeholder consultation as these aspects require the completion of the designs and locations of construction materials and contractor’s camps. These are difficult to discuss in detail at this stage until the design is completed.

Planning therefore as it relates to consultation has already started and has included the undertaking of this Environmental Impact Assessment. The scoping phase of the planning process had involved extensive consultations with the adjacent communities and key stakeholders. The EIA process has also involved various meetings and discussions have been held to try and identify the best prevention measures to possible impacts.

Detailed surveys and investigations activity involve road alignment and condition survey, detailed topographical survey, detailed soils and materials investigation, drainage structures. Furthermore, sites or sources for construction materials such as gravels and stones can be agreed to be the existing ones unless the existing sources are depleted. In case there will be need to open new borrow pits, the contractor will have to make all necessary arrangement for land acquisition in accordance with the country laws. Environmental Impact Assessment includes identification of environmental and social impacts. The assessment also considers both positive and negative impacts of the project and proposes mitigation measures for the negative impacts.

The pre-construction activities also include the economic analysis which involves traffic surveys and analysis. Furthermore, this will also involve compensation for affected private assets and relocation of various infrastructures and utilities such as water and electricity reticulation lines.

The project will involve detailed engineering design and preparation of tender documents. Upon completion of the bidding documents, tenders will be floated to find the credible road project contractor.

This stage will also involve mobilization of the construction human resources, construction equipment and plant, construction materials and erection of workers’ camps. At this stage, wastes (solid, liquid and gaseous) will be generated from construction of camps. The staff camp like any other domestic place will generate garbage, packaging, sacks, papers, cardboard boxes, plastic, wood crates, bottles, glass, metal cans and the like. Such wastes will need to be segregated for recycling or incinerating at site.

4.4.2. Construction Phase

The construction project activities have been planned to flow such that conflicts with the environmental setting as well as the social and economic activities along the corridor are minimized. It is expected that upon project commencement, the Contractor will prepare a realistic project activity schedule to share the same with the Client and the Supervisor. The conceptual activities, however, will be as follows:
4.4.2.1. Activities Related to the construction of the Bypass Road

1. **Site Preparation**: Construction process begins with the alignment surveying, pegging and clearing. This involves bush clearing, top soil stripping to be followed with earthworks. Bush clearing removes vegetation cover including grass, shrubs and young trees. Often, grown trees will also be removed and the Contractor is expected to maintain a record of the number, species and characteristics of the trees removed for compensation through planting.

2. **Earthworks**: Earth moving is the removal of the overburden along the alignment to give way for filling with appropriate materials. This generates significant spoil earth materials to be disposed-off or reused elsewhere. The activities will involve moving fill materials (gravel) to fill and development of the base on which the road surface will be formed.

3. **Construction Camps Establishment**: The Contractors will search for appropriate land to set up the construction camp sites to house among others the following:
   
   **A. Main Camp Sites;**
   - Consultants’ offices,
   - Contractors’ offices,
   - Workshops,
   - Materials laboratories,
   - Stores,
   - Fuel farms,
   - Truck parking yards, and
   - Workmen camp site for residential quarters.

   **B. Materials Holding and Batching plants; and**

   **C. Pre-cast yards.**

4. **Materials Sourcing and Extraction**: Mobilization of materials will be the main activities such as to include aggregate from the quarry sites, gravel from borrow areas and water from sources. Materials haulage, storage, batching and applications are major activities of the project. The current assessment has not included an assessment on sources of construction materials and this will be done once the funds are secured for the construction of the dry port and the by pass road. A separate environmental and social assessment will be conducted and submitted to ZEMA for approval.

5. **Pavement Laying**: The actual road construction will involve the following activities:
   - Road side clearance, relocation of services, earthworks, pavement construction and finishing works
   - Site clearance; including removal of urban trees and buildings in the ROW if necessary
   - Construction of temporary diversions (if the space is available) for traffic and for construction access
   - Earthworks will involve excavation of cuttings and placement of fill for embankment in the low lying areas to uplift the new road on areas subject to flooding.
   - Placement of sub-base, base course and laying of surfacing layers
   - Finishing works (e.g. installation of signs and guard-rails)
   - Site clean-up and restoration of borrow-pits and quarries.

6. **Rehabilitation and Restorations**: The Contractor will undertake the following restoration activities:
   - Landscaping and beautification of the project road corridor,
   - Rehabilitation of spoil disposal areas,
   - Restoration of borrow areas,
   - Rehabilitation of quarry site, and
   - Decommissioning of camp sites and clean-up.
Various wastes, ranging from solid to liquid and gaseous types will be generated. The staff camp like any other domestic place will generate wastes in form of garbage, packaging, sacks, papers, cardboard boxes, plastic, wood crates, bottles, glass, metal cans and the like. Such wastes will need to be segregated for recycling or incinerating at site. However, burning or incineration should be done with great care excluding materials with poisonous emissions.

4.4.2.2. Activities related to the construction of the Dry Port
The initial activities during this phase relating to construction management will include:
- Establishment of the construction Project Management Team (PMT);
- Establishment of a professional Site Inspection Team; and
- Establish and agree management, inspection, and reporting procedure.

Construction activities will involve the following:
- Site preparation (clearance of existing vegetation, preparation of a site office and stores, fencing to avoid intrusion),
- Disposal of excavation and site clearance wastes,
- Landscaping, earth moving and filling,
- Procurement of construction materials and delivery of the same to the site,
- Civil, mechanical, and electrical works,
- Building works, trampling and removal of construction wastes,
- Storage and utilization of materials, and
- Solid waste collection and commissioning of the project.

There will be no labour camp on the project site, although security personnel will be accommodated on the site.

1) **Excavation and Foundations**: In order to prepare the site for construction of the project, a lot of excavations will be carried out. This will involve the excavation of trenches for foundation strips for buildings. The geotechnical survey of the site is indicative that the bearing capacities of soils are good and the foundation depth and design for the intended structures will not be complicate.

In this regard, heavy earthmoving machinery and human labor will be relied upon. Debris and excavate materials from earthworks, especially soil and stones will be used in various construction activities while those of no use will be dumped in sites approved by the Chipata City Council.

Various plant and equipment to be used during excavation of civil works will include:
- Graders
- Cranes
- Vibrators Rollers
- Water Trucks;
- Bulldozers
- Front End Loader
- Generator Set 125 KVA
- 6m Containers
- Concrete Mixers
- Concrete Pokers Excavators
- Water Pumps
- Mechanical Tool Boxes
- Compressors
- Civil Plate Compactors x3
- Pedestal Rollers
• Tipper Trucks
• 10 Ton Trucks 4

2) **Sub-Structural works and floor works:** Completion of excavations will be followed with setting a foundation for the sub-structural works and floor slabs. This will involve block work, mixing, pouring and compaction of concrete, backfilling and compaction of material according to specifications. This sub structural works will include the laying of water and sewage reticulation pipes and underground electrical cables.

3) **Construction of Superstructures:** This will involve:
   - The preparing of mortar and concrete;
   - Structural steel erection;
   - The laying of concrete block walls;
   - Fixing of roofs;
   - Erection of roof trusses;
   - Installation of finishes and fixing electrical and plumbing fixtures and fittings; and
   - Landscaping.

4.4.2.3. **Facilities & Accommodation**

It is expected that the Contractor’s approach will be to recruit a significant size of the workforce locally through subcontractors. Small camps may be required for temporary accommodation of specialist workers.

The location of these camps will be on sites out of the residential areas. This will be done to prevent potential adverse impacts on the local community. Any such facilities to be located within sensitive area would need to be fully justified. Near sensitive habitats, construction sites will be clearly delineated to avoid damage in non-working areas.

At this stage, the actual sites or areas where construction camps are to be located are not known and would only be known once the contractor mobilizes. However, all facilities for accommodation of workers will be designed and operated in accordance with the provisions of the IFC Workers Accommodation Guidance. This guidance document provides guidance and benchmarking standards over the range of topics related to the provision and management of worker’s accommodation, covering following topics:

- General living facilities (including topics such as drainage, heating, ventilation, lighting, water, sanitation, waste disposal);
- Room/dormitory facilities (including bed arrangements and storage facilities);
- Sanitary and showering facilities;
- Canteen, cooking and laundry facilities;
- Food safety and nutritional standards;
- Medical facilities, doctors;
- Leisure, social and telecommunication facilities;
- Management of the accommodation;
- Community relations and consultation;
- Fees and charges for the facilities and services;
- Health and Safety on site;
- Accommodation and local community security;
- Workers’ rights, rules and regulations; and
- Workers’ consultation and grievance mechanism.
The key principles of note regarding the provision of worker’s construction compounds which will be considered in the development of accommodation for the Project are summarized below:

- Workers’ must enjoy their fundamental human rights and freedom of association in particular; workers’ accommodation arrangements should not restrict workers’ rights and freedoms.
- Housing standards must include special attention to minimum space allocated per person, supply of safe water in the workers’ dwelling in such quantities, adequate sewage and garbage disposal systems and appropriate protection against heat, cold, damp, noise, fire, and disease-carrying animals, and insects.
- For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems must be provided. Both natural and artificial lighting must be provided and maintained in living facilities.
- A separate bed for each worker must be provided. The practice of “hot bedding” should be avoided.
- The minimum space between beds should be 1 meter. Double deck bunks are not advisable for fire safety.
- Canteen, cooking and laundry facilities must be built in adequate and easy to clean materials. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition.
- If workers wish to cook their own meals, kitchen space will be provided separate from sleeping areas.
- There must be management plans and policies especially in the areas of overall operation of the facility, health and safety (with emergency responses), local community and security.
- A security plan including clear measures to protect workers against theft and attack is implemented.
- Security staff must be checked to ensure that they have not been implicated in any previous crimes or abuses.
- Processes and grievance mechanisms for workers to articulate their grievances must be provided and clearly explained to workers.
- Community representatives must be provided with an easy means to voice their opinions and to lodge complaints to the management. There must be a transparent and efficient process for dealing with community grievances.

4.4.2.4. Contractor Facilities

Usually, contractor facilities are located near the accommodation for workers. Construction project trailers as storage or office space, with or without utilities, could be located outside the worker camps.

Prior to the start of construction works, the Contractor shall submit a site plan showing the locations and dimensions of temporary facilities, including layouts and details, equipment and material storage area (onsite and offsite), and access and haul roads, avenues of ingress/egress to the fenced area and details of the fence installation, locations of safety and construction fences, site trailers, construction entrances, trash dumpsters, temporary sanitary facilities, and worker’s parking areas.

The minimum working conditions and systems that will need to be provided within the Contractor facilities are listed below:

- Safe premises-surfaces, structures and installations should be easy to clean and maintain, and not allow for the accumulation of hazardous compounds. Buildings should be structurally safe, provide appropriate protection against the climate, and have acceptable light and noise conditions;
- Safe machinery and materials;
4.4.2.5. Materials Sourcing and Extraction

Mobilization of materials will be the main activities such as to include aggregate from the quarry sites, gravel from borrow areas and water from sources. Materials haulage, storage, batching and applications are major activities of the project. The current assessment has not included an assessment on sources of construction materials and this will be done once the funds are secured for the construction of the dry port and the by-pass road. A separate environmental and social assessment will be conducted and submitted to ZEMA for approval.

- **Borrow pit**—Existing borrow pits along the route will be used. New borrow pits may have to be established where existing borrow pit material is not suitable or enough. Designated borrow pit areas will be identified once current design process has been completed on the proposed project. The establishment of borrow pits will be done in consultation with the District Environment Officers and the Community. In addition, an Environmental Project Brief (EPB) will be prepared and submitted to ZEMA for Approval before extraction of construction material.

- **Stones for Aggregate & Crushed Stones**—Rock sources suitable for asphalt, crushed stone base materials, surface dressing chippings and concrete stones have been identified at one location within the project area.

- **Water for construction activities**—Regarding sources of running water that can be used for construction purposes, the Chipata and Luntembwa Dams are the major and reliable source of water that can be used for construction. The project therefore will depend on the Chipata and Luntembwa Dams as a major source of surface water for its construction needs.

4.4.3. Operations and Maintenance Activities

4.4.3.1. Activities Related to the operation of the Bypass Road

During project road construction, the detours and diversions will need to function normally to allow the road to continue with its activities of serving the area as it is presently operating. Thereafter, maintenance activities of the detours and diversions will cease to allow reinstatement and re-vegetation of these areas or any development activities that existed before. Normal maintenance of the road will be carried out throughout the road operation phase estimated to be about 20 years. This will include but not limited to grass cutting, cleaning of drainage systems,
sweeping, and vegetation control within the ROW. During this operation phase there are some activities to be carried out with little road use interference. Other activities will entail installation of signboards, thermo-plastic road marking, maintenance of spoiled road sections, and reinforcement and replacement of road furniture.

It is also expected that during operation phase, few amounts of solid waste will be generated mainly from road users by discarding plastic bags, bottles, papers and other related staff. Therefore, it will be the councils’ obligations to regularly collecting and dispose of, all discarded materials along the project road, in a way which is environmentally friendly. In case of liquid waste, it is anticipated that hydrocarbon spillage due to road accidents may be the main source of pollution during operation phase. This can be controlled by quick response of nearby rescue team, where contaminated soil or water is taken for treatment measures like soil washing or any other reliable technology.

4.4.3.2. Activities related to the operation of the Dry Port
The main activities that will exist during the operation stage will be those that will relate to the specific different parts of the development.

Activities during operation essentially relate to the various uses of the dry port facilities for handling and storage of goods for import and export. Additional activities will include clearing and forwarding services, value addition, sampling and activities related to safety and security of the facilities. It is foreseen that at peak use of the facility a maximum of 1000 twenty-foot-equivalent-unit (TEU) containers will come in per month, either by road or by rail. A similar amount of containers will be outbound per month.

Both solid and liquid wastes will be produced during this phase of the project. To manage solid wastes (domestic), the tenants will be advised on clean management strategies for solid and liquid waste, thus contribute and purchase litterbins.

Effluent from toilets and washrooms will be discharged into septic tanks, which shall be constructed. On the other hand, storm water will be conveyed to the council’s storm water drainage system.

Carpenters and plumbers among others will be contracted to carry out repairs and maintain the during the operational phase of the project. Also ground man will be hired to do repairs, painting and landscaping open spaces.

4.4.4. Decommissioning Phase
During decommissioning of the dryport, buildings, pavements, drainage systems, parking areas and perimeter fence will be demolished in order to restore land to its original state. Different kind of workers and equipment will be deployed to carry out these tasks. This will produce a lot of solid waste, which will be reused for other construction works or if not reusable, disposed of appropriately by a licensed waste disposal company.

Electrical installations, sewerage system, furniture, pipes and sinks among others will be dismantled during decommissioning of the project. The proponent is expected to recover most materials for sale or future use.

Those that are obsolete or greatly damaged shall be disposed in authorized dumping sites and incinerate some to reduce their volume in the environment.
Decommissioning of the road is not foreseen. However, decommissioning of related facilities, especially contractor’s camps and workshops, are inevitable. Further, decommissioning of quarries and borrow sites will be done upon completion of construction works.

Upon completion of the Contracted Work, the contractor shall remove all his tools, materials and other articles from the construction area. Should the contractor fail to take prompt action to this end, the RDA, at its option and without waiver of such other rights as it may have, upon sixty (60) calendar days’ notice, may treat such items as abandoned property. The contractor shall also clean areas where he worked, remove foreign materials and debris resulting from the contracted work and shall maintain the site in a clean, orderly and safe condition.

Materials and equipment shall be removed from the site as soon as they are no longer necessary to minimize the demobilization work after completion of the project. All the camp sites will be built as temporary structures, and these will also include the use of movable structures such as movable containers. All the temporary structures that can be beneficial to the community should be left to the local government for other uses in the area.

4.5. PROCESS AND TECHNOLOGY
For vegetation clearing, earth moving equipment such as bull dozers and graders will be used. Cleared material will be loaded onto trucks using front-end loaders for off-site disposal at designated landfill sites regulated by the Chipata City Council.

Preparation of the roadbed for the Bypass Road will involve the use of graders to level the in-situ material, water bowers to moisten the material and rollers to compact the roadbed.

Construction of pavement support layers will involve the use of tipper trucks delivering gravel and cement to the site, graders to spread and shape the material, water bowers to water the material and rollers to compact the materials to specified levels. Off-site, gravel will be borrowed using excavators and front-end loaders.

The construction of the surface wearing course will involve bitumen distributors spraying hot bitumen at the required spray rate, chip spreaders placing crushed stones at the required rate, rollers compacting the stones into the bitumen and brooming equipment to remove loose stone.

Other construction operations include the fabrication of concrete kerbs and barriers which will either be formed in place with shutters, or pre-cast-off site. For in-place construction, concrete mixer trucks will deliver mixed concrete from the mixer plant to be established by the contractor in his yard or from commercial suppliers. Poker vibrators will be used to compact the concrete in the formwork.

Final activities will include road marking with thermal plastic paint applied with automatic sprayers.

4.6. RAW MATERIALS INPUTS
A number of raw materials are expected to be used during implementation of the proposed project especially for the construction of the dry port facilities. Locally sourced materials will be used as much as possible. For construction, key materials to be used include: - mm bolls 88 gauge, 100 mm diameter pvc heavy duty piping, 1000 G polythene sheet, 110 x 50 x 3 mm “Z” section purlins, 150 mm pvc pipes, 150 mm thick block walls, 230 mm thick block walls 26 gauge IT5 pre-painted long span profile sheet, 6mm thick obscure glass in windows, 75 x 50 x 3 mm tie beams, 75 x 50 x 30 mm rafters, BRC mesh (A-142), Cement, Ceramic tiles (various sizes), Ceramic toilet roll holders, Electrical wires, Glazed aluminium, Water taps, Timber doors, Metal grilled doors, Paved concrete
blocks, Pvc gully traps, Ring beam size 230 x 230 mm, Sand and gravel, Satin finish paint in approved colours, Sawn formwork in softwood, Thick hardcore, Timber, Union 3 lever locks, W.C suite complete with 9 liters cistern, White glazed tiles, Wash Hand Basins complete with chromium plated pillar taps, waste outlets, stay rubber plug and pipe work.

Other raw materials and especially for the bypass road construction will include:

- **Stones for Aggregate & Crushed Stones** - Rock sources suitable for asphalt, crushed stone base materials, surface dressing chippings and concrete stones have been identified at one location within the project area along the Chipata-Mwami Road, but the quality and quantity are yet to be confirmed.

- **Water for construction activities** - Regarding sources of running water that can be used for construction purposes, the Lutembwa and Chipata Dams are the only major and reliable sources of water that can be used for construction. The project therefore will depend on these two sources of water and RDA will ensure that the contractor obtains water rights from WARMA and the Eastern Water and Sewerage Company and before extraction of water from these sources of water.

- **Sand** - It is assumed that the requirement for natural sand for the Project will be relatively small, mainly for blinding material, mortar and some concrete. Normally the aggregate production produces excessive amounts of quarry dust, which may be used in lieu of natural sands. Sources of sand were identified from commercial suppliers within the City of Chipata.

- **Cement** - Cement is easily available in the mainland, packed in 50kg bags and sourced from the factories by Lafarge Cement and Dagote Cement works in Ndola is the sources for supply of cement for the entire project requirements.

- **Reinforcement Steel** - M/S Good Time Steel (Zambia) Ltd and M/s UMCIL, Lusaka is the major source of steel for the entire project requirements. Strength and other properties of reinforcing steel to be confirmed by testing of samples in approved testing laboratories.

- **Bitumen** - Bitumen for road works is generally readily available from either Indeni Oil Refinery in Ndola or external suppliers. Supply at Indeni Oil Refinery is limited capacity 400t/day. Therefore, continuous supply to the project may be delayed or inadequate to meet the target progress. In such case option of importing bitumen and emulsion direct sources from South Africa and Zimbabwe. Bitumen properties need to be checked by testing representative samples in approved laboratories.

The materials and equipment to be used in the fencing project will include the following as indicated in Table 4-2:

<table>
<thead>
<tr>
<th>S.no</th>
<th>Raw Material</th>
<th>Purpose</th>
<th>Source</th>
<th>Mode of delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>River and building sand</td>
<td>For concrete and building mortar</td>
<td>Local suppliers / borrow areas</td>
<td>Road truck</td>
</tr>
<tr>
<td>02</td>
<td>Laterite / gravel</td>
<td>Foundations and construction of embankments</td>
<td>Borrow areas within dam basin/Approved borrow areas within project area</td>
<td>Road truck</td>
</tr>
<tr>
<td>03</td>
<td>Rock/stone</td>
<td>For fill and Riprap</td>
<td>Obtained from the Overburden/rubble extracted on site during preparation.</td>
<td>Road truck</td>
</tr>
<tr>
<td>04</td>
<td>Aggregates</td>
<td>For concrete</td>
<td>ZEMA approved quarry</td>
<td>Road truck</td>
</tr>
<tr>
<td>05</td>
<td>Cement</td>
<td>For concrete, mortar and road / Infrastructure works</td>
<td>Local approved supplier (i.e Lafarge Cement Plc,)</td>
<td>Road truck</td>
</tr>
<tr>
<td>06</td>
<td>Concrete blocks</td>
<td>For building works</td>
<td>To be manufactured on and off-site</td>
<td>Road truck</td>
</tr>
<tr>
<td>07</td>
<td>Diesel</td>
<td>For operation of plant and machinery</td>
<td>Delivered by contracted and Storage at approved RDA fuel</td>
<td>Road truck</td>
</tr>
</tbody>
</table>
## 4.7. WASTE AND BY-PRODUCTS

### 4.7.1. Construction Waste and Emission Inventories

The Table below presents indicative characteristics of wastes that will be generated by the Proposed Project.

**Table 4-3: Characteristics of Potential Project Waste**

| 08 | Water | For construction, dust suppression, earth compaction and workers domestic use; total demand estimated at 3 l/s | Chipata and Lutembwa Dams | Pump and reticulation |
| 09 | Electricity | Operation of machinery | Supply by on-site generator, Reticulation |
| 10 | Finished products and equipment | For pipe works, etc | Imported ensuring compliance with Zambian standards and regulations. | Road truck |

It is expected that the special specifications in the Tender Documents will obligate the contractor to dispose of different categories of waste appropriately.

In general, the contractor will be required to develop construction specific Waste Management Plans prior to the start of construction work. At the start of the construction contract, the contractor will undertake a waste minimization/treatment/disposal study, guided by the project waste management strategy. The study will identify and quantify the expected wastes and describe:

- Proposals for reduction, treatment processing;
- Third parties to whom waste will be transferred for re-use;
- Liaisons with the local Councils to identify and document suitable council disposal sites, ground, landfill and incineration facilities;
- Other locations of landfills or waste storage sites to be adopted if local Council facilities are inadequate; and
- On site incineration facilities to be adopted if local Council facilities are inadequate.
The findings of the study will be used in the development of the construction waste management plans which must adhere to the Environmental Management (Licensing) Regulations, 2013—Waste Management. At a minimum, these plans will include:

- A consolidated summary of the applicable regulations and restrictions governing the generation, handling, treatment and disposal of wastes generated during the construction/commissioning phases of the Project;
- Any permitting requirements for waste treatment or disposal;
- Detailed method statement for each element of the waste management handling, treatment and disposal process; and
- Any third-party agreements for waste handling, transfer or disposal.

After construction of the road, the waste handling/disposal facilities established by the contractor under the construction program will be closed.

If a waste handling/disposal facility procured by the contractor is closed, the contractors will be required to ensure that it is appropriately de-commissioned (i.e. including capping of any disposal sites) and the surface will be re-instated according to the Project Reinstatement Strategy. If the facility is retained, it will be transferred to the proponent.

4.7.2. Release to the Atmosphere
Atmospheric emissions will be generated by the proposed roads project activities principally, during construction of road works. It is anticipated that the most significant components of such emissions will be combustion gases, specifically:

- Nitrogen Oxides (NOx);
- Carbon monoxide (CO);
- Sulphur Dioxide (SO\textsubscript{2});
- Particulate matter (PM);
- Volatile Organic Compounds;
- Aldehydes; and
- Secondary pollutants.

4.7.3. General Wastewater Disposal
Wastewater includes all water flows from the temporary site office, work sites and subsidiary operations such as vehicle and equipment washing.

Wastewater from temporary site office should be treated in a septic tank and related soak-a-ways.

Wastewater from the works will generally be from the roadside drains and during curing of concrete works. These wastewaters are not hazardous but should be monitored to ensure that they do not cause adverse effects.

4.7.4. Construction Waste Management
Major wastes generation associated with the project construction and their treatment/disposal methods are described in the table below:
Table 4-1: Major waste and their treatment/Disposal Method

<table>
<thead>
<tr>
<th>Activity</th>
<th>Waste type</th>
<th>Amount</th>
<th>Treatment/ Disposal Method(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic activities at the composite</td>
<td>food waste, papers, tins, glasses, cloths, woods, metals</td>
<td>114,975tons</td>
<td>Collected and disposed at the Dumpsite. Other option include burial and Burning as directed in Table 6 below</td>
</tr>
<tr>
<td>Site Clearance (1 to two meters on both sides of the road)</td>
<td>Trees and Shrubs</td>
<td>Not Significant</td>
<td>Sell or give to villagers to be used as source of energy</td>
</tr>
<tr>
<td></td>
<td>Vegetable soil (top Soil)</td>
<td>Not Significant</td>
<td>This organic soil is full of manure, will be stockpiled to be used during planting of vegetation</td>
</tr>
<tr>
<td>Excavation of drains and foundation (Where applicable)</td>
<td>Spoil Soil</td>
<td>Not Significant</td>
<td>This soil shall be stock piled along the foundation trenches. The soils shall be used to reinstatement site at the end of the project</td>
</tr>
<tr>
<td>Actual Construction</td>
<td>Rubbles</td>
<td>Not Significant</td>
<td>Will be crushed and used to fill the pot holes at nearby areas</td>
</tr>
<tr>
<td></td>
<td>Scrap metals</td>
<td>Not Significant</td>
<td>Sell to recyclers</td>
</tr>
<tr>
<td></td>
<td>Timber</td>
<td>Not Significant</td>
<td>Sell to recyclers</td>
</tr>
<tr>
<td></td>
<td>Cement bags</td>
<td>Not Significant</td>
<td>Sell to recyclers</td>
</tr>
</tbody>
</table>

4.7.5. Best practices in Waste Handling

1. Waste for Burial- Only inert materials or readily decomposable materials may be disposed by burial. Inert materials include materials such as brick or concrete debris. Readily decomposable materials include materials such as paper, cloth, wood, and vegetative waste. Best practices for burial include the following:
   - No liquids or material containing liquids may be buried;
   - No waste shall be buried below the water table or less than 1 meter above the water table;
   - If the water table has seasonal fluctuations, this restriction applies to the highest seasonal water level;
   - No waste shall be buried within 100 meters of a surface water body or water well;
   - No waste shall be buried within 300 meters upgradient of a surface water body or water well;
   - No waste burial site shall have a surface slope greater than 4:1 (horizontal to vertical);
   - Waste burial sites shall be protected against future erosion;
   - Local and district authorities (Chipata City) must be notified of the locations of any waste burial sites;
   - The locations should be identified with GPS coordinates. If appropriate, the chainages and offsets of the waste burial sites should be listed;
   - All waste burial sites must be clearly marked around the perimeter indicating that the cover soil within the perimeter should not be disturbed;
• At the end of the project, the Contractor shall mark all the waste burial sites on the as built drawings. The Contractor shall also produce a single drawing with all the waste burial sites marked, and with the coordinates listed in a table shown in the drawing; and
• The Contractor shall produce a record of the types and volumes of wastes buried at each site and the dates of operation for each site.

2. Waste for Removal - All waste that is to be removed from site of production will be taken to the various dump sites approved by the local authorities. RDA and the contractor shall ensure that there are no surface water bodies within 5km of the boundaries of the dump. RDA and the Contractor shall further maintain a record of all wastes disposed in an approved dump. The record shall include the types and volumes of wastes disposed and the disposal location.

Table 4-5 gives the directives on the proper methods of handling wastes.

Table 4-5: Waste types and disposal methods

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Burial</th>
<th>Approved Dump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food waste</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
<tr>
<td>Paper</td>
<td>Allowed</td>
<td>Allowed</td>
</tr>
<tr>
<td>Cloth</td>
<td>Allowed</td>
<td>Allowed</td>
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<td>Plastics</td>
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<td>Glasses</td>
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</tbody>
</table>
CHAPTER FIVE

ANALYSIS OF THE PROJECT ALTERNATIVES

5.1. ALTERNATIVES CONSIDERED FOR THE CHIPATA DRY PORT

5.1.1. Without Project Situation

The selection of the “No-action” alternative would mean the discontinuation of the proposed project. Thus, the site is retained in its existing form. If this alternative is selected, the site is unlikely to undergo any major changes from its present condition. This option may be based on the principles that the proposed:

- Site is found on a land parcel not belonging to the proponent and there are no clear land agreement between the proponent and the land owner;
- Site is environmentally sensitive such as having one or more threatened, rare, endangered, endemic or key stone plant or animal species or any other flora or fauna that is considered for preservation under an Act of Parliament;
- Site is found in an archaeological or historical site or is found to have a historically or archaeologically important material; and/or
- Project will have severe implications on the environment if implemented.

The findings of the site visit are that:

- The proposed land for the dry port belongs to the Zambia Railways, which is a department within the Ministry of Transport and Communication and the Zambia Railways will be active beneficiary of the proposed project.
- The proposed development will not be an impediment to any other development in the area.
- The products of the proposed project will not have serious implications on the environment in the neighbourhood.
- Currently, the proponent does not have an alternative site ideal for a dry port construction.

If this action is implemented, it will lead to loss of certain benefits that the “with scenario” would bring to the client, the region and Zambia as a whole. These benefits include amongst others:

- Reduction in transport cost for the import and export of goods into and out of Zambia;
- An upgraded road and railway network;
- Creation of new services, industry and jobs in the area and the region;
- The stimulation of Chipata as a “growth pole” that will attract a multitude and diversification of investments and development;
- Development of road network to avoid or minimize congestion of the Chipata town;
- It would discourage the proponent and any other local and international investors from investing in the area; and
- The proponent would be at a loss in terms of financial commitments already made in designing and planning for the project. These commitments include application fees to the central government; professional fees to the project managers, quantity surveyors, land surveyors, Environmental experts, public health officers and physical planners and application for EIA approval and licensing that would be made to the agency.
5.1.2. Site Alternative
This option would mean transfer of the proposed development to another site. If this option is selected the proponent is required to look for an alternative site either within or outside the Zambia Railways land. This option may be based on the principles that the proposed development:

- The site is found on a land parcel not belonging to the proponent and there are no clear land agreement between the proponent and the land owner;
- Is to be sited in a zone planned for other developments or the project will be an impediment to future developments;
- Is a hindrance to an existing development;
- Is not compatible with other developments in the area; and
- The project site is ecologically sensitive area.

The site findings show that:

- The proposed land for the dry port belongs to the Zambia Railways, which is a department within the Ministry of Transport and Communication and the Zambia Railways will be active beneficiary of the proposed project.
- The proposed development will not be an impediment to any other development in the area.
- The products of the proposed project will not have serious implications on the environment in the neighbourhood.
- Currently, the proponent does not have an alternative site ideal for a dry port construction.

The implications of implementing this action would be:

- The GRZ would be at a loss in terms of financial commitments already made in designing and planning for the project.
- It might take a very long time looking for, finding a similar land, and completing all official transactions relating to change of land ownership.
- There is also no guarantee that the land would be available, and if such land is available, its cost might be beyond affordable means for the proponent.
- With the changing demand and supply at the market, the prices and availability of materials to be used may not be promising to the proponent at the time the proposal is finally approved by the authorities.
- The processes of designing and planning will have to start over again. This means that the proponent will have to undergo an extra expense in designing and planning for the project.

5.1.3. Technical Options for the Dry Port
Six alternatives for the layout of the Dry Port facility within the proposed site have been explored based on technical, environmental, economic and practical considerations. Option 1 & 2 gave the overall best technical and service response to the needs of the market and best encapsulated the activities included in the Guidelines to establish a dry port in Zambia. The two options are described below:

- **Option 1: The Parallel Option** - This is laid out parallel to the current railway line in a westerly direction and encompasses a dry goods section, both in containerized and bulk format and a wet goods section which would have the ability to store mainly petrol, diesel and aviation fuels for the Eastern Province. This option utilizes only Zambian Railways land and the terrain is relatively flat though it slopes downwards on its western end.

- **Option 2: Perpendicular Option** - This goes at 90 degrees to the current station in a southerly direction and encompasses a dry goods section, both in containerized and bulk formats and a wet goods section. It utilizes both private and railway land, as per the pre-feasibility study and negotiations will have to commence with the owner to acquire the private land. The terrain is relatively flat though it slopes downwards in the south-easterly corner. The wet goods area would be located close to residential areas in the south easterly corner.
After analysis of the above technical solution, Option 1 was adopted since this option will not result in land acquisition and the whole development will be accommodated within the Zambian Railways land. Option 2 was discarded because it could have resulted in further land acquisition and demolition of the existing Zambia Railways houses.

5.2. ALTERNATIVES CONSIDERED FOR THE CHIPATA BY-PASS ROAD

5.2.1. The “NO” project option
The “NO” Project Option, or the “do nothing” alternative, is the current use of the T4 road that passes through the town center of Chipata to Mwami Border and beyond. With the proposed Chipata Dry Port, it means that the heavy trucks will have to turn into Kalindawalo road at the main town center and then passing near the golf course and Magazine Compound to the Chipata Dry Port.

The Chipata City Center is already a congested area and adopting the “Do Nothing Alternative” so that trucks can continue passing through the town center will only worsen the already congested T4 road and can be a source of accidents among other hazards such as noise.

The Magazine Compound, through which the trucks have to pass through to access the Chipata Dry-port is very high populated area and allowing heavy good vehicles to go through this route can be serious potential source of accidents and other hazards such as noise pollution.

Given the above consideration, the “No Project Alternative” was discarded as this will not be in the interest of preventing potential accidents and decongesting the Chipata City Center.

5.2.2. Route Alternatives for the Chipata Bypass Road
Two route alternatives have been considered for the proposed Chipata Dry Port Road.

The first route is proposed to start at St. Monica Secondary School Turnoff and will follow the existing gravel road. The road is proposed to pass through undeveloped land mainly used for subsistence farming between the mountain and the Appolo dam before it joins the Zambia Railways land where the Dry port is proposed to be constructed. After the dry port, the bypass road will cross the Chipata-Chadiza Road before it rejoins the T4 Road.

The second route is proposed to start at Musekera Junction and will run in the south easterly direction until it joins the existing road from St.Monica Secondary School and then continue in the south easterly direction and passing through undeveloped land mainly used for subsistence farming between the mountain and the Appolo dam before it joins the Zambia Railways land where the Dry port is proposed to be constructed. After the dry port, the bypass road will cross the Chipata-Chadiza Road before it rejoins the T4 Road just after the Lutembwa Bridge near SOS.

After considering the implication of each route, the second route from Musekera Junction as described above has been adopted basically because it does not pass close to any built-up areas and will not affect any structures but will only require to acquire land for the alignment. This route basically passes through undeveloped land used for subsistence farming.

The first route alternative has been discarded because its first 3km section is found in a very built up areas, which cannot accommodate the heavy trucks for which the proposed bypass road is intended to serve.
5.2.3. Design Alternatives for the Chipata Bypass Road

5.2.3.1. Alternative 01 option-Paved Standard
The project road will be upgraded from the current gravel to paved design standard. Direct land requirements for this planned upgrade will be about 3.0 hectares (ha) per kilometer (km). Since the road is located in a rural setting, the width of the rights-of-way will be made sufficient just to include traffic lanes and shoulders.

The cross section that has been developed for this option will be an open road with normal pedestrian traffic and will have two (2) lanes each of 3.1m width and 1.5m wide shoulders on either side of the road.

In terms of Surface Layer for this option, the bypass road will be upgraded to an all-weather road with a hard surface pavement of double surface dressing. The paved roadway will consist of two layers above the sub-grade: the sub-base and base course. Each layer will be compacted by a roller before proceeding with the next layer. The pavement structure has been decided based on minimum practicable thicknesses, which will create a balanced pavement structure. The strength of the sub grade was determined using a Dynamic Cone Penetrometer (DCP), down to minimum depth of structural influence of the sub grade, as well as laboratory verification of CBR values.

The sub-grade is earth that has been graded to the desired elevation. The soil may need to be amended with stabilizing additives (e.g. lime, Portland cement, or fly ash) to provide adequate, uniform support to the overlying road structure.

The sub-base layer is designed to evenly spread the load of the pavement and the traffic to the ground below. A 200mm thick natural gravel base (Min. CBR 30% at 96% MDD modified AASHTO) has been proposed as the sub-base layer.

The base course is the strengthening layer of the pavement. The material used is similar to that of the sub-base, but with the addition of cement as a stabilizer, and strength enhancer. The base course will be 150mm thick (Min.UCS 1.5 MPa at 98% MDD modified AASHTO).

The wearing course is the top layer which needs to be even to provide a smooth ride for cars and trucks. A double surface dressing will be used for the wearing course. The basic input materials used in double surface dressing construction are hot liquid bitumen and aggregates (crushed stone).

A 200mm thickness compaction / re-compaction above the roadway embankment has been considered for preparing the roadbed.

Sealed shoulders are proposed for the entire road length.

The road has been generally kept at the same level, with raising achieved by the thickness of the pavement layers. However, at the locations of drainage structures and where the road is relatively low compared to surrounding ground, a slight raising has been considered.

5.2.3.2. Alternative 02 option-Class II Grave Design Standard
In this design option, the Chipata Bypass Road will be upgraded from the current gravel to all-weather Class II gravel design standard. For this type of design, all the features discussed above in alternative 01 option for paved standard will apply except that there will be no application of hot liquid bitumen and aggregates (crushed stone).
In addition, during the operational life of this type of road, the rehabilitation of the entire road corridor would be required once every year and gravel materials in large quantities will be required for rehabilitation.

5.2.3.3. The selected Design alternative
Alternative 02 is expensive in the sense that the rehabilitation of the entire bypass road corridor would be required once every year given that the proposed Chipata Bypass Road is intended to serve heavy trucks. The implication of this on the demand for gravel materials is phenomenal and might be unsustainable. It also is less economically efficient.

Based on the above project alternatives evaluated, and government’s announcement that the project road shall be of paved standard just like the main T4 road, selected design alternative 01 suits the engineering, environmental and social requirements.
CHAPTER SIX

ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

This Chapter provides a brief description of the environmental and social synopsis of the project area for the proposed Chipata Dry Port and the proposed Chipata Bypass Road, focusing on the proposed Project Area, as is described in Section 2.8. This baseline is based primarily on a review of available secondary information.

It is important to gain an understanding of the physical, biological and socioeconomic attributes of the Project Area and surrounds, as this will allow for a better understanding of the environment in which the project is being considered. Consideration of the receiving environment is a prerequisite for the identification of potential environmental and social impacts.

6.1. PHYSICAL ENVIRONMENTAL SETTING

6.1.1. Climatic Conditions

Climatic data obtained from literature review has been relied upon for the project site. Overall, the climate of the project area is controlled largely by the north-south migration of the Inter Tropical Convergence Zone (ITCZ) with seasons. The ITCZ migrates between the equator and the Tropic of Capricorn (23º S) between November and February. In winter, it is located over the northern tropics. The summer rains are brought by the southward migration of the ITCZ, and are characterized by thunderstorms, which are occasionally severe, with excessive lightning and sometimes hail.

The climatic conditions of the project area have been accurately described as a tropical continental highland climate\(^{14}\). Due to the combined effect of low latitude (15 S), continental position and high elevation above sea level, the climate shows the combination of a clear division into a dry and a rainy season, the predominance of the diurnal cycle over the seasonal, and large daily ranges of temperature.

Figure 4-1 shows the approximate position of the ITCZ\(^{15}\).


\(^{15}\) Figure 6-1: Approximate position of the ITCZ during the Southern Hemisphere winter (dashed line) and summer (thick line) and predominant wind directions during summer (arrows).
According to the Food and Agriculture Organization (FAO), Zambia can be divided into 4 agro-climatic regions:

- **I** – the Zambezi and Luangwa valley with low rainfall (less than 700mm per year) with poor soil. Zone 1 covers 23% of Zambia, and includes the major valleys (Gwembe, Lunsemfwa and Luangwa). It has the lowest agricultural potential, with rainfall of less than 800 mm per annum, a short growing season of between 80–120 days, and a medium to high risk of drought.

- **II** – The Central plateaus with rainfall of 800mm to 1,000mm, with more productive soil. Iib – The Western plateau with rainfall of 800 to 1,000mm with poor soil. Zone 2 covers the Sandveld Plateau, the Kalahari Sand Plateau and the Zambezi floodplains of the Western Province. Rainfall is between 800–1,000 mm per annum, and the growing season is 100–140 days. It has a medium to low risk of drought. 87% of the area is suitable for agriculture, but only half of this is accessible, as the remainder is in national parks, game management areas and forests.

- **III** – the North and North-western plateaus characterised by high rainfall between 1,000 to 1,800mm. Zone 3 has a mean annual rainfall of 1,000 mm and a growing season of 120–150 days. The risk of drought is almost nil. However, only 52.7% of the land is suitable for cultivation due to the soils being highly leached. Very little of this zone is in national parks, game management areas and forests.

The proposed Chipata Dry Port and the Bypass Road are all located wholly in the homogenous agro-climatic zone II.

Figure 4-2 shows the Agro-ecological zones of Zambia including the project area in Zone 2.
6.1.1. Rainfall
The project site is located within the agro-ecological region II whose average annual rainfall is 900-1000mm. Most of the rain falls between October and April, with December and January as the wettest months.

Data from recent years suggests that the ITC convergence is becoming less consolidated and that a significant amount of rainfall now results from convective systems within the ITC/CAB during the core rainfall months of January and February. Rainfall therefore tends to be more extreme and patchier. Mean annual rainfall in project area is 1,200mm, but average rainfall varies significantly and records indicate that this may range between 523mm and 1,444mm\(^{16}\).

National Adaptation Programme of Action (NAPA)\(^{17}\) against the impacts of climate change recognises that Zambia may see both increases and decreases of average annual rainfall, depending on global drivers (for example La Nina and El Nino Southern Oscillation patterns) and the future development of air mass convergence patterns\(^{18}\). Nevertheless, overall temperatures in the region and the frequency of extreme weather events are expected to increase. There are insufficient data to draw significant conclusions, but mean annual rainfall appears to continue to fluctuate between 800mm and 1,400mm with no dramatic departure.

Figure 4-3 illustrates the distribution of mean monthly rainfall for the project area with a mean annual rainfall of 1,202mm.

\(^{16}\) Rainfall data captured at the farm rain gauge
\(^{17}\) Ministry of Tourism, Environment and Natural Resources, 2007: National Adaptation Programme of Action on Climate Change.
\(^{18}\) Northern Zambia is expected to experience an increase in mean annual rainfall while the south of the country may show a significant reduction in mean rainfalls.
Figure 6-3: Average Rainfall common to project area

According to an isohyetal map for the whole of Zambia prepared by JICA in their study for the National Water Resources Master Plan, it can be seen from Figure 4-4 that the isohyetal lines are almost parallel from west to east and annual rainfall varies from 1400mm in the northernmost area to 700mm in the southernmost.

Figure 6-4: Isohyetal Map of Zambia

6.1.1.2. Temperatures
The ameliorating effects of altitude (1,200m to 1,400m in the project area), are most noticeably felt in cooler average temperatures, also partly resulting from wind flows from local temperature-induced pressure gradients. Mean annual temperature in the project area is 20.4°C with a seasonal average maximum temperature of 23.6°C (in October) and a season average minimum of 15.8°C in July. Absolute temperature maxima and minima in the project area are 42°C (in October) and 0°C (in June).
6.1.1.3. Evaporation
The daily evaporation rate in the area ranges from 3 to 10 mm. In the warmer months (September and October), evaporation reaches a peak of 13 mm. The lowest evaporation rates occur in the month of February towards the end of the wet season (AMC, 2009).

6.1.1.4. Sunshine
Mean annual hours of bright sunshine in the project area are 2,800, with a mean daily maximum of 9.5 hours in August and September and a mean daily minimum of 5.0 hours in February. The availability of sunshine hours is not a limiting factor to crop growth in any month.

6.1.1.5. Wind direction and speed
The wind field for an area is an important parameter with respect to air quality and dust control. Whilst rainfall and temperature attenuate the behavior and concentration of a pollution plume after the release of a pollutant into the atmosphere, wind can generate dust emissions and thereafter control the dispersion of a pollution plume. The degree to which the winds have an influence on dispersion depends on wind speed, with higher winds speeds resulting in longer travel distance and dilution of the pollutants. Lower more stable wind conditions result in shorter travel distance and build-up of pollutant levels (especially gases) over a smaller area.

Regional winds in the dry month (May to October) are driven by the anticyclonic pressure system over northern Mozambique and Zimbabwe. In the wet season (November to April) cyclonic systems develop over Angola and Botswana. The resulting wind directions tend to be south-easterly to easterly in the dry months, reversing to become north-westerly to westerly in the wet months. Average recorded wind speeds in the project area are 1.5 to 2.2 m/s (5 to 8 kph) but morning airspeeds may average 4 m/s (15 kph) for several hours in July, August and September. Wind speed is a function of local pressure gradients. Consequently, the highest wind speed tends to be associated with widening diurnal temperature contrasts from late July to September; with heat cell-induced cyclonic “dust devils”, mainly in September and October; or with strong gusting convectional storms during the rainfall months from October to February. Extreme winds associated with “dust devils” and thunderstorms may exceed 20 m/s (80 kph) for brief periods. Soil that is not bound or compacted my start being moved by turbulent winds above 20 kph and the capacity for soil movement is then increases in as a cube function of wind speed.

Of importance to the proposed Chipata Dry Port and Bypass Road are is that wind speeds are highest in the dry season, which also corresponds with the peak construction period.
Figure 4-5 shows the wind speed and direction common in the project area.

![Wind Speed and Direction in the project area](image)

**Figure 4-5: Wind Speed and Direction in the project area**

6.1.2. **Topography**

The predominating topography of the district is a mixture of high plateau and rugged hills with an altitude of approximately 1000m to 1500m above sea level particularly towards the south and south-west of the District. The northern zone of Chipata is undulating and mostly low lying with altitudes of up to 1000m above sea level. The Chipata Township lies in the valley and is surrounded by hills in the western and eastern part.

The area around the project sites consists of moderately flat wide crests and moderately incised river lines. Generally, the topography of the project site and surrounding areas is flat with altitude ranging between 1250 m amsl to 1350 m amsl above mean seal level.

Figure 6-6 shows typical landscape of the project area for the proposed Chipata Dry Port and the Bypass.

![Typical landscape of the proposed site for the Chipata Dry Port and Chipata Bypass Road](image)

**Figure 6-6: Typical landscape of the proposed site for the Chipata Dry Port and Chipata Bypass Road**
6.1.3. Geology and Geomorphology
The project area is covered by the Mozambique Belt which is part of the Pan-African Orogenic belt system. It is mainly formed by polymetamorphosed and complexly folded high-grade gneisses, charnokites, and granulites cut by granitic, synitic and basic intrusion. The main rock types include limestone, dolomite, conglomerate and granite.

The geological underground determines the drainage pattern. In areas of outcropping bedrocks, or where the overburden is not well developed, the rainwater largely fails to seep into the underground. Accordingly, the drainage pattern forms a dendrite like surface system.

The areas covered by sediments tend to remain empty of any small rivers. The geological underground and the hills are not formed by granites but by gneisses of different origin and similar highly metamorphic rocks. The gneisses are interlaid by quartzite.

Extended areas around Chipata are largely covered by layers of unconsolidated sediments (regolith) on top of the basement. These layers have been essentially in-situ generated and are the products of an intensive chemical weathering which is typical for this part of Africa.

The thickness of the loose overburden varies from place to place but remains comparatively thin (reaching may be up to 20 or 30 m below ground). This depth is indicated by results of boreholes and by the nearby outcropping rocks of the basements (the hills). The hills are not covered by sediments as the weathering products have been washed away towards the valley.
6.1.4. Soils, Soil Management and Nutrient Cycling

The Zambian soil resource is characterized in the following figure, taken from the Soil Map of Zambia, 1983. It shows the location of the Project within the Luvisol-Phaeozem category. Luvisol-Phaeozem are soils with a mixed mineralogy and high nutrient content, with generally good drainage, suitable for agriculture. They are dark in colour with a high base status and are found in humid and sub-humid steppe areas.

The main soil types found in Chipata include acrisols, fersiallitic soils and lithosols (SOE Outlook Report for Chipata District). The acrisol soil group occurs on the plateau areas and is widely spread. This soil group is used for agriculture but requires good soil management for effective crop production.

The fersiallitic soils occur in limited distribution around Chipata and are good productive soils for agriculture, while the lithosols are confined to the hilly or escarpment areas of the district, especially around the Muchinga escarpment.

Cultivation in lithosols is limited as they tend to be very shallow, fragile and sensitive to mechanical disturbance (Veldkam, 1987).

Lowland soils – i.e. including those found along watercourses – are blackish, dark brown to light reddish brown, and contain more organic matter than the upland soils. They are less well drained, with some evidence of water logging and gleying (removal of iron compounds from the soil due to anaerobic, waterlogged conditions) on the very low, flat lands adjacent to watercourses.
Figure 6-8: Soil Map of Zambia including the Project area in Chipata

Typical Soils type along the project road corridor
6.1.5. Hydrology and Hydrogeology

6.1.5.1. Surface hydrology
The project is located in the Luangwa catchment of the Zambezi River Basin. Chipata District is well drained and has four major streams draining into the Luangwa River such as Lutembwe, Msandile, Kasenengwa, and Rukuzye. There are 62 earth fill dams and weirs. The dams provide an important source of water to domestic animals and people during the dry season. The District has a wide range of water strike depths which average 25 metres. In some cases strike depths of 50 metres have been encountered. The bypass road does not traverse any water bodies.

The Township of Chipata including the project area water facility is served by the Apollo Dam I and II located in the direction of the Dry Port area. The main tributaries of the dam are the stream near the Railway Station and the Lutembwe stream near the prison and the various water sources coming from the hilly southern zone.

6.1.5.2. Groundwater Resources
The project area is underlain by relatively low-to-average yield aquifers. This is because the types of rocks underlying the area are largely non-porous and impermeable and thus are inherently not primary aquifers. Groundwater availability in these rocks is dependent on secondary properties. According to the Classification of Zambian Aquifers, typical yields for the type of aquifers underlying the project area range from 1.01 to 10 L/s. However, based on information on the historical yields and nature of water bearing formations in the area, it is possible to have discrete, local, relatively high yielding pockets of water in the area under certain geological conditions, i.e.:

- Where the rock units are highly fractured and or fissured either due to tectonics, intrusion of igneous rock bodies or chemical dissolution in the case of carbonate rocks like marble and limestone.
- Where there is high degree of weathering or rock alteration, or where the rocks are under a thick cover of unconsolidated alluvial sediments, e.g. ultramafic rocks (rocks high in iron and magnesium which are common in the area) are particularly unstable under weathering conditions and so they tend to decompose and increase accommodation for groundwater, and
- Along lithological contacts (i.e. boundaries between different rock types).
Aquifers whose groundwater yielding capacity is qualified by the above three conditions are referred to as secondary aquifers. Groundwater intersected at the boreholes established around the project area is likely to arise as a result of any one or a combination of the above three factors.

No detailed studies are available but preliminary investigation from literature review indicate that the project road corridor area is underlain by a shallow and a deep aquifer system with structural geology and weathering playing a major role in aquifer development. The shallow aquifer consists of ferricrete and alluvium material and occurs from surface to depths of 10 meters below ground level (mbgl). Wetlands/marshes within the study area are formed as part of the shallow, perched aquifer. The deeper, intermediate aquifer is formed by weathered/fractured bedrock and occurs from 40 mbgl to 200 mbgl. This aquifer is underlain by a deep aquifer deeper than 200 mbgl that consists of solid/fractured bedrock at varying intersection depths (Vivier & Mostert, June 2013).

As seen from the foregoing discussion therefore, the natural availability of ground water in the project area in terms of quantity and quality is governed mainly by:

- Hydraulic properties of the underlying geological formations.
- Geological framework, and
- Climate of the area.

The water-bearing properties of the underlying rocks arise from the susceptibility of the rocks to weathering, geochemical alteration, degradation, and transformation by various geological processes as well as geotectonic structures. Therefore, the specific hydraulic properties that govern groundwater storage and transmission in the area are:

- Solution cavities in the carbonate rocks (limestone and marble).
- Foliation planes within the metasediments and basement rock (schists and gneisses).
- Faults, joints and shear zones.

These structures are openings in the rock mass, which were created after the rocks were formed. Therefore, they are referred to as secondary structures (secondary aquifers) and they define secondary porosity and permeability. The ability of the geological formations to transmit water and yield it in usable quantities to wells depends on the permeability.

The availability of water at ground level also depends on climate, and the ability of surface water to infiltrate into the rock, with infiltration rates depending on the thickness and permeability of the unsaturated zone in the subsurface as well as the topography of the area.

**6.1.6. Fauna and Protected Ecosystems**

The network of Zambia’s statutory protected areas is composed of 20 National Parks (NPs) covering 63,630 km², 36 Game Management Areas (GMAs) covering about 167,557 km² and 490 Forest Reserves (FRs) covering 74361 km². The project area is not close to a National Park (NP) or Game Management Area (GMA).

Figure 5-1 shows the location of protected areas in Zambia in relation to the proposed project area.
Figure 5-1: Location of Protected Ecosystems in Zambia

Approximate location of the proposed Chipata Dry port and Chipata Bypass Road Project
6.1.6.1. Mammals
Although the project area is largely cleared of its original vegetation to support habitat for wildlife, there are pockets of forested areas especially as one moves inland. Strips of forested areas can also be seen in the Musekera area. It is possible that some animal species that are found in these forested areas occasionally find their way to the project area especially at night. Some community members reported that small species of animals of no economic importance such as rabbit (Poelagus marjorita) are occasionally spotted. Also reported are some reptiles and soil micro-invertebrates belonging to the Phyla Annelida, Mollusca and Arthropoda families are common place.

Table 6-1 and Table 6-2 shows the mammals which are frequently seen and those which are assumed to inhabit the forested areas adjacent to the project area respectively. Rats are found in cultivated areas where they feed on the various root crops such as cassava and sweet potatoes.

Table 6-1: Mammals seen in forested areas of the project area

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<th>No</th>
<th>Scientific name</th>
<th>Common name</th>
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<tbody>
<tr>
<td>1.</td>
<td>Canis adustus</td>
<td>Side-striped Jackal</td>
</tr>
<tr>
<td>2.</td>
<td>Paraxereus cepapi</td>
<td>Bush Squirrel</td>
</tr>
<tr>
<td>3.</td>
<td>Lepus saxatilis</td>
<td>Scrub hare</td>
</tr>
<tr>
<td>4.</td>
<td>Thryonomys swinderianus</td>
<td>Cane Rat</td>
</tr>
<tr>
<td>5.</td>
<td>Rattus rattus</td>
<td>Black Rat</td>
</tr>
</tbody>
</table>

Table 6-2: Mammals assumed to inhabit forested areas of the project area

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mellivora capensis</td>
<td>Honey Badger</td>
</tr>
<tr>
<td>2.</td>
<td>Dendrohyrax arboreus</td>
<td>Tree Hyrax</td>
</tr>
<tr>
<td>3.</td>
<td>Cryptomys mechoi</td>
<td>Giant Mole Rat</td>
</tr>
<tr>
<td>4.</td>
<td>Cryptomys hottentotus</td>
<td>Common mole Rat</td>
</tr>
<tr>
<td>5.</td>
<td>Galago crassicaudatus</td>
<td>Great Bush-baby</td>
</tr>
<tr>
<td>6.</td>
<td>Galago senegalensis</td>
<td>Lesser Bush-baby</td>
</tr>
<tr>
<td>7.</td>
<td>Felis lybica</td>
<td>Wild Cat</td>
</tr>
</tbody>
</table>

6.1.6.2. Avifauna
In terms of avifauna, Table 6-3 shows the diversity of avifauna frequently seen in the project area. However, although the list provided does not include threatened or near threatened bird species, it is important to note that some threatened or near threatened bird species have been recorded on the Eastern Province as shown in Table 6-5.
Table 6-4: Avifauna frequently seen in the project area

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific name</th>
<th>Common name</th>
<th>No</th>
<th>Scientific name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coracias caudata</td>
<td>Lilac-breasted Roller</td>
<td>2</td>
<td>Lanius collaris</td>
<td>Fiscal Shrike</td>
</tr>
<tr>
<td>3</td>
<td>Bucorvus leadbeateri</td>
<td>Ground Hornbill</td>
<td>4</td>
<td>Laniarius ferrugineus</td>
<td>Common Bou-bou Shrike</td>
</tr>
<tr>
<td>5</td>
<td>Lybius torquatus</td>
<td>Back-collared Barbet</td>
<td>6</td>
<td>Dryoscopus cubla</td>
<td>Puff-backed Shrike</td>
</tr>
<tr>
<td>7</td>
<td>Pogonius chrysocotis</td>
<td>Yellow-fronted Tinker</td>
<td>8</td>
<td>Cinnycincicus leucogaster</td>
<td>Plum-coloured Starling</td>
</tr>
<tr>
<td>9</td>
<td>Thripia namaquus</td>
<td>Bearded Woodpecker</td>
<td>10</td>
<td>Nectarinia chalybea</td>
<td>Lesser-double-collared Sunbird</td>
</tr>
<tr>
<td>11</td>
<td>Mirafra apiata</td>
<td>Clapper Lark</td>
<td>12</td>
<td>Ploceus bicolor</td>
<td>Forest weaver</td>
</tr>
<tr>
<td>13</td>
<td>Hirundo rustica</td>
<td>European Swallow</td>
<td>14</td>
<td>Malimbus rubriceps</td>
<td>Red-headed weaver</td>
</tr>
<tr>
<td>15</td>
<td>Oriolus larvatus</td>
<td>Black-headed Oriole</td>
<td>16</td>
<td>Ploceus velatus</td>
<td>Masked Weaver</td>
</tr>
<tr>
<td>17</td>
<td>Corvus albus</td>
<td>Pied Crow</td>
<td>18</td>
<td>Quelea quelea</td>
<td>Red-billed Quelea</td>
</tr>
<tr>
<td>19</td>
<td>Turdoides jardinei</td>
<td>Arrow-marked Babbler</td>
<td>20</td>
<td>Euplectes orix</td>
<td>Red-bishop</td>
</tr>
<tr>
<td>21</td>
<td>Phyllastrepplus terrestris</td>
<td>Terrestrial Bulbul</td>
<td>22</td>
<td>Euplectes afer</td>
<td>Golden-bishop</td>
</tr>
<tr>
<td>23</td>
<td>Cossypa heuglin</td>
<td>Heuglin’s Robin</td>
<td>24</td>
<td>Lonchura cucullata</td>
<td>Bronze Mannikin</td>
</tr>
<tr>
<td>25</td>
<td>Sylvia borni</td>
<td>Garden Warbler</td>
<td>26</td>
<td>Uraeginthus angolensis</td>
<td>Blue Waxbill</td>
</tr>
<tr>
<td>27</td>
<td>Cisticola juncidis</td>
<td>Fan-tailed Cisticola</td>
<td>28</td>
<td>Vidua macroura</td>
<td>Pin-tailed Whydah</td>
</tr>
<tr>
<td>29</td>
<td>Terpsiphone viridis</td>
<td>Paradise Flycatcher</td>
<td>30</td>
<td>Colius indicus</td>
<td>Red-faced Mouse bird</td>
</tr>
</tbody>
</table>

Table 6-5: Threatened avifauna in the Eastern Province

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Egretta vinaceigula</td>
<td>Slaty Egret</td>
</tr>
<tr>
<td>2</td>
<td>Falco naumanni</td>
<td>Lesser Kestrel</td>
</tr>
<tr>
<td>3</td>
<td>Grus carunculata</td>
<td>Wattled Crane</td>
</tr>
<tr>
<td>4</td>
<td>Hirundo rustica</td>
<td>European Swallow</td>
</tr>
<tr>
<td>5</td>
<td>Phoenicopterus ruber</td>
<td>Greater Flamingo</td>
</tr>
<tr>
<td>6</td>
<td>Phoenicopterus minor</td>
<td>Lesser Flamingo</td>
</tr>
<tr>
<td>7</td>
<td>Glareola nordmanni</td>
<td>Black</td>
</tr>
</tbody>
</table>

6.1.6.3. Terrestrial Reptiles

Some locals interviewed provided information on terrestrial reptiles present in the areas of interest. Table 6-6 shows a list of such wildlife. Reptiles such as snakes may also be present as can be seen from Figure 6-14.

Table 6-6: Reptiles found in the project area

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific name</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Python sebae</td>
<td>African Rock Python</td>
</tr>
<tr>
<td>2</td>
<td>Bitis arietans arietans</td>
<td>African Puff-adder</td>
</tr>
<tr>
<td>3</td>
<td>Naja nigricollis nigricollis</td>
<td>Black–necked Spitting Cobra</td>
</tr>
<tr>
<td>4</td>
<td>Dendroaspis polylepis</td>
<td>Black-mouthed Mamba</td>
</tr>
<tr>
<td>5</td>
<td>Dispholidus typus</td>
<td>Boomslang</td>
</tr>
<tr>
<td>6</td>
<td>Chamaeleon chamaeleon</td>
<td>Common African Chameleon</td>
</tr>
<tr>
<td>7</td>
<td>Varanus exanthematicus</td>
<td>Monitor lizard</td>
</tr>
</tbody>
</table>
Insects
A number of insects were observed during baseline study some of which are beneficial while others are harmful to human beings. A listing of insects is shown in Table 6-7 and included, among others, honey bees (*Apis mellifera*), which were noticed visiting flowering plants such as *tithonia*, termites (*Microtermes goliath*) that were observed working their way through dead plant material and on tree trunks.

Table 6-7: Insects observed in the project area

<table>
<thead>
<tr>
<th>No</th>
<th>Scientific name</th>
<th>Order/Family</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Apis mellifera</em></td>
<td>Hymenoptera</td>
<td>Honey bee</td>
</tr>
<tr>
<td>2</td>
<td><em>Microtermes goliath</em></td>
<td>Isoptera</td>
<td>Termite</td>
</tr>
<tr>
<td>3</td>
<td><em>Dorylus helvolus</em></td>
<td>Formicidae</td>
<td>Ants</td>
</tr>
<tr>
<td>4</td>
<td><em>Solenopsis</em> spp.</td>
<td>Formicidae</td>
<td>Red ants</td>
</tr>
<tr>
<td>5</td>
<td><em>Belonogastar junceus</em></td>
<td>Vespidae</td>
<td>Wasp</td>
</tr>
<tr>
<td>6</td>
<td><em>Helicopris</em> spp</td>
<td>Scarabaeidea</td>
<td>Dung beetle</td>
</tr>
<tr>
<td>7</td>
<td><em>Anopheles</em> spp.</td>
<td>Culicidae</td>
<td>Mosquito</td>
</tr>
<tr>
<td>8</td>
<td><em>Musca domestica</em></td>
<td>Diptera</td>
<td>House fly</td>
</tr>
<tr>
<td>9</td>
<td><em>Brachytrypas membranecus</em></td>
<td>Orthoptera</td>
<td>Giant cricket</td>
</tr>
<tr>
<td>10</td>
<td><em>Cicadetta</em> spp.</td>
<td>Cicadida</td>
<td>Cicada</td>
</tr>
</tbody>
</table>
Others are various species of butterflies and moths that were noticed foraging and breading as shown in Figure 6-6.

![Insect cocoon attached to syzygium tree leaves](image)

**Figure 6-2: Insect cocoon attached to syzygium tree leaves**

### 6.1.6.5. Aquatic Species

In terms of *aquatic species*, the presence of the Apollo Dam close to the project site provides a good environment for the presence of fish species enjoyed by the local people. These included; *Oreochromis macrochir*, *Tilapia rendalli*, *serrachromis robustus*, *Momyrus longishith*, *Momyrus delicisias*, *Momyrus laceda*. Others include, *Discodus sp*, *Labeo ativeries*, *Clarias mozambicas*, *Clarias zambeziensis* and *Synodolis zambeziensis*.

![Niloticus species captured from Appolo Dam close to project site in Chipata](image)

**Figure 6-11: Niloticus species captured from Appolo Dam close to project site in Chipata**
6.1.6.6. **Endangered or Rare Species**
The project area does not possess any rare or endangered species. However, it is worth noting that on a wider scale human threats to mammalian life continue to increase with continued growth of human population which seeks more land for food production, more space for settlement and even greater development to improve quality of life. The threat on the area is on the modification of the ecosystem by removal of certain habitats which are perceived to be of lower value compared to the envisaged developments. These threats are eminent for all-natural resources- inclusive of the above listed mammal species. Snaring of small animals like bush babies and rodents is common in the area. Most of the mammal species listed in this discussion are still under the threat of poaching by local people, principally for game meat.

6.1.7. **Flora and Protected Ecosystems**

6.1.7.1. **Vegetation Types**
The vegetation of the area has been extensively modified for settlement, charcoal production and agricultural activities. Moreover, there are no protected forests, rare or endangered tree species. The vegetation is characterized by mainly herbaceous plants and grasses interspaced with regenerated miombo. The diversity of habitats and tree species is extremely low along this stretch with regenerating Miombo tree species being generally small (less than 6m in height).

The species in this area include sugar bushes (*P. angolensis* and *P. gaguede*), Mfungo (*Anisophyllea Boehmii*). Along the Appolo Dam and the Luntebmwa stream, the area is characterized by a strip of riparian vegetation dominated by grasses, Mkunyu (*Ficus Sycomorous*, Mushikish (*Trichilia Emetica*), and other riparian species. While the strip of riparian vegetation can be considered an ecologically fragile zone, these will not be affected by the project activities at the construction stage due to the distance between the project site and the dam. Another important feature of the flora of this area is the presence of planted fruit trees. All across this zone, the dominant planted tree species is the mango (*Mangifera Indica*). Occasionally, banana, guava and lemon trees were also observed in the communities.

![Figure 6-12: Typical vegetation cover in the project area mainly shrubs and grass](image-url)
6.1.7.2. **Endangered or Rare Species**
The project area does not possess any rare or endangered species. However, it is worth noting that on a wider scale human threats to mammalian life continue to increase with continued growth of human population which seeks more land for food production, more space for settlement and even greater development to improve quality of life. The threat on the area is on the modification of the ecosystem by removal of certain habitats which are perceived to be of lower value compared to the envisaged developments. These threats are eminent for all-natural resources- inclusive of the above listed mammal species. Snaring of small animals like bush babies and rodents is common in the area. Most of the mammal species listed in this discussion are still under the threat of poaching by local people, principally for game meat.

6.1.8. **Air Quality**
Air quality varies with the season, reflecting variations in temperature, humidity and rainfall. During the dry season any smoke and dust which arises, lingers in the near-ground air layers and causes frequent, but not significant, haze and reduced visibility. However, during the wet season, heavy rainfall quickly disperses smoke and dust, and maintains good air quality.

For the proposed Chipata Dry Port and Chipata Bypass road construction, particulate matter with PM$_{10}$ (particles with a diameter of 10µm or less) was considered for baseline. These are particles that are able to reach the lower regions of the human respiratory tract and are therefore, responsible for most of the adverse health effects associated with suspended particulate pollution. Major concerns to human health are effects on breathing and the respiratory system, damage to lung tissue, cancer, premature death and loss of visibility.

The approach to air quality impacts was to evaluate the baseline in terms of ambient concentrations of pollutants that could be affected by the proposed Chipata Dry Port and Chipata Bypass road construction and determine impacts in terms of compliance with ambient air quality standards. The method of sampling employed the use of a Microdust Pro (Casella 712k) in selected locations along the project area. The sampling process included time intervals ranging from thirty minutes (00:30 min) to one hour (01:00 hour).

The results obtained for all communities show that the ambient concentration of dust over the sampling period is within the given limit, and the ambient noise levels are low as demonstrated in Figures from 6-6 to 6-9. The yellow lines in the figures indicate the dust levels while the green line indicates the acceptable dust levels. It can be seen from the graphs that most times the dust levels are within acceptable standards (i.e. below or very close to the green line). However, dust levels within the project area tend to be higher when there is movement of vehicles as demonstrated by the Figures below where the yellow line was observed to go above the green line.

The results therefore means that although during the dry season the project area is characterized by very dry and dusty conditions with large quantities of windblown dust visible in the atmosphere, the major source of dust in the project area is movements of vehicles and trucks, resulting from the re-suspension of dust from the dirt road surfaces.

The Figures below shows the sampled of air quality monitored at various location within the project area.
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

ESIS FINAL REPORT

June 2019
6.1.9. Noise

The Zambian regulations do not currently provide for the noise guidelines. The international guidelines, specifically the World Health Organization Guideline Values have been used (see Table 6-2).

Table 6-1: WHO Noise Levels Guideline Values

<table>
<thead>
<tr>
<th>Receptor</th>
<th>Daytime</th>
<th>Nighttime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>07:00 hrs - 22:00hrs</td>
<td>22:00hrs - 07:00hrs</td>
</tr>
<tr>
<td>Residential; institutional; educational</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Industrial; commercial</td>
<td>70</td>
<td>70</td>
</tr>
</tbody>
</table>

As was the case with monitoring air quality, the approach to noise monitoring was to also evaluate the baseline in terms of ambient noise levels. The method employed was the use of a sound level meter (Casella 63x) in selected locations within the project area.

The results indicate variations in noise levels depending on whether there is movement of tucks or not. During low vehicular movement in the project area, noise results indicated L_Aeq values below 37.6dB, less than the World Health Organization (WHO) residential guideline values (55).
During the movement of vehicles along the road corridor, the level levels tend to be higher than the WHO recommended levels. For example, the noise levels monitored during vehicular movement indicated L.Aeq values above 55 (i.e. 69.8dB).

It can therefore be concluded that the movements of vehicles (i.e mainly heavy trucks) along the road corridor, is the major source of noise. Other noise sources along the road corridor include community activities, wind gusts and birds chirping.

6.1.10. Archaeological, Cultural and Historical Sites
The following points describe the baseline context on cultural heritage in the Project area:

- Overall, in terms of intangible cultural heritage, although there are some traditional beliefs, the feedback from the communities is that traditional and ancestral worship is not practised on a large scale by the communities in the project area. Baseline aspects of social dynamics, household structures and traditions are covered in Section 6.2 on socio-economics.

- There have been no significant concerns raised by the local communities related to tangible and intangible cultural heritage during the assessment. Therefore, cultural heritage is considered by the local communities and stakeholders as a relatively low priority issue, although certain aspects will still need to be managed and monitored.

The study for cultural and heritage sites for this report considered both cultural and natural heritage. Cultural Heritage falls into five types as follows:

- Anthropological;
• Historical Heritage;
• Historical engineering and Structural site;
• Archeological heritage and
• Rock ward-old traditional paintings.

Natural Heritage includes:
• Water falls;
• Hot springs; and
• Fossils.

According to the National Heritage Conservation Commission\textsuperscript{19} in Chipata, other than anthropological features, all the forms of natural heritage are not known to exist in the project area. This section of the report therefore only focuses on Anthropological heritage (i.e. traditional ceremonies, cultural beliefs and cemeteries).

6.1.10.1. **Cultural Heritage**

The project area is endowed with a contemporary culture for the Ngoni people who moved into these areas in a series of migratory waves a few centuries ago. They grew in numbers and established chiefdoms.

Culturally, the Ngoni people have a rich cultural heritage which is shared among the different people that constitute the Ngoni ethnic group. The shared heritage marks a distinguished label of cultural and national identity.

The Ngoni People of the project area and indeed of Eastern Province trace their origin from the Zulu People of Kwa Zulu-Natal Province in South Africa. The inhabitant of this region were and are still the Bantu-speaking people collectively called the Nguni.

Traditionally, the Ngonis are pastoral people. Hunting and eating of game animals is very deeply entrenched in their customs and traditions. Apart from this, farming and gathering are also part of their traditional economy.

In the Ngoni tradition, life is regarded as a cycle and this cycle is characterized by stages that are referred to as the rites of passage. These stages a called child undergoes to mark important changes in its life. These phases include: Conception/birth, initiation, marriage and death, marked with appropriate rites and ceremonies.

6.1.10.2. **Traditional ceremony-The Nc’wala Ceremony**

The Nc’wala is the first annual fruit ceremony of the Nguni people. It traces its origin to Zululand in South Africa where even before Shak became king, Zulu Chiefs used to hold their first fruit ceremony known as “Ukunyeateila” meaning “stepping into” a new year annually to welcome the new fruits and new year. The ceremony lasted for four days with each day different parts took place such as killing of a black bull from which the warriors cut its fresh into long strips called “Mizyongo” roasted and

6.1.10.3. **Cemeteries**

Another aspect of cultural heritage which is still practiced in the project area is the respect accorded to burial sites. These are considered as protected areas, as no cutting of trees can take place, apart from when burying the dead. There are no burial sites seen or reported within the project area as all the people within the project area are required to bury at the council cemetery which is located away from the project site.

\textsuperscript{19} Personal Interviews with Mr.
6.2. SOCIO-ECONOMIC ENVIRONMENT

6.2.1. Administration
Zambia is a land-locked country in southern Africa, covering an area of about 752,000 km². It gained independence in 1964. The population of Zambia at the time of the 2010 census was just over 13 million, including about 1.75 million in Lusaka.

There are 10 Provinces in Zambia, and the project area is entirely located in Eastern. Chipata district is situated approximately 567 Km east of Lusaka, the capital city of Zambia. The district has an international boundary with Malawi and borders the districts of Lundazi to the north, Mambwe to the west, Kateete to the south-west and Chadiza and Vubwi Districts to the south. Chipata district covers an area of approximately 2,616 km². The district capital, Chipata town is located on a fairly high altitude of 1,500m above sea level and near to the Lake Malawi/Luangwa River watershed.

Figure 4-16 shows the map of Eastern Province including Chipata City where the proposed project is located.
6.2.1.1. Local Government Administrative Structures

Political governance of the districts in the province including Chipata City is that areas are divided into constituencies and wards. Thus, the ward is the lowest political administration.

The District Commissioner (DC) is the head of the District Administration and is assisted by the District Administration Officer (DAO). The District Commissioner is part of Central Government and falls under the Office of the President while at the same time heading the District.

The heads of the different government departments represented in the district fall under the DC/DAO. The Office of the DC coordinates activities of all government departments in the district as well as those of NGOs and where applicable of the Local Authority, related to District development. The office also harmonizes the functions of Central Government with those of Local Government.

Chipata City Council is composed of 22 political wards and 4 parliamentary constituencies. Each of these wards is represented by a councilor elected by ward residents. Members of Parliament (MP) represent the constituencies. The councilors and the MPs together form the Chipata City Council.

The major role of this body is to formulate local policies and by-laws that promote and guide development activities in the district. The Mayor heads the council.

The project area is found in Chipata Central Constituency and in two political wards namely Dilika and Kanjala.

The District Development Coordinating Committee (DDCC), chaired by the DC and secretariat provided by the City Council, is the main body where all institutions, NGOs, faith based organizations and other stakeholders in development come together to coordinate and inform the DC and subsequently the Provincial Development Coordinating Committee (PDCC).

6.2.1.2. Traditional Administration

The rural population in Eastern Province is also governed by the traditional leadership system of the Chiefs. Senior Chiefs and Chiefs are assisted by Senior Headmen as chief advisors and Headmen. Group and village headmen also form part of the leadership structure.

Eastern Province has 2 Paramount Chiefs (Gawa Undi for the Chewas and Inkosi yama Nkosi Mpezeni for the Ngonis) and 55 Senior Chiefs and Chiefs. The traditional leaders are the custodians of customs and cultural and traditional norms.

The project area is falls within the chiefdom for the Inkosi yama Nkosi Mpezeni of the Ngonis.

They act as arbitrators in terms of disputes as well as judges when crimes of a traditional or customary nature are committed. (Senior) Chiefs administer issues of local importance, such as local development related to water, health and sanitation, and more specifically land allocation and use.

6.2.2. Population of Zambia, Eastern Province and the Project Area

The socio-economic impacts of the proposed project on population does not only end with the immediate population but the project is most likely to affect the whole city though indirectly. In discussing the population figures, a larger perspective was taken. The demographic details were however only restricted to the surrounding areas. Two sample cluster areas were selected, which included Magazine and lower part of Muchini as parameters areas for the demographic data.
The CSO 2010 Population and Housing Census reports that Zambia has an estimated population of 13,046,508. The population had significantly increased from 9.9 million at the 2000 census, at an average rate of 2.8% per year over that 10-year time period. The population of Zambia has been forecast to grow to 17.9 million by 2020 and 26.9 million by 2035 (CSO 2013).

According to the 2010 Central Statistics Office (CSO) census, Eastern Province had a population of 1,707,731. Of this population, 49 percent were males while 51 per cent were females. Chipata district had the largest percentage share of population in the province at 26.5 per cent. Chipata has a total population of 452,428, 49% male and 51% female. The population density for Chipata, standing at 67.6, is the highest in the province. The population of Chipata has been forecast to grow to 766,122 by 2035 (CSO 2013).

Chipata City is the administrative centre for Eastern Province and the most urbanized with people moving from rural parts of the district and other parts of the province seeking employment, business opportunities, and access to better services. This movement has put pressure on the City’s ability to deliver quality services, such as water, sanitation, land and housing.

Given the centrality of the proposed project, the population which is likely to be affected by the proposed Chipata Dry-port and the proposed Chipata Bypass road is that for Chipata Central Constituency, which is estimated to have a population of 156,773.

### 6.2.2.1. Demographic Features of the Project Area of Influence

Households around Magazine and Munchini areas were taken as parameters of discussion and analysis for the immediate areas of influence of the proposed project. These areas were identified for inclusion in the baseline socio-economic survey on the basis that they fulfilled one or of the two of the following criteria in relation to the proposed project:

- Living within < 1km of the proposed project; and
- Living within the influence of the activities of the projects.

#### 6.2.2.1.1. Age

A snap shot household survey was administered in the two sampled areas to assess the age of household members. The ages of household members were captured in this snap shot household survey and analyzed because it might help the developer to take into consideration the various needs of various age groups around the proposed project.

A total of 115 households were conveniently (randomly) sampled in the two sampled areas. The results of this household survey indicate that majority of the heads of households in the communities around the project area are male (83.4%) compared to 16.6% female who are heads of households. The ages of household heads in the sampled area ranged from 30-45 years (47.3%); 45-60 years (31.5%) and above 60 years accounting 21.3%.

In terms of age distribution of other members of the household, the age group of 17-30 years (34.2%) dominated the results followed by those younger than 17 years old (27.3%). This means that the youth population is higher than the adult population.

One of the implications of this observed age distribution to the proposed project is the availability of young people to be employed by the proposed project. The 34.2% (20-35 years) and the 47.3% (30-45) means that there is a population that can be engaged by the project both during construction and operational phases.
6.2.2.1.2. Education levels and Available Skills

The level of education and availability of a set of skills will be very important to the proposed project. During the snap shot household survey, effort was made to collect data on these variables. The results of the snap shot survey indicate that majority (63.4) of household heads have attained tertiary training while a significant 89.3% of the other household members have completed secondary education.

This finding indicates the availability of potential manpower that can easily be trained by the developers to manage various responsibilities required by the proposed project both in the construction and operational phases.

An array of skills among the people interviewed equally exists and ranged from carpentry, bricklaying, tailoring, etc. Overall, the snap shot household survey reviews that people in the sampled areas have the level of education and necessary skills that the proposed project might need.

Beyond the sampled areas, the labour environment in Chipata lends itself to the fact that most if not all skilled workers required for the project can be sourced within the Chipata area for both construction and operation. Semi-skilled and unskilled labour is available in abundance in the immediate environs of the project are due to close vicinity of high-density townships such as Magazine and Munchini. High levels of migration to the city coupled with high unemployment rates contribute to a large pool of readily available semi-skilled and unskilled labour in Chipata area.

For Chipata in general, 71.7% of the population falls within the active working bracket of 15-64 years old. This proposes that there is a broad based economically active population. Of the total male population 58.5% are economically active while 45.5% of the total female population are economically inactive.

6.2.2.1.3. Gender

Gender is also another socio-economic variable which would be of interest to project developer and which should be taken into considerations in the design of the proposed project. The snap shot household indicate that there more female than males in majority of households (56.4% and 43.6% respectively). The project developer would need to take this finding to ensure that where possible more female job seekers are given opportunities. The project developers can also make deliberate policies where certain jobs are exclusively reserved for the females.

6.2.2.1.4. Disability

Disability was another variable captured at household level. Though the survey results reviewed only 9.3% of households with disabled household members, the developers should consider the needs of the disabled in the design of the proposed project.

6.2.3. Land Tenure and Land Use

Land tenure in the project area is similar to the rest of the country and is vested in the Republican President who holds it on behalf of the Zambian people. Access to land is on tenure basis as governed by the Lands Act. There are basically two types of land tenure systems in Zambia namely traditional and leasehold. The majority of land in Zambia is held by traditional leaders who have powers to issue it for use by their subjects. In the project area however, land is under leasehold arrangement and is under the Chipata City Council Planning Jurisdiction.

The concept of ‘land use planning’ is still new and only practiced to a limited extent in urban areas where specific areas are assigned for industries, commercial building and dwelling. However, most
of the structures including some structures within areas where local authorities have planning jurisdiction have no titles.

The land designated for the establishment of the Chipata Dry Port is owned by Zambia Railways Systems and is currently not used for any activities while land for the proposed alignment of the Chipata Bypass Road is in private lands under the 99-year leasehold. RDA would therefore need to acquire land from land owners for proposed bypass road.

Urban land use refers to spatial distribution of social and economic activities. Accordingly, an up-to-date land use inventory is frequently required to facilitate urban planning and growth patterns as well as monitoring of urban expansion. Discussion with the City Physical Planner from the City Council revealed that there about six major land-use classes in the project area of influence. These include Residential use, Industrial, commercial and service centres, Infrastructure land use, urban agriculture as well as Water bodies and riverine areas.

Residential development is probably the major land use in the project area and the Magazine and Munchini Compound are very close to the proposed Chipata Dry Port.

The proposed Chipata Bypass Road will mostly pass through land which is mostly used for agricultural activities with the Prison Farm being the largest farming area.

The newly constructed Muchinji-Mwami Railway line and the rail line station is probably the major infrastructure development close to the project area, while commercial and institutional facilities such as the Luntembwa Primary School and the Chipata Prison Services are also very close to the project area.

The Luntembwa Dam 2 is within 2Km from the proposed site for the Chipata Dry Port and is a major land use for water reticulation for Chipata City.

6.2.4. Livelihoods and Poverty
During the field survey, it was noted that the residents of the project area make their livelihoods in a variety of ways both in the formal and informal sector. Some of the businesses in the area include; Malls, banks, restaurants, apartments and letting businesses (real estate) just to mention a few. Others included the vast number of schools and educational institutions in the area that have employed locals. Some locals are also employed in the construction teams in the developments occurring in the area that were under construction during the field survey.

While urban district is associated with the formal economy and carries the majority of households in the formal sector, most rural areas are associated with the informal economy and accommodate many of the identified vulnerable groups.

Some people work in the central business of the city where as others work in these sectors locally in the compounds such as Magazine, through shops in the commercial and market centers, others work in the local institutions fulfilling diverse roles.

During the baseline survey, it was established that few if any households in the project area can meet all their needs through one activity. The key characteristic of livelihood strategies is that of a combination of activities and resources natural resources (forest) utilization. People seek to balance the time, resources and risk allocated to various activities so that in total, a wide range of needs are met. The strategies employed are dynamic and adapt constantly to changing situations. Another essential point is that there is enormous variation between households, areas, and years in the type and balance of activities undertaken.
The main strategies however include subsistence agriculture (crops, livestock), wage employment, cash remittances, and “wild” natural resources, including trees, grasses, fish, nuts, fruits, and medicinal plants. The most ubiquitous activity is agriculture -- virtually all households grow crops and the majority in project area of influence own or have access to livestock and crop fields. However, it is noticeable both from literature review and field interviews that although almost all residents of the project areas identify agriculture as their main activity, it is only some who rely on it as their main source of income. This indicates the inadequacy of agriculture as a source of cash income and widespread dependence on off-farm income. But it also shows that even those who have other main sources of income still regard agriculture as a core activity.

6.2.4.1. Crop Production
The type of farming in the project areas is subsistence and is characterized by low external inputs, very little cash inflow, use of manual labor and bartering of the produce with other household items. The major cash crops grown are: maize, cotton, beans, groundnuts, and sorghum. Other crops grown on small scale include: soya beans, pigeon peas, cow peas, Bambara nuts, sweet potatoes, sugar cane and sunflower. Horticultural crops grown include: oranges, guavas, granadilla, pawpaw, lemons, mango, avocado, banana, pineapple, tangerines and coffee.

Discussion with farmers in the affected communities reviewed that crop production provides households with many benefits and the following are some of the benefits, which were identified:

- **Limited cash incomes**: Surplus grains are sold (by a small proportion of farmers) or used to produce products for sale or in-kind trade. Other farmers identified cash cropping as the main source of income. However, it is clear from the discussion held in the affected communities reviewed that when oxen, land, labour and good conditions are available, significant income from sale of surplus grain can be earned by a fair proportion of farmers. Income from beer brewing is likely a significant source of income, particularly to households with few other cash sources.

- **Savings**: Staple grains are also stored (with risk of spoilage) for future consumption or sale.

The consultation and discussion also revealed that the main inputs to crop production in the communities visited are labor (particularly women's labor) and draught power for ploughing. These determine the area that can be planted and tended. Use of mechanized and commercial inputs (fertilizers, irrigation, tractors) is low, not only because of limited availability and affordability, but because farmers adopt a low-risk approach ("low-input low-output"). A farmer investing in a costly practice to obtain higher yields loses that investment if adequate rain does not fall or if markets for surplus grains cannot be accessed. Instead, most farmers minimize risk by incurring minimal capital and operational costs and emphasizing drought tolerance.

The significance of crop production in the proposed project area, as a major source of livelihoods and income is demonstrated by the fact that crops were consistently ranked first in the importance of incoming resources or activities, in participatory discussions at household and community level, although this varies considerably between households. However, it was not easy for the study team to establish how significant crop production is in terms of maintaining food security and meeting or minimizing cash needs through sale of surplus grains.

6.2.4.2. Livestock Production
Field observations, interviews with communities and review of recent agriculture statistics show that there is a tradition of rearing cattle among the majority of the communities in the project area. The use of animal draught power is widespread even among those who may not have cattle of their own.
Data on the livestock population however, are variable and not necessarily very reliable. There is no information on the distribution of animals between households, except that the vast majority of all households report owning or having access to cattle and poultry.

Analysis of the field discussion indicates that livestock are traditionally kept for multiple goals related to basic needs (meat, milk, draught power), social and cultural activities, and consumption of luxury goods (prestige, bride wealth, status) (Low, 1986), rather than for maximizing off-take and profit as in commercial holdings. It is also evident that men traditionally have ownership of and responsibility for cattle and hence control of draft animals for ploughing and clearing land for cultivation, animals used as gifts or for a bride price, and sales to generate cash.

6.2.4.3. Micro-enterprises
Several households engage in some form of micro enterprises. A micro-enterprise can be described as an income-generating venture owned by a family and run by or on behalf of that family. Observations during the site visits revealed general characteristics for all the micro-enterprises and include the following characteristics:

- Low initial capital, low working capital and therefore, low income generated
- Members of a family or club contributed labor towards the micro-enterprise
- There was a general lack of business management skills
- Little or no credit had been sought for;
- Products were marketed in the village, sometimes on barter system; and
- Several micro-enterprises were run by women.

Whilst trade is widespread with some form of trading taking place in nearly every corner of the project area, industrial activities are very limited. Household goods and daily requisites (groceries) are the most commonly traded items. Others are farm produce of different types - grain (mostly maize, beans, millet, sorghum and groundnuts), tubers (sweet potatoes, Irish potatoes, cassava), cucurbits (pumpkins, melons and cucumbers) in the form of poultry, pigs and goats are also commonly traded. The target market for most of these products is the local people. However, some of the merchandise finds its way out of the district e.g. the Food Reserve Agency would purchase maize and sell it out of town.

6.2.4.4. Poverty Levels
Despite robust growth in recent years, poverty remains very high in Zambia including the project area. According to 2015 LCMS data, the incidence of poverty was estimated at 54.4 percent. This implies that 54 out of every 100 Zambians are poor. Analysis of the 2015 LCMS results by rural-urban reveals that poverty in Zambia has continued to be more of a rural than an urban phenomenon. The proportion of the population that is poor in rural areas had almost remained at the 2010 level of about 76 percent. In 2015 rural poverty was estimated at 76.6 percent, which is three times higher than what was obtaining in urban areas, at 23.4 percent. In absolute numbers, 7.9 million people lived in poverty, with 5.5 million of those living in extreme poverty with insufficient resources to meet their daily minimum food requirements.

This national picture for poverty incidence is similar to what is prevailing in the project area. According to the 2015 LCMS data, Eastern Province is ranked as the sixth poorest province in the country and its incidence of poverty is estimated at 70%. This means that 70 people out of 100 are poor in the province.
6.2.5. **Vulnerable People and Groups**

The main vulnerable groups in the local communities are likely to be:

- In particular, single mothers are the group that are likely to be most at risk and vulnerable in the local communities near to the mine; (about 40% of the 56 villages have more than 60% women).
- There are some households with just grandparents and children.
- People with disabilities, HIV, etc.
- Many poor families that rely on just small-scale family farming are at risk in terms of food security each year if the rains fail. Many families do not send their children to school so that they can help with the family farming activities.

There are no reliable data available on vulnerable persons in the project areas. The Social Welfare Office in Chipata has minimal data. They keep a register of vulnerable persons, but only covers people that have visited to register, and therefore is unlikely to be a comprehensive source of information.

The Social Welfare Office in the district is able to provide support to only small number of vulnerable persons. For example, in 2015/2016 it is supporting 432 children in education, 273 persons with food and nutritional support, 92 persons with shelter, and 34 persons with medical support. It is likely that these support initiatives cover sick people, orphans, education for children with single parents, etc. However, it is considered that this support covers just a small proportion of vulnerable persons in the district.

The main reasons for higher poverty levels in rural areas include inability to afford agricultural inputs, while for people in urban areas, low salaries and wages, lack of employment and lack of capital for business are cited as major reasons. The World Bank (June 2012)14 highlights two elements directly related to poverty: (i) the pattern of economic growth in Zambia has been highly unequal in remote rural areas, meaning that some sectors and populations have benefited much more than others; and (ii) overall economic growth has not increased the incomes of the poor rapidly enough to lift them out of poverty. Various social, economic and cultural factors reinforce the vulnerabilities in society, and therefore a focus on underlying socio-cultural causes with intrinsic economic dimensions within the country context is critical.
It is clear that children, young people and women are most affected by poverty. Pervasive inequalities have contributed to women bearing the biggest proportion of poverty due to their limited access to and control over productive resources such as land, livestock, credit and modern technology. In addition, discriminatory laws that restrict women’s legal capacity have a direct bearing on their income-earning capacities. For these reasons, women are overrepresented in the informal and ‘survival’ sectors where income is extremely low and unreliable. All of these factors enhance women’s vulnerability to poverty.

### 6.2.6. Health

The socioeconomic diversities in the district greatly influence the quality of life of the people, and poverty reduces the access to resources that the people may use to improve their livelihoods. Poverty is one the main factors that influences the quality of health of people in in Chipata and the province in general since restricts the quality and access to health care that an individual can get. This therefore leaves the people vulnerable to endemic diseases that occur as a result of coupling factors linked to quality/hygiene and state of their surroundings.

Linked to their socioeconomic wellbeing and quality of housing it can be seen that malaria and respiratory diseases are the most prevalent causes of morbidity in the district, while most health facilities are concentrated around the urban areas of Chipata in general.

The health services in the project area are rendered by Chipata Health Management Team under the Ministry of Health. The district has a total of 45 health facilities, 4 of which are Health Posts, 36 Rural Health Centres and 3 Urban Health Centres, 1 District Mission Hospital (Level 1) and 1 General Hospital (Level 2). The district further has 3 privately owned clinics and 2 Nursing Schools run by Mwami Mission Hospital and Chipata General Hospital.

Most of the health facilities in the district however fall short of the required standard as set by the Ministry of Health for a health facility. MOH’s definition of a health facility refers to community health centers, clinics, rural health centers or any structure where people can access conventional health services. Furthermore, health facilities should have the necessary amenities such as water, electricity or solar, adequate infrastructure, communication facilities, transport and refrigerators for storage of drugs. Availability of amenities such as electricity or solar is important because it enables health facilities to provide services on 24 hours basis. Health facilities also need transport and communication facilities for them to be able to refer patients they cannot treat to the next level of care. The health sector in the district is faced with several challenges including long distance to health facilities and lack of transport, problems of access for underserved groups, poor physical infrastructure, inadequate resource allocation and under-performance of the heath management system.

Health services provided include promotion, preventive, curative and rehabilitative services. Other services provided in the district include laboratories in three (3) centres, PMTCT and VCT in Forty-Three (43) sites, while ART services are being offered by Mwami hospital and Kapata urban. Additionally, health staff also provides outreach services at community level.

In terms of disease burden, five top diseases responsible for morbidity and mortality in the project area include malaria, diarrhoea, respiratory infections (non-pneumonia), anaemia, and maternal complications.

The entire district is endemic for malaria, with moderate-to-high transmission in all districts. A seasonal pattern of higher transmission is associated with the rains between November and April (National Malaria Control Centre, 2011). The challenge with malaria is not only fighting the disease...
and its transmission, but also getting hold of a trustworthy figure related to the actual number of people who have the disease and attributed mortality rates\textsuperscript{20}.

Without proper parasitological confirmation, diagnosis relies on non-specific clinical symptoms, mainly fever. As the disease is so spread not only in the project area but the country as a whole, any fever is frequently associated with malaria, and treated as such. Almost 50\% of the population is infected. According to the National Malaria Control Centre, malaria accounts for 40\% of all outpatient attendance, up to 40\% of all infant mortality and 15-20\% of deaths in children under five\textsuperscript{21}.

The human and economic impact of the disease is a serious curb on economic development, either directly – through the costs of health care and hospitalisation – or indirectly, through workdays lost to personal illness or caring for a sick child. Malaria accounts for 6.8 million disability-adjusted life years lost in Zambia – more than respiratory infections (5.4 million) or HIV/AIDS (3.2 million).

In terms of age, children are the most affected. Most recent data (Ministry of Health, 2012) shows that, on average, the percentage of children under five infected has been decreasing since 2006, with a small difference between the two last data points available (2010 and 2012).

Pneumonia is another disease burden in the project area and the district as a whole. Fever is a symptom of both pneumonia and malaria, making it very difficult to distinguish one disease from the other, particularly for volunteer community health workers who provide primary health care in remote rural areas of the district.

The distribution of rapid diagnostic tests (RDTs) for malaria by the Government to health facilities in the country has increased since 2007. However, as described by the National Malaria Control Centre, routine health-information data do not include reporting from all districts on RDT use for testing febrile children, so full data are not available to assess national efforts in increasing use of diagnostics.

According to research by the Centre of Global Health and Development\textsuperscript{22}, most Zambian children who come to rural community health posts with a fever are treated with antimalarial drugs; those suspected of pneumonia are referred to the health centre. This often leads to treatment for the wrong disease, exposure to inappropriate anti-malarial and delays in care for pneumonia.

Diarrhoea is also a common disease in the project area. Diarrhoea leads to fluid loss and, in young children who are malnourished or have impaired immunity, may be life threatening. In Zambia, it is one of the leading causes of mortality and malnutrition in children under five years old.

Diarrhoea is a direct result of poor sanitation and water systems in the country, in combination with poor personal hygiene habits. It weakens the child, and creates long life health problems. In the same fashion, cholera is a life-threatening, acute diarrhoeal infection that is increasing in the country, mainly in the peri-urban areas of the big cities.

In the project area and the district as a whole, Children and women face many health issues, which are exacerbated (i) by a lack of adequate infrastructure (water, sanitation and garbage management, among others); (ii) by limited knowledge and narrow perceptions in terms of health and customary

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practices; (iii) by poor availability of services and limited quality; and (iv) by their own cultural and traditional beliefs.

One of the problems faced in this section was the availability of reliable administrative data. In terms of health management, frequent and good quality administrative data is key to monitoring diseases trends and to evaluating policy interventions in the future. With the exception of malaria, data on other diseases are not easily available in Zambia.

### 6.2.7. HIV/AIDS

The Joint UN Programme on HIV/AIDS (UNAIDS) estimates that between 900,000 and 1,100,000 people in Zambia live with HIV, which represents approximately 13% of the country’s total population\(^{23}\). Urban areas still have higher HIV prevalence rates than rural areas (20% and 10%, respectively), and females (16.1%) are more likely to be HIV positive than males (12.3%) (National AIDS Council, 2011).

According to the 2014 ZDHS (Zambia Demographic and Health Survey) results, HIV infection level in Eastern Province among adults 15 to 45 years of age is estimated at 10.3% (9.5% in men and 11.0% in women). Chipata district has the highest prevalence rate (22.6 %) of all the districts in the province.

The project area is in the network and transit towns and prone to HIV/AIDS/GBV. The HIV/AIDS/GBV has great impact on many families which live in poverty and due to the fact that it has affected mainly the productive age group of 15 – 49 years. The loss in manpower due to HIV/AIDS/GBV can retard economic growth leading to deepening poverty levels.

In Zambia including the project area, 40% of HIV infections occur within the 15-24 age groups. This translates into 3 new HIV infections per hour, 72 per day and almost 27,000 per year. Overall in the country, adolescent girls are also about twice as likely to be HIV positive as boys (Figure 61). In other terms, of the three infections that occurred every hour in Zambia in 2011, two of them were in girls (UNICEF Zambia, 2011).

According to the study by UNICEF, among the 15-24-year-old female population that was HIV positive in 2007, 56% had never married. Among this specific group (female, HIV positive, 15-24 years old, never married), 55% had never had sex, meaning they might have been infected through mother-to-child transmission. Among those that were HIV positive in the age group 15-24 years old, for both men and women incidence rises with income, with a small difference for men in the lowest and second quintiles. A total of 15.2% of women infected in this age group are in the lowest quintile in comparison with 28.3% who are from the wealthiest families in the country.

Prevention is still the most important entry point to fight HIV/AIDS, especially for the young and adult populations. Prevention involves improved knowledge, behaviour change and empowerment of women. The Zambia Sexual Behaviour Survey gives important information on these three. According to this survey, the percentage of the young population (15-24) with comprehensive knowledge on HIV/AIDS decreased from 2005 to 2009, for both men and women.

On the positive side, the percentage of young women and men aged 15-24 who have had sexual intercourse before the age of 15 has been decreasing over the years. The older the start of sexual life, the higher the chances boys and girls are going to be more educated and women are going to be more empowered in terms of prevention of HIV and other diseases, as well as of undesirable pregnancies.
On the negative side, Figure 65 shows that, for the 15-19-year-old population, the difference between the knowledge that condoms can prevent HIV infection (66.5% of women, 73% of men) and their use at last intercourse (36% for women, 29% for men) shows the young population in Zambia is, in fact, not using preventive measures, and is still very vulnerable (to contracting HIV, other diseases and non-planned pregnancies). In the same figure, the number of male and female respondents who said they would ask their partner to use a condom was very high. The question that comes to mind is what are the barriers to the consistent use of condoms by the young population in a scenario where 97% of new HIV cases among people older than 15 years old are transmitted through unprotected sex?

Along the same lines, only one in each four young persons aged 15 to 19 years in 2009 had ever tested for HIV. This number is low, but represents an increase in relation to 2000, when it was only one in twenty. Most of the boys and girls in this age group know where to be tested (Figure 66). Girls represent double the number of boys ever tested for HIV. One explanation for this could be that girls are tested during ante-natal visits, in cases of early pregnancy. Among tested boys and girls, on average 98% received their results.

According to the Zambia Sexual Behaviour Survey, for the population 15-19 the main reasons for not testing for HIV are fear of the results (60%), fear of depression (29.7%), fear of stigma/discrimination (26.8%) and fear of death/dying faster (26%). Around 13.2% did not know where to be tested and 11.5% said they did not feel at risk.

According to the Provincial HIV/AIDS Task Force in Chipata, the HIV epidemic in the project area is driven by the following major factors:

- Multiple concurrent sexual partnerships,
- low condom use, low circumcision uptake,
- mobility and labour migration fuelled by creation of new job opportunities,
- vulnerable and marginalized groups,
- vertical transmission from mother to child, and
- Alcohol and drug abuse.

Stigma remains a barrier to individuals learning of their HIV infection early and accessing preventive services. Unreported cases of GBV also escalate the vice.

Despite all the investment and all the positive achievements in past years, HIV/AIDS is still an epidemic in Zambia. The disease is migrating from being characterised as urban into the rural areas of the country, posing a new challenge for the Government and partners, since access to health facilities is difficult and prevention is jeopardised by cultural beliefs.

One of the main challenges is that the true size of the epidemic remains unknown, especially among 0-14 year olds. Government and international partners work with estimates, and these do not cover small areas or certain age groups. Therefore, management and strategy might not be as efficient as it should be in order to effectively fight the disease and to prevent its spread. One example, shown in this chapter, is the gap between the population that receives ART and the population that should receive it, which has been increasing in recent years.

Further investigation is necessary, especially for 0-14 year olds. All data from the most recent health surveys covers the population older than 14-15, but there is a large data gap in the first 14 years of life of boys and girls. It would be very helpful to know if this population is actually contracting the
6.2.8. Education

Zambia’s educational system changed its structure in 2011 from basic education (Grades 1-9) and high school education (Grades 10-12) to primary education (Grades 1-7) and secondary education (Grades 8-12) (Figure 77). It follows an integrated curriculum determined by the Ministry of Education, Science, Vocational Training and Early Education (MESVTEE). Schools can be divided into four categories:

- **Government schools**: Schools that are funded by the Government. Among the Government’s responsibility are infrastructure (including water, sanitation and electricity), books and other learning materials and teachers and support staff salaries. Generally, schooling is free at primary level, though Parent Teacher Associations (PTA) may charge for particular school projects, while at secondary learners pay fees though government also provides grants.

- **Grant-aided schools**: Schools run by faith-based organizations that receive government grants.

- **Community schools**: In the early 1990s, communities, with the support of NGOs and international organizations, and embraced by the Government, began forming their own schools, usually in the absence of a nearby public school and/or in response to the inability of families to meet the costs associated with Government-provided schooling (USAID, 2006). Today, the Government recognizes the importance of these institutions, which account for 20% of primary school enrolment. Teachers are a mix of volunteers from the community and trained teachers who receive salaries from the Government. The Government also provides school grants, books and other learning materials for some community schools that meet a certain criteria.

- **Private schools**: Schools which are separate from the Government, where students pay for their education.

Chipata district has a total of 314 schools, including Government, private and community primary and secondary schools. In terms of tertiary education, the district has a Skills Training Centre and Trades School and various colleges including a Teachers’ Training College.

The education sector in the project area and indeed in Chipata district as a whole is faced with challenges such as the lack of adequate infrastructure, pupils living long distances from school, inadequate classrooms and staff houses, lack of electricity and adequate sanitation facilities and shortage of teaching staff.

There are great disparities in staffing levels between the rural and urban schools with the urban schools recording the highest numbers of teachers. Pupil drop-out rate is high, the main factors being early marriages, early pregnancies, cultural practices and long distances to schools.

Students entering at Grade 1 should not be younger than five and not older than seven. However, government’s recommended age for entering Grade 1 is seven years. At the same time, government promotes a ‘leave no child behind’ policy, hence over age children are not turned away. In urban areas, some children start Grade 1 earlier than 7 years. According to the 2011 School Census, the country had 8,993 schools from Grades 1 to 12, 60% run by Government, 29% characterized as community schools and about 11% grant aided/private schools. Run by private and/or international aid. The students have a primary leaving examination at Grade 7, while a Junior Secondary School examination is conducted at Grade 9. This qualifies those that pass to move into Grade 10. However, many who pass are unable to get into Grade 10 due to lack of space, financial and other constraints. Hence, government has embarked on a number of initiatives to expand access.
to secondary education including: upgrading of strategically located basic schools into day secondary schools (by constructing additional classrooms on the premises of the existing basic schools), absorption of Grade 9 graduates in Trades Training Institutes and promotion of a two tier system. After finishing Grade 12, students have to qualify to enter the tertiary level of education (university and/or vocational system).

According to the District Education Board, there are still more boys than girls enrolled in primary school, but the difference is not as big as in secondary school. Education from Grades 1 to 7 is free in Zambia, with a vast number of schools available for these grades.

As the change in the educational system is still recent, most of the primary schools in the district (Grades 1-7) are also responsible for Grades 8 and 9 (former upper basic education).

The absolute number of students in secondary education (Grades 8-12) has doubled, increasing since 2000, with a small decrease from 2010 to 2011. Starting at Grade 8, school fees are introduced in the educational system.

Children are enrolled mainly in Government-funded schools (86%), followed by grant-aided institutions (7%) and private schools (6%). Around 1% of students in secondary education are in community schools. The reduction in number of community schools at secondary level is due to the high cost of running secondary schools and also the requirement for trained teacher’s specialized in specific subjects, which is well beyond what the communities can manage. Children from primary community schools go into government secondary schools if they can meet the school fees.

One educational indicators common to most these schools is that while enrolment of boys and girls in most schools has increased mainly due to the free educational policy and the girl child education policy, there are few teachers in most of the schools attending to the increased number of pupils, which has led to high pupil teacher ratio, with resultant outcomes of poor performance of pupils at examination level.

In terms of enrolment, although the head teachers interviewed indicated that this is increasing especially at primary level and mainly as a result of the GRZ’s free educational policy for all primary going children, the level of drop out is also high especially at examination classes for various reasons including pregnancies and early marriages for girls, and lack of money for school requirements especially at secondary level.

Another key feature of the educational services within the project area of influence is that enrolment figures have been increasing while infrastructural development has remained stagnant. This has put pressure on the existing insufficient infrastructure such as classrooms, sanitation facilities and learning materials. Also, enrolment at both upper basic grade levels (grades 8-9) has not been increasing at the desired level because of insufficient infrastructure to accommodate pupils who progress up from grade 7. This has resulted in many pupils dropping out of the educational system, among other reasons.

6.2.9. Water Supply and Sanitation

City water supply and sanitation services in the district are provided by the Eastern Water Supply and Sewerage Company (EWSC) through a piped water system. Dams in the vicinity of Chipata town provide the surface water for the water reticulation system. Rural water supply and sanitation services are provided by the council in form of boreholes, wells and latrines. However, most families in the rural areas lack adequate water and sanitation facilities and draw water from non-improved and unprotected sources such as streams and shallow wells in dambo areas. In many cases people have to travel long distances to fetch water, the burden being borne by women and
children. Many of these water sources are also drinking points for wildlife and domestic animals. Diarrhoea, recorded as one of the most prevalent diseases in the province, is indicative of poor sanitation, unhygienic environment and poor water supplies.

The nearest compounds are connected to the Chipata City water piped system and ZESCO electricity, even though a large number of households do not have electricity nor do they have a water connection in their own house. The area as a whole is not connected to the municipal sewage system. Waste collection is organised by the Chipata Municipal Council against payment. A lot of households do not use this system but have their own rubbish pit where they bury or burn household waste. The City Council has an area for the disposal of waste but it is not well organised and doesn’t comply with Zambia regulations for waste disposal and management.

6.2.10. Electricity, Transport and Communication
The district is connected to the national grid that provides electricity through ZESCO. However, the majority of the rural areas in the district don’t yet have electricity connection and even though the capacity installed is enough to meet current electricity demand in the Chipata municipality, even there a lot of power outages and load shedding is experienced. Solar power is the main source of electricity in rural areas where people can afford to buy solar panels. Charcoal is the main source of energy for heating and cooking in the urban area while fuel wood is mostly used in rural areas.

The road network is poorly developed in Chipata District; the district has about 985 km of roads, of which 865 are rural feeder roads and 120 km are municipal roads. Only about 60 km of the municipal roads are paved. The Great East Road (T4) is the main national road connecting Chipata with Lusaka and Malawi.

There is only one railway line in the district, the Chipata-Mchinji Railway. The railway line provides the shortest route for transportation of goods between Zambia and the Port of Nacala through Malawi. The railway line is not yet operational, but it will be the main line providing in and outbound transportation for the proposed Dry Port Facility.

Chipata District has a small airport, currently only served by Pro-flight Airlines, providing flights from Chipata to Lusaka and Mfuwe, gateway to the South Luangwa National Park. The district has 2 commercial FM radio stations and 1 community FM radio station. All the stations in the district cover the radius of more than 100km. The district receives ZNBC radio 1 and 2 signals and ZNBC TV signal and fee paying channels from MUVI-TV and DSTV Multi-choice Zambia. Mobile phone providers are MTN, Airtel and ZAMTEL. Mobile phone coverage, although expanding, is still not reaching the whole district. Land line phone services are provided by ZAMTEL.

6.2.11. Industry, Manufacturing and Trade
Chipata District has 2 established cotton ginneries owned by Cargill and Chipata Cotton Companies. The Chipata Cotton Company also has a cooking oil plant that produces cooking oil from cotton seed. The most important export commodities are again tobacco and also cotton. The formal trade and industry sector in Chipata is still relatively small and is further includes a brewery, mineral water producing plant, bakeries and dairy processing plants. In addition, the town has two milling plants with the capacity to supply the whole Eastern Province.

6.2.12. Tourism
In recent years Chipata District has seen a growth in the tourism sector which has been stimulated by the investment in the tourism facilities such as hotels and lodges and the rehabilitation of the airport. The district has one five-star hotel (Protea Hotel) and 20 lodges and guest houses. Tourism is very much related to the nearby South Luangwa and other National Parks.
6.2.13. Service Sector and Shopping Facilities

Chipata town is the main commercial service centre of the Eastern Province. The town has many retail and wholesale shops dealing in a variety of goods and services such as agricultural commodities (inputs and products), hardware materials, household goods and other industrial products. There are currently 8 registered commercial banks and other firms operating in Chipata District, offering a wide range of financial services. Six Insurance companies are providing various insurance covers.

The District Development Plan for 2011-2015 alleges that the growth of industry in Chipata District has been limited by low levels of Government investment in infrastructure such as the road network. The Council, as the agency of the Central Government, has insufficient financial capacity for the improvement of the road infrastructure due to large amounts of capital required.
CHAPTER SEVEN

PUBLIC CONSULTATION AND STAKEHOLDER ENGAGEMENT

7.1. INTRODUCTION
This Section summarizes the consultation process that has been conducted at national and local levels as part of the ESIA process. It also outlines the results of that process and how they have been used to shape both the project engineering design and the development of the mitigation measures as outlined in Chapter 11. Following disclosure, this Chapter will also contain a summary of the results of disclosure including an indication as to how the comments on the ESIA have been incorporated into the ESIA.

Further details about the process to date, including details of all the organisations consulted at different stages, can be found in the Scoping Report for the project. The main findings from the project area level consultation, have been included in Chapter 6 (Environmental and Socio-Economic Baselines). A detailed explanation of the data collection process for the social baseline has been included in Chapter 2 (Methodology).

7.2. FUNCTION OF CONSULTATION
The aim of consultation is to understand as far as possible how the project will impact stakeholders, and to obtain their ideas and opinions on management of impacts to influence project design, implementation and follow-up. It is also an important opportunity for local people to become better informed about planned activities. The project has sought to carry out consultation in line with national regulations, international best practice and RDA policies.

7.3. BACKGROUND
To conform to ZEMA and EIB’s involuntary resettlement social standards, stakeholder’s consultation and participation was undertaken in preparation for the Scoping Report and consultation continued during the preparation of the ESIA and RAP Reports. The community consultation and participation provided the opportunity to raise the PAPs and stakeholder’s awareness on the proposed road project and its facets.

It is most important that people are aware of developments that are going on or planned for in their localities, particularly when these developments affect their land and their neighbourhoods. It has long been recognised that local communities have a thorough knowledge and understanding of their natural, physical, cultural and social environments. Logically, therefore, they must be involved in the identification of potential environmental and social issues, as well as in the formulation of remediation measures for any adverse impacts.

Participation of Project Affected Persons (PAPs) is an important component in the efforts of identifying impacts and designing of the Resettlement and Rehabilitation Plans. The public consultation for the project was carried out with the PAPs, key Stakeholders, NGOs and public representatives in the project area especially in identifying the impact categories, magnitude of compensation package and livelihood restoration options. Care was taken to allow for greater participation of the marginalized and vulnerable groups among the PAPs.

During the Scoping and ESIA Phases, public consultations were undertaken at various levels in order to elicit the perceptions of the different stakeholders with regard to the positive and negative impacts the proposed Chipata Dry Port and the Chipata Bypass Road. Minutes of these meetings
are contained in the Appendices. During the scoping, discussions were held with local communities within the project road corridor.

Public participation was made through public meetings and achieved the following:

- A vehicle for public input and facilitated negotiated outcomes for the whole stretch of the project roads corridor;
- It created trust and partnerships;
- Negative impacts are minimized;
- Positive impacts are enhanced; and
- It provided an up-front indication of issues that may prevent project continuation, that can cause costly delays at a later stage, or result in enhanced and shared benefits.

The Consultant conducted the public participation for the proposed Chipata Dry Port and Chipata Bypass Road in order to involve as many potential Interested & Affected Parties as possible. Accordingly, issues arising from this public participation process have been incorporated into the ESIS and used in determining mitigation measures for the project.

For projects that have environmental and social impacts, consultation is not a single conversation but a series of opportunities to create understanding about the project among those that are likely to be affected or might have an interest in it, and to learn how these stakeholders view the project and its related risks, impacts, opportunities, and mitigation measures. Listening to stakeholder concerns and feedback can be a valuable source of information to help identify environmental and social risks (real and perceived) and improve project design and outcomes of the ESIA and the project.

The stakeholder engagement plan has incorporated the comments from the consultation meeting at the scoping stage and will take into consideration further comments from stakeholders that may be received during the ESIA and RAP disclosure, which RDA intends to carry out once funds for the project are secured.

7.4. STAKEHOLDERS IDENTIFICATION AND ANALYSIS

With the help of the District Commissioner’s Office in Chipata, the Town Clerk’s Office for the City Council, and the Ward Councillors, the consultant identified organization, groups and individuals considered to be regarded as “stakeholders”. This identification was based on each one’s roles and their relevance in the proposed Chipata Dry Port and Chipata Bypass Road.

One of the major purposes of stakeholder’s identification and analysis was to provide an opportunity to involve and ensure participation of all groups of the society in the planning and implementation of a project depending on the stakeholders’ willingness and participation.

The first step was the exercise of identifying project stakeholders. Stakeholders are defined as groups or individuals who will be or are likely to be directly or indirectly affected, positively or negatively, by the project at hand. Two main categories of stakeholder were defined; differentiating between those are likely to be directly or indirectly affected, positively or negatively, (commonly referred to as project-affected people, households or communities) and those who might have an interest in or may influence the project. Following this definition, the two principal groups of stakeholders in the proposed Chipata Dry Port and Chipata Bypass Road are broadly categorized as follows:

1) **Affected groups**: People or entities directly affected by the project and have been identified as potentially vulnerable to change and who need to be engaged in identifying impacts and their significance, as well as in decision-making on mitigation and management measures. **Affected parties** are persons located within the project defined area of operations but may be elsewhere (e.g. people who live outside of the project towns but have personal or business
Interests that may be directly affected by the development of the project. Affected parties include 2 sub-groups:

- **Directly affected groups**: this has included communities, groups and individuals likely to be displaced physically and economically by the project, including any vulnerable or marginalized groups or stakeholders;

- **Indirectly affected groups**: which comprise residents, businesses, officials and administrators in project towns who may be indirectly affected by employment opportunities; local community-based groups representing affected groups and/or other affected parties; politicians at national, regional, local levels; and employees, their representatives and contractors to the proposed Chipata Dry Port and Chipata Bypass Road Project.

2) **Interested Parties**: other interested parties include people or entities that are interested in the Project and could affect the project in some way. This has included residents along the project road corridor; national and international civil society, NGOs, CBOs or and faith-based organizations (FBOs); suppliers and service providers to the Chipata Dry Port and the Chipata Bypass Road located elsewhere in Zambia or internationally; other on-going projects in the project areas or regions; the Government of Zambia, including government officials, permitting and regulating agencies at the national and regional levels; Lenders’ to the Project; and local media, academics and other interest groups.

Therefore, project stakeholders were categorized into several groups as indicated below:
### Table 7-1: Identified Stakeholders Groups for Consultation

<table>
<thead>
<tr>
<th>Stakeholder Group</th>
<th>Description of stakeholder group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Owners of land and buildings within the project footprint</td>
<td>✓ This group of stakeholders includes all those who own land or other assets that will be permanently acquired for development of the Project either by voluntary acquisition or involuntary expropriation, and those whose land is temporarily occupied during construction. It also includes a small number of owners of private commercial and mixed residential/commercial property and sports facilities whose land may be affected. The RAP report has documented all those whose land is affected, and measures will be proposed in terms of compensation.</td>
</tr>
<tr>
<td>2. Tenants and other occupiers of land and buildings within the project footprint</td>
<td>✓ Residential and commercial tenants and other occupiers of land/buildings that may be acquired or temporarily used for the Project. This group could include tenants with formal leases, those who occupy premises on a more informal basis and are therefore potentially more vulnerable, and possibly marginalised groups such as illegal squatters and homeless people using land and buildings within the footprint of the project area.</td>
</tr>
<tr>
<td>3. Owners, occupiers and users of buildings near the project and businesses operating in the neighbouring areas</td>
<td>✓ This group includes occupiers of residential, business and other buildings and other businesses which could be adversely affected by disturbance during construction or by increased traffic during operation.</td>
</tr>
<tr>
<td>4. Users of land and facilities within and adjacent to the project footprint</td>
<td>✓ This group includes people who use the land within and near the project for access and/or recreation whose activities may be disrupted by construction and/or operation of the project. It includes parents with small children using the playgrounds, People with disabilities and parents with young children (e.g. in prams and pushchairs) may be affected differently from the general public.</td>
</tr>
<tr>
<td>5. Road users</td>
<td>✓ This group includes car travelers, truck drivers and other road users of the project road whose travel may be disrupted or who may benefit from the rehabilitated road.</td>
</tr>
<tr>
<td>6. The general public and business community</td>
<td>✓ Residents along the project road corridor and indeed throughout Zambia could have views about the environmental and social impacts of the Project on the surrounding communities. Interests may relate to travel benefits, loss of green space, environmental, social or economic impacts, or business or professional interests.</td>
</tr>
<tr>
<td>7. Disadvantaged and marginalized people</td>
<td>✓ Within all the groups above there may be people who may have particular difficulty participating in the engagement process because of language, literacy, mobility, economic or other barriers. These groups are being identified by contact with the community leaders in each village along the route (see below) but will also be identified during the household questionnaire to be administered during the ESIA and RAP preparation.</td>
</tr>
<tr>
<td>STAKEHOLDER GROUP</td>
<td>DESCRIPTION OF STAKEHOLDER GROUP</td>
</tr>
<tr>
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</tr>
<tr>
<td>8. Community leaders</td>
<td>✓ Traditionally, each village is represented by a senior headman locally known as or “Mwami” or area chief representative. Politically each village is represented by a ward councilor who represents the people in his ward at the district council. These leaders deals with local administrative matters and can represent and provide a link into the local community. Community leaders have been approached to assist in identifying vulnerable and disadvantaged groups in the local population who may not be able to access the stakeholder engagement process by conventional means. Other key figures in the community can include church and school teachers.</td>
</tr>
<tr>
<td>9. Transport providers</td>
<td>✓ This includes bus and minibus operators who currently have stop facilities along the project road that could be disrupted during construction.</td>
</tr>
<tr>
<td>10. National Organizations.</td>
<td>✖ National government organizations (ministries, agencies, services) with regulatory functions relating to the Project (permitting or supervision) or providing infrastructure and services relevant to the project. A list of relevant ministries and departments is as provided in Section 2.4 of this report under “Institutional Framework”</td>
</tr>
<tr>
<td>11. Provincial Organizations.</td>
<td>✖ The Provincial governor and functional departments within the provincial administration with responsibilities delegated from national government, relevant to the Project. A list of relevant ministries and departments is as provided in Section 2.4 of this report under “Institutional Framework”</td>
</tr>
<tr>
<td>12. Municipal and District Government.</td>
<td>✖ The District Commissioner (DC and departments of the local government in Chipata Council and administrations within the districts with responsibilities relevant to the Project.</td>
</tr>
<tr>
<td>13. Local, National and International environmental and sustainability NGOs.</td>
<td>✖ Organizations with interests in the environmental and sustainability aspects of the project (pollution, waste, resources, biodiversity, birds etc) and cultural heritage issues, who aim to represent the views and interests of their members and/or the general public.</td>
</tr>
<tr>
<td>14. Local, national and international social NGOs.</td>
<td>✖ Organizations with interests in the social, community, labour health and safety or other similar aspects of the Project who aim to represent the views and interests of their members and/or the general public. Social NGOs will include those representing the interests of vulnerable groups (e.g. disabled people, women, homeless etc.).</td>
</tr>
<tr>
<td>STAKEHOLDER GROUP</td>
<td>DESCRIPTION OF STAKEHOLDER GROUP</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15. Business and professional associations.</td>
<td>✓ Business and professional organizations with an interest in the project and its impacts who aim to represent the views and interests of their members. Also includes research and educational organizations with academic/professional interests in issues raised by the Project.</td>
</tr>
<tr>
<td>16. International financial institutions.</td>
<td>✓ Multilateral, bilateral and private sector financial institutions providing project finance for construction of the Project. Engagement activities will be directed to all members of the lender group.</td>
</tr>
<tr>
<td>17. National and local TV and radio</td>
<td>✓ Various national and local (where relevant) media outlets and organizations.</td>
</tr>
</tbody>
</table>
7.5. COMMUNITY (STAKEHOLDERS) CATEGORIZATION

Community mapping will facilitate prioritizing the people in the community with human rights entitlements related to the project, as well as identifying the institutions accountable for these entitlements. Mapping will facilitate differentiation between rights and interests in the project and ensure the rights of stakeholders are respected, given that rights constitute a primary responsibility for the promoter.

A participatory stakeholder mapping exercise was conducted for community members to determine a key list of stakeholders across the entire stakeholder spectrum and ensure that no stakeholder is missed out from the onset. The UN-Habitat Toolkit for supporting Participatory Urban Decision Making was and will be utilized in this regard in the project, as it spells out a group technique that can be applied in mapping community stakeholders:

1) **Target communities** – target communities are rights holders. Individuals and communities residing along the project road corridor are likely to be directly impacted by the project.

2) **Poor women and men, the elderly, youth, orphans and other vulnerable groups** – are rights holders but are often excluded from decision-making processes. They are also most affected by the lack of basic services such as water and sanitation.

3) **Active Community-based organizations and Non-governmental Organizations** – they are not rights-holders but may act in a representative capacity for individuals who are rights-holders. They are often responsible for community mobilization, awareness raising, and training and education activities. There may also be opportunities for contracting non-governmental organizations and community-based organizations groups for project implementation and service provision.

4) **Local private sector** - improvements in water supply and sanitation will likely attract further investments and increase local economic activities in the target communities. The Local Chamber of Commerce/local private sector are, therefore, considered to be direct beneficiaries of Chipata Dry Port and Chipata Bypass Road Project.

5) **Local Media** - responsible for raising levels of awareness about safety and community health issues.

7.6. ENGAGEMENT PLANNING

In line with the Environmental and Social Standard no.10, stakeholder engagement will be built into the Chipata Dry Port and Chipata Bypass Road Project’s planning in a way that enables a meaningful information exchange with all identified stakeholder groups at the very beginning of the project and at subsequent key decision-making points in its life cycle. In this regard, the stakeholder engagement process will consist of three interrelated stages to support the assessment, design and implementation phases.

During the assessment phase, RDA through the consultant has engaged in a preliminary scoping process with identified affected individuals, communities and other relevant stakeholders to ensure the identification of all key issues to be investigated as part of the Environmental and Social Impact Assessment (ESIA) process. This has involved participatory group discussions and interviews where stakeholders have been able to provide their views and concerns, institutional capacity and governance structures, the environmental and social among others to be included in the ESIA, RAP and Designs.

The design phase will involve community sensitization meetings and stakeholder workshops to provide stakeholders with project-related information, including the opportunity to understand, review and provide input on the proposed interventions.
The implementation phase will involve the formation and operationalization of multi-stakeholder forums to monitor project implementation and provide regular feedback to the project implementation team. The forum will also act as a grievance mechanism.

7.7. INFORMATION DISCLOSURE

Information disclosure is an ongoing process that started from the early stages of the ESIA and design of the project. Relevant information preferably in the local language (Chinyanja) has been and will continue to be shared among stakeholders in a timely, accessible and culturally appropriate manner throughout project implementation. Special attention shall be given to vulnerable or minority groups and their right to equitable representation and consideration for their rights, views and interests. RDA through the consultant will continue to provide the following information to all identified stakeholders who are likely to be affected by adverse environmental or social impacts from the project:

- the purpose, nature, scope, objectives and scale of the project;
- the duration of proposed project activities, roles and responsibilities of other stakeholders;
- any risks and potential adverse impacts with regard to the environment, land tenure changes (resettlement, land acquisition or expropriation, where necessary), occupational and community health, safety and security, and any other potential adverse impact on communities arising from the project;
- the rights endowed to affected population under the Lenders’ standards, the proposed mitigation and compensation plans and associated budget;
- the available grievance mechanisms;
- any added value and opportunities for benefit-sharing;
- the envisaged consultation process and opportunities and ways in which the public will be able to participate; and
- time and venue of any envisaged public meetings, and the process by which meetings are notified, summarized, and reported.

7.8. PUBLIC CONSULTATION

Consultations have been undertaken through community meetings to explain the purpose, nature, objectives and scale of the project, opportunities for stakeholder participation and grievance mechanisms. During the consultations, stakeholders were provided with an opportunity to provide feedback on their needs and priorities with regard to the proposed project activities, therein ensuring reciprocity in the dialogue between them and RDA through the consultant.

Special effort was made and will continue to be made to promote the participation of vulnerable individuals and groups in public consultations. These individuals and groups that are regularly excluded from governance and public decision-making because they lack the organizational, social or financial means to make their voices heard and participate effectively. RDA through the consultants shall continue to make efforts on integrating vulnerable groups’ perspectives in stakeholder consultations throughout the project life cycle.

7.9. KEY ISSUES IDENTIFIED

Comments raised by stakeholder through the consultation process provided insight to various issues applicable to the proposed project. These need to be managed proactively and in many cases, effective communication and participative approaches when engaging with stakeholders will prevent issues becoming grievances. In Table 7-2 below, these key issues are listed and described.
### Issues Raised in Consultation

| 1. | Reasonable compensation should be provided for the affected structures. |
| 2. | Project should support community initiatives |
| 3. | Affected public utilities such as boreholes should be relocated with the participation of local community. |
| 4. | Consideration should be given for the appropriate management of drainage. |
| 5. | Consultation and participation of local people during construction period is necessary and should continue |
| 6. | Local community will have full support to the project during the construction. |
| 7. | Chiefs should not be involved in the process of compensation |
| 8. | Compensation funds should only be paid directly to affected people. |
| 9. | Worried that government will forcefully evict them without compensation for their affected properties such as land, structures and trees. |
| 10. | Some PAPs expressed fear that the road contractor will destroy water sources such as protected and unprotected wells and wells along the road that serve the communities. |
| 11. | Notification to the people before commencement of rehabilitation of the Road. |
| 12. | Local community will have full support to the project during the construction. |
| 13. | Appropriate compensation to the affected persons. |
| 14. | Road should be constructed reliably and sustainable without any social ills left in our communities. |
| 15. | Drainage should be properly managed during construction. |
| 16. | Employment priority should be given to local people |
| 17. | Appropriate compensation should be given to the affected households. |

### Measures to Resolve the Issues

<p>| 1. | Appropriate compensation will be provided to the affected persons and sensitization will be intensified to educate PAPs. |
| 2. | Community services support and income restoration plan will be provided in the RAP and will be implemented. |
| 3. | Consideration will be given to relocate the public utilities with the consultation of local people. |
| 4. | Attention will be given to maintain the appropriate drainage during construction. |
| 5. | Consideration will be given to participate and involve local people during construction period. |
| 6. | Local support will be appreciated for smooth construction of road. |
| 7. | Proper rehabilitation of all these loses prior to the construction of road. |
| 8. | Chiefs or their representatives will only be involved as observers. |
| 9. | Compensation funds will be paid directly to affected people because they have to sign for the money received. |
| 10. | There will be no forceful eviction as this can only happen after the expiry of window period and compensation paid |
| 11. | All water points will be replaced with better water points such as boreholes even if what is affected is unprotected well and burying of existing wells and water points will only happen after complete replacement of boreholes |
| 12. | Update information to the local people at least three months earlier in case of translocation |
| 13. | Priority to the local laborers |
| 14. | More attention to be given to check human trafficking and HIV/AIDS |
| 15. | Efforts will be made to incorporate suggestion of local people. |
| 16. | Attention will be given to proper management of drainage. |
| 17. | Kindly note that all people from all walks of life and irrespective of their location will be entitled to job opportunities in the project area and this will be done on the basis of fair and non-discriminatory terms. |</p>
<table>
<thead>
<tr>
<th>Issues Raised in Consultation</th>
<th>Measures to Resolve the Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Compensation for loss (Private structure and business).</td>
<td>18. Compensation will be provided to the affected households.</td>
</tr>
<tr>
<td>19. Community services like Public water supply, Public will be affected by the project.</td>
<td>19. Appropriate compensation will be provided to the affected persons.</td>
</tr>
<tr>
<td>20. Drainage should be properly managed during construction.</td>
<td>20. Affected community services like public water supply, will be reconstructed by the project.</td>
</tr>
<tr>
<td>21. Employment priority.</td>
<td>21. Efforts will be made to incorporate suggestion of local people.</td>
</tr>
<tr>
<td>22. Fear that properties will be demolished before they are paid their compensation packages.</td>
<td>22. Attention will be given to proper management of drainage.</td>
</tr>
<tr>
<td>23. Fear that some people will extort money from them and therefore transparency during compensation exercise.</td>
<td>23. Kindly note that all people from all walks of life and irrespective of their location will be entitled to job opportunities in the project area and this will be done on the basis of fair and non-discriminatory terms.</td>
</tr>
<tr>
<td>24. Worried that government has a habit of paying monies in instalments. PAPs demanded to receive all monies due to them in full without any delays.</td>
<td>24. Compensation will be paid in full before demolition of any property.</td>
</tr>
<tr>
<td>25. That compensation payment might delay making it impossible for them to resettle in time. If District paying agents are involved, they will pay in instalments after long periods of time and in most cases don’t pay the last instalment.</td>
<td>25. Transparency will be emphasized upon throughout this RAP process and information will be provided on time and very often.</td>
</tr>
<tr>
<td>26. PAPS requested government to give them adequate time to enable those whose properties are affected to relocate.</td>
<td>26. Full compensation will be paid and no instalments will be allowed.</td>
</tr>
<tr>
<td>27. The project affected people asked that government pay them adequately so as to enable them to replace their assets.</td>
<td>27. Resettlement will only start once compensation funds have been paid and adequate window period will be provided.</td>
</tr>
<tr>
<td>28. PAPs expressed concern that if the project construction does not start in the next few months, they would be in problems since they can’t do maintenance to their property which will not be taken into consideration</td>
<td>28. Consideration will be given to relocate the public utilities with the consultation of local people.</td>
</tr>
<tr>
<td>29. Some community members were worried that there will be an increase in theft and robbery during compensation time as those being paid will be targeted. They suggested that payment through the bank can reduce the robberies and thefts.</td>
<td>29. The Project will engage the local leadership to will work hand with the Zambia Police to ensure that issue of theft is addressed.</td>
</tr>
<tr>
<td>30. Local support will be appreciated for smooth construction of road.</td>
<td></td>
</tr>
<tr>
<td>Issues Raised in Consultation</td>
<td>Measures to Resolve the Issues</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>30. Lack of letters of administration and family conflicts about rightful person to receive compensation may cause delay in receiving compensation. In such cases, money will be kept until family grievances are resolved.</td>
<td>31. Appropriate compensation will be provided to the affected persons.</td>
</tr>
<tr>
<td>31. Gender Based Violence may increase in households as a result of men controlling and squandering compensation payments.</td>
<td>32. Traditional leaders will work with the respective District Councils to identify a piece of land where such people can settle.</td>
</tr>
<tr>
<td>32. Involve local leaders in grievance redress of household violence associated with misuse of compensation payments.</td>
<td>33. All persons irrespective of their ownership status (i.e. with or without title deeds and users) are eligible for compensation so long as they existed during property census and valuation period.</td>
</tr>
<tr>
<td>33. PAPs were concerned that receiving and keeping cash payments at home could lead to robberies. To avoid this, people preferred to receive large compensation payments in bank accounts. Most PAPs actually did not have bank accounts and requested RDA to facilitate opening them at local banks.</td>
<td>34. Any conflicts will be managed through the grievance process developed as part of this RAP.</td>
</tr>
<tr>
<td>34. Lack of legal title deeds for land and buildings to prove ownership may preclude such PAPs from receiving compensation.</td>
<td>35. In such cases, money will be kept until family grievances are resolved.</td>
</tr>
<tr>
<td>35. Lack of letters of administration and family conflicts about rightful person to receive compensation may cause delay in receiving compensation.</td>
<td>36. RDA will communicate these dates to PAPs.</td>
</tr>
<tr>
<td>36. When would compensation payments be made?</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER EIGHT

ENVIRONMENTAL AND SOCIAL IMPACTS IDENTIFICATION

Having discussed the environmental baselines at and around the proposed sites and the development plans, this chapter evaluates the potential environmental impacts that the development may have on the environment, as well as the positive economic effects that the development will have on the community. There may also be adverse effects that the development could have on the people, community and environment. The purpose of this section is to discuss both of these effects objectively.

It is common that much of the environmental damages caused by developments occur during the construction phase (P Morris et al., 2000). On the contrary environmental issues during operation phase of development is normally deemed as less worrying in nature provided all appropriate control measures for mitigation in respect to negative impacts are put into place and implemented. Under normal circumstances these would have been addressed separately. For these reasons the potential construction environmental effects and the potential operational environmental effects are being discussed together in this section.

8.1. POSITIVE ENVIRONMENTAL IMPACTS

8.1.1. Opportunity to Improve Drainage
Most of the access road from St. Monica turnoff has most of the top soil been eroded or crushed to fine powder, thus giving rise to drainage problems, as these sections of the road tend to be water logged in the rainy season. It is intended that the present effects of the road will be studied, as part of the overall design process, to improve drainage in general throughout the length of the bypass road.

At the site proposed for the dry port site, care will be taken in providing for sufficiently elaborate drainage facilities, bearing in mind that the urban setting has a tendency of increased debris disposal into the drain lines.

8.1.2. Climate Change
It is commonly known that as traffic congestion increases, CO₂ emissions (and in parallel, fuel consumption) also increase. In general, CO₂ emissions and fuel consumption are very sensitive to the type of driving that occurs. Traveling at a steady-state speed results in much lower emissions and fuel consumption compared to a stop-and-go driving pattern. By constructing the proposed bypass road, it will decongest the exist traffic in Chipata town and consequently help reduce CO₂ emissions.

8.2. KEY ENVIRONMENTAL NEGATIVE IMPACTS
This section describes the potential negative impacts to the environment and socio-economic environment as a result of the proposed project activities.

8.2.1. Spoil
Spoils will be generated from the excavation activities. Potential impacts from spoils and its disposal are (i) land for disposal of spoil, (ii) conversion of those land areas into a permanent dumping area, (iii) potential erosion from the spoil areas and spoil material reaching the river/waterways, and (iv) aesthetic impacts.
Following the criteria for assessing environmental impacts, the impact is assessed to be Short Term Moderate Adverse.

8.2.2. Contamination of Soil

The effect on soil resource can occur due to one or a combination of change on soil resource including soil erosion, soil pollution, compaction, top soil removal due to the various project construction activities. The effect on soil also influenced by factors such as terrain, land use and cover, soil characteristics and conservation practices.

The soil of the area is of erosive type and can easily be exposed to erosion effects due to construction related activities, lack of vegetation cover could facilitate erosion hazard especially in steep slope areas. The majority of the project area is flat land to rolling hills, and the bypass road will require fill embankment through appropriate material. There are also sections along the route that require earth cut and removal of material to keep design standard.

The change from agriculture use to port related activities will need earth movements to build the facility, including grading and compacting for internal access roads and hard standing areas. The removal of the surface coverage and the subsequent earth works can lead to soil erosion. Soil and underground resources can be polluted due to accidental or deliberate spillage or leakage of polluting materials (oils and fuel) during construction and operation. Considerable volumes of sand, gravel and other raw building material are required. The extraction and removal of construction material from its original location (quarries, borrow pits) can also result in landslides and land collapse, disfigured landscape and be a source of soil erosion at these sites (indirect impacts).

The removal and clearance of the vegetation cover for the various project road components like pavement, construction of access and development of borrow pits and quarries will all expose the loose soil to erosion effects and to soil losses. Surplus excavated top soil shall be stored and used to rehabilitate degraded grounds.

The other impact on soil can result from compaction due to machinery and vehicular movements affecting crop fields and grasslands. Soil compaction results in poor productivity and poor vegetation growth, due to lack of air circulation and lowered infiltration of rain water. The effect is more pronounced at material production sites, access roads to material sites and also along the sides of the proposed road alignment. The contractor, following completion of work in these areas, has to loosen by deep tilling of the land with tractors.

Impact on soil pollution can also occur due to leakage, inappropriate disposal of fuel, oils and other chemicals utilized by construction machineries and garage works.

8.2.3. Soil erosion

There are sections of the proposed route for the bypass which have hilly terrain where the road alignment passes through a more mountainous area. Therefore, it is anticipated that there is a significant risk of erosion, particularly during rainy or windy days. Erosion will mainly occur in the areas where the permanent way will run on the side of the hills, which is where the cuttings will expose large surfaces of soil. Some exposed soil will also occur at the areas of the abutments and pillars of box culverts. Because of the steep morphology of the terrain, a relatively short length of the corridor will be exposed to erosion. Soil erosion will also arise due to vehicular movement during surveys and transportation of materials.
8.2.4. Air Quality (Dust, Gaseous Emission) Impact

This section assesses the potential impacts on air quality and climate as a result of construction activities to be carried along the project road. The evaluation focuses on the following pollutants:

- Carbon dioxide (CO₂);
- Nitrogen oxides (NOₓ)-(nitrogen dioxide (NO₂) and nitric oxide (NO));
- Sulphur dioxide (SO₂);
- Carbon monoxide (CO);
- Volatile organic compounds (VOCs)\(^{25}\);
- Particulate matter (PM)\(^{26}\); and
- Nuisance dust\(^{27}\).

These substances represent the atmospheric pollutants that will be released as a result of proposed road rehabilitation that are most commonly regulated and monitored internationally, due to their potential to impact on local air quality and climate.

CO₂, CO, NOₓ, SO₂, PM and VOC are generated in varying amounts as a result of burning fossil fuels and are often termed ‘combustion gases’. NO₂, CO, SO₂, and PM are most commonly associated with impacts on local air quality.

Ambient air quality standards set pollutant concentrations that ensure healthy air quality. EU air quality standards and World Health Organisation (WHO) guidelines for these pollutants are internationally recognised and are presented below in Table 8-1. Pollutants can have acute (short-term) and/or chronic (long-term) effects on human health/ecosystems. The standards and guidelines are expressed over averaging periods that reflect whether a substance has an acute and/or a chronic effect.

### Table 8-1: EU and WHO ambient air quality standards/guidelines

<table>
<thead>
<tr>
<th>POLLUTANT</th>
<th>AVERAGING PERIOD</th>
<th>NO. OF EXCEEDENCES PERMITTED</th>
<th>LIMIT / GUIDELINE VALUE (mm gm(^3))</th>
<th>RELEVANT STANDARDS/GUIDELINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO(_2)</td>
<td>1 Year</td>
<td>N/A</td>
<td>40</td>
<td>WHO guideline</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40</td>
<td>EU (human health)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>EU (vegetation)</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>0</td>
<td>200</td>
<td>WHO guideline</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>18</td>
<td>200</td>
<td>EU (human health)</td>
</tr>
<tr>
<td>SO(_2)</td>
<td>1 Year</td>
<td>N/A</td>
<td>20</td>
<td>EU (ecosystems)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>WHO guideline</td>
</tr>
<tr>
<td></td>
<td>24 Hours</td>
<td>0</td>
<td>125</td>
<td>WHO guideline</td>
</tr>
<tr>
<td></td>
<td>24 Hours</td>
<td>3</td>
<td>125</td>
<td>EU (human health)</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>24</td>
<td>350</td>
<td>EU (human health)</td>
</tr>
<tr>
<td>CO</td>
<td>8 Hour</td>
<td>0</td>
<td>10,000</td>
<td>EU standard</td>
</tr>
<tr>
<td></td>
<td>8 Hour</td>
<td>0</td>
<td>10,000</td>
<td>WHO guideline</td>
</tr>
<tr>
<td></td>
<td>1 Hour</td>
<td>0</td>
<td>30,000</td>
<td>WHO guideline</td>
</tr>
<tr>
<td>PM(_{10})</td>
<td>1 Year</td>
<td>N/A</td>
<td>40</td>
<td>EU (Stage 1) (human health)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>EU (Stage 2) (human health)</td>
</tr>
<tr>
<td></td>
<td>24 Hours</td>
<td>35</td>
<td>50</td>
<td>EU (Stage 1) (human health)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>50</td>
<td>EU (Stage 2) (human health)</td>
</tr>
</tbody>
</table>

\(^{25}\) Particulate matter is used in this context to describe inhalable particles.

\(^{26}\) Nuisance dust is a term commonly used to describe deposition of inert dust (eg on vegetation, dwellings and clothes on washing lines etc).
Carbon dioxide and methane are the two main compounds most commonly referred to as ‘greenhouse gases’. It is believed that the accumulation of such gases in the atmosphere can contribute to global warming. Other pollutants such as the oxides of nitrogen and carbon monoxide, although not important greenhouse gases in their own right, can influence the atmospheric formation of other greenhouse gases, in particular ozone.

VOCs are indirect greenhouse gases in that they can break down in the atmosphere, in the presence of sunlight, to form methane and photochemical oxidants. VOCs are also precursors of ground level ozone, which is primarily formed by a series of complex reactions, initiated by sunlight, between VOCs and NOx. Ozone is produced naturally in the upper atmosphere (stratosphere) where it helps to provide protection against incoming UV radiation. In the lower levels of the atmosphere ozone is an irritant gas and has the potential to impact on local air quality.

The most significant issues that could potentially impact on air quality and climate during construction are combustion gas emissions and nuisance dust. During the road rehabilitation, impact on air quality can occur during construction phase which is related to increased
The high and continuous dust cover in rural area can harm the surrounding vegetation when heavily deposited on the leaves. Much of the project road corridor where the proposed road construction activities will take place is currently used for crop production hence reduced crop production may occur temporarily during the construction period.

8.2.5. Noise
Noise will be generated from vehicular movement, excavation machinery, and construction activities during the construction phase. The sources of noise during construction will be excavators, generators and other construction machinery and vehicles. During construction phase, the contractor will only work from 06:00 to 18:00 hrs.

The equipment to be used for the construction activities are mostly powered by internal combustion engines including earth moving equipment, handling materials and stationary equipment. An outline of major machinery and vehicles that are envisaged to be required for the project construction works along with its maximum noise level are given in the following Table 8-1:

Construction machinery and vehicle numbers and anticipated noise level from the machinery and vehicles are presented in Table 8-3 below.
Table 8-3: Noise pollution sources and Relative Range of Noise

<table>
<thead>
<tr>
<th>S#</th>
<th>Machinery / Equipment</th>
<th>Noise level, dBA at 15m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>1</td>
<td>*Excavators</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Dumpers</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Batching Plants</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Loaders</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Power Generators</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Rollers</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Tractor Trolley</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>Transit Mixer</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Compactor / Roller</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Crane</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>**Crush Plant</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Concrete Pump</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Vibro Hammer</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Welding Generators</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>Watering Tanks (moveable)</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Haulage Trucks</td>
<td>40</td>
</tr>
<tr>
<td>17</td>
<td>Cars/Pickups</td>
<td>15</td>
</tr>
</tbody>
</table>

Range of sound levels from various types of construction equipment to be used for project (Sources: Analysis in the light of US-EPA 1972).

The tabulated noise level is calculated on single construction machinery basis and as per requirement of the contractor, more than one specific machinery or equipment, does not work together on a single section of the canal or pressure pipe. These machineries will be distributed on different sections of the project road corridor as per requirement of the works.

Based on the limited available data samples, the excavators, loaders and crush plants are grouped in the same class.

The EPA has set 75 decibels (day time) and 65 decibels (at night time) as the maximum exposure limit in the workplace. Above this level, hearing protection should be worn. The IFC adopted the WHO standards for noise level as presented in the following Table 8-4 must be followed;

Table 8-4: IFC Noise Level Guidelines

<table>
<thead>
<tr>
<th>Receptor</th>
<th>One Hour L_{Aeq} (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day Time 07:00-22:00</td>
<td>Night Time 22:00-07:00</td>
</tr>
<tr>
<td>Residential: institutional; educational</td>
<td>55</td>
</tr>
</tbody>
</table>

Following the criteria for assessing environmental impacts, the impact is assessed to be Short Term Minor Adverse.
8.2.6. Dust Emission

Potential sources of dust are construction material stockpiling and loading, transportation and unloading, excavation, preparation of camp sites and access tracks for operations, off road vehicular traffic on unpaved roads during construction, open storage of solid materials, exposed soil surfaces and excavation and placement of fill materials in excavated areas.

Generation of dust from these activities is likely to be significant if not mitigated. Following the completion of the preparatory works, the generation of dust from construction sites may reduce, but will be elevated above the baseline due to removal of ground vegetation and unused material.

Within the wider project area, an increase in particulate matter is expected near haulage routes. Dust generation on embankments is only likely during the works to place and compact the fill material. Following the works to each section, the material shall be compacted, reducing any dust generation.

Following the criteria for assessing environmental impacts, the impact is assessed to be Short Term Moderate Adverse.

8.2.7. Impact on Water Resource and Quality

The project road construction related activities like excavation, generation of wastes, installation of embankments & crossing bridges, direct water abstraction for construction purpose may have effect on the existing water resource.

Close to the project area there is a stream which drains its water into the Apollo dam, the main surface water source for Chipata Municipality. Washing of vehicles or other construction equipment in this stream can be a source of water pollution and might affect the Apollo Dam.

Considerable quantities of water will be used during construction and operation for consumption and work-related activities. Pollution of water sources may arise at or close to the work site or construction workers camp (if any) if no or inadequate sanitary and waste facilities are provided. Accidental or deliberate spillage or leakage of toxic, harmful materials, oils or oily compounds and other raw materials may occur. Such pollution adversely affects those who depend on local water resources and groundwater pollution in particular, can have serious long-term effects on water quality. Inappropriate disposal of refuse and some materials used in construction can also lead to public and animal health hazards.

Pollution of these resources may arise at or close to the base camps or work sites because of inadequate provision of sanitary and waste facilities and accidental or deliberate spillage or leakage of polluting materials. Such pollution adversely affects those who depend on local water resources, and groundwater pollution can have serious long-term effects on water quality. Inappropriate disposal of refuse and of some materials used in construction can also lead to public and animal health hazards.

The adverse impact on water quality is related to increase of suspended sediment and risk of residual chemical contamination from earth work activities, machineries and other construction activities. Oil products used for the machinery and vehicles during construction works and waste generated in camps and garages could also be sources of pollution to the water resources in the project influence area.

Excavations, grading and site clearances during construction generate large volumes of spoil soil that can get their way into the natural water body and result in siltation of streams as described in soil impact above. These spoil materials should be disposed in identified dump sites which may include the nearby excavated material sites. Otherwise, spoil material can be washed and carried by wind or
flood, into tributary rivers and ultimately to the lakes body. Excessive transportation of soil and solids into the water bodies can cause undue silt accumulation and deterioration of the water quality, reduce the water carrying capacity and affect aquatic biodiversity (fishery).

8.2.8. Contamination of Ground Water
The risk posed to groundwater flow, quality and quantity is generally greatest during the construction phase of such a project, as this is when the most concentrated impacts generally occur. Potential construction phase impacts identified here are based upon construction activities commonly undertaken on road construction projects of a similar nature and include:

a) Disturbance and Ground Clearing-Clearing of access roads and the new road itself can alter groundwater recharge, introduce pollutants and increase sediment runoff.

b) Significant Compaction-Compaction can result in reduced groundwater recharge and can act as a barrier to shallow groundwater flow in shallow groundwater areas. It can also drive contaminated groundwater out of fill or acid sulfate soils (ASS). Surface compaction is a necessary and common construction activity in the construction of a new section of road. As such, this is expected to occur along the entire alignment.

c) Significant Cut and Fill-Excavation of road cuttings can alter the groundwater recharge and alter the permeability of the subsurface. It can also reduce the depth to groundwater for surface contaminants. Fill placement for road construction can reduce recharge and can impact on water quality if the fill is contaminated.

d) Drainages-Road drainage and excavation can lower the water table in surrounding areas, while embankments and structures can raise the water table by restricting flow. The potential effects include deterioration of vegetation, increased susceptibility to erosion.

e) Dewatering-If dewatering activities for excavations are needed in construction, the water table could be lowered and reduce the groundwater quantity.

f) Fuel and other Chemical Spills- Fuel, Lubricant and other chemical spillages from normal construction activities, chemical storage areas, raw material stockpiles, refueling areas, and because of accidents have the potential to contaminate groundwater. Groundwater impacts from spills are particularly likely in areas where surface soils are porous or where recent soil disturbance has created preferential pathways for the infiltration of contaminants down towards the water table.

8.2.9. Waste Impacts
It is expected that large quantities of solid waste will be generated at the site camps, main camp and other construction waste. The types of waste generated will include domestic waste, food waste, sewage (waste water), workshop waste (oils, mechanical parts) chemical waste, medical waste, packing waste, demolition material (concrete, masonry, etc), debris from construction sites (excess aggregate, sand etc.) and excavation.

Improper disposal of waste can result in contamination by leachate or runoff reaching the ground or surface water resources. Proper management of solid waste is also important because of the risk to human health and the environmental degradation. Careless and indiscriminate open dumping of wastes can create unsightly and unsanitary conditions within the project area. Delay in delivery of solid wastes to landfills results in nuisance and unpleasant odours, which attract flies and other disease vectors. Direct contact with them can be dangerous and unsafe to the workers and local public, as infectious diseases such as cholera and dysentery can spread through contact with these wastes. Open solid waste dumps can also provide breeding places for vermin and flies and other disease vectors and can also contain pathogenic micro-organisms.

Solid waste will also be generated from construction of the fence and associated facilities, and from left over construction materials used in the erection of the fence. Other solid wastes will be generated
by construction workers in form of waste food, papers, packaging materials etc. Solid waste may also result from dumping along the fence by communities living adjacent to the conservancy.

Solid wastes may result to subsequent soil pollution, foul smells, and if allowed to pile up or spread, to an eyesore. Solid wastes especially food, also have the potential for affecting some wildlife behavior as some become dependent on human foods. Littered plastic paper bags in the conservancy may be swallowed by animals leading to death.

Human wastes- will also arise from the construction workers although will dependent on how they will be accommodated during the construction phase. With no proper facilities, construction workers will relieve themselves along the fence line with resultant impacts on health and hygiene, and pollution.

8.2.10. Adverse impact on flora
The baseline assessment showed that majority of the natural vegetation in and around the proposed project area and route corridor has already been cleared for crop cultivation, rural settlement and other socio-economic purposes. Construction of the proposed project can result in adverse impacts to the remaining natural vegetation in the project area due to establishing camp and garage sites, access road construction and material site development activities.

To this effect, impacts such as fire hazards and tree felling for domestic energy requirement, notably charcoal production, are anticipated.

In addition, the project would need to clear vegetation where workers and workshop compound and other accommodation facilities will be constructed.

Clearing of vegetation will destroy some biodiversity and reduce wildlife habitat. The vegetation affected also forms part of the overall life supporting resources for animals, and an important component of the forest’s ecological services role which will be lost with the clearing. Loss of vegetation will also result in soil erosion and loss of soil moisture.

In terms of magnitude of impact, the most serious impacts are those which are likely to cause permanent adverse impact on the integrity of an ecological system and those which affect a major proportion of vulnerable habitats or species within the wider study area. The potential magnitude of impact to the habitat is the most significant in terms of biodiversity as its effects shall be felt long after construction is complete and this in turn could affect the fauna which the habitat supports.

The primary impact to existing habitats will be during the implementation of the proposed works. The most notable impact shall be due to the establishment of borrow areas and camps and yards, involving the clearing of vegetation—this will result in a permanent change in the habitat of these areas. This could result in a negative impact on the short-tailed grass warbler which is known to prefer low lying habitats and is a sensitive receptor in the project area.

8.2.11. Adverse Impact on Wildlife and Avi-Fauna
The proposed project does not interfere or fall in a park boundary and hence the project construction expected to have no direct adverse impact on the wetland habitat and fauna.

During construction, avifauna may be disturbed due to sensory disturbance from construction; movement of vehicles and crew personnel; location and operation of camps; and site restoration. This will be a temporary disturbance within the project area. Following construction, there will also be an impact on avifauna due to the loss of habitat but this would be compensated by tree planting.
8.2.12. Adverse impact on aquatic habitat
Direct adverse impact on aquatic habitat can be encountered during installation of bridge and other structures across or near water bodies (rivers, streams) which result in destruction of local habitat or disruption in natural flow regime. However, this impact is only expected to occur during rainy season when streams crossed by the project road has water. The construction activities are expected to be carried out during dry season and all of the streams are usually dry during this period of the year, which will make the impacts on aquatic to be very negligible.

8.2.13. Impacts from Construction Materials
The requirement for construction materials can give rise to environmental impacts at the locations from which they are obtained, which may be outside the project area. These may relate to the use of renewable or non-renewable natural resources, or the need to process materials for use in construction. These impacts can only be identified in general terms, since the locations from which construction materials are to be obtained (and in may cases their specifications and quantities) are not known at the present time.

8.2.14. Impacts on geology
There are no known geo-hazards in the project area. However, construction is related to a certain amount of earthworks (the construction of road embankments and bridges), and the probability of landslides and other mass movements in road cuts, erosion from fresh road cuts and fills, and sedimentation of natural drainage channels must be considered. Special attention should be given to the river crossing areas (bridges).

The principle impact that road development projects have on the natural geologic erosion process includes temporary exposure of disturbed soils to precipitation and to surface runoff. The soil exposure and the resulting reshaping of the topography may create situations when detrimental erosion and sedimentation temporarily occur.

The two factors that have the greatest impact on the slope stability are the slope gradient and the groundwater. Generally, the greater the slope gradient and the presence of the groundwater, the lower is the stability of a certain slope regardless of the geologic material or the soil type.

The erosion of embankments and river terrace slopes as a result of road construction activity may have serious environmental impacts, including:
- Pollution of surface water,
- Damage to adjacent land, and
- Degradation of streams and of the aquatic habitat.

In general, the process may be controlled by:
- Selection of a reasonable embankment height and stabilization of the slopes;
- Establishment of temporary berms, slope drains, temporary pipes, contour ditches, ditch checks, diversions, sediment traps etc.

Culverts used in the road, bridge and berm construction are to prevent flooding and washing out of roads. They also minimize erosion, build-up of standing water, and provide pathways for run-off.

8.2.15. Impacts on the landscape
Much of the landscape modification will be associated with land take for the bypass road construction and cut and fill sections to improve both horizontal and vertical alignment. These are permanent features as it is highly improbable that any land taken, or earthworks constructed for the project will ever be returned or reinstated.
Channels, culverts and mitre drains are essential to divert water from the road surface. They are important because if the water continuously remains on or close to the road, it tends to ‘consume’ away the surface, gradually causing potholes and ditches or pits. However, poor construction of these structures, particularly on hilly and rainy areas, can have serious consequences, including soil erosion, leading to man-induced channels and gulleys that if unattended early can later be unmanageable.

In addition, the contractor might create borrow pits in locations adjacent to the existing ones in order to increase the supply of gravel. Quarries and borrow pits, cut slopes and material stockpiles, when exposed to the public, often lead to visual intrusion. If the construction contracts specify that material sites/borrow areas and quarries are to be landscaped after use to blend with the landscape as far as is reasonably possible, visual intrusion associated with these activities would be minimized, hence the impact would be minor.

8.3. POSITIVE SOCIO-ECONOMIC IMPACTS

8.3.1. Local Employment and Procurement Opportunities
The detailed labour requirements for the project will not be known until the appointment of the construction contractor. This section therefore includes a preliminary assessment of the number of workers that will be required which should be regarded as indicative only, and will change prior to commencement of the project.

It is currently estimated that approximately 300 people will be employed during peak construction periods (approximately 36 months) for construction of the Bypass Road and the Dry port and in management of the construction camps. This includes a combination of skilled, semi-skilled and unskilled workers. Skilled workers will include experienced professional staff in categories such as welding and machinery operation. Semi-skilled workers will include experienced drivers, mechanics, night watchmen and chefs. Unskilled work may include sand bag filling, acting as a banksman for machine operators, hustling skids etc and workers may be employed with no prior construction experience, though preference will be given to applicants with experience.

Skilled and semi-skilled workers will normally be expected to move with the construction activities along the length of the road to avoid safety issues associated with constant rehiring. Unskilled workers will probably be hired for shorter periods as construction passes through their area.

At peak, the number of road construction jobs to be created by this project will be approximately 400. It is currently estimated that Zambia nationals should be able to fill 50 to 80% of these jobs. This will be dependent upon whether a suitable number of Zambian are found to possess the necessary skills for certain jobs.

Approximately 200 workers will be employed at the potential construction camps at peak periods in the road construction process. Each camp is likely to require around 100 support staff. These will be primarily Zambian. The total of 200 workers is based on the assumption that two construction camps will be operating at any one time. The actual number of camps and yards will be determined by the construction contractor.

The construction phase is expected to last about 36 months. However, the peak construction period will be approximately 24-30 months and many of the jobs will only be available for a proportion of the overall period.
8.3.2. Procurement of goods and services during construction

The project will provide direct service opportunities for companies at the national and regional level, and also to some extent for communities along the route. This is contingent on whether local suppliers can offer sufficient quality and reliability and can meet the stringent standards, particularly on health and safety required by all parties to be involved in the project (including sub-contractors). The types of local contracts that are anticipated during construction are listed below:

- Catering services to camps and construction sites;
- Laundry services to camps;
- Security services at camps and construction sites;
- Supply of vehicles (e.g. imported tractors, trucks);
- Provision of food supplies (indirectly through catering services);
- Supply of bottled water;
- Supply of some construction equipment and materials, including timber, stone, land reinstatement materials;
- Etc.

A large proportion of these services are most appropriate for the construction camps. In addition, there will be secondary employment and local development of small supporting businesses.

8.3.3. Enhanced Local Skills

There will be a positive impact on local skills through the experience gained by workers and any training that they receive. The scale of the impact will depend upon the quality of the training programme, the work experience, and the individuals themselves.

It is likely that the entire workforce will need at least some training prior to employment, in order to perform tasks to the international standards that have been set by the project on issues such as Health, Safety and Environment (HSE).

8.3.4. Boost to the local economy

During construction, the workforce will possibly find accommodation and get most of their food and other necessities from the surrounding area. This will provide opportunities for local small food producers and small businesses (guesthouses, restaurants, road vending stalls, market women, local shops), which will especially benefit women, who are mostly involved in this type of small income generating activities. This applies equally to the operational phase when people from outside, such as truck drivers and handlers, will need accommodation and basic necessities in the area. This will in turn increase the incomes of the local people which can be invested in other (productive) activities and be used for paying school fees, medical expenses and other domestic needs. The facility will further stimulate local economic activities by:

- Stimulation of business activities related to contracting works for local entrepreneurs (subcontractors), such as transporters, vehicle maintenance and repair business, clearing and forwarding agents, consolidators and related agents, insurance companies etc.;
- Providing trading opportunities for local communities and other small enterprises in the area;
- Providing opportunities for provision of basic and other services catering for the expected increase in traffic and people such as private health facilities, fuel station, repair and maintenance crews etc.;
- Providing opportunities for e.g. assembly of imported components for regional markets, value-adding to bulk commodities including re-bagging, sampling as well as information processing.

8.3.5. Increased public revenues

Multiplier effects resulting from increased employment and operation will include increased public revenues such as taxes (PAYE to ZRA) and contributions to NAPSA from formally employed
persons and other indirect taxes resulting from the construction project such as VAT on materials and services.

8.3.6. **Boost to construction sector (regional/national multiplier effect)**
The construction of the project will provide a positive boost to various sectors related to the construction industry as it is recommended that the developer will ensure that raw materials, finished products and services will be sourced as much as possible from the local area for its successful completion. This in turn will promote employment opportunities in related sectors in the region.

Manufacturers and suppliers of local (i.e. regional) materials will include manufacturers of protective ware, cement manufacturers, local manufacturers of blocks, sub-contractors for the supply of sand and gravel as well as manufacturers of other local building materials such as timber and e.g. door/window frames. Other materials such as fuel, oil and motor/construction vehicle spares could also be provided through local suppliers as much as possible.

8.4. **NEGATIVE SOCIO-ECONOMIC IMPACTS**

8.4.1. **Impacts on Property, Buildings and Heritage, Access**

8.4.1.1. **Impact on property within the site for the Dry port**
No new land will have to be acquired for the development of the proposed Chipata Dry Port facility. The area in possession of the Zambia Railways Authorities (62 ha.) encompasses the total area of 12 ha for the present development and leaves spaces for future development. There are existing buildings within the 62 ha. railway land, such as the Chipata Railway Station, the offices for the Railway Authority and 24 houses, originally belonging to the ZRA but presently belonging to the occupants, who have been given the right to buy the property and remain within the confines of the railway area. The properties as such will not be affected but their occupants might be affected in various ways, especially related to dust, vibration and noise, due to their nearness to the Dry Port Facility. No other properties exist within the boundaries that will be affected.

8.4.1.2. **Permanent expropriation of land for the Bypass Road**
The project will need to acquire land for the construction of the Bypass Road. It is estimated that about 43Ha of land belonging to 17 households would need to be acquired for the Bypass road alignment. The land to be acquired is mostly used for subsistence farming by the local people. A full resettlement Action Plan has therefore been prepared as a standalone document to this effect.

8.4.1.3. **Impact on access**
The current road/track to the Chipata Railway Station, the railway offices and the 24 houses near the offices, inside the railway premises, is also used by other people to reach the houses being built on the slope behind the railway offices in Magazine compound and as a short cut for people farming in the railway area and beyond. It is very likely that this road will be closed off to the general public as it will lead directly into the Dry Port Facility, thereby preventing people direct access to their homes and fields.

8.4.1.4. **Impacts on Productive Land and Agriculture**
The area designated for Dry Port Development and the larger Railway property is in use for agricultural production by the nearby communities. None of the people producing there own the land or have a title to the land and they have been allowed to cultivate by the previous owner (farmer) and the current owner (Railways). They have been informed that after the present production season (2017-2018) no one is allowed to continue cultivating within the Railway area. No
compensation is to be provided and people will have to source other areas for agricultural production further away from their homes on customary land.

Along the Bypass Road, land owner have titled to the land and the alignment will in certain cases pass through crop fields. Land owners in these areas will be compensated for the loss of their land and a full resettlement Action Plan has therefore been prepared as a standalone document to this effect.

8.4.2. Impacts on Occupational Health and Safety

Construction of the project will involve many activities and procedures with potentially high risk levels to the occupational health and safety of workers and personnel. Also during operation, occupational health hazards exist. Procedures with potentially high risk levels include:

- Work in hazardous environments (e.g. dusty environment), dust nuisance is potentially significant if unmitigated and can lead to either chest/respiratory problems and eye irritations;
- Blasting, grading and digging operations (e.g. flying rock and debris), causing casualties;
- Work with open flames (e.g. welding and cutting operations) causing fire hazards, casualties;
- Work at height (e.g. scaffolding, platforms and cutting operations) with the risk of fatal accidents and/or casualties; Operation and handling of heavy plant and machinery e.g. operation of cranes and mobile equipment; movement of construction traffic and machinery around the sites, operation of heavy trucks, with the risk of accidents and nuisance/stress caused by vibration;
- Work in a noisy environment: Sustained noise levels during construction as well as operation are expected to be much higher than the ambient noise level in the project area as a result of construction activities (concrete mixing plants, grading, stone crushing) as well as use of heavy equipment, truck traffic, wagon movements and other similar sources during operation, resulting in possible elevated stress levels, headaches etc.

8.4.3. Impacts on Public Health and Safety

8.4.3.1. Risk of accidents at worksite

There is a risk of accidents occurring, involving members of the public who may gain unauthorized access or inadvertently venture on to the construction sites and operational area.

8.4.3.2. Risk of road related accidents (construction)

The increase in (heavy) construction traffic can cause an increase in traffic related accidents, involving other vehicles and members of the public.

8.4.3.3. Increased dust and noise related problems and diseases

The increase in construction related traffic and in particular the increase of heavy traffic during operation (an estimate of up to 53 trucks per day at peak period) and the operation of the railway with loaded wagons combined with the use of heavy equipment, will cause more exhaust gasses and possibly dust as well as a lot of noise and vibrations, not only affecting the communities, schools and prison in the area nearest to the site, but also the people living along the roads that will be used as main access roads to the facility. This can lead to an increase in respiratory diseases, eye infections and stress related problems affecting the quality of life of the people.

8.4.3.4. Increased risk of transmission of HIV and communicable diseases

Construction projects are commonly associated with social interactions amongst the construction workers and local communities. This among other factors may produce an inherent increased risk of transmission of sexually transmitted diseases, HIV and other contagious diseases such TB, pneumonia etc.
The nature of a Dry Port Facility and bypass road involves constant movement of goods and people during operation. Truck drivers will most likely have to spend one to several nights in Chipata waiting for goods to be handled and cleared. This will again increase social interaction with the local communities with the same inherent risks.

8.4.3.5. Increased risk of health problems related to sanitation and waste products
Solid waste, hazardous waste (see paragraph 5.2.6) and human waste and the process of their storage and disposal can have an impact on public health and safety during construction and in particular during operation. The town of Chipata does not yet have the proper facilities for waste management that respond to official requirements. The collection and dumping of waste from the Dry Port area in landfills or other areas not suitable, will pose additional (health) risks to humans and animals near those sites.

The town sewerage network does not extent to the proposed project.

Waste products include discarded building and packaging material (e.g. bags for packaging maize, fertiliser and other goods), cement bags, scrap timber, carrying crates, workers garbage and domestic waste from workers’ and truckers’ canteens, sanitary waste from workers ablution etc. Improper handling can cause casualties, bad smells and vapours can be a source of infectious disease such as diarrhoea and malaria.

8.4.4. Impacts on Social Relations and other Social Aspects
During the construction and operational phase it is expected that a lot of movement of people from outside will take place. Skilled and semi-skilled construction workers that cannot be sourced from the local area will (temporarily) move in. During operation truck drivers from within Zambia and elsewhere will constantly be moving in and out and there will be a permanent group of workers of the Dry Port Facility. Prostitution, alcohol related problems and petty crime might increase, as well as possible other conflicts between the local resident population and new comers/travellers.

8.4.5. Impacts on Existing Social Facilities
The limited influx of people and increase in traffic during the construction phase will not have a significant impact on the existing facilities.

However, the larger influx and increase in trade and traffic during the operational phase will most likely put pressure on the existing facilities in Chipata, such as the health facilities, other services like fuel provision, road system in town, prison services, fire department etc. Electricity and water to the Dry Port Facility is provided by ZESCO and the Water & Sewerage Company respectively. The final design of the facility will provide the estimates for the use of electricity and water during the operational phase and will advise on the need for additional capacity.

8.4.6. Impacts on Aesthetic Qualities
The visual quality of the area will be affected by the creation of a the dry port facility, mainly by the building of structures that rise high above the flat landscape, such as warehouses, silos and liquid fuel terminal port facilities, lighting and other optical disturbances (cranes, stacked containers etc). The landscape may be changed into an artificial scene of industrialisation. Some port facilities may give an unpleasant impression to people. The people on the hill side behind the Chipata railway station will have their current wide view on the flat area and the dam beyond disturbed.
8.4.7. Specific Impacts on Security and Safety

8.4.7.1. Security
During the construction and in particular during the operational phase there will be a lot of movement of material and goods in and out of the premises of the dry port, which might attract people with bad intentions to the facility. Port areas and hubs where large volumes of trucks, railway wagons and containers are parked and handled are notorious for (large scale) theft. The closeness of the prison to the Dry Port imposes an additional treat to the security. Vandalism and the occurrence of (new) crimes such as drugs and human trafficking might appear or increase.

8.4.7.2. Fire
During operation goods will be stored and handled that are particularly susceptible to fire hazard. These goods include stored agricultural products, such as cotton, that is highly inflammable and goods stored in the Wet Goods area/Liquid Terminal. Petroleum is toxic, can exude fumes and gas and can explode. Stored gas can explode and likewise cause fire. Specific type of goods need specific measures to fight fire as for instance fire caused by gas and certain chemicals cannot be fought with water.
CHAPTER NINE

EVALUATION OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

9.1. INTRODUCTION
Potential impacts were identified in the narratives in Chapter 9 above. Prediction and evaluation of environmental and social impacts within this ESIS Report are considered against the baseline (including its value/sensitivity). In addition to the Key Principles provided by ZEMA, and as a basis for assessing environmental and social impacts, the methodology applied to this ESIA has been developed using a combination of the criteria, methodology and guidance provided by international requirements/best practice.

The ZEMA key Principles are as follows:
- Nature and magnitude of the intended activity and the existence of similar projects at the site or similar sites;
- Extent of the impact of the proposed project; and
- Location of the project and the nature of the surrounding environment and nearby residential clusters.

Table 9-1 presents the terminology used throughout this chapter to describe and rank environmental and social impacts according to the categories defined above.

Table 9-1: Terminology Used to Describe Environmental and Social Impacts

<table>
<thead>
<tr>
<th>Category</th>
<th>Terminology</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>Frequent</td>
<td>Uninterrupted or on a daily basis</td>
</tr>
<tr>
<td></td>
<td>Infrequent</td>
<td>Once or more per day</td>
</tr>
<tr>
<td></td>
<td>Rare</td>
<td>Less than once per day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single event/less than once per year</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Certain</td>
<td>Impact possibility estimated to be 100%</td>
</tr>
<tr>
<td></td>
<td>Likely</td>
<td>Impact possibility estimated as between 50% and 99%</td>
</tr>
<tr>
<td></td>
<td>Unlikely</td>
<td>Impact possibility estimated as &lt; 50%</td>
</tr>
<tr>
<td></td>
<td>No impact</td>
<td>Zero estimated possibility of impact</td>
</tr>
<tr>
<td>Extent</td>
<td>Local</td>
<td>Within 2 km of the Project site</td>
</tr>
<tr>
<td></td>
<td>Provincial</td>
<td>Outside the Project site but &lt;20 km away</td>
</tr>
<tr>
<td></td>
<td>Regional</td>
<td>Outside the Project site but &lt; 200 km away</td>
</tr>
<tr>
<td></td>
<td>National</td>
<td>Within Zambia</td>
</tr>
<tr>
<td></td>
<td>International</td>
<td>Outside Zambia</td>
</tr>
<tr>
<td>Duration</td>
<td>Short</td>
<td>Less than the life of Project</td>
</tr>
<tr>
<td></td>
<td>Medium</td>
<td>The life of project</td>
</tr>
<tr>
<td></td>
<td>Long</td>
<td>Greater than the life of Project</td>
</tr>
<tr>
<td>Magnitude</td>
<td></td>
<td>• Defined in relation to the limit criterion where available, e.g.:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Very low</strong>: Parameter &lt; 10% limit criterion</td>
</tr>
</tbody>
</table>
## ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

### Impact Magnitude

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low</td>
<td>Low: Parameter 10 to &lt;50% limit criterion</td>
</tr>
<tr>
<td>Low</td>
<td>Medium: Parameter 50 – 100% limit criterion</td>
</tr>
<tr>
<td>Medium</td>
<td>High: Parameter 100 – 200% limit criterion</td>
</tr>
<tr>
<td>High</td>
<td>Very High: Parameter &gt; 200% limit criterion. Or, for qualitative assessments:</td>
</tr>
<tr>
<td>Very high</td>
<td>• Very low: No degradation/adverse alteration to resource/receptor</td>
</tr>
<tr>
<td></td>
<td>• Low: Minor degradation/adverse alteration to resource/receptor</td>
</tr>
<tr>
<td></td>
<td>• Medium: Moderate degradation/adverse alteration to resource/receptor</td>
</tr>
<tr>
<td></td>
<td>• High: Significant degradation/adverse alteration to resource/receptor</td>
</tr>
<tr>
<td></td>
<td>• Very High: Permanent degradation/detrimental alteration to resource/receptor</td>
</tr>
</tbody>
</table>

### Type of Impact

<table>
<thead>
<tr>
<th>Effect</th>
<th>Positive</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beneficial impact</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adverse impact</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>Direct</th>
<th>Indirect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>caused solely by activities within scope of Project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Impact which does not result directly from activities within the scope of Project, but which has a connection with the Project’s presence.</td>
<td></td>
</tr>
</tbody>
</table>

### Potential Significance

<table>
<thead>
<tr>
<th>Significance</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any low magnitude impact, or medium magnitude impact that is unlikely to occur or is of short duration.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any medium magnitude impact that is certain or likely to occur and of medium or long duration. Also, any high magnitude impact that is unlikely to occur, of short duration, or local in extent.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any high magnitude impact that is certain or likely to occur, of medium or long duration, and regional in extent.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) All terms are characteristics of the impact(s). For example, duration refers to duration of impact, not the activity causing it.

(2) As indicated, the impact magnitude for some environmental aspects can be defined in relation to the limit criterion specified by ZEMA or international regulations, or best practices when national standards are not available. However, in the absence of definitive quantitative criteria, a qualitative assessment of the magnitude is used relating to the impact type.
<table>
<thead>
<tr>
<th>Impact</th>
<th>Impact Description</th>
<th>Impact Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity to Improve Drainage</td>
<td>Road act as a barrier to natural drainage, which cause flooding in certain low areas</td>
<td>Infrequent Likely Local Short Low Positive Direct Low Medium</td>
</tr>
<tr>
<td>Spoil generation</td>
<td>Potential impacts from spoils and its disposal are (i) land for disposal of spoil, (ii) conversion of those land areas into a permanent dumping area</td>
<td>Frequent Likely Local Medium High Negative Direct High High</td>
</tr>
<tr>
<td>Contamination of Soils</td>
<td>Soil pollution can occur due to leakage, inappropriate disposal of fuel, oils and other chemicals utilized by construction machineries and garage works</td>
<td>Infrequent Likely Local Short Low Negative Direct Low Low</td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Soil erosion can occur on hilly terrain where the bypass road alignment passes through a more slope area particularly during rainy or windy days.</td>
<td>Infrequent Likely Local Short Low Negative Direct Low Low</td>
</tr>
<tr>
<td>Impact</td>
<td>Impact Description</td>
<td>Frequency</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Air Quality (Dust, Gaseous Emission) Impacts</td>
<td>Deterioration of air quality due to increase in dust/particulate level and increased emission from heavy construction equipment and trucks.</td>
<td>Frequent</td>
</tr>
<tr>
<td>Noise</td>
<td>Noise will be generated from vehicular movement, excavation machinery, and construction activities during the construction phase.</td>
<td>Frequent</td>
</tr>
<tr>
<td>Impact on Water Resource and Quality</td>
<td>Road and dry-port construction activities like excavation, generation of wastes, installation of embankments &amp; crossing bridges, direct water abstraction for construction purpose may have effect on the existing water resource.</td>
<td>Rare</td>
</tr>
<tr>
<td>Contamination of Ground Water</td>
<td>Fuel, Lubricant and other chemical spillages from normal construction activities, chemical storage areas, raw material stockpiles, refueling areas, and because of accidents have the potential to contaminate groundwater.</td>
<td>Rare</td>
</tr>
<tr>
<td>Impact</td>
<td>Impact Description</td>
<td>Frequency</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Waste Impacts</td>
<td>It is expected that large quantities of solid waste will be generated at the site camps, main camp and other construction waste.</td>
<td>Frequent</td>
</tr>
<tr>
<td>Adverse impact on flora</td>
<td>Construction of the proposed road can result in adverse impacts to the remaining natural vegetation in the project area due to establishing camp and garage sites, access road construction and material site development activities.</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Adverse Impact on Wildlife and Avi-Fauna</td>
<td>The proposed road route does not interfere or fall in a park boundary and hence the project construction expected to have no direct adverse impact on the wetland habitat and fauna.</td>
<td>Rare</td>
</tr>
<tr>
<td>Adverse impact on aquatic habitat</td>
<td>Impact on aquatic habitat can be encountered during installation of bridge and other structures across or near water bodies (rivers, streams) which result in destruction of local habitat.</td>
<td>Rare</td>
</tr>
<tr>
<td>Impact</td>
<td>Impact Description</td>
<td>Impact Evaluation</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Impacts on the landscape                   | Quarries and borrow pits, cut slopes and material stockpiles, when exposed to the public, often lead to visual intrusion                                                                                                                                                                                                                           | Frequency: Frequent  
Likelihood: Likely  
Extent: Local  
Duration: Medium  
Magnitude: Medium  
Effect: Negative  
Action: Direct  
Sensitivity: Medium  
Significance: Medium |
| Stimulation of economic growth at local levels | The construction workers will obtain most of their food and other necessities from the surrounding area. This will create a potential market for the local agricultural producers, fishermen, craftsmen and other small businesses like hammer mills and local shops.                                                                                   | Frequency: Frequent  
Likelihood: Likely  
Extent: Regional  
Duration: Medium  
Magnitude: Medium  
Effect: Positive  
Action: Direct  
Sensitivity: Medium  
Significance: Medium |
| Potential Impacts on Employment            | During construction of the road, employment will be generated mainly for construction workers. The workforce needed when work will be assumed is thus estimated to be in the range of 300-500 workers.                                                                                                                     | Frequency: Frequent  
Likelihood: Likely  
Extent: Regional  
Duration: Medium  
Magnitude: High  
Effect: Positive  
Action: Direct  
Sensitivity: Medium  
Significance: High  |
### Potential Impacts on Education and Training
It is expected that during the construction phase some level of capacity building will be provided (organized and unorganized) through transfer of new technologies and new skills.

<table>
<thead>
<tr>
<th>Impact Description</th>
<th>Frequency</th>
<th>Likelihood</th>
<th>Extent</th>
<th>Duration</th>
<th>Magnitude</th>
<th>Effect</th>
<th>Action</th>
<th>Sensitivity</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is expected that during the construction phase some level of capacity building will be provided (organized and unorganized) through transfer of new technologies and new skills.</td>
<td>Frequent</td>
<td>Likely</td>
<td>Regional</td>
<td>Medium</td>
<td>Medium</td>
<td>Positive</td>
<td>Direct</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

### Permanent land take
The project will need to acquire land for the construction of the Bypass Road. It is estimated that about 43Ha of land would need to be acquired for the Bypass road alignment.

<table>
<thead>
<tr>
<th>Impact Description</th>
<th>Frequency</th>
<th>Likelihood</th>
<th>Extent</th>
<th>Duration</th>
<th>Magnitude</th>
<th>Effect</th>
<th>Action</th>
<th>Sensitivity</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Frequent</td>
<td>Likely</td>
<td>Local</td>
<td>Medium</td>
<td>High</td>
<td>Negative</td>
<td>Direct</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

### Impacts from the influx of temporary workers
It is expected that the increased number of workers and higher concentration of residents near construction sites will have impact on local communities.

<table>
<thead>
<tr>
<th>Impact Description</th>
<th>Frequency</th>
<th>Likelihood</th>
<th>Extent</th>
<th>Duration</th>
<th>Magnitude</th>
<th>Effect</th>
<th>Action</th>
<th>Sensitivity</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is expected that the increased number of workers and higher concentration of residents near construction sites will have impact on local communities.</td>
<td>Frequent</td>
<td>Likely</td>
<td>Local</td>
<td>Medium</td>
<td>Medium</td>
<td>Negative</td>
<td>Indirect</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>

### Impacts from increased community exposure to disease
The presence of many workers can give rise to an increased spread of communicable diseases. Construction projects are commonly associated with social interactions amongst the construction workers and local communities.

<table>
<thead>
<tr>
<th>Impact Description</th>
<th>Frequency</th>
<th>Likelihood</th>
<th>Extent</th>
<th>Duration</th>
<th>Magnitude</th>
<th>Effect</th>
<th>Action</th>
<th>Sensitivity</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>The presence of many workers can give rise to an increased spread of communicable diseases. Construction projects are commonly associated with social interactions amongst the construction workers and local communities.</td>
<td>Frequent</td>
<td>Likely</td>
<td>Local</td>
<td>Medium</td>
<td>Medium</td>
<td>Negative</td>
<td>Indirect</td>
<td>Medium</td>
<td>Medium</td>
</tr>
</tbody>
</table>
CHAPTER TEN

IMPACT ENHANCEMENT AND MITIGATION MEASURES

10.1. ENHANCEMENT MEASURES FOR POSITIVE ENVIRONMENTAL IMPACTS

10.1.1. Opportunity to Improve Drainage
RDA will ensure that proper drainage systems are constructed as per the project design to significantly reduce water stagnation on the new pavement. In addition, provision has been made in the design for box culverts at various stream crossings in the final design to improve drainage in the project area.

10.2. ENHANCEMENT MEASURES FOR POSITIVE SOCIO-ECONOMIC IMPACTS

10.2.1. Impacts on the Local and Regional Economy (multiplier effect)

10.2.1.1. Provision of employment (skilled and unskilled)
As far as possible, priority should be given by the Contractor to the employment of labour from the local communities (Magazine compound) around the project area during construction. The contractor should liaise with the Ward Development Committees and Ward Councillors to guarantee as much as possible an equitable recruitment of workforce. This will increase economic benefits accrued to local communities during construction in terms of income as well as be an advantage to the Contractor due to reduced transport time and costs for workers.

The Dry Port Authority should also be required to recruit as much as possible local people for casual about during operation in the fulfilment of many cargo handling duties as well as semi-skilled and skilled people that have the required capacities from the area.

10.2.1.2. Boost to construction sector (regional/national multiplier effect)
Where feasible, the Contractor will be required to use licensed local providers of sand and other raw material as well as providers in the region for other (building) materials.

10.2.1.3. Boost to the local economy
Municipal Authorities and relevant Provincial and district departments should provide the necessary guidance, control and support for small and medium scale enterprises to start businesses related to the activities in the Dry Port area. Likewise, the Dry Port Authority could stimulate certain related businesses (handling cargo, clearing and forwarding, insurance etc.) by formalising these activities and place them under properly structured contractual arrangements overseen by the Dry Port Authority.

10.2.1.4. Capacity building
Capacity building programmes and technical training courses as well as on the job training will be provided in specific skills areas for suitable candidates from the area to enhance minimum levels of education and the possibility of being employed during construction (and/or operational) phase.
10.3. MITIGATION MEASURES FOR NEGATIVE ENVIRONMENTAL IMPACTS

10.3.1. Spoil Generation
The first step towards addressing the impacts of spoil is to minimize the generation of spoils by recycling the excavated material to the maximum extent possible by using them as aggregate or fill material works. An analysis of spoils will be carried out to assess its usability of the spoil by the contractor. Surface excavations consisting of loose soil material are not expected to meet the requirement of aggregates and much of it will have to be either used as fill material or disposed of in approved sites.

10.3.2. Soil erosion
Measures to mitigate soil erosion include:
- Limiting clearance of vegetation and prompt re-vegetation of appropriate cleared areas;
- Installing retaining walls, mud screens, and reinforcing embankments, as needed;
- Maximum height limitations for material piling and storage;
- Programming works during the dry season and postponing works during storm events;
- Carrying out reforestation of the disturbed area after construction activities;
- Limit movement of heavy machinery only to designated access routes and operational areas; and
- Periodic monitoring will be conducted, including visual surveys of erosion and sediment control measures every 3 months in dry season and monthly in wet season, as well as a quarterly audit of quarry operations.

10.3.3. Air Quality (Dust, Gaseous Emission) Impacts
The relevant guidelines from the IFC and the project specific construction stage mitigations are given in the following:
- Managing emissions from mobile sources (such as on-road and off-road vehicles) including: All project plant (including generators & batching plant) and vehicles must be serviced as per manufacturer’s guidelines.
- Implementation of manufacturer recommended engine maintenance programs, Emissions from vehicles not to exceed limits recommended in Table 10-1.
- Training of drivers on driving practices to reduce fuel consumption, including measured acceleration: - The contractors staff training programme, shall include driver training for fuel efficient driving.
- Avoid open burning of solids: - Incineration of any solids which may release toxic chemicals on combustions, such as plastics, shall be prohibited. Burn pits shall be visually monitored and the quantity of burning waste and incineration temperature controlled to minimize smoke emission.
- Ensure emissions resulting from the project do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines, including annual stack testing at generators and batching plant for NOx, SO2, and PM. Where emissions are found to exceed national standards, point source air emissions prevention and control techniques should be considered. Quarterly effects monitoring of ambient air against IFC and WB Guidelines is proposed in the monitoring plan.

The emissions from vehicles used in the project area shall not exceed the values given in Table 10-1.
Table 10-1: WHO Ambient Air Quality Guidelines Emission Limits for Vehicles

<table>
<thead>
<tr>
<th>Emission</th>
<th>Averaging Period</th>
<th>Guideline value in mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfur dioxide (SO2)</td>
<td>24-hour</td>
<td>125 (Interim target-1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 (Interim target-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 (guideline)</td>
</tr>
<tr>
<td></td>
<td>10 minute</td>
<td>500 (guideline)</td>
</tr>
<tr>
<td>Nitrogen dioxide (NO2)</td>
<td>1-year</td>
<td>40 (guideline)</td>
</tr>
<tr>
<td></td>
<td>1-hour</td>
<td>200 (guideline)</td>
</tr>
<tr>
<td>Particulate Matter PM10</td>
<td>1-year</td>
<td>70 (Interim target-1)</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>50 (Interim target-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 (Interim target-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20 (guideline)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>150 (Interim target-1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 (Interim target-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75 (Interim target-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 (guideline)</td>
</tr>
<tr>
<td>Particulate Matter PM2.5</td>
<td>1-year</td>
<td>35 (Interim target-1)</td>
</tr>
<tr>
<td></td>
<td>24-hour</td>
<td>25 (Interim target-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 (Interim target-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 (guideline)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75 (Interim target-1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 (Interim target-2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>37.5 (Interim target-3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25 (guideline)</td>
</tr>
<tr>
<td>Ozone</td>
<td>8-hour daily maximum</td>
<td>160 (Interim target-1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 (guideline)</td>
</tr>
</tbody>
</table>

Table 10-2: Emission Limits for project vehicles

<table>
<thead>
<tr>
<th>Emission</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulate Matter</td>
<td>100 mg/Nm³</td>
</tr>
<tr>
<td>Sulphur Dioxide</td>
<td>3% Sulphur</td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>1,460 mg/Nm³</td>
</tr>
</tbody>
</table>

Source: IFC General Environmental, Health and Safety Guidelines.
10.3.4. Noise

The relevant guidelines from the IFC and the project specific construction stage mitigations are given in the following:

- **Selection of equipment with lower sound power levels:** The Contractor shall provide latest equipment required for completion of each task.
- **Installation of silencers & suitable mufflers on engines exhausts:** The Contractor shall provide acoustic guards, covers and doors.
- **Limiting hours of operation:** The contractor shall plan his operations to be completed based on a six-day working week from 6am to 6pm. Should the Contractor require additional working hours, or weekend working, he shall submit a request to the Engineer for permission to work extended hours and giving full reasons for the requests.
- **Develop a mechanism to record and respond to complaints:** A complaints register shall be placed at the contractors and Engineers Officer to address complaints. The register shall record measures taken in response to the complaints. The contractor shall be required to employ a full time, qualified Community Liaison Officer for the project who is conversant with WB social safe guide policies and can address grievances and other community liaison issues.

The project specific construction stage mitigation measures are:

- The contractor shall provide equipment only of the size/power required to complete each task.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Reference Time Average</th>
<th>Guideline limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sulfur dioxide (SO₂)</td>
<td>10 minutes</td>
<td>500 μg/m³</td>
</tr>
<tr>
<td></td>
<td>1 hour</td>
<td>350 μg/m³</td>
</tr>
<tr>
<td>2. Sulfur dioxide &amp; SO₃ in combination with Total Suspended Particles (TSP)* and PM₁₀</td>
<td>SO₂</td>
<td>6 months</td>
</tr>
<tr>
<td></td>
<td>6 months</td>
<td>50 μg/m³</td>
</tr>
<tr>
<td></td>
<td>TSP</td>
<td>6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours</td>
</tr>
<tr>
<td></td>
<td>PM₁₀</td>
<td>6 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours</td>
</tr>
<tr>
<td>3. Respirable particulate matter PM₁₀*</td>
<td>PM₁₀</td>
<td>24 hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 months</td>
</tr>
<tr>
<td></td>
<td>PM₂·₅*</td>
<td>24 hours</td>
</tr>
<tr>
<td>4. Oxides of nitrogen (NOₓ) as nitrogen dioxide (NO₂)</td>
<td>1 hour</td>
<td>400 μg/m³</td>
</tr>
<tr>
<td></td>
<td>24 hours</td>
<td>150 μg/m³</td>
</tr>
<tr>
<td>5. Carbon monoxide (CO)</td>
<td>15 minutes</td>
<td>100 mg/m³</td>
</tr>
<tr>
<td></td>
<td>30 minutes</td>
<td>60 mg/m³</td>
</tr>
<tr>
<td></td>
<td>60 minutes</td>
<td>30 mg/m³</td>
</tr>
<tr>
<td></td>
<td>1 hour</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td></td>
<td>3 hours</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td>6. Ambient lead (Pb)</td>
<td>3 months</td>
<td>1.5 μg/m³</td>
</tr>
<tr>
<td></td>
<td>12 months</td>
<td>1 μg/m³</td>
</tr>
<tr>
<td>7. Dust fall</td>
<td>30 days</td>
<td>Residential &amp; Light commercial area</td>
</tr>
<tr>
<td></td>
<td>Non-residential and Light commercial area</td>
<td>500 mg/m²/day</td>
</tr>
<tr>
<td>8. CO₂</td>
<td>8 hours</td>
<td>120 μg/m³</td>
</tr>
</tbody>
</table>

*1) Total suspended particles (TSP) are particles with diameter less than 45 micrometers (μm).

*2) Respirable particles (PM₁₀) are particles with diameter less than 10 micrometers (μm).

*3) Respirable particles (PM₂·₅) are particles with diameter less than 2.5 micrometers (μm).

**NOTE:** Reference times are the 98th percentile averaging times.
**10.3.5. Dust Emission**

The project specific construction stage mitigation measures are:

- Clearing of vegetation for site clearance will be kept to a minimum.
- Vegetation clearance for camps and access roads will be kept to the minimum required.
- Clearing of vegetation beyond the CoI/RoW shall be avoided.
- Existing tracks shall be favoured for haulage of material.
- Access tracks will follow natural contours to minimize disturbance to natural topography and soils; cutting along the sides of the slopes will be minimized.
- During construction the preparation of new access tracks will be minimized.
- Where improvement of existing tracks or development of short lengths of new tracks is unavoidable the width of the access track will not exceed 3 m.
- Vehicle speeds will be regulated and monitored to avoid soil erosion.
- Off-road travel will be minimized observance of this restriction will be monitored during the operation.
- Periodic trainings will be provided to drivers on mitigation measures related to off-road travel and speeds limits.
- During construction movement of construction equipment will be restricted to work areas and established access tracks to avoid unnecessary disturbance to soils in the project area.
- Spoil heaps (whether temporary or permanent) will be protected from erosion by trimming and grading.
- In addition to the above, the slopes of permanent spoil heaps shall be compacted and stabilized.
- Earthworks shall be rescheduled, where practical, to avoid periods of high wind.
- At mobilization, the contractor shall be required to submit a Traffic Management Plan to the Engineer. This plan shall define all the access and haul routes to be established as part of the...
project and their position relevant to existing settlements. Within this plan, the contractor shall be required to demonstrate no practicable alternative haulage routes where a haulage route is required within 150 m of a settlement.

10.3.6. Impact on Surface Water Resource and Quality
The relevant guidelines from the IFC and the project specific construction stage mitigations are given in the following Table 11-3. Guidelines relating to sewerage systems are included in this section due to the risk to surface water quality posed by overloading of these systems.

<table>
<thead>
<tr>
<th>S#</th>
<th>IFC Guidelines</th>
<th>Mitigation Measures for the project road</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Discharge of process wastewater or sanitary wastewater to surface water should not result in contaminant concentrations in excess of local and WB ambient water quality criteria</td>
<td>Quarterly monitoring of surface water and treated wastewater against NEQS and WB guidelines.</td>
</tr>
<tr>
<td>02</td>
<td>Discharge to existing sewerage systems must meet the pre-treatment requirements for municipal and liquid industrial effluents</td>
<td>Mitigating the O &amp; M impacts of the project Contractor’s Camp and Project staff Office to be facilitated with a standardized gravity sanitary sewerage system along with drainage plan and septic tank to treat the water before disposal in the river or other areas.</td>
</tr>
<tr>
<td>03</td>
<td>Discharge to existing sewerage systems must not interfere, directly or indirectly, with the operation and maintenance of the collection and treatment systems or adversely impact the characteristic of residuals from wastewater treatment operations</td>
<td>If waste is to be discharged from the Contractor’s camp into the existing sewerage systems, the operator of the system (Southern Water &amp; Sewerage) must be notified of the nature of the waste and consent, in writing, to receiving this discharge.</td>
</tr>
<tr>
<td>04</td>
<td>Existing sewerage systems must only be used where they have adequate capacity to meet the local standards</td>
<td>(Southern Water &amp; Sewerage approved sewerage systems may be used.</td>
</tr>
<tr>
<td>05</td>
<td>Septic systems must only be used for treatment of sanitary waste</td>
<td>Disposal of construction waste water to septic systems shall be prohibited.</td>
</tr>
<tr>
<td>06</td>
<td>Septic systems must be properly designed and installed to prevent any hazard to public health, or contamination of land, surface or groundwater and be installed in areas with sufficient soil percolation for the design wastewater loading rate</td>
<td>If septic systems are to be used, the contractor must submit a plan for treatment using septic systems to the Engineer for approval. The plan must include designs or specifications demonstrating that the treatment rate of the system exceeds the loading rate</td>
</tr>
<tr>
<td>07</td>
<td>Septic systems must be installed in areas of stable soils that are approximately level, well drained and permeable, with enough separation between drain field and the groundwater table and surface water</td>
<td>A location plan of the septic system must be included in the treatment plan to be submitted to the Engineer for approval. The location should ensure that in the event of surcharge of the system, sewage shall not flow to the rivers/tributaries, canals, wetlands or ponds.</td>
</tr>
<tr>
<td>08</td>
<td>Septic systems must be well maintained to allow effective operation</td>
<td>A maintenance programme must be included in the treatment plant to be submitted to the engineer</td>
</tr>
<tr>
<td>09</td>
<td>Sludge from septic systems should be disposed in compliance with local regulatory requirements</td>
<td>A plan for treatment and disposal of sludge from septic systems must be included in the treatment plan</td>
</tr>
<tr>
<td>10</td>
<td>Transfer of pollutants from process wastewater to another phase should be avoided</td>
<td>Washout from concrete batching plant should be treated to meet WHO/IFC guidelines. Treatment may include, as necessary, flow and load equalization with pH adjustment and sedimentation of suspended solids using settling basins or ponds.</td>
</tr>
<tr>
<td>11</td>
<td>Stormwater at campsites should be separated</td>
<td>Camps site should provide all necessary drainage</td>
</tr>
</tbody>
</table>
In addition, the project specific construction stage mitigation measures are:

- Discharge of untreated sanitary wastewater into flowing water will not be allowed.
- Vehicles will not be washed in the perennial and non-perennial rives and will only be washed in designated areas within campsites.
- The fuel shall be carried out in leak proof drums with a platform mounted with impervious (iron or plastic) sheet overlain by absorbent foam or sand.
- The platform as well as boat shall be fixed to the vessel carrying the plant to be refuelled.

### 10.3.7. Contamination of Soils and Ground Water Quality

The relevant guidelines from the IFC and the project specific construction stage mitigations are given in the following Table 10-4.

<table>
<thead>
<tr>
<th>S#</th>
<th>IFC Guidelines</th>
<th>Mitigation Measures for the project</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
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<td>Quarterly monitoring of surface water and treated wastewater against NEQS and WB guidelines.</td>
</tr>
<tr>
<td>02</td>
<td>Discharge to existing sewerage systems must meet the pre-treatment requirements for municipal and liquid industrial effluents</td>
<td>Mitigating the O &amp; M impacts of the project Contractor’s Camp and Project staff Office to be facilitated with a standardized gravity sanitary sewerage system along with drainage plan and septic tank to treat the water before disposal in the river or other areas.</td>
</tr>
<tr>
<td>03</td>
<td>Discharge to existing sewerage systems must not interfere, directly or indirectly, with the operation and maintenance of the collection and treatment systems or adversely impact the characteristic of residuals from wastewater treatment operations</td>
<td>If waste is to be discharged from the Contractor’s camp into the existing sewerage systems, the operator of the system (Southern Water &amp; Sewerage) must be notified of the nature of the waste and consent, in writing, to receiving this discharge.</td>
</tr>
<tr>
<td>04</td>
<td>Existing sewerage systems must only be used where they have adequate capacity to meet the local standards</td>
<td>Estern Water &amp; Sewerage approved sewerage systems may be used.</td>
</tr>
<tr>
<td>05</td>
<td>Septic systems must only be used for treatment of sanitary waste</td>
<td>Disposal of construction waste water to septic systems shall be prohibited.</td>
</tr>
<tr>
<td>06</td>
<td>Septic systems must be properly designed and installed to prevent any hazard to public health, or contamination of land, surface or groundwater and be installed in areas with sufficient soil percolation for the design wastewater loading rate</td>
<td>If septic systems are to be used, the contractor must submit a plan for treatment using septic systems to the Engineer for approval. The plan must include designs or specifications demonstrating that the treatment rate of the system exceeds the loading rate.</td>
</tr>
<tr>
<td>07</td>
<td>Septic systems must be installed in areas of stable soils that are approximately level, well drained and permeable, with enough separation between drain field and the groundwater table and surface water</td>
<td>A location plan of the septic system must be included in the treatment plan to be submitted to the Engineer for approval. The location should ensure that in the event of surcharge of the system, sewage shall not flow to the rivers/tributaries, canals, wetlands or ponds.</td>
</tr>
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<td>08</td>
<td>Septic systems must be well maintained to allow effective operation</td>
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</tr>
<tr>
<td>09</td>
<td>Sludge from septic systems should be disposed in compliance with local regulatory requirements</td>
<td>A plan for treatment and disposal of sludge from septic systems must be included in the treatment plan</td>
</tr>
<tr>
<td>10</td>
<td>Transfer of pollutants from process wastewater to another phase should be avoided</td>
<td>Washout from concrete batching plant should be treated to meet WHO/IFC guidelines. Treatment may include,</td>
</tr>
</tbody>
</table>
### 11 Stormwater at campsites should be separated from process and sanitary wastewater streams

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Stormwater at campsites should be separated from process and sanitary wastewater streams</td>
</tr>
<tr>
<td></td>
<td>Camps site should provide all necessary drainage of storm water away from the camp &amp; construction areas and community settlements.</td>
</tr>
<tr>
<td>12</td>
<td>Surface runoff from potential sources of contamination should be prevented, or if not possible, segregated from less contaminated runoff</td>
</tr>
<tr>
<td></td>
<td>Hazardous material storage sites should be covered and runoff from refueling and plant wash down sites should be treated before being disposed. Drainage shall be provided to divert natural rainfall runoff around the site location</td>
</tr>
</tbody>
</table>

In addition, the project specific construction stage mitigations are:

- All fuel tanks and other hazardous material storage containers will be properly marked to highlight their contents.
- The Contractor in consultation with ZEMA, will identify the sites for disposal of oil contaminated soil etc.
- Fuel storage areas and generators will have secondary containment in the form of concrete or brick masonry bunds. The volume of the containment area should be equal to 120% of the total volume of fuel stored.
- Fuel and hazardous material storage points must be included in camp layout plan to be submitted to Engineer for approval. Hazardous material storage areas shall include a concrete floor to prevent soil contamination in case of leaks or spills. Fuel tanks will be checked daily for leaks and all such leaks will be plugged immediately.
- Designated vehicles/plant wash down and refueling points must be included in camp layout plan to be submitted to the Engineer for approval.
- Run-off from wash down and refueling points shall be treated in a separation tank–oil shall be collected and treated as hazardous waste.
- Wash-down points will have a concrete pad underneath to prevent soil contamination in case of leaks or spills.
- Refueling points shall be provided with a concrete pad and bund, or drip trays shall be used to prevent soil contamination in the event of leaks or spills.
- Vehicles will be checked daily for fuel or oil leaks. Vehicles with leaks will not be operated until repaired.

**Treatment following spills**

1. The soil contaminated from minor and moderate spills will be removed and burnt in the burn pit.
2. The soil contaminated from major spills may require specialized treatment such as incineration or bioremediation.
3. Shovels, plastic bags, and absorbent material shall be present near fuel and oil storage or handling areas to attend to spills and leaks.

The residual impact post mitigation is assessed to be low adverse.

### 10.3.8. Waste Impacts

The relevant guidelines from the IFC and the project specific construction stage mitigations are given in the following Table 10-5.
<table>
<thead>
<tr>
<th>S#</th>
<th>IFC Guidelines</th>
<th>Mitigation Measures for the project road</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Topsoil, overburden, and low-quality materials should be properly removed, stockpiled near the site and reused during site rehabilitation.</td>
<td>IFC Guideline shall be adopted</td>
</tr>
</tbody>
</table>
| 02 | Waste management should be addressed through a waste management system that addresses issues linked to waste minimization, generation, transport, disposal & monitoring and includes:  
  - Characterization of waste according to composition, source, types and volumes in waste management planning  
  - Minimize hazardous waste generation by implementing stringent waste segregation to prevent commingling of non-hazardous and hazardous waste to be managed | Waste management plans from hazardous and non-hazardous waste have been developed                        |
| 03 | Establishment of a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of waste | IFC Guideline shall be adopted                                                                         |
| 04 | Avoid or minimize generation of waste as far as practicable                     | Excess construction material shall be returned to suppliers or sold for use locally                      |
| 05 | Where waste generation cannot be avoided but has been minimized:  
  - Recovering and reusing waste  
  - Evaluation of waste production processes and identification of potentially recyclable materials  
  - Identification and recycling of products that can be reintroduced to the activity on site | Non-combustible recyclable waste including plastic or glass bottles and cans will be temporarily stored on site and sold/handed over to a waste/recycling contractor who will utilize these wastes for recycling purposes. If no contractor is available, waste shall be disposed of.  
  The scrap steel shall be sold to local contractors or for recycling using approved facilities |
| 06 | Investigation of external markets for recycling  
Providing training to employees in order to meet objectives | Demolition waste shall be reused in construction activities such as for aggregate, landscaping and road formation |
| 07 | Where waste cannot be recovered or reused:  
  - treating, destroying, and disposing of it in an environmentally sound manner  
  - On- or off- site treatment of waste material to render it non-hazardous prior to final disposal  
  - Treatment or disposal at permitted facilities specially designed to receive the waste |  
  - IFC guideline adopted  
  - Biodegradable domestic waste shall be disposed of in landfills established in the project area or disposed of at Chipata City waste facilities where available  
  - Sanitary waste shall be transferred to local sewage treatment system or treated using septic tanks (See Table 10-4).  
  - Packaging paper and card shall be incinerated in burn pit if recycling is not possible  
  - Fire extinguishers to be provided burn pits  
  - Medical wastes will be temporarily stored onsite |
<table>
<thead>
<tr>
<th>S#</th>
<th>IFC Guidelines</th>
<th>Mitigation Measures for the project road</th>
</tr>
</thead>
</table>
| 08 | Hazardous waste materials shall be disposed of through reputable and legitimate enterprises, licensed by the relevant regulatory agencies. In the absence of qualified waste disposal operators, facilities for long-term storage of wastes in site or at an alternative location shall be constructed until external commercial options are available. The contractor shall prepare a plan for treatment of hazardous waste including details of a licensed contractor to be used (including relevant certification) or details of long-term storage facilities of hazardous waste if licensed contractor is not available. The plan shall be submitted to the Engineer for approval prior to commencement of works. | • Areas for storage for hazardous materials (including hazardous waste) shall be identified on the camp layout to be submitted to the Engineer for approval.  
• Hazardous material storage areas shall be covered, secured and include a concrete floor to prevent infiltration of contaminants to ground or ground water.  
• Hazardous storage areas must not be situated adjacent to surface water or in areas at risk of flooding. |
| 09 | Hazardous waste storage should: Be separate to non-hazardous waste. Prevent or control accidental releases to air, soil, and water resources. Be in closed containers away from direct sunlight, wind and rain. Be clearly identified and demarked both on site and on a site plan. | • Hazardous waste storage area should allow for inspection between containers to monitor leaks and spills.  
• Be inspected periodically and findings documented.  
• Space must be maintained between hazardous storage containers in the storage area to allow personnel to inspect each container.  
• Hazardous storage areas should be inspected weekly by the contractor and the findings documented by the contractor and made available to the Engineer on request. |
| 10 | Hazardous storage areas should be subject to special management actions, conducted by employees who have received specific training and limiting access to employees who have received training. | • Hazardous areas must be secure, and access only permitted to those who have received specific training.  
• Training on handling, use and disposal of hazardous material must be included in the contractors training for specified personnel. |
| 11 | A spill response and emergency plan should address accidental releases of hazardous waste. Spill kits, including sand buckets (or other absorbent material) and shovels must be provided at each. | • A spill response and emergency plan should address accidental releases of hazardous waste. Spill kits, including sand buckets (or other absorbent material) and shovels must be provided at each. |
| 12 | Providing training to employees in order to meet objectives of waste management strategy. Waste management for all site staff to be included in Contractor’s training plan. | • Providing training to employees in order to meet objectives of waste management strategy. Waste management for all site staff to be included in Contractor’s training plan. |

The project specific construction stage mitigation measures are:

- Topsoil, overburden, and low-quality materials should be properly removed, stockpiled near the site and reused during site construction.
- While biodegradable domestic waste shall be disposed of in landfills established in the project area or disposed of at municipal waste facilities where available; sanitary waste shall be transferred to local sewerage treatment system or treated using septic tanks.
- Training on handling, use and disposal of hazardous material must be included in the contractors training plan for specified personnel.
• Minimize hazardous waste generation by implementing stringent waste segregation to prevent mixing of non-hazardous and hazardous waste to be managed;
• Hazardous areas must be secure, and access only permitted to those who have received specific training
• Spill kits, including sand buckets (or other absorbent material) and shovels must be provided at each designated location
• Waste management training for all site staff to be included in Contractor’s training plan;
• A separate waste management plan will be prepared by Contractor which includes a plan for treatment of hazardous waste including details of a licensed contractor to be used (including relevant certification) or details of long-term storage facilities of hazardous waste if licensed contractor is not available. The plan shall be submitted to the Engineer for approval prior to commencement of works.

Land Fill for Waste: Measures for mitigating impacts from Land-fill are:
• Landfills shall be sited in an area where groundwater is low and, where the base of the landfill is highly permeable, the base shall be lined with an impervious layer (such as clay) to prevent ground water contamination from leachate.
• Provide fences and secure landfills to prevent unauthorized access.
• Inert waste/demolition debris shall be disposed of in burial sites away from settlements in the large barren area(s).
• The waste will be transported to disposal points in well maintained, designated and covered vehicles.
• Any excess excavated material will be dumped in vast plain area with the permission of Project Environmentalist and the Engineer.
• Within the camp areas all solid wastes will be stored in waste bins provided within the camp area and waste disposed of regularly.
• It will be ensured that after restoration activities the campsites are clean and that no refuse has been left behind.
• Guidelines in the solid waste management plan should be strictly followed.

After adopting the above-mentioned mitigation measures, the residual impact will be minor adverse.

10.3.9. Adverse impact on flora
Mitigations proposed during the design and planning stage of the project include:
1) The selection of potential camp sites to avoid areas of dense vegetation.

In addition, the following mitigation measures are proposed to be implemented during the construction stage:
a) The establishment of borrow areas or access tracks in forest land shall be strictly prohibited;
b) The area required for camp sites, borrow sites (if required), and dumping sites will be kept to the minimum required.
c) Approval from the Engineer shall be required before clearance of vegetation
d) Clearing of vegetation will be kept to a minimum and will not extend beyond the area required for works.

Tree cutting
a. The cutting of trees shall be minimized – a tree management plan shall be prepared during implementation of the project. Every tree removed will be compensated with the planting of 05 seedlings to ensure at least 02 mature trees.
b. An inventory of trees to be cut shall be maintained by the contractor
c. Selective and careful pruning of trees shall be made where possible to reduce need of tree removal.
d. Supply appropriate fuel in the work camps to prevent fuel wood collection.
e. The felling of a tree which houses an active nest or eggs shall be prohibited. The felling of such trees will be carried out in non-breeding seasons. Dumping of construction materials should be avoided where large number of terrestrial trees, shrubs, herbs, grasses and fruit trees are found.

10.3.10. Adverse Impact on Wildlife and Avi-Fauna

During the construction phase a reduction in animal populations could be expected due to killing of animals by vehicles and machinery (crushing or collisions) or from illegal hunting by construction workers; destruction of nests, burrows, and other animal sheltering/breeding structures, or the displacing individuals due to the presence of humans and running vehicles and machinery. Among the species affected there may be sensitive species that might be present in the surroundings of the construction works.

To minimize this impact during construction, the following measures shall be implemented:

- Hunting or harassment of wildlife will be strictly prohibited;
- Vehicles will be maintained in good condition and provided with mufflers to reduce noise;
- The construction camp site(s) need to be selected in an area non-sensitive to wildlife so as to minimize any impacts of its operation on the wildlife;
- Construction activities shall be scheduled so as to avoid the breeding season and other sensitive seasons or times of day, especially in areas where high sensitive species are concerned associated to sensitive habitats;
- Prior to the commencement of any construction work activity on a site, a fauna survey of the area and its surroundings shall be carried out by a qualified biodiversity expert;
- In case active breeding sites of sensitive species of fishes, amphibians, reptiles, bird, or mammals, including bats, are found, they will be transported by specialized technicians to another appropriate location away from the road construction area, unless the biodiversity expert decides on other precautionary measures to take;
- All equipment and personnel movements will occur within the established construction works site and hauling roads;
- Traffic of construction vehicles and machinery will be reduced as much as it is possible to perform construction works adequately;
- The speed of vehicles in the area of construction works and hauling roads will be limited to a specific maximum speed (30 km/h) and drivers reminded through signage and installation of speed bumps, where necessary;
- Any animal crushing or collision of animals will be recorded in a logbook; and
- Before the start of works, construction workers will be trained on the natural values of the area and the need to be proactive in implementing the measures for the protection of wildlife.

The mitigation measures designed to protect soil and surface water during the construction phase will also contribute to minimize killings or injuries to wild animal associated to riparian habitats.

For Avi-Fauna, the following construction stage mitigation measures are proposed:

- The establishment of borrow areas (if required) within river bed forests will be, prohibited to mitigate the impact to the key species of avifauna.
- Borrow areas (if required) shall only be approved where these are on barren land.
- The development of borrow areas or access tracks through strands of vegetation including identified tree species shall be prohibited
- Development of new access tracks will be minimized, and where they are prepared their width will be kept to 3 m.
- Biodiversity monitoring is proposed quarterly within the project area to monitor the status of avifauna in the project area and the impacts of habitat loss.
- Hunting or harassment of wildlife will be strictly prohibited.
Vehicles will be maintained in good condition and provided with mufflers to reduce noise. The construction camp site(s) need to be selected in an area non-sensitive to wildlife so as to minimize any impacts of its operation on the wildlife.

10.3.11. Impacts from Construction Materials
It should be a contractual requirement for the contractor to integrate quarry restoration plans in the general project implementation. To this effect, the contractor should ensure:

- Height and orientation of the quarry face need to be controlled if reinstatement is to be effective.
- Surplus soil materials (overburden) from the road excavations should be stockpiled at quarry sites to be sued during site restoration.
- Access roads to quarries if not needed by local communities should be scarified and revegetated. Site restoration should utilise native vegetation species and replanting undertaken during the rainy season to ensure high revegetation success.
- Compensate any accidents to people or injurious damage to structures due to fly rock from stone/rock blasting.
- Resident Engineer should not issue completion certificate to contractor or payments withheld until quarry sites are satisfactorily rehabilitated.
- Any unsuccessful vegetation regrowth should be replaced during the contractor's defect liability period.
- Existing gravel and stone quarries can be used to meet required material specifications to avoid opening new ones.
- Workers should be provided with protective gear (muffs, hard hats, overalls, foot protection).
- Control dust by good housekeeping practices and process control.

10.3.12. Impacts on geology
The following measures will be implemented:

- When the runoff is allowed to flow down an excavated slope, the risk of erosion is high. A combination of diversion ditches and slope blankets may be considered.
- The outer surface of a fill is usually less compact than the rest of it. In wet weather, the moisture content of the outer layer will increase and the slope of adequate stability may fail in dry conditions. Compaction, use of temporary shields.
- Bridge end fill slopes often suffer from the effects of concentrated flow, either running off the deck or from the deck drains. Blocking the surface drains on the bridge temporarily, until vegetation becomes established, in the meantime collecting the water in a controlled manner at the end of the deck or placing water impact protection such as sufficiently large pads of rock fill under the drains.

10.3.13. Impacts on the landscape
Proposed Mitigation Measures include the following:

- Once the Contractor has identified borrow pits and quarries to use as sources of stones, he must prepare an Environmental Project Brief for submission to ZEMA.
- Borrow pits must not be in forests or forest reserves, or any protected areas, in accordance with the Forests Act Cap 199 and National Parks and Wildlife Act Cap 201.
- All access routes to materials sites should be planned ahead of construction and described in the tender documents.
- People living at or near the materials sites must be informed of the environmental implications of excavation at the time of selection of the sites. The owners of the site must be compensated for material borrowed. Site owners must also be told of the options available to them after excavation, for example landscaping, terracing, planting and replacing vegetation/trees and/or fencing. The tender documents should instruct the Contractor to
maintain fences and “make good” afterwards, in accordance with the written agreement with the landowner. Borrow pits must be landscaped, then reinstated or backfilled with overburden / topsoil. Separate stockpiles should be made for topsoil, overburden, gravel, etc.

- Borrow pits must be excavated such that drainage is controlled, and water is not allowed to accumulate. Any water that does collect has to be pumped out and disposed of sensibly.
- The area to be excavated should be cordoned/fenced off, to keep livestock and children away.

10.4. MITIGATION MEASURES FOR NEGATIVE SOCIO-ECONOMIC IMPACTS

10.4.1. Impacts on access
A new access route for the 24 houses near the railway offices as well as for several houses on the slopes of the hill behind the offices should be opened, which avoids the need for the occupants of these houses to go through the security area of the Dry Port. This route should preferably already be established prior to construction.

10.4.2. Impacts on Occupational Health and Safety
The following measures will be taken to minimise fugitive dust releases during construction:

- Use of modern digging and blasting techniques where needed;
- All exposed work areas on site will be watered down regularly by water bowser or other means;
- Large stockpiles of materials such as sand and gravel should be avoided or covered and watered as much as possible;
- A maximum speed limit of 30 km/h will be imposed on all internal access roads by use of speed bumps and appropriate road signage;
- Emergency Preparedness Plan for accidents response for the construction stage will be developed by Contractor/s and approved by RDA;
- Occupational Health and Safety Plan will be developed by Contractor/s and accepted by RDA;
- Implementing strict and enforceable safety practices. The general contractor and all subcontractors on the site will be required to provide a reasonably safe work environment and to warn employees of hazards there. They must hire responsible personnel to coordinate job safety, and to supervise compliance with legal rules and regulations;
- Construction Safety Plan will be developed by Contractor/s and approved by RDA.

Similar measures will be taken during operational phase as well as additional measures such as:

- Use of proper conveyor belts or other transport means that minimises dust from dry bulk cargo handling;
- Use of covers, proper warehouse or silos for bulk storage;
- Monitoring of air quality to ensure acceptable levels of emissions.

A site specific Emergency Plan will be developed in accordance with the Dry Port Authority Emergency Procedure and Safety Management in collaboration with the relevant authorities and following Zambian and international safety regulations. This will provide details of actions to be taken and responsibilities in the event of a safety or health emergency incident.

All employees will be required to acquaint themselves with Port Authorities’ rules and procedures with respect to safety and the Emergency Plan and every employee will be required to perform his
work in such a manner as to prevent accident to himself, his fellow workers and plant equipment and property. Some of the areas that should be covered in the plan/rules and procedures are listed below:

- Use of personal protective equipment (PPE);
- Permit-to-work-isolation-procedures;
- Accident procedures;
- Fire procedures and assembly points;
- Regulations pertaining to operation of mobile equipment;
- Good housekeeping (sanitation and waste management);
- Other major safety points.

To maximise safety on site, the contractor during the construction phase and the Port Authority during the operational phase shall:

- Ensure that all equipment, tools, facilities and other items used to carry out the works are in a safe sound and good condition;
- Conduct risk assessment in the planning of potentially hazardous tasks to be done;
- Ensure that a system of permits/procedures shall be required depending on the type of works and risk levels (e.g. for working in confined spaces (cleaning silos, fuel storage), work at heights, etc.);
- Issue Personal Protective Equipment (PPE) as required to the various categories of the workforce;
- Ensure that all personnel performing welding and cutting or operating mobile equipment shall be trained and qualified;
- Ensure that fire drills shall be conducted at regular intervals. The Authority shall provide the necessary number of fire extinguishers and fire hydrants and make the necessary arrangements with the local fire brigade to ensure adequate fire protection for the site. Burning of any kinds of waste or construction material is forbidden;
- Ensure that a fire engine and adequate water source for fire-fighting is available on site;
- Key personnel shall receive training in basic First Aid. The Port Authority shall provide a First Aid or Health post on site, which is appropriately equipped and staffed by fully trained First Aid/Health personnel. In case of serious injuries on site, e.g. accidents with heavy machinery, etc., the Port Authority will comply with the Emergency Plan developed in collaboration with relevant Health authorities, to deal with such emergencies;
- Avail all people, not belonging to staff of the Dry Port, entering the Dry Port premises (such as truck drivers, cargo handlers etc.) with a copy of the Emergency Plan and any other specific safety rules and regulations relevant to them;
- Apply strict systems and control regulating the entering and leaving of the premises.

10.4.3. Impacts on Public Health and Safety

10.4.3.1. Risk of accidents at worksites

A hording fence / security barrier will be erected around the worksite by the Contractor during construction as a preliminary action to ensure that there is no unauthorised access to the site. In addition, all visitors will be required to sign a visitors log at the entrance to the site. A permanent safety fence will be erected around the specific Dry Port Area as well as around the total area belonging to the Zambian Railway Authority.
10.4.3.2. Risk of road related accidents (construction)
The construction of a by-pass is recommended for the operational phase. The construction phase might not yet need the use of a by-pass but mitigation measures need to be taken to avoid accidents and road damage during construction. This includes a “face lift” of the current road surface and edges. Speed limit signs, traffic and safety barriers and other relevant warning signs will have to be established in and around construction site and access route. Awareness campaigns on traffic safety will have to be held for children through the local schools, and notice and warning messages, prior to road upgrading, will have to be disseminated among the local population.

10.4.3.3. Increased dust and noise related problems and diseases
Mitigation measures that reduce the risk of occupational health and safety measures will have an impact on public health and safety as well, where it concerns issues related to dust and noise. Additional measures include:

- A green belt zone (trees, plants) a closed fence, stacked containers or open space between the construction site and the surrounding community could be an effective buffer against noise and dust;
- Temporary pavement of roads during construction will considerably reduce dust emission while the total area should be paved and landscaped during operation;
- Noise could be considerably reduced by adoption of low noise equipment;
- Limitation of working hours is an effective way to mitigate the nuisances of construction activities.

10.4.3.4. Increased risk of transmission of HIV and communicable diseases
An intensive HIV/AIDS awareness programme shall be put in place in consultation and association with the Provincial and District Aids Coordination Advisors. This programme shall be geared towards workers employed during construction, the staff employed during operation as well as the communities surrounding the area and all people accessing the Dry Port Facility. Special attention should be given to truck drivers and other workers who are very often long times away from home and family as well as formal and casual sex workers. Free provision of condoms within the Dry Port premises and establishing various sales points of condoms in the area should be considered as part of a more extensive approach towards combating and mitigating HIV and other STDs.

10.4.3.5. Increased risk of health problems related to sanitation and waste products
Temporary ablution / sanitary facilities will be provided for construction workers connecting to prefabricated septic tanks and soak aways.

All solid waste shall be collected at site, skips shall be provided on site for the disposal of construction waste and refuse, such as rejected off-cuts and packaging, workers garbage, waste from workers canteen etc. and for the collection of solid waste during operation. Waste from the skips shall be collected on a regular basis by the Municipal Council or a designated waste collector for disposal in accordance with ZEMA Waste Management Regulations (Statutory Instrument No. 71 of 1993 of EPPCA, 1990). The Chipata City Council is required to identify and organise appropriate and safe waste disposal and management facilities. The designated area should be appropriately designed, according to the characteristics of the waste with retaining fences, setting ponds, specific treatment systems, capping of landfills etc.

10.4.4. Impacts on Social Relations and other Social Aspects
Clear awareness raising campaigns for the local community on the importance, the advantages and disadvantages of the Dry Port Facility and related activities will have to be organised by the City Council. Ward committees, chair persons and local councillors should be involved in activities related to crime prevention, alcohol abuse and prostitution, specifically geared towards youngsters.
The surrounding communities, the Zambia Police Service and Prison Management should be informed of the specific risks related to facilities such as the Dry Port and communities should be informed where and how to report (specific) crime cases.

10.4.5. Impacts on Existing Social Facilities

It is not expected that during construction phase the demand for existing facilities will exceed the current supply. However, to avoid pressure on the facilities during operation, a health post facility within the premises of the Dry Port should be established to deal with minor health and accident issues.

A fire engine should be acquired for the Dry Port as not to rely only on the (limited) capacity of the CMC fire brigade. Access to sufficient water for the operation of the fire engine should be secured nearby or on the premises. A generator set for back up electricity provision in case of black outs and load shedding from the ZESCO supply should be acquired. Above ground water storage facility with a capacity enough for water provision for several days in case of problems with the utility company (EWSC) system (mainly linked to electricity problems) should be installed.

10.4.6. Impacts on Aesthetic Qualities

The design of the Dry Port should cause it to blend in with its surroundings as much as possible. Special attention to the colours of port facilities and landmarks will help to improve port scenery. A green belt zone with trees around the dry port may block an unpleasant view of the port and be a more pleasant sight as well as serve as wind break. Security flood lights should as much as possible be directed away from surrounding houses.

10.4.7. Specific Impacts Security and Safety

10.4.7.1. Security

During construction and operation of the Dry Port the area should be secured to prevent people not authorised to access the area, to enter.

Appropriate fencing should be provided, including the installation of security gates, shelters and/or security guards for the construction and operation to maintain security of all the equipment and materials and of the staff on the works site.

A green belt should be established around the facility to isolate the area and make it safe. The green belt could also act as a fire break zone as well as wind break to reduce wind velocity and isolated the area from others.

Good relations between the contractor, Port Authority and the local communities and their leaders should be developed, which in turn would help reduce the likelihood of vandalism and theft. Valuable objects should be stored in safe locations and such areas should always be locked. Staff members involved in actions of theft or that pose security risks to other workers and the community should be dismissed and the fact communicated to the relevant authorities.

10.4.7.2. Fire

Ensure that fire drills shall be conducted at regular intervals. The Port Authority shall provide the necessary number of fire extinguishers and fire hydrants and make the necessary arrangements with the local fire brigade to ensure adequate fire protection for the site. The fire department can be engaged for specific training courses for all personnel on fire hazards and protection.
Burning of any kinds of waste or construction material is forbidden.

Personnel Protection Equipment is required to ensure safety of all workers. Specific PPE will be available for members of fire-fighting and rescue teams at the time of emergencies involving leakages of toxic and flammable substances.

A buffer zone should be established around the facility to function as fire break; the green belt could function as such.
CHAPTER ELEVEN

ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN

11.1. INTRODUCTION
The Environmental and Social Management and Monitoring Plan (ESMMP) for the construction of the Chipata Dry Port and the Chipata Bypass Road is presented in this Chapter. It has been prepared so that all relevant stages of the Project are implemented in compliance with applicable national laws and regulations, EIB’s Environmental and Social Standards and in accordance with the ESIA and the result of the consultations with the stakeholders.

The ESMMP describes the environmental and social mitigation and monitoring measures, the criteria for their successful implementation and the organizational measures to be implemented during the pre-construction, construction and operation of the Project.

The ESMMP adopts a long-term and phased process in the sense that it will need to be regularly reviewed and updated as the Project evolves to reflect any changes in the Project implementation and organization as well as in regulatory requirements. Following amendments, the updated ESMMP will need to be communicated to all relevant parties and stakeholders.

11.2. OBJECTIVES OF THE ESMP
To facilitate the implementation of the mitigation measures, the EMP has been prepared to manage probable adverse environmental impacts due to the project interventions in a way which minimises these adverse impacts on the environment and socio-economic conditions of the project area. The specific objectives of the ESMMP are to:

- Ensure the project is compliant with applicable national environmental and social legal requirements;
- Identify the required mitigation measures that are needed in order to reduce negative impacts and enhance positive ones;
- Ensure that all mitigation measures and recommendations identified during the ESIA are incorporated into documents that are referenced and expanded if necessary during the various phases of the project;
- Outline the mitigating/enhancing, monitoring, consultative and institutional measures required to prevent, minimize, mitigate or compensate for adverse environmental and social impacts and/or to enhance project related beneficial impacts;
- Draw responsibilities for project proponent, contractors, and other members of the project team for the environmental and social management of the Project;
- Define a monitoring mechanism to ensure that the ESMP achieves its desired objectives;
- Ensure the complete implementation of all mitigation measures;
- Ensure the effectiveness of the mitigation measures;
- Maintain essential ecological process through preservation of Biodiversity; and,
- Assess training requirements for different stakeholders at various levels.

To achieve the above, the ESMMP ensures that:

1) **During project planning and design**, all mitigation measures identified in the ESIA that can be incorporated into the planning and design of the project are considered during the detailed planning and design phase.

2) **During construction** all constraints, restrictions and actions required to minimize construction related impacts are implemented.

3) **During commissioning and operation**, detailed operating procedures are developed so that all constraints, restrictions and actions required to minimize impacts caused
by commissioning and operation are developed, implemented and monitored for all aspects of the project.

4) **During the life of the project**, continue to enhance positive impacts and ensure mitigation for negative impacts. An important component of this monitoring, evaluation and communication of findings, and adherence to the principle of continued improvement.

5) **During decommissioning**, detailed procedures are developed to ensure that the project area is rehabilitated to an acceptable and previously agreed-to level.

### 11.3. INSTITUTIONAL ARRANGEMENTS FOR EIA/EMP IMPLEMENTATION

#### 11.3.1. Project Director-RDA

Overall responsibility for environmental management and environmental monitoring will rest with the Project Director (PD) for RDA. RDA has an Environmental and Social Management Unit (ESMU) with direct reporting line to the PD. An Environment Specialist and a Social Development Specialist will be a part of the PD office to ensure compliance to the ESMP. The responsibilities of ESMU will be, but not limited to the following:

- Ensure effective compliance of ESMP as per ZEMA requirements.
- Provide technical assistance to the project team, in matters related to ESMP, and to environmental and social safeguards.
- Put in place reporting mechanism and monitoring regimes for project staff as well as contractors.
- Ensure that ESMP related clauses specifically, and environment related clauses in general, are part of all the tender/bid/RFP documents.
- Provide technical input to the various training programs proposed as a part of the ESMP.
- Ensuring that all regulatory clearances from the ZEMA are obtained before starting civil works for the Project.
- Conduct on site spot checks to check the compliance level, as well as for any outstanding issue not being covered by the ESMP - Regularly report to PD on progress related to ESMP Compliance.
- For effective compliance of an ESMP, roles and responsibilities need to be defined at the onset, with relevant professionals hired as project team members at the executing agency (EA) levels. Moreover, these professionals are to be placed in the project hierarchy in such a way whereby they cannot be influenced by the operational teams (engineers, procurement, contractors, etc.) to lessen their compliance monitoring responsibilities.
- Approve the site-specific EMP (SSEMP) prepared by the Contractor and monitor the implementation of the SSEMP.

#### 11.3.2. Project Implementation Consultants

The PD will be supported during implementation of the Project by Project Implementation Consultants (PICs).

The PICs to be engaged by the project proponent shall be responsible for day to day monitoring of the EMP on behalf of the Client (KPID) during the execution of the Civil Works of the Project and shall submit periodic reports to the PD and ADB regarding the EMP implementation status. In general, the PICs will have the following responsibilities pertaining to the environmental aspects of the project:

- Review all relevant documents, particularly the Environmental Impact Assessment study and update these as may be required to bring it in compliance with ADB’s SPS.
• Prepare/update a cost effective environmental management and monitoring plan for the Project in line with EIA/EMP recommendations so as to ensure minimal environmental effects both during and following the construction period.
• Review the site specific environmental management plan (SSEMP) for the project prepared by the contractors.
• Monitor the implementation of ESMP on a regular basis during execution of civil works by the Contractor.
• Prepare and execute required appropriate actions to mitigate any negative environmental impacts associated with construction activities in collaboration with all concerned stakeholders.
• Develop training materials for the contractor staff to support environmental protection measures and to monitor and mitigate potential environmental impacts.
• Ensure that any environmental impact assessments, if required, fully comply with ZEMA and ensure, that all required mitigation measures are identified and acceptable environmental management and monitoring plans reflecting full details regarding the estimated mitigation costs are in place through the SSEMMP.
• Prepare internal monitoring reports on implementation of environmental safeguards and ESMP during project implementation.

11.3.3. The Contractor
The Contractor will be responsible for the implementation of the ESMP as well as maintaining responsibility for environmental protection liabilities under ZEMA KP Environmental Management Act 2011 and relevant ESMP provisions for the Project. The Contractor will also be responsible for training his crew in all aspects and implementation of the ESMP. The contract would include an environmental and social mitigation budget as part of the engineering costs of the respective works.

The contractor will prepare a site specific Environmental Management Plan (SSEMP) which would include the contractor’s plan to implement environmental management and monitoring requirements specified in the ESMP. The SSEMP will be prepared in line with international guidelines such as those by EIB and the SSEMP shall be approved by the PIC/PD Office for RDA. The Contractor will also prepare a compensatory tree planting plan as part of the SSEMP and will undertake replantation. The Contractor will also be responsible for site restoration.

The key positions to be filled within the contractor’s staff for implementation of the EMP include:
• An Environmental Coordinator.
• Two (02) Environmental Inspectors.
• A Health and Safety Officer, and
• A Community Liaison Officer for the Project.

11.4. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS
Environmental management plan is prepared for the proposed Chipata Dry Port and Chipata Bypass Road by RDA based on the findings of this ESIA and is given in Table 11-1.
### Table 11-1: Environmental and Social Management Plan (ESMP)

<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>IMPACT</th>
<th>ENHANCEMENT/ MITIGATION MEASURES</th>
<th>MONITORING INDICATORS</th>
<th>FREQUENCY OF MONITORING</th>
<th>TIME FRAME</th>
<th>RESPONSIBILITY</th>
<th>COST (ZMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONSTRUCTION PHASE</strong></td>
<td><strong>SITE PREPARATION AND CLEARANCE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tree cutting</strong></td>
<td>Loss of habitats and natural resources</td>
<td>Tree cutting to be marked in advance and approved by Site Engineer</td>
<td>Written approval from Site Engineer for cutting of marked trees prior to cutting</td>
<td>Quarterly</td>
<td>Prior to excavation and site preparation</td>
<td>Contractor Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cutting only of trees approved by Site Engineer</td>
<td>Cutting only of marked trees</td>
<td>Quarterly</td>
<td>As above</td>
<td>Contractor Project Director’s Office for RDA</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tree cutting and clearance of dense vegetation for establishment of temporary haul routes avoided</td>
<td>Damage to trees minimized on temporary haul routes</td>
<td>Quarterly</td>
<td>During site clearance</td>
<td>Contractor Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor shall prepare an inventory of cut trees including details of girth, species, height and ownership</td>
<td>Maintenance of inventory and Ownership</td>
<td>Quarterly</td>
<td>Throughput construction period</td>
<td>Contractor Project Director’s Office for RDA</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compensatory planting and aftercare of saplings of native trees at a ratio of 5 trees for each 1 tree cut</td>
<td>Planting of trees and survival rate of trees</td>
<td>Quarterly</td>
<td>From commencement of tree plantation to end of defects liability period</td>
<td>Contractor Project Director’s Office for RDA</td>
<td>50,000</td>
</tr>
</tbody>
</table>
## CONSTRUCTION PHASE

### CONSTRUCTION AND LABOUR CAMPS

<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>IMPACT</th>
<th>ENHANCEMENT/MITIGATION MEASURES</th>
<th>MONITORING INDICATORS</th>
<th>FREQUENCY OF MONITORING</th>
<th>TIME FRAME</th>
<th>RESPONSIBILITY</th>
<th>COST (ZMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locating Camps</td>
<td>Community disturbance</td>
<td>Locate camp at least 300m away from the communities especially for the fencing project</td>
<td>Review of Camp layout plan</td>
<td>Quarterly</td>
<td>Before camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td>Employment of Community Liaison Officer</td>
<td></td>
<td>Community Liaison Officer Employed</td>
<td>Quarterly</td>
<td>After mobilization of the Contractor</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Supply of drinking water</td>
<td>Depletion of local drinking water resources</td>
<td>Contractor shall make his own arrangements for supply of water ensuring water supply and availability to local communities is unaffected</td>
<td>Contractor is not using public water resources</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td>Spread of disease through unsuitable water supply</td>
<td>Provision of safe drinking water and annual testing according to the national standards and other international organization such as WHO</td>
<td>Water Supply provided at Camp and test results are within the permissible limit of WHO</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Siting and planning of construction camps</td>
<td>Flood risk within Camp</td>
<td>Drainage will be provided and maintained to convey storm water away from camp and settlement</td>
<td>Drainage provided in camps</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td>Camp shall be located above or beyond flood plain</td>
<td>Review of Camp layout plan</td>
<td></td>
<td>Quarterly</td>
<td>Before camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
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</tr>
<tr>
<td>Siting and planning of construction camps</td>
<td>Surface run-off through camp and pollution of surface water</td>
<td>Drainage provided to divert surface run-off from surrounding</td>
<td>Drainage provided in camps</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td>Camp shall be located above or beyond flood plain</td>
<td>Review of Camp layout plan</td>
<td>Quarterly</td>
<td>Before camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td>Hazardous material storage area shall be covered</td>
<td>Covered storage of hazardous materials</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>Run-off from refueling and wash down areas collected from treatment</td>
<td>Measures are in place to collect the run-off from refueling and wash down areas</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Spread of disease due to unhygienic looking/cooking/eating/sanitary quarters</td>
<td>Provision of solid flooring and work surfaces which are easily to clean</td>
<td>Solid flooring and surfaces are provided</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor shall regularly clean camps</td>
<td>Regular cleaning in all areas of camps</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suitable latrines and washing facilities provided in vicinity of camps</td>
<td>Latrines are provided at each camp</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lined washing facilities including shower, available near each latrine, including clean running water, soap and drying facilities</td>
<td>Suitable washing facilities provided at each camp</td>
<td>Quarterly</td>
<td>Following the camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Treatment and disposal of sanitary wastes</td>
<td>The waste management plan is prepared by Contractor</td>
<td>Quarterly</td>
<td></td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
</tbody>
</table>
## CONSTRUCTION AND LABOUR CAMPS

<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>IMPACT</th>
<th>ENHANCEMENT/MITIGATION MEASURES</th>
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<th>TIME FRAME</th>
<th>RESPONSIBILITY</th>
<th>COST (ZMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Siting and planning of construction camps</td>
<td>Provision of electricity and lighting</td>
<td>Lighting and electrical supply provided with generator back-up</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provision of sheltered kitchens separated from living quarters with raised washable preparation surfaces</td>
<td>Provision of adequate kitchen</td>
<td>Quarterly</td>
<td>Following the construction of the camp</td>
<td>Contractor</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provision of Medical Officer</td>
<td>Doctor visiting camp site regularly</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequately stocked dispensary shall be provided</td>
<td>Adequately stocked dispensary available to all site staff</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Tree cutting</td>
<td>Contractor shall supply staff with cooking fuel</td>
<td>Tree wood not used in kitchen</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>Safety of staff</td>
<td>Segregated pedestrian and vehicle routes provided</td>
<td>Review of Camp layout plan</td>
<td>Quarterly</td>
<td>Before camp construction</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td>Spread of communicable and vector</td>
<td>Include information on HIV/AIDS and sexually transmitted diseases to be</td>
<td>Information on HIV/AIDS and</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>300,000</td>
</tr>
</tbody>
</table>
borne diseases included within Code of Conduct for workers

sexually transmitted disease included in the Code of Conduct

Code of conduct signed by all staff

Quarterly Throughout construction phase

Include awareness raising on HIV/AIDS and sexually transmitted disease and prevention and treatment of vector borne disease in Contractor training plan

Approval of Contractor training plan

Quarterly At mobilization

Training as per approved plan

Quarterly Throughout construction phase

Contractor Project Director’s Office for RDA 450,000

28 To be prepared by Contractor and approved by PIC
<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
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</tr>
<tr>
<td><strong>Siting and planning of construction camps</strong></td>
<td>Community Conflicts</td>
<td>Set up a public complaint receiving center (vide GRM in previous section) register at Contractor and Engineer’s office</td>
<td>Complaint register maintained</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor shall develop a code of conduct to govern behavior of workers</td>
<td>Code of conduct approved by Engineer</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor shall deliver training on cultural sensitivity to migrant workforce during induction</td>
<td>Code of conduct signed by all staff</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td>Contractor’s Community Liaison Officer to consult local communities and focus on impacts to women and girls</td>
<td>No complaint received regarding mobility of women and girls</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td>Migrant construction staff visits to nearby villages to be controlled</td>
<td>No complaint received regarding migrant staff</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td>Hunting and loss of Fauna</td>
<td>Ban on hunting, poaching and trapping of all fauna by all project personnel</td>
<td>No hunting reported/observed</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td>Biodiversity monitoring of impacts of fauna</td>
<td>Status and behavior of terrestrial and avi- fauna</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
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<td>PROJECT ACTIVITY</td>
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</tr>
<tr>
<td>Siting and planning of construction camps</td>
<td>Threats to life</td>
<td>Contractor shall prepare a shutdown procedure and evacuation plan</td>
<td>Plan submitted to Engineer</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Emergency access routes shall be signed and maintained</td>
<td>Annual evacuation drill</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fire extinguishers to be provided through out camp</td>
<td>Emergency access routes clear and signed</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Public areas at risk from fire in camp identified in emergency plan with evacuation measures</td>
<td>Fire extinguishers provided</td>
<td>Quarterly</td>
<td>Throughout construction phase</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Camp Planning</td>
<td>All the above issues</td>
<td>Camp layout plan to be submitted to Engineer</td>
<td>Review of Camp layout plan</td>
<td>Quarterly</td>
<td>Before camp Construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commencement of works not before approval of plan</td>
<td>Quarterly</td>
<td>Before camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction of camp as per plan</td>
<td>Quarterly</td>
<td>During construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
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</tr>
<tr>
<td><strong>STORAGE OF MATERIALS</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Stockpile storage of materials</td>
<td>Increase in particulate matter</td>
<td>Proper covered storage; Water sprinkling of any uncovered stockpile where dust is generated</td>
<td>Generation of dust from stockpiles minimized</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce distance between storage of aggregates, cement and sand to batching plant</td>
<td>Review of camp layout plan</td>
<td>Quarterly</td>
<td>Before camp construction</td>
<td>Contractor</td>
<td>15,000</td>
</tr>
<tr>
<td>Storage of hazardous materials</td>
<td>Health and safety issues due to improper use of hazardous material</td>
<td>Fuel tanks and other hazardous material storage containers will be properly marked to highlight their contents</td>
<td>Hazardous material storage containers adequately labeled</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous areas to be secure and access limited to trained personnel only</td>
<td>Untrained personnel’s are not accessing hazardous storage areas</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>10,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous material sites identified on site</td>
<td>Signs provided to identify hazardous material storage area</td>
<td>Quarterly</td>
<td>Following camp construction</td>
<td>Contractor</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide fire extinguishers</td>
<td>Fire extinguishers are provided</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide and enforce use of PPEs as per Contractor Health and Safety Plan</td>
<td>PPEs used</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
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</tr>
<tr>
<td>Storage of hazardous materials</td>
<td>Ground or surface water pollution</td>
<td>Fuel storage areas shall have masonry or concrete secondary containment area with 120% capacity of fuel stored</td>
<td>Bunding provided at fuel bowser</td>
<td>Quarterly</td>
<td>Following camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous material storage areas shall be covered and provided with concrete floor</td>
<td>Concrete flood and cover to hazardous material storage areas and generators</td>
<td>Quarterly</td>
<td>Following camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Concrete or masonry bunds provided at perimeter of hazardous material storage area</td>
<td>Enclosures provided for hazardous material areas and generators</td>
<td>Quarterly</td>
<td>Following camp construction</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Daily check of fuel tanks and immediate plugging of leaks</td>
<td>No leakage observed at fuel tanks</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shovels, plastic bags and sand provided at fuel tanks and hazardous material storage area</td>
<td>Spill kits provided</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spill prevention and contingency plan prepared by Contractor</td>
<td>Approval of Plan</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous material storage area or fuel tank not to be situated adjacent to watercourse</td>
<td>Review of camp layout plan</td>
<td>Quarterly</td>
<td>Before construction camp</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Space maintained between containers to allow inspection</td>
<td>Containers spaced to allow inspection</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
</tbody>
</table>
## PROJECT ACTIVITY

### CONSTRUCTION PHASE

<table>
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<tr>
<th>Project Activity</th>
<th>Impact</th>
<th>Enhancement/Mitigation Measures</th>
<th>Monitoring Indicators</th>
<th>Frequency of Monitoring</th>
<th>Time Frame</th>
<th>Responsibility</th>
<th>Cost (ZMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage of hazardous materials</td>
<td>Health safety and Pollution</td>
<td>Designated oil storage area used</td>
<td>Stockpiles only in storage areas identified in camp layout plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Training on handling, use and disposal of hazardous material shall be provided to all those with access to hazardous material area</td>
<td>Training as per Contractor’s approved training plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Covered transportation of hazardous material</td>
<td>Hazardous material covered during transport to site</td>
<td>Quarterly</td>
<td>At completion of works</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ground and surface water pollution after closure of works</td>
<td>All excess materials (other than earth stockpiles) shall be removed on completion of works</td>
<td>Quarterly</td>
<td>At completion of works</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
</tbody>
</table>
## ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
FOR THE PROPOSED CONSTRUCTION OF THE CHIPATA BY-PASS ROAD AND CHIPATA DRY PORT IN CHIPATA CITY OF EASTERN PROVINCE BY THE ROAD DEVELOPMENT AGENCY (RDA)

### PROJECT ACTIVITY

<table>
<thead>
<tr>
<th>WASTE MANAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONSTRUCTION PHASE</strong></td>
</tr>
</tbody>
</table>

### IMPACT

<table>
<thead>
<tr>
<th>Generation of Sanitary Wastes</th>
<th>Surface and groundwater pollution and health of staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposal of sanitary wastes using municipal system (if available)</td>
<td>Introduction of inappropriate contaminants or waste volume to municipal system</td>
</tr>
<tr>
<td>Treatment of sanitary wastes using septic tank</td>
<td>Introduction of inappropriate contaminants into the septic System</td>
</tr>
<tr>
<td>Ineffective treatment of waste leading to ground or surface water pollution</td>
<td></td>
</tr>
</tbody>
</table>

### ENHANCEMENT/MITIGATION MEASURES

| Generation of Sanitary Wastes | All excess materials (other than earth stockpiles) shall be removed on completion of works |
| Disposal of sanitary wastes using municipal system (if available) | Quarterly testing of wastes and submission of results to Engineer |
| Use of municipal system | Only government approved system to be approved |
| Treatment of sanitary wastes using septic tank | Only sanitary wastes treated in septic tank |
| Ineffective treatment of waste leading to ground or surface water pollution | Regular maintenance of the system by Contractor |

### MONITORING INDICATORS

| Generation of Sanitary Wastes | Excess construction material removed |
| Disposal of sanitary wastes using municipal system (if available) | Test results show wastes are within NEQS limit for pre-treatment |
| Use of municipal system | Written consent from the operator of the municipal system submitted to Engineer |
| Treatment of sanitary wastes using septic tank | No construction waste water entering septic tank |
| Ineffective treatment of waste leading to ground or surface water pollution | Monitoring of effluents |

### FREQUENCY OF MONITORING

| Generation of Sanitary Wastes | Quarterly |
| Disposal of sanitary wastes using municipal system (if available) | Quarterly |
| Use of municipal system | Quarterly |
| Treatment of sanitary wastes using septic tank | Quarterly |
| Ineffective treatment of waste leading to ground or surface water pollution | Quarterly |

### TIME FRAME

| Generation of Sanitary Wastes | At completion of works |
| Disposal of sanitary wastes using municipal system (if available) | Throughout construction period |
| Use of municipal system | At mobilization |
| Treatment of sanitary wastes using septic tank | Quarterly |
| Ineffective treatment of waste leading to ground or surface water pollution | Throughout construction period |

### RESPONSIBILITY

| Generation of Sanitary Wastes | Contractor |
| Disposal of sanitary wastes using municipal system (if available) | Contractor |
| Use of municipal system | Contractor |
| Treatment of sanitary wastes using septic tank | Contractor |
| Ineffective treatment of waste leading to ground or surface water pollution | Contractor |

### COST (ZMW)

| Generation of Sanitary Wastes | 20,000 |
| Disposal of sanitary wastes using municipal system (if available) | 30,000 |
| Use of municipal system | 15,000 |
| Treatment of sanitary wastes using septic tank | 20,000 |
| Ineffective treatment of waste leading to ground or surface water pollution | 30,000 |

**Project Director’s Office for RDA**

### Additional Notes

- **Execution** and **Monitoring** columns are not specified in the table for all entries.

**ESIS FINAL REPORT**

June 2019
<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>IMPACT</th>
<th>ENHANCEMENT/MITIGATION MEASURES</th>
<th>MONITORING INDICATORS</th>
<th>FREQUENCY OF MONITORING</th>
<th>TIME FRAME</th>
<th>RESPONSIBILITY</th>
<th>COST (ZMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td><strong>CONSTRUCTION PHASE</strong></td>
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<td></td>
</tr>
<tr>
<td>Collection of domestic wastes</td>
<td>Surface and groundwater pollution</td>
<td>Provide garbage bins within all camps for domestic wastes</td>
<td>Provision of bins</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>20,000</td>
</tr>
<tr>
<td>Regular collection and disposal of wastes</td>
<td>Regular and disposal of wastes</td>
<td>Bins are not full</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>Generation of wastes</td>
<td>Air, ground and surface water pollution</td>
<td>Return excess construction material to supplier</td>
<td>Used construction material not disposed of</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>15,000</td>
</tr>
<tr>
<td>Use of recycling</td>
<td></td>
<td>Recyclable material not disposed of</td>
<td></td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>50,000</td>
</tr>
<tr>
<td>Reuse of domestic wastes (if applicable)</td>
<td>Domestic waste included in Local authority reuse programs</td>
<td></td>
<td></td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>20,000</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
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<td>TIME FRAME</td>
<td>RESPONSIBILITY</td>
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</tr>
<tr>
<td>Construction Phase</td>
<td>Waste Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel emissions</td>
<td>Air pollution</td>
<td>Fuel of any material resulting in release of toxic emissions should not be allowed</td>
<td>Permitted fuel used</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>Fire</td>
<td></td>
<td>Contractor shall provide fire extinguishers at burn sites</td>
<td>Fire extinguishers are provided</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>Disposal of medical wastes</td>
<td>Ground, groundwater and surface water pollution, health and safety</td>
<td>Medical wastes stored on site and ultimately disposed of at medical incinerator at Chipata Central Hospital</td>
<td>No medical wastes in landfill or burn pits</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>Disposal of hazardous wastes</td>
<td>Ground, groundwater and surface water pollution, health and safety</td>
<td>Hazardous wastes to be passed to licensed contractor, or, it available wastes to be stored in long term storage facilities meeting requirement of hazardous material storage area to be taken on client following construction. Details to be provided in pollution plan to the Engineer.</td>
<td>Approval of Plan</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>Transport of wastes</td>
<td>Littering, pollution</td>
<td>Wastes shall be covered (e.g. with a tarpaulin) during transport</td>
<td>No wastes littering the project area</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
<td>ENHANCEMENT/MITIGATION MEASURES</td>
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<td>FREQUENCY OF MONITORING</td>
<td>TIME FRAME</td>
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<tr>
<td>CONSTRUCTION PHASE</td>
<td>WASTE MANAGEMENT</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Disposal of Batching Plant washing</td>
<td>Ground, groundwater and surface water pollution, health and safety</td>
<td>Washout to be treated for industrial effluents</td>
<td>Treatment as per approved plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Disposal of excess excavated materials</td>
<td>Loss of habitat, loss of productive land and defacing of landscape</td>
<td>Reuse excavated material</td>
<td>Use of excavated material construction of embankment</td>
<td>Quarterly</td>
<td>During Excavation for pressure pipe and canal</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dispose the excavated material in stockpiles on barren land</td>
<td>Disposal of the excavated material along outer toes of embankment</td>
<td>Quarterly</td>
<td>After completion of the works</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>General wastes management</td>
<td>All above</td>
<td>Wastes management for all sites to be included in Contractor’s training plan</td>
<td>Submittal and approval of plan</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Closure of works</td>
<td>Ground, groundwater and surface water pollution, health and safety</td>
<td>All solid wastes not within the landfill shall be removed from the project area on completion of works</td>
<td>All solid wastes landfill or removed from the site</td>
<td>Quarterly</td>
<td>On completion of works</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
</tbody>
</table>
## CONSTRUCTION PHASE

### CONSTRUCTION PLANTS AND VEHICLES

<table>
<thead>
<tr>
<th>PROJECT ACTIVITY</th>
<th>IMPACT</th>
<th>ENHANCEMENT/MITIGATION MEASURES</th>
<th>MONITORING INDICATORS</th>
<th>FREQUENCY OF MONITORING</th>
<th>TIME FRAME</th>
<th>RESPONSIBILITY</th>
<th>COST (ZMW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement/operation of vehicles/plant and equipment on site</td>
<td>Air pollution</td>
<td>All plants and vehicles are regularly services as per manufacturers requirements</td>
<td>Black smoke not observed emitting from Vehicles/plant</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Monitoring of ambient air quality</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficient driving practices included in Contractor's training plan</td>
<td>Submittal and approval of plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Training as per approved plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Generation of dust</td>
<td>Access road to be adequately compacted or regularly sprinkled to prevent dust generation during use</td>
<td>Dust not reaching the settlements in the project area</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td>Construction traffic limited to work area and established tracks</td>
<td>Construction traffic use only established tracks</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
<tr>
<td>Soil and Groundwater pollution</td>
<td>Vehicles/plants will be checked daily for fuel oils and leaks and fixed as required</td>
<td>No fuel oil leaks observed form plant/vehicle</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>15,000</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
<td>ENHANCEMENT/ MITIGATION MEASURES</td>
<td>MONITORING INDICATORS</td>
<td>FREQUENCY OF MONITORING</td>
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</tr>
<tr>
<td>Movement/ operation of vehicles/ plant and equipment on site</td>
<td>Community disturbance increase in traffic</td>
<td>Vehicles/plants will be checked daily for fuel oils and leaks and fixed as required</td>
<td>No fuel oil leaks observed form plant/vehicle</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Project vehicles in plant parked in designated areas as per camp layout plan</td>
<td>No vehicle observed parked outside the approved areas</td>
<td>Project vehicles in plant parked in designated areas as per camp layout plan</td>
<td>Project vehicles in plant parked in designated areas as per camp layout plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Movement of vehicles/plant restricted to work hours</td>
<td>No movement of vehicles/plant beyond works hours</td>
<td>Movement of vehicles/plant restricted to work hours</td>
<td>Movement of vehicles/plant restricted to work hours</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Safety of community, other road users, fauna and staff</td>
<td>Heavy vehicle speed limited to 30 km/hr in access roads and camp area</td>
<td>Heavy vehicle speed limited to 30 km/hr in access roads and camp area</td>
<td>Heavy vehicle speed limited to 30 km/hr in access roads and camp area</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Safe driving practices included in Contractor's training plan</td>
<td>Training as per approved plan</td>
<td>Safe driving practices included in Contractor's training plan</td>
<td>Safe driving practices included in Contractor's training plan</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>All Drivers hold a valid license</td>
<td>Drivers able to show valid license</td>
<td>All Drivers hold a valid license</td>
<td>All Drivers hold a valid license</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Flag persons to be provided where access roads cross/meet main road</td>
<td>Flag persons provided</td>
<td>Flag persons to be provided where access roads cross/meet main road</td>
<td>Flag persons to be provided where access roads cross/meet main road</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Contractor's Community Liaison Officer to collaborate with communities to identify sensitive areas and inform communities prior to movement of large plant</td>
<td>No complaint received from communities</td>
<td>Contractor's Community Liaison Officer to collaborate with communities to identify sensitive areas and inform communities prior to movement of large plant</td>
<td>Contractor's Community Liaison Officer to collaborate with communities to identify sensitive areas and inform communities prior to movement of large plant</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Plant/vehicles with restricted rear visibility to be fitted with audible back-up alarm or provided with banks men</td>
<td>Back-up alarms or banks men provided</td>
<td>Plant/vehicles with restricted rear visibility to be fitted with audible back-up alarm or provided with banks men</td>
<td>Plant/vehicles with restricted rear visibility to be fitted with audible back-up alarm or provided with banks men</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Mud shall be cleared from vehicle before entering public roads, or else public roads shall be cleared of mud regularly</td>
<td>No mud on public roads</td>
<td>Mud shall be cleared from vehicle before entering public roads, or else public roads shall be cleared of mud regularly</td>
<td>Mud shall be cleared from vehicle before entering public roads, or else public roads shall be cleared of mud regularly</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Driving in project area after nightfall is prohibited except on public highways</td>
<td>No complaint received from communities</td>
<td>Driving in project area after nightfall is prohibited except on public highways</td>
<td>Driving in project area after nightfall is prohibited except on public highways</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
<td>ENHANCEMENT/MITIGATION MEASURES</td>
<td>MONITORING INDICATORS</td>
<td>FREQUENCY OF MONITORING</td>
<td>TIME FRAME</td>
<td>RESPONSIBILITY</td>
<td>COST (ZMW)</td>
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<tr>
<td><strong>CONSTRUCTION PLANTS AND VEHICLES</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Movement/operation of vehicles/plant and equipment on site</td>
<td>Damage to public infrastructure</td>
<td>Damage to roads, infrastructure and property immediately repaired/compensated by Contractor</td>
<td>Damages to roads/infrastructure rectified/compensated</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Use of horns is prohibited near settlements</td>
<td>Noise level within WHO near settlements</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>Acoustic guards, cover and doors provided on plant and vehicles shall be left in place</td>
<td>Acoustic guards, silencers, cover and doors provided on plant and vehicles left in place</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>15,000</td>
<td></td>
</tr>
<tr>
<td>Plants and vehicles to adhere to noise standard</td>
<td>Monitor with noise meter</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>50,000</td>
<td></td>
</tr>
<tr>
<td>Plants/vehicles shall be restricted from playing radio/taps audible beyond the plant</td>
<td>Radio/taps are not audible at 50m or further from plant</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Deliveries to Site</td>
<td>Community disturbance and increase in traffic</td>
<td>Traffic management plan to be submitted to Engineer for approval; and to include routes for delivery vehicles</td>
<td>Submittal and approval of plan</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delivery vehicles are following designated routes</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delivery vehicles should aim to avoid peak traffic hours (9-11am and 2-5pm)</td>
<td>No deliveries between 9-11am and 2-5pm</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delivery vehicles are prohibited from queuing on public roads</td>
<td>No queuing delivery vehicles on public roads</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehicles to be unloaded at designated locations</td>
<td>No unloading on public roads</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
<td>ENHANCEMENT/ MITIGATION MEASURES</td>
<td>MONITORING INDICATORS</td>
<td>FREQUENCY OF MONITORING</td>
<td>TIME FRAME</td>
<td>RESPONSIBILITY</td>
<td>COST (ZMW)</td>
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<tr>
<td><strong>CONSTRUCTION PHASE</strong></td>
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</tr>
<tr>
<td><strong>CONSTRUCTION PLANTS AND VEHICLES</strong></td>
<td></td>
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</tr>
<tr>
<td>Refueling of vehicles and plant on land</td>
<td>Ground, ground and surface water pollution</td>
<td>Refueling points to be provided with a concrete pad and bund or drip trays used. Spill fuel</td>
<td>No fuel spillage from refueling operations</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>20,000</td>
</tr>
<tr>
<td>or filling of fuel drums</td>
<td></td>
<td>disposed of as hazardous waste</td>
<td></td>
<td></td>
<td></td>
<td>Project Director’s Office for RDA</td>
<td></td>
</tr>
<tr>
<td>Wash down of plants and vehicles</td>
<td>Ground, ground and surface water pollution</td>
<td>Wash down of plants only in designated areas as per site layout plan</td>
<td>Vehicles not washed down outside designated area</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>30,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wash down areas have concrete pad foundations</td>
<td>Concrete pad foundation provides</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Project Director’s Office for RDA</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Run-off from wash down areas to be collected and treated in separation tank.</td>
<td>Wash down water is treated</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Project Director’s Office for RDA</td>
<td>50,000</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Depletion of local water resources</td>
<td>Use of groundwater by the contractor will be monitored and controlled by Engineer</td>
<td>Contractors use of Groundwater monitored by Engineer</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Project Director’s Office for RDA</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>GENERATORS and BATCHING PLANT OPERATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation of Batching Plan</td>
<td>Air pollution</td>
<td>Plant regularly services as per manufacturers requirement</td>
<td>Black smoke not observed emitting from the plant</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Contractor</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use batching plant with low emission</td>
<td>Low emission batching plant in use</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Project Director’s Office for RDA</td>
<td>30,000</td>
</tr>
<tr>
<td>Operation of Batching Plan</td>
<td>Dust</td>
<td>Water sprinkling at batching plant as dust suppression method</td>
<td>Minimal dust generation from the batching plant</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Project Director’s Office for RDA</td>
<td>15,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>program work to be completed between 6am and 6pm</td>
<td>No operation of batching plant between 6am and 6pm</td>
<td>Quarterly</td>
<td>Throughout construction period</td>
<td>Project Director’s Office for RDA</td>
<td>50,000</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
<td>ENHANCEMENT/ MITIGATION MEASURES</td>
<td>MONITORING INDICATORS</td>
<td>FREQUENCY OF MONITORING</td>
<td>TIME FRAME</td>
<td>RESPONSIBILITY</td>
<td>COST (ZMW)</td>
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<td><strong>CONSTRUCTION PHASE</strong></td>
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<tr>
<td></td>
<td><strong>HEALTH AND SAFETY OF WORKFORCE</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General construction works</td>
<td>Health and safety of staff</td>
<td>Contractor shall prepare and submit health and safety plan</td>
<td>Submittal and approval of plan</td>
<td>Quarterly</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inclusion of training of all staff in health and safety best practices within the Contractor training plan</td>
<td>Submittal and approval of plan</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provision and enforcement in use of all necessary PPEs as per approved health and safety plan</td>
<td>Use of all necessary PPEs by staff at working site</td>
<td>Quarterly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor will submit accident report to the Engineer following any accident on site. Report must detail actions to be taken to reduce risk of occurrence</td>
<td>Submittal of accident report</td>
<td>Quarterly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Qualified health and safety manager will be appointed by Contractor</td>
<td>Qualified health and safety manager present on site</td>
<td>Quarterly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contractor shall engage a full time Doctor on site</td>
<td>On site Presence of qualified Doctor</td>
<td>Quarterly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provision of dispensary for treatment of staff. Dispensary to be stocked with appropriate medicines for likely incidents, diseases and ailments to be occurred on site. Stock to be replenished as necessary.</td>
<td>Dispensary available on site and regularly restocked</td>
<td>Quarterly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Inclusion of training of all staff in health and safety best practices within the Contractor training plan</td>
<td>Submittal and approval of plan</td>
<td>Quarterly</td>
<td>At mobilization</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provision and enforcement in use of all necessary PPEs as per approved health and safety plan</td>
<td>Use of all necessary PPEs by staff at working site</td>
<td>Quarterly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>PROJECT ACTIVITY</td>
<td>IMPACT</td>
<td>ENHANCEMENT/MITIGATION MEASURES</td>
<td>MONITORING INDICATORS</td>
<td>FREQUENCY OF MONITORING</td>
<td>TIME FRAME</td>
<td>RESPONSIBILITY</td>
<td>COST (ZMW)</td>
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</tr>
<tr>
<td>Bypass Road Alignment</td>
<td>Displacement of people due to land acquisition</td>
<td>Properties identified and compensation effected</td>
<td>Number of property owners not compensated</td>
<td>Quarterly</td>
<td>Before project roads construction</td>
<td>RDA’ ESMU</td>
<td>Project Director’s Office for RDA</td>
</tr>
<tr>
<td>Relocation of infrastructures outside the road reserve</td>
<td>Discussions are being held with the service providers for the various utilities along the project corridor to inform them of the project activities and likely demand for services. Infrastructural services relocated and noted service interruption</td>
<td>No service interruption</td>
<td>Weekly</td>
<td>Throughout contract period</td>
<td>Contractor</td>
<td>Project Director’s Office for RDA</td>
<td>Budget for infrastructures to be relocated see separate quotations supplied by Service providers in separate reports</td>
</tr>
</tbody>
</table>
11.5. COST OF IMPLEMENTING THE ESMP
The cost for the implementation of the mitigation measures and compensation of affected assets as outlined in the tables for the Environmental and Social Management Plan (ESMP) and in the Resettlement Action Plan (RAP) Report is estimated at Fifteen Million, Seven Hundred and Fifty Thousand Zambian Kwacha, (ZMW 15,750,000); broken down as follow:

3. Compensation for assets and properties **ZMW 11,520,000**.
4. Environmental & Social Mitigation **ZMW 4,230,000**.

11.6. ENVIRONMENTAL AND SOCIAL MONITORING PLANS

11.6.1. Structure Of The ESMMP
It is a requirement of EIB policy that the project is undertaken in line with national law and EIB’s standards. The requirements described in this ESMMP, therefore, reference the Republic of Zambia legislation and are supplemented, where necessary, with measures needed to meet EIB’s standards; International law and conventions, and relevant international good practices.

The ESMMP has been structured as follows:

- Environmental and Social Management Plan with the following requirements:
  - General Requirements for Environmental and Social Management;
  - Socio-economic Requirements;
  - Environmental Requirements;
  - Stakeholder Engagement Requirements;
  - Land Acquisition, Involuntary Resettlement & Economic Displacement Requirements;
- Environmental and Social Monitoring Plan.

The detailed EMP is provided in Table 11-2.
<table>
<thead>
<tr>
<th>RECEPTOR / PROPOSED MITIGATION MEASURES</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. GENERAL REQUIREMENTS:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A1. Environmental and Social Management</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RDA and the Contractor will regularly review, and update as required the ESMMP and SEP to ensure it is responsive to changes in project circumstances.</td>
<td>Continual through all Phases</td>
<td>RDA, Contractor</td>
<td>All Phases</td>
</tr>
<tr>
<td><strong>A2. Applicable Standards</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The project will be managed, constructed and operated in a manner that is compliant with applicable national, and International law and conventions, and EIB requirements</td>
<td>Continual through all Phases</td>
<td>RDA, Contractor</td>
<td>All Phases</td>
</tr>
<tr>
<td><strong>A3. Applicable Project Documentation</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>RDA and Contractor will implement and comply with all measures specified within the relevant Project Documentation, including inter alia:</td>
<td>Performance monitoring demonstrates compliance with environmental and social requirements.</td>
<td>RDA, Contractor</td>
<td>All Phases</td>
</tr>
<tr>
<td>- ESMMP;</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Stakeholder Engagement Plan (SEP);</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- Resettlement Action Plan (RAP); and</td>
<td></td>
<td></td>
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<tr>
<td>- Project contractually binding documents, including the Employer Requirements.</td>
<td></td>
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</tr>
<tr>
<td>Environmental and Social Impact Assessment/Statements and related Decisions from the Competent Authority (i.e. ZEMA)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>A4. RDA Environmental &amp; Social Resources &amp; Organization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDA will establish within their organization the environmental &amp; social management capacity and capability to undertake inter alia:</td>
<td>RDA to establish sufficient environmental and social management capacity and capability for each phase.</td>
<td>RDA</td>
<td>All Phases</td>
</tr>
<tr>
<td>- Reviews of the environmental and social performance of their contractors and suppliers during railway construction and operation;</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>- Co-ordinate the implementation of actions/measures under the ESMMP which the responsibility of RDA is;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Regular reviews of compliance with the ESMMP obligations; and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Review and update to ESMMP to ensure it reflects project circumstance and still complies with Lender Requirements.</td>
<td></td>
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</tbody>
</table>
### B. ENVIRONMENTAL & SOCIAL MANAGEMENT SYSTEMS

#### B1. Construction Environmental & Social Management System (CESMS)

As part of the Site Management Plan the Contractor will develop and implement a Construction Environmental & Social Management System (CESMS) to support the implementation of the ESMMP & SEP and support good environmental & social management practices. The CESMS will be developed and implemented in-line with international standards (i.e. ISO 14001, EU EMAS & SA 8000) and include inter alia:

- Organization, responsibilities and resources (including commitment that critical ESHS positions will be identified and maintained);
- Construction Environmental & Social Management Plan, including supplementary plans (e.g. Waste Management Plans, Hazardous Materials Management Plans);
- Procedure which assesses ESHS risks;
- Monitoring Plan (see Section 8.4);
- Emergency Preparedness & Response Plan;
- An audit process and programme (including performance audits, audits on labour & working conditions);
- Training programme; and
- Reporting of Environmental & Social performance.

The Contractor shall appoint an appropriately qualified Environmental, Social, and Health & Safety (ESH&S) Manager who will be responsible for the development and implementation of the CESMS and co-ordination to ensure the provisions of the ESMMP are complied with. The ESH&S Manager shall have appropriate qualifications, training, authority & responsibility and resources. The ESH&S Manager shall have assigned responsibilities including, but not limited to:

- Implementation and maintenance of the CESMS (including audits, corrective actions, etc.);
- Implementation of the ESMMP;
- Implementation and co-ordination of Construction Environmental & Social Management Plan and associated management & mitigation plans;
- Preparation of quarterly reports for compliance with ESMMP (and other applicable standards/documents) and related to CESMS and Construction Environmental & Social Management Plan;
- Managing an incident reporting system (including near-misses); and
- Preparation and submission of environmental monitoring reports to RDA and reports as required to EIB/Lenders which will include review of compliance with ESMMP obligations.

In the event more than one main contractor is appointed then one overarching Project CESMS should be established for all Contractors to adopt.

<table>
<thead>
<tr>
<th>RECEPTOR / PROPOSED MITIGATION MEASURES</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CESMS</strong></td>
<td>CESMS must be in place prior to construction. Draft Manual to be provided for review and approval by RDA within 45 days of contract award.</td>
<td>RDA/ Contractor</td>
<td>Construction Phase</td>
</tr>
</tbody>
</table>

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**Note:**

CEMS must be in place prior to construction. Draft Manual to be provided for review and approval by RDA within 45 days of contract award.
### RECEPTOR / PROPOSED MITIGATION MEASURES

<table>
<thead>
<tr>
<th>Environmental &amp; Social Management Systems</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>B2. Site Management Plan (SMP)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation and implementation of Site Management Plan for construction, including inter alia:</td>
<td></td>
<td>RDA/Contractor</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>• Location of borrow pits and inert waste landfills to be used;</td>
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<td></td>
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<tr>
<td>• Location of batching and crushing plants and construction camps;</td>
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<tr>
<td>• Haulage routes;</td>
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<tr>
<td>• Site Clearance plan;</td>
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<tr>
<td>• Construction Travel Plan (including volume and type of construction vehicles etc) &amp; Traffic Management;</td>
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</tr>
<tr>
<td>• Location of workforce accommodation camps; and</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Security plan.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Within the Site Management Plan the Contractor must demonstrate how they intend to ensure clear delineation of the ‘Project Area’ (i.e. site) to ensure construction activities (including site clearance, movement of machinery &amp; vehicles etc.) do not go outside specified area approved in main design and clearly identify any additional land acquisition needs will comply with the RAP(if appropriate).</td>
<td></td>
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</tbody>
</table>

**B3. Sub-contractor/Supplier Management**

The road Contractor will apply contractual agreements for securing services of sub-contractors and suppliers, which ensure they are obliged to comply with all environmental and social requirements contained with applicable Project documentation and standards. The Contractor will advise their sub-contractors and suppliers of their Environmental, Social, Health & Safety (including Labour & Working Conditions) responsibilities, including relevant requirements within the ESMMP. Applicable ESHS requirements shall be contained within contractual agreements, including the requirement for sub-contractors to pass requirements to any of their sub-contractors and establish provisions for EHS reporting.

| Sub-contractor & supplier agreements to contain ESHS requirements. | Contractor, RDA | Construction Phase |
## C. SOCIO-ECONOMIC REQUIREMENTS

### C1. Stakeholder Engagement

- **RDA** shall maintain and implement a Stakeholder Engagement Plan (SEP) and grievance mechanism relevant for each Phase of the Project to ensure that all stakeholders are identified, that sufficient information about issues and impacts arising from the Project (e.g. construction impacts) and proposed mitigation are disclosed in a timely manner and that all stakeholders are consulted in a meaningful and culturally appropriate way throughout project implementation. Determine whether any vulnerable / disadvantaged groups or communities are likely to be disproportionately or permanently and adversely affected by the Project and identify and implement appropriate communication methods to consult with them about mitigation measures.

- Contractors shall adopt the SEP and grievance mechanism principles and requirements within their own Management Systems as appropriate, and provide training to staff on the SEP requirements.

- RDA will aim to involve stakeholders and to keep good communication practices during the lifetime of the project through its PR Division. Their objectives will be:
  - Providing local communities with a project schedule and information on project activities that may affect them, together with mechanisms for their feedback
  - Provide general information to improve knowledge of what the project involves, with all stages and expected Performance
  - To make available to the public a grievance procedure, in order to collect, respond and resolve issues and complaints on a timely basis (30 days)

- For each of the stakeholder groups defined in the SEP communication tools suggested will be used in order to ensure easy, transparent, direct, open and interactive communication with all stakeholders.

<table>
<thead>
<tr>
<th>RECEPTOR / PROPOSED MITIGATION MEASURES</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakeholder Engagement Plan and operational grievance mechanism in place prior to construction.</td>
<td>RDA</td>
<td>During all phases of the project</td>
<td></td>
</tr>
</tbody>
</table>
### SOCIO-ECONOMIC REQUIREMENTS

#### C2. Land acquisition, involuntary resettlement & economic displacement

- All feasible alternative project designs should be explored to avoid or at least minimise physical and/or economic displacement.
- The Project shall comply with and implement the RAP and ensure all affected owners / users of land (including those who are using land informally) are appropriately informed, consulted and compensated for their assets and any losses:
  - a. Primarily through negotiated settlements;
  - b. At full replacement cost;
  - c. Additional assistance to be provided to the people who will be resettled for restoring their standards of living and further improve them;
  - d. People who have not vacated their houses which were expropriated during 2004 should be advised in good time about the Project and the risk of remaining nearby the line so they can move out;
  - e. Prior to displacement; and
  - f. With any additional resettlement assistance needed

- Any grievances are resolved on a timely basis, with evidence of formal and informal communication retained.
- Resettlement Action Plans to be prepared by a suitably qualified specialist approved in consultation with ZEMA & EIB.
- Affected persons shall be given the opportunity to participate in the negotiation of the compensation packages, eligibility requirements, resettlement assistance and the proposed timing.

<table>
<thead>
<tr>
<th>RECEPTOR / PROPOSED MITIGATION MEASURES</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2. Land acquisition, involuntary resettlement &amp; economic displacement</td>
<td></td>
<td>RDA</td>
<td>Design Phase/Construction phase</td>
</tr>
<tr>
<td>• Resettlement Action Plans to be prepared.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• AFFECTED people are informed about final Project footprint.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• All project affected people have restored their livelihoods and standards of living.</td>
<td></td>
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</tr>
<tr>
<td>• Monitor number and type of submitted grievances.</td>
<td></td>
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</tr>
<tr>
<td>RECEPTOR / PROPOSED MITIGATION MEASURES</td>
<td>TARGET</td>
<td>RESPONSIBLE INSTITUTION/S</td>
<td>TIMING</td>
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<td>-----------------------------</td>
</tr>
<tr>
<td><strong>C2. Land acquisition, involuntary resettlement &amp; economic displacement</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Detailed socio-economic survey needs to be undertaken in order to recognize the real situation for all project affected people, taking into consideration those without legal rights over properties and belongings.</td>
<td>• Detailed survey and census to be conducted</td>
<td>RDA</td>
<td>Design Phase/Construction phase</td>
</tr>
<tr>
<td>• <strong>Resettlement Action Plans</strong> to be prepared, separately for each section based on Expropriation Study, Detailed survey and Census. RDA shall ensure that the affected families are duly compensated for all their belongings and expenses connected with being resettled in accordance with the Resettlement Compensation Framework developed under this ESIA.</td>
<td>• Resettlement Action Plans to be prepared separately for each section</td>
<td>RDA</td>
<td>Design Phase/Construction phase</td>
</tr>
<tr>
<td>• With regards to the loss of agricultural production due to temporary land loss, owners to be compensated according to the Resettlement Action Plan (RAP). When available and preferred by owners, other land (state owned) to be utilized for continuation of agricultural production.</td>
<td>• Support to affected families in restoring their life and standards</td>
<td>RDA</td>
<td>Design Phase/Construction phase</td>
</tr>
<tr>
<td>RECEPTOR / PROPOSED MITIGATION MEASURES</td>
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<td>RESPONSIBLE INSTITUTION/S</td>
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<tr>
<td><strong>C3. Community Health and Safety</strong></td>
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<td>RDA/Contractor</td>
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<tr>
<td>• Construction work shall commence on site only when the construction phase Health &amp; Safety (H&amp;S) Plan has been adequately developed by the Contractor and approved by RDA’s Supervising Engineers.</td>
<td>• H&amp;S Plan will be developed</td>
<td></td>
<td>During the Design Phase and prior to the start of construction works</td>
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<tr>
<td>• <strong>Traffic Management Plan</strong> will be developed for the safe use of vehicles on and off site; driving standards; safe access to construction sites with minimum negative impact on the existing roads and in parallel for ensuring community safety and easy access to their properties (homes, land and gardens). Workforce transportation should be considered within TMP.</td>
<td>• Development and implementation of the Traffic Management Plan</td>
<td>Contractor/RDA</td>
<td>During the Design Phase, prior start of construction works and during construction works</td>
</tr>
<tr>
<td>• For traffic control and safety, the information about the project activities and driving standards will be announced through the local radio/TV. RDA and the Contractor/s will openly and transparently inform residents in the affected places and villages as a minimum on a quarterly basis regarding the planned activities and safety measures to be employed.</td>
<td>• All main design studies for railway construction prepared by designer to be reviewed by RDA. Evidence of public consultation on crossing locations.</td>
<td>RDA/Designer</td>
<td>Prior start of Construction Phase</td>
</tr>
<tr>
<td>• The traffic flow through the site and within the urban areas especially in Chipata town will be coordinated with the responsible traffic engineers in the municipalities.</td>
<td>• Avoid conflicts between workers and local</td>
<td>RDA/Contractor</td>
<td>Prior start of construction works/Construction</td>
</tr>
<tr>
<td>• A <strong>CONSTRUCTION Community Health and Safety Educational Programme</strong> will be developed to inform and build awareness and understanding of the local community and drivers on the construction hazards and potential adverse impacts during the construction phase and how to minimize the potential for an accident and/or injury to occur. The Programme will be linked to the SEP and utilise various communication methods to address the needs of vulnerable groups such as children and illiterate residents.</td>
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<tr>
<td>Worker transportation and modes for workforce movements during construction works will be organised in a way that will minimize negative impacts on local residents.</td>
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<tr>
<td>To avoid unauthorized entrance at worker camps and contractor’s facilities, the design, layout and site location of facilities should facilitate natural surveillance by police and the security guards engaged by Contractor/s. Worker camps not to be adjacent to local settlements.</td>
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<tr>
<td>Adequate selection of qualified security guards and appropriate training. The project shall apply the Voluntary Principles on Security and Human Rights.</td>
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<td>The design and location of road level crossings must take into account the views and concerns raised by local residents and other stakeholders. Evidence of consultation with stakeholders to be retain</td>
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<tr>
<td>Warning devices to be installed to warn pedestrians that a train is approaching, special attention to be given to the stations and where vulnerable residents are located e.g. children. Any hazards such as overhead power lines will be fitted with appropriate warning signs.</td>
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<tr>
<td>RDA, together with the Road and Transport and Safety Agency (RTSA) will undertake a series of public relation activities (must run and support a series of community activities, including school visits, safety centers, diversionary activities and communications programmes), in order to inform local citizens, passenger and workers about the dangers associated with the construction of the road use of improved road.</td>
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<th>Item</th>
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<tr>
<td>Consultation Plan.</td>
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<td>Designer/Contractor (RDA: review and implement (as required)</td>
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<tr>
<td>During the Design Phase</td>
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<tr>
<td>Public access to the information on railway, informing local citizens, passengers and workers on the nature of the project road works, benefits and risks</td>
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<td>RDA</td>
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<td>Prior start of Construction Phase/During Operational Phase</td>
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<td>RECEPTOR / PROPOSED MITIGATION MEASURES</td>
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<td><strong>SOCIO-ECONOMIC REQUIREMENTS</strong></td>
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<tr>
<td><strong>C4. Community Issues</strong></td>
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<tr>
<td>• Workers will receive training and guidance on how to avoid conflicts with the local community members and sign a labour code of conduct, in order not to minimize potential conflict and community tensions.</td>
<td>No community tensions</td>
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<tr>
<td>• Location of workers camps to be outside existing communities.</td>
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<tr>
<td>• Local Workforce Recruitment Plan to be developed to assure employment of much as possible local workforce.</td>
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<tr>
<td>• Modes for workforce movements (will be well organized and reviewed by RDA and Contractors.</td>
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<td><strong>C5. Access</strong></td>
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<tr>
<td><strong>A Traffic Management Plan</strong> should will be developed and implemented, and will cover inter alia:**</td>
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<tr>
<td>• The risks assessment that which clearly identifies all risks from the construction works to the travelers, drivers, workers will need to be developed;</td>
<td>Development and implementation of a Traffic Management Plan</td>
</tr>
<tr>
<td>• Identification of the new access roads for construction vehicles and safety measures used for pedestrian access and crossings minimizing and avoiding agricultural temporary land loss;</td>
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<tr>
<td>• Identification of all public roads and paths that will be affected and proposed for the transport routes during the construction period (which sections will be closed and till when, where the traffic will be diverted);</td>
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<tr>
<td>• Minimization of the traffic disturbance;</td>
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<td>• The signing of the construction area, new directions, ring roads, access roads etc;</td>
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<tr>
<td>• Public notification of any traffic-related concerns, such as road/streets closures; and</td>
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<tr>
<td>• The risks assessment which clearly identifies all risks from the construction works to the travelers, drivers, and workers needs to be developed.</td>
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### RECEPTOR / PROPOSED MITIGATION MEASURES

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<td><strong>C5. Utilities</strong></td>
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<tr>
<td>• Prior to construction works during the Design Phase, the designer will obtain available underground cadastre from relevant service providers.</td>
<td>• Minimal disruption of utilities</td>
<td>RDA/Designer/Contractor/</td>
<td>Design Phase/ Construction Phase/Operational Phase</td>
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<tr>
<td>• Prior excavation works, Contractor/s will inform service providers in writing about planned construction activities which could affect some utilities and to request presence of their representatives on site. Where necessary the isolation of services which may pose a problem are to be arranged.</td>
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<td>• In case of lack of underground maps consultation with local citizens will be carried out to identify underground connections especially in regards with their properties and consequently to inform referenced service providers.</td>
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<tr>
<td>• Ensure water and electricity requirements for Project do not result in supply issues with utilities to surrounding area.</td>
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<td><strong>C6. Vulnerable Groups</strong></td>
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<tr>
<td>• To ensure the safety of people living near project road, there will be adequate markings and signage, for both construction and operational phase.</td>
<td>RDA/Designer/Contractor</td>
<td>Design Phase/ Construction Phase/Operational Phase</td>
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<tr>
<td>• The level of literacy of the affected people should be taken into consideration in the communication methods and signage design.</td>
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### SOCIO-ECONOMIC REQUIREMENTS

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<tr>
<td><strong>C7. Workforce &amp; Worker Accommodation</strong></td>
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<tr>
<td>• To adopt and/or maintain appropriate Human Resources Policies and procedures. These policies will be clear, understandable and accessible to workers and comply with national labour laws and international good practices and EIB standards.</td>
<td>• Human Resources policies to be prepared and implemented</td>
<td>RDA</td>
<td>Design Phase</td>
</tr>
<tr>
<td>• To develop policies to promote non-discrimination and equal treatment and to prevent harassment (including sexual harassment) and bullying in the workplace, and make sure that they are clearly communicated and accessible to management, supervisors and workers.</td>
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<tr>
<td>• To ensure that managers and supervisors are trained in the application of the HR policies.</td>
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<tr>
<td>• To ensure that job advertisements, job descriptions and applications do not refer to applicants/workers race, gender etc. (except rare cases where legal exceptions apply).</td>
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<tr>
<td>• To ensure that decisions on hiring, working conditions, pay, benefits, training, promotion, termination, redundancy are not made on the basis of discriminatory grounds or on the basis of criteria which disproportionately impact on one group more than another.</td>
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<tr>
<td>• To ensure that women and men are paid the same wages for work of the same value, i.e. remuneration is based on the employee’s skills, experience, responsibilities and other objective, non-gender related factors</td>
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<tr>
<td>• To monitor the workplace for any form of harassment and, where it is found, act quickly to address it.</td>
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<tr>
<td>• To ensure that workers are not asked about or required to undergo health or pregnancy testing, except where there is a genuine health and safety need.</td>
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</table>
### 7. Workforce & Worker Accommodation

- To take steps to enable workers with disabilities to retain their jobs and make accommodations required by national law for physically disabled persons.
- Workers camps to be located outside communities.
- RDA to undertake audits of the design and implementation of the worker’s compounds against the checklist in the IFC; audits will be scheduled as follows:
  - a) prior to construction of the accommodation (i.e. an audit of the design);
  - b) prior to its opening;
  - c) On an annual basis (each year after opening).
- Audits of worker accommodation to be undertaken by RDA against the IFC worker accommodation guidelines. Any defects or issues (where relevant) identified in the audits to be addressed and then reassessed for compliance within one month of the audit.
- All workers will receive appropriate ESHS training in required languages. This will form part of the site/project induction process. The ESHS training will cover appropriate ESHS requirements including: the Code of Conduct, community interactions, the grievance mechanisms and biodiversity issues; prevention measures and awareness raising of potential diseases and health issues that may be introduced or effect the workforce and Emergency Planning and Response.

<table>
<thead>
<tr>
<th>Receptor / Proposed Mitigation Measures</th>
<th>Target</th>
<th>Responsible Institution/S</th>
<th>Timing</th>
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<tr>
<td><strong>Socio-Economic Requirements</strong></td>
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<tr>
<td><strong>C7. Workforce &amp; Worker Accommodation</strong></td>
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<tr>
<td>- To take steps to enable workers with disabilities to retain their jobs and make accommodations required by national law for physically disabled persons.</td>
<td>Ensure workers camps are designed and constructed/operated according to EBRD guidance document</td>
<td>RDA</td>
<td>Prior to Construction Phase and annually</td>
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<tr>
<td>- Workers camps to be located outside communities.</td>
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<td>- RDA to undertake audits of the design and implementation of the worker’s compounds against the checklist in the IFC; audits will be scheduled as follows:</td>
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<td>a) prior to construction of the accommodation (i.e. an audit of the design);</td>
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<tr>
<td>b) prior to its opening;</td>
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<tr>
<td>c) On an annual basis (each year after opening).</td>
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<tr>
<td>- All workers will receive appropriate ESHS training in required languages. This will form part of the site/project induction process. The ESHS training will cover appropriate ESHS requirements including: the Code of Conduct, community interactions, the grievance mechanisms and biodiversity issues; prevention measures and awareness raising of potential diseases and health issues that may be introduced or effect the workforce and Emergency Planning and Response.</td>
<td>Site/Project Induction Information/ESHS Training planned within CESMS &amp; OESMS and grievance mechanism &amp; Response</td>
<td>RDA &amp; Contractor</td>
<td>Construction Phase</td>
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<tr>
<td>RECEPTOR / PROPOSED MITIGATION MEASURES</td>
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<tr>
<td>C7. Workforce &amp; Worker Accommodation</td>
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<tr>
<td>Social Facilities and Services Plan</td>
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<tr>
<td>- Housing standards must include special attention to minimum space allocated per person, supply of safe water in the workers’ dwelling in sufficient quantities, adequate sewage and garbage disposal systems and appropriate protection against heat, cold, damp, noise, fire, and disease-carrying animals, and, in particular, insects.</td>
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<tr>
<td>- Medical Risk Assessment and Medical Response Plan for on-site first aid requirements and medical emergencies in compliance with Lenders requirements.</td>
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<td>- For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems must be provided. Both natural and artificial lighting must be provided and maintained in living facilities.</td>
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<tr>
<td>- A separate bed for each worker must be provided. The practice of “hot bedding” should be avoided. The minimum space between beds should be 1 metre. Double deck bunks are not advisable for fire safety.</td>
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<tr>
<td>- Canteen, cooking and laundry facilities must be built in adequate and easy to clean materials. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition. If workers wish to cook their own meals, kitchen space will be provided separate from sleeping areas</td>
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<tr>
<td>- There must be management plans and policies especially in the areas of overall operation of the facility, health and safety (with emergency responses), local community and security.</td>
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<tr>
<td>- A security plan including clear measures to protect workers against theft and attack is implemented. Security staff must be checked to ensure that they have not been implicated in any previous crimes or abuses.</td>
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<tr>
<td>- Community representatives must be provided with an easy means to voice their opinions and to lodge complaints to the management. There must be a transparent and efficient process for dealing with community grievances.</td>
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<tr>
<td>- Mechanisms for workers’ consultation and grievances to be designed and implemented for the duration of the project. Processes and grievance mechanisms for workers’ to articulate their grievances must be provided and clearly explained to workers.</td>
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<tr>
<td>- Emergency Preparedness &amp; Response Plan for the construction stage.</td>
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<td><strong>Contractor/s but approved by RDA</strong></td>
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<tr>
<td>Prior to start of Construction Phase and during Construction Phase</td>
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<tr>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
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<tr>
<td>- Occupational Health and Safety Plan to be provided to ensure compliance with National and EIB safety requirements.</td>
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<tr>
<td>- All work activities carried out on site are to be properly planned and assessed so that all hazards have been recognised, those who may be at harm have been identified and adequate control measures implemented to reduce the risks to those workers and third parties who may be harmed to as low as reasonably practicable.</td>
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<tr>
<td>- Occupational Health and Safety Plan</td>
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<td>Contractor/s but approved by RDA</td>
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<td>Prior to the start of Construction Phase and during Construction Phase</td>
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- All workers are to be provided with suitable information, instruction, training and supervision as is necessary to ensure the health, safety and welfare of all persons working on site.
- Any lifting operations carried out on site will be properly planned, assessing the ground conditions and above ground obstruction in the immediate area. The equipment will not exceed the safe working load and be operated by a suitable competent operator. All loads will be secured and the lift control by a competent person at all times in direct communication with the crane operator at all times.
- Any working at heights which can’t be avoided will be carried out using suitable working platforms with adequate guard rails to prevent falls. Where a risk of falling may still be possible all workers must be provided with, and trained in the use of, suitable safety harnesses / fall arrest equipment to mitigate the consequences if a fall should occur.
- All construction traffic on site will be restricted to a maximum speed of 10km/hr at all times on site. Any reversing will be carried out under the guidance of a suitable trained person wearing high visibility clothing. All traffic will have suitable warning devices to allow others of its approach and be suitable segregated from any pedestrians.
- Any temporary work structures used during the construction phase will be designed and constructed under the guidance of a suitable competent engineer.
- All work activities on site are to comply with national laws and EU Directives and meet best international practise.

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<tr>
<td>• Implementing strict and enforceable safety practices. The general contractor and all subcontractors on a job site are required to provide a safe work environment and to warn employees of hazards there. They must hire responsible personnel to coordinate job safety, and to supervise compliance with legal rules and regulations.</td>
<td>• Implementing strict and enforceable safety practices</td>
<td>Contractor/s but approved by RDA</td>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
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<td>C8. Quality of life</td>
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<td>Dust Management</td>
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<td>• Construction site, transportation routes and materials handling sites will utilise dust suppression measures such as water-spraying on dry and windy days to reduce dust emissions. This is especially relevant to any residential areas and commercial and business areas. This will be achieved through the implementation of Dust Management Plan.</td>
<td>• Dust Management Plan to minimize annoyance caused by dust</td>
<td>Contractor/s but approved by RDA</td>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
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<td>• If crushing of construction material or waste is required, crushers should be located away from sensitive receptors.</td>
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<td>• Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards and to reduce the leakages of motor oils and dispersion of pollution in waters and soil (the maintenance should be provided by the professional service company).</td>
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<td>• Restriction of the vehicle speed to 30km/hr on all access roads and settlements. (There needs to be a figure here although I am not familiar with the types of roads or existing speed limits)</td>
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<td>• Construction materials will be stored in appropriate places and covered to minimize dust.</td>
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<td>• Vehicle loads likely to emit dust will be covered.</td>
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<td>• Usage of protective masks for the workers if dust generation is expected.</td>
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</tr>
</tbody>
</table>
## SOCIO-ECONOMIC REQUIREMENTS

### C8. Quality of life

#### Noise and Vibration Management (Design and Construction Phase)

<table>
<thead>
<tr>
<th>Receptor/Proposed Mitigation Measures</th>
<th>Target</th>
<th>Responsible Institution/s</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce the risk from any noise and vibration impacts by ensuring that the construction activities are at a distance of at least 10 meters from the residences.</td>
<td>No construction activities closer than 10 meters of any residence</td>
<td>Contractor/s but approved by RDA</td>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
</tr>
<tr>
<td>Information to the public about the construction works will be announced through the local radio/TV station for carefully low speed driving near the construction location (especially important for Chipata urban and other heavily settled areas).</td>
<td>Providing information to citizens</td>
<td>Contractor/s but approved by RDA</td>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
</tr>
<tr>
<td>Methods and equipment which minimize noise during execution of foundation works will be utilized, especially when working in densely populated areas. Methods to minimize the noise level include using less machines at the same time for the work.</td>
<td>Minimize annoyance caused by noise</td>
<td>Contractor/s but approved by RDA</td>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
</tr>
<tr>
<td>The construction work should not be permitted during the nights, the operations on site shall be restricted to the hours 07.00-19.00 h.</td>
<td>No grievances relating to noise issues.</td>
<td>Contractor/s but approved by RDA</td>
<td>Prior to the start of Construction Phase and during Construction Phase</td>
</tr>
<tr>
<td>The vehicles that are excessively noisy due to poor engine adjustment or damage of noise abatement equipment shall not be operated until corrective measures have been taken.</td>
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</tr>
<tr>
<td>The maximum permissible speed for the heavy mechanization vehicles and predetermined route for passing near the settlements will be strictly enforced.</td>
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<tr>
<td>The local residents will be kept informed of the planned works and advised in advance of noisy works.</td>
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<tr>
<td>The location of noisy equipment will be chosen as far as possible away from sensitive receptors (houses, workplaces, schools and hospitals).</td>
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<tr>
<td>The workers will be provided with ear protective devices (ear muffs and/or ear plugs).</td>
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<tr>
<td>The good management practice would be used for the on distribution of the heavy noise equipment along the route, to avoid cumulative noise.</td>
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<tr>
<td>The construction work will as much as possible be organised in a manner where noise is limited as much as possible, e.g. work should be performed during day</td>
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</tbody>
</table>
time in the populated areas and should be announced ahead in good time

- In cases where the very noisy work has to go on at night or during a longer period than one day in a place, a noise shield will be erected around the working area.
- Monitoring of vibration during performance of critical working processes will be undertaken. Buildings which are within a distance of 20-30 meters from the area where the foundation of piles and catenary masts take place will be monitored during the work.
- Damaged buildings will be repaired or compensation paid if damage from vibration occurs.
- Before construction work is initiated, the houses nearby the area where the foundation of piles and catenary masts will take place should be photo registered for later documentation of any damages, which the work may have caused.

<table>
<thead>
<tr>
<th>Time in the pop. areas</th>
<th>In cases noisy work at night/period &gt; one day</th>
<th>Monitoring vibration</th>
<th>Damaged buildings</th>
<th>Before construction work</th>
</tr>
</thead>
<tbody>
<tr>
<td>time announced</td>
<td>Announced in good time</td>
<td>Monitoring</td>
<td>Damaged buildings</td>
<td>Photo registered</td>
</tr>
<tr>
<td>Noise shield</td>
<td>Erected around working area</td>
<td>Vibration monitoring, measures for preventing damages and fair compensation of damages</td>
<td>Repaired or compensation paid</td>
<td>Documentation of any damages, which the work may have caused</td>
</tr>
</tbody>
</table>

Contractor/s and RDA

Prior to construction and during Construction Phase
### RECEPTOR / PROPOSED MITIGATION MEASURES

- Construction workers will be given training sessions, prior and during construction works, to make them aware of the importance of soil, surface water and groundwater, flora, fauna, landscape, and archaeological remains as valuable resources for humans and nature, and the need for protecting them.
- High level or awareness on environmental issues in the construction workforce

<table>
<thead>
<tr>
<th>Sedimentation and Erosion Control Plan</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Will be developed in order to identify specific erosion control techniques for use at particular sites along the railway alignment. The Plan will be based on several principles and approved by RDA prior to construction:</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Each site characteristics (topography, soils, drainage patterns, and covers) will be considered when developing the plan. Areas which are prone to erosion will be left undisturbed and undeveloped if possible. Entrance and exits points for runoff will be protected from erosion and equipped with sediment control devices.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Minimize the extent of the disturbed area and the duration of exposure and stabilize disturbed areas as soon as possible. Typically, if an area is not going to be worked on in more than 45 days, it will be protected by erosion control mats.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- The use of heavy equipment and techniques that will result in excessive soil disturbances or compaction of soils will be minimized, especially on unstable slopes.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- The drainage and runoff controls will be established before starting the site clearance and earthworks. The existing vegetation will be retained as much as possible.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Where water would need to be removed from excavations, it will be transferred at the minimum practical distance to be discharged.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Concentrated flows if possible will be diverted away from sensitive areas.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Sediment control devices such as sediment control ponds will be used to retain sediments from leaving the site.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- The most effective erosion control devices will be implemented:</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- a) temporary seedlings; ii) temporary mulching;</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- b) permanent sodding;</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- c) temporary or permanent erosion control blankets;</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- d) permanent vegetative buffer strips;</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- e) Sediment control devices to be implemented will include:</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- f) site fencing; ii) straw bales; iii) sediment basins or traps;</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- g) storm inlet traps;</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- h) Rock check dams and vii) interception berms/swales.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Once construction is completed at a site, the decompaction and restoration of the disturbed areas that are not going to be occupied by permanent structures will be carried out by tilling the land before proceeding to the vegetation reinstatement.</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td>- Each river or large stream will have a specific Crossing Plan defining the mitigation measures to be applied (see Surface water below).</td>
<td></td>
<td>Contractor/RDA</td>
</tr>
</tbody>
</table>
### ENVIRONMENTAL REQUIREMENTS

D3. Hazardous Materials Management and Spill Prevention Plan to address issues such as:

<table>
<thead>
<tr>
<th>Environmental Requirements</th>
<th>Target</th>
<th>Responsible Institution/S</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>- All roads and hard standings will be kept clean and tidy to prevent the build-up of oil and dirt that may be washed into a watercourse or drain during heavy rainfall.</td>
<td>- Preparation and implementation of the Hazardous Materials Management and Spill Prevention Plan to prevent the contamination of soil and waters with hazardous substances</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>- The spill kits will be located close to the construction sites in case there is an accidental spill, so that it can be immediately cleaned up.</td>
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</tr>
<tr>
<td>- No refuelling, storage, servicing or maintenance of the equipment will take place within 100 m of drainages, water courses, alluvial plains or other sensitive environmental resources. If these activities had to be done at the construction site, all precautionary measures shall be taken to prevent leaks or spills from reaching the soil or nearby water courses.</td>
<td></td>
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<tr>
<td>- These activities (refuelling, storage, servicing or maintenance) will take place in designated repair and maintenance third party sites adequately prepared for these purposes (adequately lined for preventing any soil and groundwater contamination, and equipped with culverts along the perimeters to collect water runoff that will be directed to wastewater treatment facilities).</td>
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<tr>
<td>- Ready-mix concrete trucks containing alkaline cement or residues of cement will not be allowed to enter any watercourse. Washout of the concrete trucks shall be performed at the concrete batching plant camp, where appropriate facilities will be provided. If the washout of concrete trucks were necessary at or near the construction site, this shall be done at distance greater than 200 m of any watercourse and never in a very high or high habitat sensitivity area. The washout area will be clearly signposted and drivers shall be aware of the designated locations for washout.</td>
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<tr>
<td>- Setting up camps on alluvial terrains has to be avoided because of the high levels of the underground water table and the risk of pollution.</td>
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<tr>
<td>- The proper handling and storage of lubricants, solvents will be organized as well proper usage of construction equipment.</td>
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<tr>
<td>- The storage of substances that are harmful to soils and waters (e.g. fuels for construction machinery) on the construction site will be minimized. All hazardous substances either products to be used or waste, shall be stored in adequate places, far from sensitive areas (e.g. water courses, habitats with a rich biodiversity) and adequately equipped to prevent any soil, surface water or groundwater contamination.</td>
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<tr>
<td>- For the storage of the wooden sleepers removed from the railway track in section 1, the temporary storage areas near the construction site will be lined and provided with runoff collectors. Removed sleepers will be taken to a safe storage place or handled to a hazardous waste contractor as soon as possible.</td>
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<tr>
<td>- Vehicles and construction machinery will be subject to regular preventive maintenance so as to reduce leakages of lubricants, motor oil and fuel.</td>
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</table>
### RECEPTOR / PROPOSED MITIGATION MEASURES

<table>
<thead>
<tr>
<th>ENVIRONMENTAL REQUIREMENTS</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D3. Hazardous Materials Management and Spill Prevention Plan to address issues such as:</strong></td>
<td></td>
<td>RDA/Contractor – Construction Phase</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>The Waste Management Plan will implement procedures for waste minimization, recycling, treatment and disposal in accordance with national and EU requirement and will cover the following:</td>
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<tr>
<td>- The different waste types that could be generated at the construction site (due to the materials used and waste generated in different sections) shall be identified and classified according to the national List of Waste (Official Gazette no.100/05) on hazardous and non-hazardous waste streams.</td>
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<tr>
<td>- Complete separation of hazardous from non-hazardous waste streams at the construction site will be done.</td>
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<tr>
<td>- The waste material (concrete, iron, rocks, etc.) accidentally deposited will be immediately removed from highly sensitive habitats.</td>
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<tr>
<td>- Municipal solid alike waste generated in the construction site and camps (food, beverages, packaging waste such as paper, bottles, glass, etc., glass bottles, batteries) will be collected and treated according to national legislation (separation of recycling waste materials from the waste stream that will be disposed of in the solid waste municipal landfill). Recyclable waste will be given to an authorized recycling company.</td>
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<tr>
<td>- A contract with the company for waste collection and transportation shall be signed for the collection and transport of the waste generated at the construction site to the nearest municipality landfill.</td>
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<tr>
<td>- Inert waste landfills shall be constructed according to specifications set in the national and EU requirements.</td>
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<tr>
<td>- The Closure Plan for the closure of the inert landfills will be established and implemented taking into account the need for cultivation of the landfills area.</td>
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<tr>
<td>- The contracts signed with the companies dealing with waste recycling and recovering will ensure that the delivery and acceptance of the waste streams is performed on a frequent basis so that the construction sites remain clean at any time.</td>
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<tr>
<td>- The excavated soil and construction waste will be reused as much as possible.</td>
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</tr>
<tr>
<td>- Possible hazardous waste (motor oils, vehicle fuels) should be collected separately and authorized collector and transporter should be sub-contracted to transport, recovery or finally dispose the hazardous waste;</td>
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</tr>
<tr>
<td>- Waste Management Plan to be prepared and implemented to prevent soil and water contamination with hazardous substances contained in wastes, the introduction of extraneous materials in soils and waters, and to prevent the impairment of the landscape quality.</td>
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</tbody>
</table>
- The Temporary Hazardous Waste Storage Points should be established according to national legislation on handling, labelling, storage and management with hazardous waste;
- The hazardous waste management procedure should be established and followed;
- The hazardous waste will be packaged and labelled showing the R and S phrases (risk and safety statements of the hazardous waste) and it will be temporary stored on safety storage facility equipped with adequate ventilation, fire resistant conditions especially if there are VOC emissions, mercury containing lamps, asbestos materials form demolition works;
- The access to these temporary hazardous waste storage points need to be allowed only for trained and equipped staff with prohibited entrance of workers and public;
- All waste spills will be promptly cleaned up;
- Full records of the type of waste stream generated, quantity composition, origin, disposal destination and method of transport for all different waste streams will be kept available for inspections;
- The reporting on waste management will be done on regular base to the particular municipality and the legal obligation is for further reporting to the ZEMA through the Annual Reports;
- The waste material (concrete, iron, rocks etc.) accidentally deposited will be immediately removed from highly sensitive habitats.

**Soil Management Plan shall be prepared by Contractors and approved by RDA.**

**Selective removal and storage of top soil will be conducted which will:**

a) Topsoil will be stripped from the soil surface so as to serve for reuse in the restoration of disturbed areas not occupied by the railway.

b) Topsoil will be reused to restore cuttings, embankments, wildlife crossings, construction and workers camps, landfills, and borrow pits.

c) Temporary storage areas will be located along the strip of land along the alignment, near the sites where the soil was removed from, so that it can be reused in those same areas.

- The layers of the stripped top soil will be placed aside, on the established storage areas, in the same order as the original soil levels. The topsoil removed will be collected on ridges to be built in flat areas so as to avoid the loss of the organic and biotic properties of the soil, and protected it from weather agents, mainly wind and rain, which cause the erosion of the soil ridge. The topsoil storage areas shall be signposted and

- Selective removal and storage of topsoil to be conducted to minimize the loss of fertile soil and ensure its properties are preserved for its reuse in rehabilitated construction sites or elsewhere (e.g. agricultural amendment)
maintained in proper condition until the reutilization of the topsoil.

<table>
<thead>
<tr>
<th>RECEPTOR / PROPOSED MITIGATION MEASURES</th>
<th>TARGET</th>
<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D4. Surface Water</strong></td>
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</tr>
<tr>
<td>• Each river or large stream will have a specific Crossing Plan defining the risks and mitigation measures to be applied (taking into account the measures listed below as relevant). Plans will be approved by RDA in advance of works.</td>
<td>• River Crossing Plans</td>
<td>Contractor approved by RDA in advance</td>
<td>Before Construction Phase.</td>
</tr>
<tr>
<td>• The construction of drainage pipes and bridges in watercourses will be carried out during the dry season. The design of the drainage pipes will take account of projected maximum flood events and potential changes in future flow regimes due to climate change.</td>
<td>• Construction of civil objects in water courses to be done during dry season to minimize effects on water flow, water quality and aquatic flora and fauna</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>• The extension of the construction area next to water courses will be only that strictly necessary to adequately perform the construction works. The perimeter of the area will be marked with signalling ribbons that neither vehicles and machinery nor workers will trespass. No occupation of the stream bed or the banks will be allowed, unless there is no other reasonable alternative to carry out the construction work.</td>
<td>• Any extension of the construction area next to water courses only occurs when signed off by RDA</td>
<td>Contractor for application to develop near water course. RDA to sign off on application.</td>
<td>Construction phase</td>
</tr>
</tbody>
</table>
| • The following guidelines will be taken into account in the construction of bridges:  
  ✓ Single span bridges are the preferred structure for crossing streams as they cause the least disturbance to watercourses both hydraulically and environmentally.  
  ✓ Multiple span bridges are acceptable on wide streams. Acceptable arrangements will include:  
    a) Piers located outside the normal low flow stream width. In this regard, a three span bridge may be preferable to a two span bridge. The spans do not | • Design & Construction to follow stated guidelines | Designer/Contractor/RDA | Design and Construction Phase |

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need to be of equal length.

b) Piers aligned parallel to the direction of flow.
c) Riprap provided around the piers to mitigate local scouring.
d) If piers/piles have to be constructed inside the normal low flow stream width, they would occupy less than 5% of the cross sectional area for not to cause a significant change to the available waterway.
e) The bridge abutments would be located so they do not significantly encroach into the waterway and thereby reduce the available waterway area. Abutments will also be located so as to avoid obstruction of movement of terrestrial fauna along the riparian zone.
f) Rock beaching will be used on the batters to protect against abutment scour, as this area will generally not revegetate due to inadequate light and lack of rainfall. Beaching should generally extend 3 metres upstream and downstream of the bridge abutments.
g) The batter is to be excavated to the depth of the beaching to maintain the waterway area. The slope of the batters would be in the range of 1V:1H to 1V:2H. In general, the beaching should extend at least 600 mm below the toe of the bank to mitigate undermining. Where the stream banks are stable, rock beaching may not be required.

- The road drainage will be directed to retention basins or grassed filter zones to trap sediments and other contaminants, rather than discharging directly to the water courses. These sediment and contaminant retention structures will be constructed in the areas where habitats of very high or high sensitivity are located along the alignment or in a close location downstream of the effluent discharge point.
- Regular control and maintenance of drainage structures and retention basins will be conducted to check they are not clogged with debris or sediments.

| • Designing & Construction to follow stated guidelines | Designer/Contractor/RDA | Construction Phase |
| • No blocked drainage structures | RDA | Operational Phase |
### Environmental Mitigation Measures

<table>
<thead>
<tr>
<th>Environmental Requirements</th>
<th>Target</th>
<th>Responsible Institution/S</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D5. Groundwater</strong></td>
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<tr>
<td>Where the groundwater table is encountered during excavation or cutting works, the intercepted area will be sealed as soon as possible so as to re-establish the normal hydrogeological flow regime.</td>
<td>No major alterations of groundwater flow</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>Hazardous Materials Management and Spill Prevention Plan to be developed (see mitigation measures for soil) and will address the potential for direct groundwater contamination for activities where the groundwater may become exposed to the atmosphere (e.g. during the construction of pillars near a water course).</td>
<td>No significant contamination of groundwater</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
</tbody>
</table>

### D6. Air Quality

- Measures to be implemented to minimize dust emissions and included with a Dust Management Plan:
  1. Hoardings will be constructed around the construction sites to minimize the spread of dust.
  2. Accesses and construction sites will be kept moist to reduce dust formation. Water sprays will be implemented during drilling and excavation activities.
  3. In the dry season, hygroscopic additives will be used in water to increase its presence in the ground.
  4. Dust-generating activities will be slowed down in days of strong wind.
  5. In windy and dry conditions, earth stockpiles will be moistened to prevent the lifting of dust particles.
  6. Ground will be moistened during loading and unloading of aggregates in trucks.
  7. Truck dumpers carrying spoil or other dusty materials will be covered with tarps.
  8. Loaded trucks will be washed down prior to exit from the working site to ensure that loose material is not tracked onto the roads.
  9. Work sheds will be large enough to allow stockpiling of the excavated tunnel material, access of trucks and truck loading operations.

- Measures to be implemented to minimize emissions of combustion gases:
  a) Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards.
  b) No unnecessary idling of construction vehicles at the construction sites will be allowed.
  c) Construction truck traffic will be optimized so as to get a minimum number of trucks carrying the maximum volume of materials. This will be addressed in the Construction Traffic Management Plan.
d) The truck routes will be planned to avoid peak traffic hours or routes with heavy traffic.

<table>
<thead>
<tr>
<th>Measures to be implemented to avoid asbestos emissions during demolition of buildings:</th>
<th>Contractor/RDA</th>
<th>Construction Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>2) The storage and transport of demolition materials will be removed, packed, labelled and processed in accordance with national and EU legislation on management of hazardous waste and asbestos (Directives 87/217/EEC and 91/689/EEC).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) A risk assessment will be carried out before beginning an activity involving exposure to asbestos dust or to materials containing asbestos.</td>
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<td></td>
</tr>
<tr>
<td>• Regular maintenance of the diesel equipment will be performed to keep them in optimal working conditions, including the achievement of minimal air emissions set by the manufacturer.</td>
<td>Minimise emission of combustion gases</td>
<td>RDA/Contractor</td>
</tr>
<tr>
<td>• Every effort will be made to use the cleanest fuels (e.g. on-road grade diesel) within technically feasible possibilities.</td>
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</tr>
<tr>
<td>• In train stations with heating systems based on fossil fuels, these systems will be subject to regular maintenance so that combustion is complete and emission of combustion gases are kept below regulatory thresholds.</td>
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</tbody>
</table>
### Environmental Requirements

#### D7. Noise and Vibrations

- All construction equipment will comply with the requirements of EU Directive 2000/14/EC on noise emission in the environment by equipment for use outdoors (there is a lack of national legislation on outdoor equipment emission noise levels). All the equipment shall bear the CE marking and the indication of the guaranteed sound power level and shall be accompanied by an EC declaration of conformity.

- The equipment will be fitted with appropriate noise muffling devices that will reduce sound levels.

- Construction works shall not be permitted during the night; the operations on site shall be restricted to the period 07.00 - 19.00 h.

- All vehicles and machinery used at the construction sites shall be subject to regular maintenance. The vehicles and machines that are excessively noisy due to poor engine adjustment or damage noise control devices shall not be operated until corrective measures have been taken.

- The construction traffic plan shall establish speed limits for construction vehicles and machinery at the construction site and the haulage roads used, and organize traffic so as to avoid as much as possible populated areas.

- Affected local residents will be kept informed on due time of the planned works and the vibration and noise levels and periods during which they will occur.

- The location of noisy equipment will be chosen as far as possible from sensitive receptors (houses, workplaces, schools and RHC). When near sensitive receptors, construction works will be scheduled and provided with the necessary resources so that the time of exposure is as short as possible.

- Good management practice will be used to distribute heavy noise equipment along the route so as to avoid the cumulative effects of noise.

- In the case where noisy works would need to be performed at night or during a longer period than one day at a given site, a noise shield shall be erected around the working area.

- Monitoring of vibration during the performance of critical work processes (e.g. foundation of piles and catenary masts) should be undertaken in buildings which are within a distance of 20-30 meters from the area where the these works take place.

<table>
<thead>
<tr>
<th>Receptor / Proposed Mitigation Measures</th>
<th>Target</th>
<th>Responsible Institution/s</th>
<th>Timing</th>
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</thead>
<tbody>
<tr>
<td><strong>Noise and Vibrations</strong></td>
<td></td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
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<tr>
<td>• Noise emissions from the Project meet national and EC guideline limits</td>
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<td>Should buildings result damaged as a result of vibrations generated by the construction works, the damaged buildings will be repaired or compensation paid.</td>
<td>• No lasting damage to buildings</td>
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<tr>
<td>• Operate earthmoving equipment on the construction site far away from vibration-sensitive receptors as possible.</td>
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<tr>
<td>• Activities such as demolition, earthmoving and ground-impacting operations shall be scheduled so as not to occur in the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately.</td>
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</table>
| • Decrease vibration from construction sources, including:  
  a) Blasting. Explosive type and weight, delay-timing variations, size and number of holes, distance between holes and rows, method and direction of blast initiation.  
  b) Dynamic compaction. A smaller falling weight will produce smaller vibrations.  
  c) Pile driving. Predrilling, projecting, replacement of displacement piles with non-displacement ones, switch impact hammer to vibratory one, replacement of driven piles with augered cast in-place piles or drilled shafts.  
  d) Select demolition methods not involving vibration impact, where possible.  
  e) Avoid vibratory rollers and packers near sensitive receptors. |
## Environmental Requirements

### D8. Landscape

- The landscape impact can be mitigated by hiding from observers the construction site, the camp and ancillary areas. For this, screens will be installed around the perimeter of these sites.

- Shaping of the terrain around altered impacted areas so as to recreate the surrounding land morphology. During further design areas where potential visual and/or shading issues for residential areas/properties could occur will be reviewed and measures incorporated into design and/or mitigation measures identified and implemented.

Vegetation with autochthonous species present in the surrounding area of:

1. Slopes of the cuttings and embankments. Vegetation measures are generally recommended for 2H:1V slopes.
2. Areas around the tunnel mouths.
3. Water courses and banks underneath constructed bridges, as well as in the abutment areas.
4. Affected areas underneath the viaducts as well as above, in abutment zones.
5. Aesthetic integration of the structural parts of viaducts and bridges (e.g. deck, pillars) and tunnel mouths, using construction materials with colours and textures that blend well with those of the surrounding landscape (e.g. dark concrete for pillars in a black pine forest).

- Design of the landfill waste disposal patterns so that the final contours are integrated with those of the unaffected part of the waste receiving Sag.

- Vegetation of the sealed landfills with autochthonous species adapted to the resulting Sag conditions.

<table>
<thead>
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<th>Responsible Institution/S</th>
<th>Timing</th>
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<tbody>
<tr>
<td>ENVIRONMENTAL REQUIREMENTS</td>
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<tr>
<td>D8. Landscape</td>
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<tr>
<td>• The landscape impact can be mitigated</td>
<td>• No significant visual impacts</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
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<td>by hiding from observers the construction site, the camp and ancillary areas. For this, screens will be installed around the perimeter of these sites.</td>
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<th>RESPONSIBLE INSTITUTION/S</th>
<th>TIMING</th>
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<tbody>
<tr>
<td><strong>D9. Fauna</strong></td>
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<tr>
<td>• Construction activities shall be scheduled so as to avoid the breeding season and other sensitive seasons or times of day, especially in areas where high sensitive species are concerned associated to sensitive habitats</td>
<td>• No construction activities during the breeding season in sensitive habitats</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>• Prior to the commencement of any construction work activity on a site, a fauna survey of the area and its surroundings shall be carried out by a qualified biodiversity expert.</td>
<td>• No significant disturbance of sensitive fauna occurs</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>• If active breeding sites of sensitive species of fishes, amphibians, reptiles, bird, or mammals, including bats, are found, they will be transported by specialized technicians to another appropriate location away from the railway construction area, unless the biodiversity expert decides on other precautionary measures to take.</td>
<td>• Traffic of construction vehicles and machinery will be the minimum required to perform construction works adequately.</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>• The speed of vehicles in the area of construction works and hauling roads will be limited to a maximum speed and remembered to the drivers through signage and installation of speed bumps, where necessary.</td>
<td>• Any animal injury or mortality will be recorded in a logbook, and as appropriate further mitigation measures are developed.</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>• Hunting of wildlife in the area of the construction works will be prohibited to workers.</td>
<td>• Before the start of works, construction workers will be trained on the natural values of the area and the need to be proactive in implementing the measures for the protection of wildlife.</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td>RECEPTOR / PROPOSED MITIGATION MEASURES</td>
<td>TARGET</td>
<td>RESPONSIBLE INSTITUTION/S</td>
<td>TIMING</td>
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<tr>
<td><strong>D10. Cultural Heritage</strong></td>
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<tr>
<td>• Chance Find Procedure to be established and implemented prior to construction works commencing. In accordance with Zambian Law on Protection of Cultural Heritage and EIB requirements. In the event of the unexpected discovery of archaeological objects the Contractor shall immediately inform RDA and the NHCC and follow their instructions. The construction works will be temporary stopped while the authorities decide if any research are needed or any protection measures should be applied. The Contractor shall follow the instructions provided by the authorities responsible for the protection of cultural heritage.</td>
<td>• Implement a Chance Finds Procedures</td>
<td>Contractor/RDA</td>
<td>Construction Phase</td>
</tr>
<tr>
<td></td>
<td>• Cultural Heritage training shall be provided to construction workers before the start of earth works to foster their awareness on how to identify artefacts and the importance of protecting Zambian cultural heritage.</td>
<td>• All staff, particularly those operating excavation equipment to be trained in the chance finds procedure</td>
<td>Contractor/RDA</td>
</tr>
<tr>
<td></td>
<td>• RDA to undertake the necessary works as directed by the NHCC responsible for the protection of cultural heritage to protect any archaeological finds from damage and plunder.</td>
<td>• No damage of discovered cultural heritage sites</td>
<td>Contractor/RDA</td>
</tr>
</tbody>
</table>
CHAPTER TWELVE

ANALYSIS OF TECHNICAL INSUFFICIENCY & NEED FOR UPDATE OF THE EISA STUDY

12.1. INTRODUCTION
For the preparation of the ESIA, the team had at their disposal sufficient information, data and documents. The main sources were official adopted documents by districts, documents at regional or national level, environmental reports issued by the responsible institutions and the Project Proponent – RDA. Several site visits in the project areas, and interviews with responsible persons (GRZ district departments such environmental officers, inspectors, water management staff, urban planners) from the Chipata City Council were held. Scoping stakeholder meetings were held where additional information was pointed out by the different stakeholders. Following review of this information the team conducted further detailed research on some of the environmental and socio-economic issues. Relevant national legislation, EIB standards and good practice examples from other road projects were considered in the development of the ESIA as well.

Several technical insufficiencies and assumptions in the preparation of the ESIA were identified, which are addressed below.

12.2. ENVIRONMENTAL ISSUES

12.2.1. Topography & Landscape
There are no published landscape unit maps for the study area. A digital terrain model (DTM) to describe the visual envelope could not be prepared due to lack of available 3D map data for the study area. Therefore, a digital intervisibility map (or “point to point” visibility map) for systematically determining visual exposure relationships (e.g. visual envelope), was not prepared.

12.2.2. Geology, Geomorphology and Soils
The primary resource for the geological data was the Basic Geological Map of Zambia for Southern Region. No other geological maps are available. The information was collected from these sources indicated is limited to these sources and the expert knowledge of the geologists that prepared the baseline.

The description of soils along the road corridor was based on the limited available information existing about the study area, the different types of soils known to be present in the area of the road corridor may occupy and on the types of geological substrates intersected by the road corridor.

12.2.3. Hydrology (Surface Water) & Hydrogeology (Groundwater)
With regards to groundwater, existing hydro-geological information for the Eastern region is very scarce. With regards to geothermal areas, the detailed investigations about this area are lacking.

12.2.4. Climate and Air Quality
There is no any air quality monitoring stations put in place in this part of the country mainly due to lack of industries or any major source of air pollution. Expert judgment was used to describe the baseline conditions.
There is no national legislation adopted yet on air emissions from mobile sources and outdoor equipment specification on air emission limits. There is no information on the testing for compression ignition engines and emissions limits on CO, HC, NOx, NMHC and particulates.

12.2.5. Noise and Vibration
As is the case with Air quality, there is no data available for noise and vibrations along the project road corridor and the consultant only undertook noise level assessment for the project road corridor, which was not very detailed, to just identify and predict noise levels at all sensitive receptors along the alignment (especially across housing zones) and determine specific and optimum noise abatement measures according the WHO standards.

12.2.6. Waste Management
There is no information on total quantities of waste disposal in the existing landfills. The Chipata City Council has adopted annual programs for waste management, but there is limited implementation. Moreover, the council rarely report to the Zambia Environmental Management Agency (ZEMA).

12.2.7. Nature Conservation & Biodiversity
The preparation of the biodiversity baseline has been mainly limited by the lack of existing detailed data specific to the road corridor. This has been particularly true for plants and mammals. No vegetation maps or habitat maps exist in the Republic of Zambia at the national or regional levels. Much of the information, thus, has been newly generated by the experts in the various biology fields participating in the ESIA study, through interpretation of cartography, satellite images and aerial photographs, and field surveys.

Moreover, the determination of sensitive plant and animal species that are potentially present along the project road corridor has been limited by the fact that no Red Data Books and Red Lists for Zambia flora, fauna and fungal have been prepared yet at a national or regional level. Thus, the establishment of the presence of sensitive species in the road corridor area had to be done on the basis of the most relevant international conventions and treaties. These international documents contain lists of species threatened to different levels (e.g. from Least Concern to Extinct). The problem arises from the fact that there may be species that are of low concern at an international level, but have some level of threat in Zambia (or vice versa), thus underestimating (or overestimating) the sensitivity value of the species.

12.2.8. Cultural Heritage and Archaeology
No assumptions have been made or limitations encountered.

12.3. SOCIAL ISSUES
The latest available census data was from the Census 2010 which obviously is a limitation of this dataset. However, all available recent data, from different sources were used in preparation of this study to present more or less the current socio-economic baseline within this region.

12.3.1. Need for Update of the EISA Study
The need to update the ESIA fully depends of the existing technical insufficiency that the ESIA Team was faced during the development of the Study and the time that will pass before RDA and the construction contractor can start the project and hence implement the proposed ESMP.

Each of the project stages (design, construction and operation) need environmental and social evaluation with main objectives: a) to determine the effectiveness of the proposed minimizing (preventive, mitigative or compensatory) measures and b) to provide feedback to the project developer regarding necessity of modification/add some more effective measures.
The broader benefit of the post-construction evaluation will convert ESIA into a more accurate and useful tool to achieve sound, rational and sustainable infrastructure /road development.

The main tasks to be performed raised from the proposed Monitoring Plan for each environmental and social element and the general activities include: a) listing of parameters to be evaluated (from the Monitoring Plan), b) Nomination of the Evaluators, c) Adoption of the standard evaluation methodology, d) involvement of the public participation in open-transparent way, e) Collection, review and analysis of the monitored data and information, f) Evaluation of the compliance with national, EIB and good practices from the IFC.

The separate Report should be added to the main ESIA Study with the main findings after the evaluation and the updated version of the Environmental and Social Mitigation and Monitoring Plan should be prepared and discussed with the public.
CHAPTER THIRTEEN

CONCLUSION AND RECOMMENDATIONS

13.1. INTRODUCTION
The proposed Chipata Dry Port and Chipata Bypass Road is scheduled to be implemented as soon as all necessary approvals from various institutions such as ZEMA are obtained and funds are secured from potential financiers such as the EIB.

To comply with the legal requirements in Zambia and indeed for good international practices, the project had to be subjected to a full ESIA process since the project falls within the second schedule of the ZEMA EIA regulations.

The purpose of the ESIA was to identify and assess the potential positive and adverse impacts that may arise from the Project on the physical and natural environment, on the socio-economic wellbeing and conditions of the population (community and workforce) at the local (municipality), regional (Eastern Province), national (Zambia) and transboundary levels.

Identified impacts have been assessed taking into account the environmental and social baseline conditions analyzed for the study area, and, where necessary and appropriate, mitigation measures to avoid, prevent, mitigate or compensate significantly adverse impacts and enhance beneficial impacts have been proposed. In this regard, a mitigation and monitoring plan to both monitor and evaluate the implementation of mitigation measures and the Project performance on environmental and social baseline conditions has been included as an integral part of the ESIA.

Furthermore, the assessment has determined the significance of residual effects remaining on the environment and community as a result of the Project following implementation of the mitigation measures.

13.2. SUMMARY OF POTENTIALLY SIGNIFICANT RESIDUAL ENVIRONMENTAL EFFECTS

12.3.2. Construction Phase
With the application of the mitigation measures during the construction phase, the majority of residual effects were found to have a slight negative significance except for 2 potentially significant residual effects in relation to the destruction of top soil and impairment of noise quality, which were found to be of a moderate adverse nature.

- **Destruction of Top Soil**—Along the project road corridor, about 82% of the top soil present which will be permanently removed comprise of natural and semi natural soils of high to very high sensitivity and 10% corresponds to medium sensitivity agricultural soils. It was determined in the assessment that even if top soil is removed selectively for reuse in the rehabilitation of disturbed surfaces along the road alignment and for agricultural purposes, the loss of top soil would still be distinguishable and measurable, although however it is not considered this will affect the integrity of the resource in the area.

- **Impairment of Noise Quality**—Noisy construction operations (earth movements, bridges construction, demolition, production of gravel and concrete, transport of materials in
and out the construction site, etc.) will take place in areas which are currently very quiet, within several small villages along the route. It has been considered that for most of the receptors in any section that live near to the road alignment, there will be potential impacts on noise levels during construction of a high magnitude. Mitigation measures to minimize noise and vibration emissions during construction include compliance of all construction equipment with the requirements of WHO and IFC guidelines on noise emission in the environment by equipment for use outdoors, application of restrictions to noise emissions according to noise level areas, limitation of construction activities to a day-time schedule, regular maintenance of vehicles and machine, implementation of a traffic plan, and monitoring of vibrations during the performance of critical work processes. However, it was considered that although these measures are certainly necessary to minimize the impact, the disturbance to neighbours due to noise and vibrations from the construction activities would still have a moderate significance, even though this will be of a temporary short-term nature.

The main negative socio-economic impacts of the project will arise from the need to acquire land required for the construction of the Chipata Bypass road. The alignment requires an estimated 42Ha of land and much of this land is currently used for subsistence farming.

Other impacts include:
- The permanent loss of acquired land and assets;
- The permanent loss of the productive potential of the acquired land and resources and, therefore, the loss of future food supplies and business;
- The permanent loss of residential accommodation and business premise;
- The temporary loss of land and assets for land used as road deviation during the construction phase of the project; and
- The possible loss of social cohesiveness and social networks when affected people or entities are required to move away from the project area.

Although not directly related to the acquisition of land for project purposes it is possible that construction teams may adversely impact land or property located outside the road reserve. These include contractors who will excavate road construction materials from the project area. The affected people will, therefore, suffer losses, which may be temporary or permanent and such displacement. A separate RAP will be prepared for material sites, which can only be identified by the contractors once they have been contracted.

13.3. CONCLUSION

The Proposed Chipata Dry Port and the Chipata Bypass Road is a viable project that will benefit the community by improving (i) relieve competition for storage and customs space at the Nacala Port itself; (ii) speed the flow of cargo between ships and major land transportation networks, creating a more central distribution point; and (iii) improve the movement of imports and exports, moving the time-consuming sorting and processing of containers inland, away from congested Nacala Port.

The acquisition of land for the Chipata Bypass Road will create displacement of farming fields, loss of livelihood and some interference with resources and sensitive receptors during construction, however there are many short and long term benefits that will arise from the proposed project.
Where displacement or impact is unavoidable, appropriate mitigation measures will be put in place to reduce to a minimum or eliminate any undesirable effects of the project. Majority of project affected persons are subsistence farmers.

There was prior awareness and knowledge of the project from the initial RAP community sensitization and consultation exercise. After this study the project affected persons should all be continuously informed of the project progress and the timelines of the major activities like compensation after negotiation, compensation payment, relocation and resettlement.

The Chipata City Council and local communities in the proposed project area will fully support the project but requested to be fully informed on the plans and their concerns looked into. The communities also requested to be engaged in the planning and implementation at all levels so that they can be sure to get first-hand information and details regarding compensation and resettlement including timelines. There is also need to involve the chiefs of the areas where the road has affected households and pieces of land in order to verify the legal owners before compensation to avoid family feuds and mistrust.

13.4. RECOMMENDATIONS

- The Proposed Chipata Dry Port and the Chipata Bypass Road is a viable project that will benefit the community by improving transportation of people and goods. However, the study has established that there will be need for land acquisition for the construction of the Chipata Bypass Road requiring compensation and resettlement.
- RDA should ensure that all affected persons are consulted. The PAPs should be fully compensated in a timely manner. The identification and acquisition of land for resettlement should be done with due consideration of the wishes of the affected persons and support given after resettlement to ensure that the project does not leave them worse off.
- All the project affected persons who will be displaced or relocated, should be informed in good time (given approximately 3 months to prepare them for relocation) and modalities of conducting resettlement counselling put in place.
- The RAP will be modified in line with situations experienced when the actual resettlement begins. In particular the monitored indicators are discussed at least quarterly so that appropriate measures and readjustments can be made.
- Conduct sensitization meeting to restrain people from encroaching the road reserve.

DECLARATION OF AUTHENTICITY OF REPORT

I do hereby attest that the information presented in this Environmental and Social Impacts Statement (ESIS) Report concerning the proposed Chipata Dry Port and Chipata Bypass Road is correct and complete to the best of my knowledge. I disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

(Dickson Ndhlovu (Director Planning)
ROAD DEVELOPMENT AGENCY
BIBLIOGRAPHY

2. Bingham, M. (2011);
3. Bridges, E.M. (1990); World Geomorphology
9. Leonard, P. (2005); Important Bird Areas in Zambia
10. Odoki, J B, Michael Anyala and Robert Akena (April 2009); Economic Benefits of an Efficient North-South Corridor - Strategic Level Analysis of Investments in the North-South Corridor Using HDM-4, Final Report; Alta Innovations Ltd/University of Birmingham and Regional Trade Facilitation Programme Project Management Unit (PMU)
11. Ministry Of Works and Supply (November 2003); Involuntary Resettlement Framework - Roads Sector Final Draft; Environmental Management Unit, Roads Department
12. TradeMark Southern Africa (March 2011); North-South Corridor Roads; TMSA Case Study Series in partnership with COMESA-EAC-SADC Tripartite
13. TradeMark Southern Africa (July 2012); North-South Corridor Roads; TMSA Update in partnership with COMESA-EAC-SADC Tripartite
14. TradeMark Southern Africa (undated); Infrastructure Components of the North-South Corridor Roads; TMSA in partnership with COMESA-EAC-SADC Tripartite
CHAPTER FOURTEEN

APPENDICES

14.1. APPENDIX 1: ZEMA TOR APPROVAL LETTER

ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

May 3, 2018

The Chief Executive Officer
Road Development Agency
P.O Box 5003
LUSAKA

Dear Sir,

RE: TERMS OF REFERENCE AND SCOPING REPORT FOR CONSTRUCTION OF THE CHIPATA DRY PORT AND BYPASS ROAD (RDA/CS/LS/01017) BY ROAD DEVELOPMENT AGENCY

The Zambia Environmental Management Agency ("ZEMA") is in receipt of your Terms of Reference (ToRs) and Scoping Report for the above proposed project which you submitted. This is in accordance with the provisions of the Environmental Impact Assessment (EIA) Regulations Statutory Instrument No. 28 of 1997.

Kindly be advised that the review of the Terms of Reference and Scoping Report indicates that the general objectives are acceptable. ZEMA therefore has no objection in you proceeding with the study. In conducting the EIA studies ensure that address the issues raised in the attachment.

Please do not hesitate to contact the undersigned should there be any issue during the study needing our attention.

Yours faithfully,

Constantino Mwembela
Acting Manager Operations -South
For/Director General
ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

ZEMA/DEPT/101/1/107/19

ORD 2133

08 MAY 2018

Received

All correspondence to be addressed to the Director General - Head Office
Email: info@zema.org.zm, Website: www.zema.org.zm
Emergency Toll Free No. on Zambian Lines: 913
ISSUES TO BE INCLUDED IN THE ENVIRONMENTAL IMPACT STATEMENT

1. RESETTLEMENT ACTION PLAN

   i. The Resettlement Action Plan should include detailed maps, showing the location of the project and the area affected.
   ii. The Resettlement Action Plan should provide an accurate estimate of the costs of the different components, along with the schedule for disbursements.
   iii. Analysis of Alternatives, justifying the need for displacement;
   iv. Objectives of the resettlement project;
   v. Institutions involved in the project (general areas of responsibility); and
   vi. Participation of local agencies, NGOs, organizations of affected people.

   a. Socio-economic Environment

   The consultant will examine the following:

   i. Specialized study on the Social economic profile;
   ii. Assessment of nearby settlements, compensation issues, farms, burial sites, shrines in the project area;
   iii. Assessment of Social Institutions in the area and assessment of the available NGOs in the project area;
   iv. Identify the educational facilities in the area and the enrolment, dropout and pass rates;
   v. HIV/AIDS and other diseases and the projects likely to influence on the disease;
   vi. Customs, value systems, social classes, hierarchical relationships and kinship structure;
   vii. Assessment of the community development issues in the area; and
   viii. Assessment of community capacity to self-sustain themselves and social welfare situation.

2. Biological Diversity

   i. Effect on number, diversity, breeding sites, etc. of flora and fauna
   ii. Breeding populations of fish and game; and
   iii. Effects on the gene pools of domesticated and wild sustainable yield.
   iv. Effects of soil fertility;
   v. Nutrient cycles;
   vi. Aquifer recharge, water run-off rates, etc;
   vii. Aerial extent of habitats; and
   viii. Bio-geographical processes
3. Air Quality Study

   i. Thorough review of literature, collection and review of the local meteorological data around the project area;
   ii. State and analyze different sources of air quality;
   iii. Evaluate the existing air quality around the project area, which may be affected due to the development.

4. Waste Generation

   i. Establish the baseline situation with regards to categories of waste according to construction waste, domestic waste e.t.c;
   ii. Impacts of waste to the surrounding communities.

5. Land Use and Tenure

   The consultant will examine the following:

   i. Current zoning classification of the site;
   ii. Current use of the site and adjacent properties;
   iii. Existing structures on the site and if such structures will be demolished;
   iv. Existing wetlands and other protected areas (if any);
   v. Existing hazardous waste sites;
   vi. Land use compatibility assessment;
   vii. Existing farmland, residential and business relocation.

6. Landscape

   i. Effects on the aesthetic quality of the landscape;
   ii. Effects on the character of the area;
   iii. Effects on the preservation of service of scenic views and valued features;
   iv. Effect on natural features such as streams;
   v. Visual impacts (features, removal of vegetation);
   vi. Compatibility with surrounding areas; and
   vii. Effects on natural heritage sites.

7. Geology and Hydrogeology

   The consultant will examine the following:

   i. Review of literature, collect and analyze the local geological data of the project site;
   ii. Assessment of rock formation of the project area;
   iii. Assessment of hydrogeology of the project area.
8. Hydrology

i. Assessment of movements and distribution of water;
ii. Assessment of occurrence of water in the area;
iii. Investigate the existing water quality of the area;
iv. Assessment of the depth for the existing boreholes;
v. Water Quality-Surface and Ground water Quality.

9. Noise and Vibrations

The consultant will examine the following:

i. The effects on the surrounding communities;
ii. Evaluate the noise impact due to the project development.
iii. Determine the sources of noise in the project area and how the proposed constructions will affect the surrounding communities;
iv. Determine the baseline Noise levels; and
v. Evaluate the noise impacts due to the project development.

10. Anthropological factors

The consultant will examine the following:

i. Linguistics of the people in the project area;
ii. Cultural rites
iii. Ethnic groups concerned by the project, and their living habits;
iv. Vulnerable populations in any confrontation with other cultures, etc.; and
v. Archaeology, Art, artefacts etc.

11. Project Location

Include geographical coordinates of all the important landmarks at the project sites.
14.2. APPENDIX 2: MINUTES OF STAKEHOLDER CONSULTATION

14.2.1. The Meeting Held at Chipata City Council Chamber on 2nd February, 2018

AGENDA

1. National anthem
2. Prayer
3. Introduction
4. Opening remarks
5. Presentation by consultant
6. Discussions and feedback
7. Closing remarks
8. Closing prayer

PROCEEDINGS

Meeting started at 09:30hrs at the council chamber

The meeting was called to order by the District Administrative Officer, Mr. Sikazwe who represented the District Commissioner for Chipata. He informed the house how the meeting was expected to proceed by reading the agenda.

NATIONAL ANTHEM

The National Anthem was sung to open the meeting.
PRAYER

The opening prayer was given by Mr John Phiri from PWD Chipata office.

INTRODUCTION

Introductions were done by each participant indicating their Names and Institution they were representing.

OPENING REMARKS

Opening remarks were done by the DAO Mr Sikazwe on behalf of the District Commissioner for Chipata. In his remarks he thanked the consultants for having made it to the meeting and all those who had come to attend this very important meeting. He indicated that this meeting gave an opportunity to the stakeholders to submit views with regards to the construction of the Chipata dry port and the By pass Road. He further said this was important to ensure all social and environmental aspects were actively put to consideration when doing the final survey and reports to relevant institutions. He urged all to participate.

PRESENTATION FROM CONSULTANT

Mr. Chamfya the consultant started by giving a brief background of the proposed project of constructing a Dry Port and a bypass road in Chipata district. In his explanation, he explained the envisaged economic benefits that the two facilities would bring to the district. He further indicated that the project is expected to be implement / supervised by Road Development Agency- RDA as opposed to the earlier plans of the Ministry of Transport implementing it.

He indicated that his consulting firm that was engaged through competitive bidding to consult the relevant stakeholders on the possible social and environmental areas of concern. He encouraged the technocrats to point out scopes of concern that will then be used to develop terms of reference for further studies. The reports will then be submitted to Zambia Environmental Management Agency for approval. He advised all participants to take note of the settlements and its possible impacts, the environment and its possible impact but also any other buildings or institutions within the 12 hectares of land ear marked to be used.
Among other notable development, the port may need to have warehouses, wet area, fuel tanks, shops, offices and other support services. This may imply considerable impact during construction and when the port is in full operation. The project is also expected to provide employment opportunities to the local community.

DISCUSSIONS AND FEEDBACK

EASTERN PROVINCE CHAMBER OF COMMERCE AND TRADE – Mr Mtonga,
The chamber expressed happiness that finally there was effort to complete the project which had been on paper for some time. He retaliated that fact that the Dry Port was a necessity to Chipata city and would significantly ease doing business and expedite the clearing of bulk cargo via the Nakala corridor. He emphasized that the project would create more business opportunities to the business community in Chipata.

Areas of concern –

- How will the construction of the dry port and By pass road be combined with the planned construction of the Chipata, Petauke and Serenje rail line.
- He said there is need to agree on which proposed rout will be used, weather the msekera – Chadiza road rout or the St. Monica’s - Rail station rout. This will be better informs what compensation requirements will be needed.
- He indicated also the need to put a time frame to the project to quickly allow the Nakala corridor operational on the Zambian side just like in Mozambique and Malawi.

ROAD DEVELOPMENT AGENCY (RDA) – the engineer from RDA said the project will be a milestone in increasing access and providing appropriate transit for heavy goods. He further informed the House that RDA had already came up with proposed map for the planned rout. He said this consultation was important to conclude the social and Environmental assessment before formulating a final project plan. He said this would also minimize costs as the project will definitely affect other services provided to community such as water, Electricity, Farming, Housing and settlements etc.

Areas of concern –

- A map needs to be concretized taking into consideration cost effectiveness and environmental impacts
- RDA was ready to implement the project but was waiting for other legal processes to conclude

EASTERN WATER AND SEWERAGE COMPANY (EWSC) –

Areas of concern –

- Taking into consideration that the stream which provides water resource which is about 300m from the proposed site for the port, how will the water resource be protected during construction and when the Port is operational.
- Taking into account that the road reserve should leave up to not less that 50 m for the rail line, how will the treatment plant and other High pressure pipes be protected as the proposed routs pass on, or are within the proposes rout for both the new rail line and by pass road.
What measure will be put in place to avoid spillage of hazardous materials in the water resource?

What will be done to control borrow pits and drainage systems to avoid solid waste from infesting the water resource stream?

DISTRICT GOVERNMENT WORKS SUPERVISORY OFFICE
Areas of concern –
- How will the Prisons and Houses which are very close to the rail line be treated?
- What modalities will be used to determine compensating those farms and settlers who will be displaced?
- What measure will be put in place to ensure safety of the community members in case the tracks and trains will be currying flammable or hazardous materials?

ROAD TRANSPORT AND SAFETY AGENCY
Areas of concern –
- In view of high traffic likely to be experienced, how will the packing arrangement for trucks be made to avoid congestion and obstruction, he further proposed that a Public Private Partnership arrangement can be used to come up with parking spaces on a fee.
- There is need for the road to have speed control facilities.

MINISTRY OF EDUCATION
Areas of concern –
- How will the school (Lutembwe Secondary and Primary School) which is some few meters away be protected from the negative impacts of the operations of the Port?
- How will the issues of HIV and AIDS be mitigated as such a development will provide an opportunity for new infections if left unchecked?

DEPARTMENT OF PHYSICAL PLANNING
Areas of concern –
- All stakeholders should be engaged in coming up with the map for the proposed route.

COMACO
Areas of concern –
- Most natural resources such as trees may be negatively affected if measures are not put in place to rehabilitate those areas that will be damaged during construction and putting up of new structures.
- Traditional sites such as graveyards, villages among others should be protected through the engagement of the local traditional leadership and communities.
MINISTRY OF LABOR AND SOCIAL SECURITY
Areas of concern –
  ➢ The Department must be engaged from the onset of the project to avoid labor related conflicts between the contractor and workers

CLOSING REMARKS
In concluding the meeting, the house resolved to continue meeting and work collectively to ensure multi-sectoral input to the planned projects. It was also resolved that any other developments will communicated to the consultants with regard to proposed plans by those directly involved.

The DAO thanked all who came and the consultant in particular for the consultative process which he believed had brought out pertinent issues in development of the terms of reference for the detailed social and environmental assessment and plans to be used in the next process.

CLOSING PRAYER
Prayer was given by a volunteer at 12:40hrs and the meeting closed.
### APPENDIX 3: ATTENDANCE LIST TO THE STAKEHOLDER MEETING AT CHIPATA CITY COUNCIL CHAMBER

<table>
<thead>
<tr>
<th>Name</th>
<th>Organization</th>
<th>Position</th>
<th>Contact Information</th>
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<tbody>
<tr>
<td>Nikes Chima</td>
<td>Chipata Consulting</td>
<td>Executive</td>
<td>Office: 0751438533</td>
</tr>
<tr>
<td>Zeph Consulting</td>
<td>Chipata Consulting</td>
<td>Director</td>
<td>Office: 0751438533</td>
</tr>
<tr>
<td>Michael Nalule</td>
<td>Agriculture Ministries</td>
<td>Manager</td>
<td>Office: 0751438533</td>
</tr>
<tr>
<td>Moses Zimba</td>
<td>Chipata Consulting</td>
<td>Manager</td>
<td>Office: 0751438533</td>
</tr>
<tr>
<td>Albert Mwabe</td>
<td>Chipata Consulting</td>
<td>Officer</td>
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</tr>
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<td>Solomon Mokola</td>
<td>Chipata Consulting</td>
<td>Officer</td>
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<tr>
<td>Alexander Mulungu</td>
<td>Chipata Consulting</td>
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<td>Samuel Chirwa</td>
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<td>Joseph Mwape</td>
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<td>Richard Mwale</td>
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<tr>
<td>Peter Mwape</td>
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Enviromental and Social Impact Assessment for the Proposed Construction of the Chipata Bypass Road and Chipata Dry Port in Chipata City of Eastern Province by the Road Development Agency (RDA)

**ESIA Final Report**
June 2019

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HELD ON 8TH FEBRUARY 2019

TO THE ESIA SCOPING MEETING

CHIPATA BY PASS ROAD (RDA/EC/AS/010/17)
Resettlement Action Plan (RAP) for the Construction of the Chipata Dry Port and the
Assessment (ESIA), Environmental and Social Management Plan (ESMP) and the
Consultancy Services for the Preparation of the Environmental and Social Impact
## Environmental and Social Impact Assessment

For the Proposed Construction of the Chipata By-Pass Road and Chipata Dry Port in Chipata City of Eastern Province by the Road Development Agency (RDA)

### ESIA Final Report

June 2019

### Attendace List

**Chipata By-Pass Road (RDA/CS/L5/010/17) Resettlement Action Plan (RAP) for the Construction of the Chipata Dry Port and THE ESIA) Environmental and Social Management Plan (ESAMP) and THE Consultant Services for the Preparation of the Environmental and Social Impact Assessment**

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