FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

Ethiopian Roads Authority

Meisso _ Dire Dawa Expressway Project

DRAFT

Environmental and Social Impact Assessment (ESIA) Report

. Aarvee Associates Architects Engineers & Consultants Pvt. Ltd.
In JV with Net Consult P.L.C

Addis Ababa, Ethiopia

February, 2021

Disclosed DRAFT for support of the public consultations and stakeholder engagement process

World Bank - COVER NOTE

The Environmental and Social Impact Assessment (ESIA) for Component 1 of the proposed Horn of Africa Initiative for Regional Economic Corridor Project financing by the World Bank is being disclosed in its present draft preliminary version as it will contribute to the ongoing public consultations and stakeholder engagement process of regional and local government officials and communities in the challenging context of COVID-19.

Although the ESIA is overall comprehensive and meets many of the requirements of the World Bank Environmental and Social Framework (ESF), this ESIA report is a draft preliminary report. Important amount of additional and more detailed assessments remain to be completed by the borrower to meet all ESF requirements applicable to this type of investment project and be approved by the World Bank. However, the draft ESIA in its present state is considered sufficient to be disclosed in the public domain as it will further contribute to the public consultations and stakeholder engagement process that is ongoing.

The proposed project consists of five components: i) construction of a 134km long, 4-lane fenced expressway connecting Mieso (in alternative spelling "Meisso") and Dire Dawa and if funding is available, another 72km-long Awash-Mieso section will be included as well; ii) construction and refurbishment of border posts, dry ports and other investments for trade facilitation and logistics enhancements; iii) a community livelihoods component for local communities, vulnerable and historically disadvantaged groups which includes construction of localized infrastructure including access roads, roadside markets, logistics facilities; iv) institutional strengthening and project management; and v) a Contingency Emergency Response Component (CERC).

The World Bank disclosed the Concept stage Environmental and Social Review Summary (ESRS) for the proposed financing by the World Bank of the Horn of Africa Initiative for Regional Economic Corridor Project on February 11, 2021. Both environment and social risks are rated High. The ESRS provides a description of these risks and the design and mitigation measures proposed to manage these risks. The ESRS also provides a summary description of the applicability of each the Environment and Social Standards (ESS 1 to 10) to the project as well as the instruments to be prepared by the borrower including the ESIA. An updated Appraisal Stage ESRS will be publicly disclosed upon the World Bank' review and clearance of the final ESIA.

A summary of environmental and social issues that will be further assessed and consulted upon to finalize the draft ESIA include but are not limited to the following:

- **Environmental and Social Management Framework (ESMF):** Should be developed to address impacts that will become known once the more specific Right of way (ROWs) and alignments are known and detailed engineering is available including for ancillary works that are unlikely to be determined until implementation. This ESMF would be a chapter of the final ESIA and should provide a clear and full picture of what will be covered, the steps to address E&S issues, and requirements for responsibilities and stakeholder engagement.
- **Ancillary works:** A preliminary assessment is included in Section 7.4.11 of the ESIA. An annex, to be developed, will provide further details. Among those ancillary works, material sites, disposal sites and access roads often have more significant impacts than others, hence should be highlighted in the

assessment. The ESMF noted above will cover those ancillary works that may not be determined at project preparation.

- **Alternative analysis:** Further work is needed to address that needs inputs from engineering design.
- **E&S scoping and assessment:** Regarding presenting scoping results, further refining the table 7.2.3-1 and Annex A is needed. Project's technical design is well advanced and three rounds of consultation have been done, which should be fully reflected in the impact assessment and mitigation.
- **Cumulative impacts:** Needs further work to show key elements and steps of a Cumulative Impact Assessment (CIA): define spatial and temporal boundaries; identify various actions and sources of impacts; identify VECs; describe baselines tailored to CIA assessment; cumulative impact assessment and mitigation strategies. Also since this is phase 1 CIA, Terms of Reference for the phase 2 should be developed based on phase 1 findings.
- **Regional impact assessment:** Given the type, scale and diversity of the project activities associated with Components 1, 2 and 3, we recommend including a regional impact assessment. This can start with a preliminary assessment of strategic/regional environmental and social impacts in the ESIA is preliminary and a TOR for more in-depth assessment to be conducted during implementation.
- **Environmental and Social Management Plan (ESMP):** Needs to be more detailed, specify implementation arrangements, and standards to be complied, monitoring with budget updated based on additional assessments and all project activities.
- **Free, Prior and Informed Consent (FPIC):** The ESF requirement for obtaining Free, Prior and Informed Consent (FPIC) is a key social issue. As such the ESIA will clearly and unequivocally state that a comprehensive process to obtain FPIC aligned with ESS7 is ongoing and that alternative ROW or road alignments will be developed if FPIC of communities is not obtained and documented. Furthermore, the ESIA should indicate that since the road project is still at the design stage and the specific detailed engineering alignment of most road segments and respective ROWs is not known, and also given the access challenges related to COVID, the completion of the engagement process to obtain FPIC from all communities may occur during project implementation. Nevertheless, the project ESCP will clearly commit that no road segment or ROW will be built in areas where FPIC has not been clearly obtained and documented from communities.

Note that, as outlined in the disclosed ESRS, several additional risk management instruments will be developed, including a resettlement framework, a Gender Based Violence Action Plan, Labour Management Procedures, etc. (see ESRS for details). They will be disclosed separately.

World Bank/International Development Association, February 24, 2021

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AASHTO	American Association of State Highway and Transportation Officials
AfCAP	African Community Access Partnership
BC/SC	Box Culvert / Slab Culvert
CEFCC	The Commission for Environment, Forest and Climate Change
CI	Cumulative Impact
CIS	Corrugated Iron Sheet
COVID-19	Corona Virus Disease 2019
CPA	Conditions of Particular Application
CSE	Conservation Strategy of Ethiopia
DC	Design Class
EA	Environmental Assessment
ECA	Environmentally Critical Areas
EHS	Environmental, Health, and Safety
EIA / ESIA	Environmental Impact Assessment / Environmental and Social Impact Assessment
EIS	Environmental Impact Statement
EMB	Environmental Management Branch
EMP / ESMP	Environmental Management Plan / Environmental and Social Management Plan
EMSB	Environmental Monitoring and Safety Branch
EPA	Environmental Protection Authority
EPE	Environmental Policy of Ethiopia
ERA	Ethiopian Roads Authority
ERC	Ethiopian Railway Corporation
ESA	Environmental and Social Assessment
ES	Environmental Specialist
ESCP	Environmental and Social Commitment Plan
ESDP	Education Sector Development Program
ESIA/EIA	Environmental & Social Impact Assessment / Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
ESOSD	Environment, Social and Occupational Safety Directorate
ESSF	Environmental and Social Safeguard Framework
ETB	Birr / Ethiopian Birr
ETP	Education and Training Policy
FDRE	Federal Democratic Republic of Ethiopia
Fig.	Figure
GCC	General Conditions of Contract
GHGs	Greenhouse Gases
GoE	Government of Ethiopia
Ha	Hectares
HH	Household
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome

His	Health Institutions
HSDP	Health Sector Development Program
IBA	Important Bird and Biodiversity Area
IEC	Information, Education and Communication
IT	Information Technology
JV	Joint Venture
KM	Kilometre
l.	Litters
LHS / RHS	Left Hand Side / Right Hand Side
LULC	Land Use Land Cover
masl	Meter above Sea Level
Max / Min	Maximum / Minimum
mg	Milligram
mm	Millimetre
MCA	Multi-Criteria Analysis
MoFEC	Ministry of Finance and Economic Cooperation
MOFED	Ministry of Finance and Economic Development
MOLSA	Ministry of Labour and Social Affairs
MSDS	Material Safety Data Sheets
NAP-GE	National Plan of Action for Gender Equality
N/A	Not Applicable
NCS	National Conservation Strategy
NGO	Non-Government Organization
No.	Number / Serial Number
ODS	Ozone Depleting Substances
OHS	Occupational Health and Safety
OHSMP	Occupational Health and Safety Management Plan
ORA	Oromia Road Authority
PA	Peasant Associations
PAP	Project Affected People
PC	Pipe Culvert
PCR	Physical and Cultural Resources
PLC	Private Limited Company
PPE	Personal Protective Equipments
PM	Particulate Matter
PSNDP	Productive Safety Net Development Program
RAP	Resettlement Action Plan
RE	Resident Engineer
RHS / LHS	Right Hand Side / Left Hand Side
RK	Rural Kebele
RoW	Right-of-Way
RSDP	Road Sector Development Program
RSM	Route Selection Manual

SEP	Site Environmental Plan
SHs	Stakeholders
STI / STD	Sexually Transmitted Infections / Sexually Transmitted Diseases
TD	Tender Document
TMP	Traffic Management Plan
ToR	Terms of Reference
URRAP	Universal Rural Access Project
USD	United States Dollar
UTI	Upper Tract Infections
VOC	Vehicle Operating Cost
VPD	Vehicles per Day
WB	The World Bank
WHO	World Health Organisation
UNESCO	United Nations Educational, Scientific and Cultural Organization

EXECUTIVE SUMMARY

The corridor from Meisso to Dire Dawa lies along the along the Addis _ Djibouti Transit and Transport Corridor, which is the major passage to the national export – import commerce. The existing trunk road provides service to fuel tankers, trucks and different automobiles, where it has come in to pressure to accommodate the growing traffic in relation to continuously growing transit. Accordingly, the Government of Ethiopia (GoE) has allocated funds through the Road Sector Development Program for the Feasibility Study of Meisso – Dire Dawa expressway Road. The World Bank has the recent in financing the expressway project.

Through a bid, consequently, the consultancy for Detail Feasibility Study and Preparation of Procurement Document of the Meisso – Dire Dawa Expressway Road Project was awarded to Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. in Joint Venture with Net Consult P.L.C. in February 2020.

Environmental and Social Impact assessment (ESIA), presented in this document, is part of this service and aims to predict the environmental impacts of the developmental activities at an early stage in project planning & designing to find ways and means to reduce their adverse impacts, shape the project to suit the local environment and present options to decision-makers. It is a systematic process to preview current scientific knowledge to check the social and environmental consequences of projects, policies and programmes and device strategies to mitigate their adverse impacts. The ESIA has been prepared in compliance to national legislations, manuals of CEFCC and ERA, and the World Banks framework for Environmental and Social Safeguard.

Design of the Road

The current study for the Meisso – Dire Dawa section will be part of the overall Adama _ Awash _ Meisso _ Dire Dawa Expressway networking to Addis _ Adama Expressway on the beginning side and making connection to Djibouti port at the end.

The project is designed to AASHTO's Freeway standards (AASHTO, A Policy on Geometric Design of Highways and Streets and ERA's Geometric Design Manual (ERA's Latest Version Geometric Design Manual). Based on the design standards for the project, the main road will have a total length of 141.8 km and DC-5 standard for Freeway and Link Roads, having a right of way (ROW) of 90m. There will be two lanes of 3.60 m width on each carriageway that means 2 x (2x3.6) which is equal to 14.4 m, 1.5 m wide inner hard shoulder, 3 m wide outer hard shoulder, 0.75 m wide outer soft shoulder in each side of the expressway, and 9 m median at the centre.

The route crosses the existing Mieso – Afdem – Bike – Dire Dawa Road segment three times. Hence, it will build vehicular crossings in these locations. Pedestrian, animal and railway crossings will as well be provided. The project also involves link roads to connect the expressway to the nearby towns at Meisso, Afdem, Bike and Erer towns. The project will demand utilisation of ancillary sites for extraction of water and material (sub-base, gravel, sand and rock) and establishment of different facilities, as camps, crushing plant and asphalt plant.

Project Location

The project Meisso – Dire Dawa expressway Road extends from the central to eastern part of the nation, crossing two regional states and one city administration. The commencing point of the project is at Meisso town, in Oromia Regional State. Offsetting to the north from the existing trunk road, it then follows parallel alignment to Meisso _ Afdedm _ Erer gravel road. Much of the alignment lies in Somali Regional State, crossing four woredas of the zone, i.e. Miesso, Afdem, Bike and Erer Woredas in Sitti Zone of of the regional state. The project finally end is at the northern part of Dire Dawa's city administration.

Baseline Environment

Topographic feature of the project corridor is, considerably, flat topography. However, only few sections of the adjacent corridor, near Bike Town and going towards Erer, the topography have mountainous natures. The terrain classification of the route, particularly, has predominantly (69% of the alignment), a rolling terrain, where as the rest (31%) exhibits flat terrain. The elevation of the project near the beginning near Meisso is 1394 masl. In the end section, Dire Dawa, it lowers a bit to 1276 masl. The project area dominantly falls under the climatic zone of Kolla /Hot-Warm/ characteristics which have moderately warm temperatures.

The temperature in Meisso Woreda of Somali has annual average maximum 36 ^{o}C and minimum 24 ^{o}C temperature. Getting warmer as going further, maximum and minimum annual average temperature gets from 40 ^{o}C to 27 ^{o}C and 13 ^{o}C to 23 ^{o}C in Erer woreda and Bike Woreda respectively. The rainfall data shows that annual precipitation ranges from annual average 500 mm to 700 mm, 650 mm to 850 mm, 500 mm and 650 mm in Meisso Oromia Woreda, Afdem Woreda and Dire Dawa.

Main vegetation along the corridor is made up of Acacia-dominated woodland. The ecosystem also includes Jatropha, Prosopis Juniflora, and Euphorbia Abyssinica. There are also significant grazing and agricultural areas along the road project. Agricultural production includes both rained and irrigation framings. Main products are Corn, Barley, Sesame, Oranges, Tomato, Mango, Banana, Onion, etc...

In hydrologic aspects, the project corridor lies in the Awash Basin, starting in the basin's south-western part and runs to its south-eastern part, crossing multiple rivers tributary to Awash. Geologically, the dominant formation of the project corridor is Volcanic Rocks formation; with Pleistocene – Oligocene – Miocene formation being dominant. Soil type along the route has Lithosols characteristics, in the first half till mid part, changing to Gieyic Solonchaks, and Lithosols and Eutric Regosols characteristics near the end. Erosive soil forms and gully formations were watched near KM 121+500.

Local communities rely on natural resources of water resources and wood / vegetation. Furthermore, the corridor was noted to be highly vulnerable to risks of drought, flood and malaria risks. COVID-19 Epidemic & Locust spared were recent disasters in the corridor. Majorly, the locust disaster has incurred damages to farmlands, vegetation and grazing lands. Yet, data for the scales of these impacts were not adequately gained. T

The local people in these areas are pastoralists and agro- pastoralists. The most important livelihoods are livestock production and farming (agro-pastorals), where most of the population is cattle breeders, mainly sheep and cattle, in less productive areas camels and goats. The population in the traversed woredas is a total of 9,773 people. Ethnically, oromo and somali people are major components of the community. Most of the population has Muslim religion.

The communities, based on the assessment, are also considered to be underserved communities with relatively lower development. They exercise their own lifestyle and norms in regards of marriage, death, social support mechanisms and property ownership and inheritance. Notably, vulnerable groups along the project influence area are the local underserved communities, men and women members of the community, GBV survivors and project workforce.

Labour employment in the area had concerns of GBV, child labour, lower awareness of rights and obligations. Security incidents were noted to be recent incidents. These incidents were occasional where the causes for most were ethnic tensions.

Alternative Analysis

The design study proposed three alternative routes for comparison, taking section from Awash to Meisso and to Dire Dawa. Alternative 1 and 2 start at the end of Adama _ Awash section, (exit of Awash town in Afar), then goes to Dire Dawa via Meisso, Mulu, Afdem and Erer. The first alternative takes shortcuts becoming more directional which makes it the shortest of all alternatives, with 202.8 KM length. But the second one doesn't takes shortcuts becoming in most cases parallel and/or near to the existing gravel road, railway lines and towns in Sitty zone, which makes it a bit longer than the former alternative, about 206.8 KM. The third alternative route basically runs along and the road from Awash to Dire Dawa via Chiro. It has a total length of about 283.8 KM starting from Awash and ending up on the Dire Dawa – Dawalle Highway.

In summary, based on the environmental route selection, following ERA's Route Selection Manual 2013, alternative 1 and 2 were preferred equally, as they have higher vegetation clearance from the third but better characteristics and less impacts of water resources, farming, soil erosion and landscape alteration.

In most criteria related to terrain, landscapes, erosion, farm, hydrological related impacts the impact from the third alternative is very high. For this reason this route is not environmentally preferred.

Finally, with overall MCA route selection analysis of different disciplines, i.e. Engineering, Social, Environment, Economic and Administrative preferences and selection results, Alternative 2 has scored the highest, 89.22 out of 100 percentages. Accordingly, alternative 2 was the selected route, and design of the expressway was done for this alignment.

SHs Consultations

Consultations to local administrations and community representatives were carried out in multiple stages.

- → The first consultation was made from 2nd to 3rd of June 2020 and at second stage it was made from 28th October to 9th November 2020. These consultations were conducted with SHs with the aim of informing stakeholders and administrative bodies about the project, identify towns and important points, gather their opinion, consult them in the route selection and discuss on the overall project implementation and potential impacts.
- → Additionally, from 14th to 18th of December, 2020 representatives of local community with different age and community groups (kebele leaders, religious leaders, women representatives and youth representatives) from all traversed kebeles were gathered to woredas and consulted. The discussions were particularly on the ESIA aspect of the project with the aim of informing them on the expressway study, take their opinion on social and environmental components, identifying sensitive environmental issues, discuss on environmental considerations and mitigations and compensation issues.
- → Moreover, extra consultations were made from December, 29th 2020 to 5th January, 2021 with the aspire to gain additional data collection. Particular data on community health, gender violence, waste and pollution, and security were collected during this consultation. Data collected from these consultations were also used for the preparation of the project specific community H&SMP, GBV Management Plan, Social Assessment and Social Development Plan, OHSMP, Resource Efficiency and Pollution Prevention and Management Plan, and Security Management Plan.

Environmental Impact and Mitigations

The project is expected to increase mobility with beneficial implications of enhanced import export, better road safety, induce economic development and social services. The project will also create job opportunities to local communities from its construction activities.

Government bodies of regional and federal level are recommended to conduct necessary maintenance works, protect the infrastructure. To enhance potential benefits efficient bureaucracy shall be created in supporting the local people to participate in potential businesses. The expressway directorate, within ERA with these administrative bodies shall attempt to engage local community in business opportunities and lead them on how to benefit from the business opportunities.

Like many other development projects, however, the construction of this expressway will also have adverse impacts on the natural and social environment. Evaluation of impacts took natures (direct, indirect and cumulative), duration and scales. Security and OHS risks were also taken in depth analysing risks in range of levels.

Scenarios of project impacts post-mitigation implementation or pre-mitigation measures were also into consideration. Similarly, the project impact was analysed in combination to cumulative impacts.

Brief summary of anticipated impacts are:

Impact on Surface and Ground Water Resource: availability reduction and flow modification due to project activities and water consumption, and pollution from storage of petrol diesel, oil and lubricants, bitumen, and solvents, disposal of used oil, lubricants and solvents, asphalt plant, use of bitumen, camps.

Impact on Soil: Erosion due to earthworks, spoil material, quarries and borrow pits and contamination from wastes at different facilities. Like that of water resources, soil could as well be contaminated from similar sources.

Land Use and Landscape Alteration: Land taken for the expressway and related activities will alter the existing land uses. Though is aligned along flat and rolling terrains at ancillary sites landscapes are to potentially be altered significantly.

Impact on Biodiversity: The project will not cross over conservation area or park. In clearing operations of excising bush lands, dominated with acacia tree vegetation, and grazing lands vegetation and fauna resources are to, still, be at risks. The project will demand clearing of 156.83 Ha of vegetation to be cleared in the alignment. Additionally, 40.67 Ha of land will be required for gravel, sub-base, and rock extraction sites. Most of the sites for these land acquisition are covered with scattered bushes, with few areas of farm. Moreover, access roads will be cleared for many of these sites, taking more land of 15.83 Ha. Invasive alien species will also have the potential to be introduced risking biodiversity nature of the area. Some of the land takes for exploitation of material are to be temporary, while some are to be permanent.

Air Pollution: Higher GHG emissions during construction and operation periods are expected. Dust pollution is majorly expected in time of construction.

Noise and Vibration Increment: Operation of construction equipment will pollute the local communities creating higher noises and vibration. Higher traffic at time of service will also incur similar pollutions.

Waste Generation: Different forms of wastes including earthworks, camps, garages, clinics, sanitary or domestic wastes, other solid wastes, use of pesticides, clinical wastes and other hazardous and non-hazardous wastes are to be generated from different facilities necessary for the expressway construction. As disposal site for wastes from earthworks 162.6 Ha area of land will be required.

Risks to Community Health & Safety: Health risks of COVID-19, malaria, HIV/AIDS, and other types of diseases will likely be higher. Exposure to higher risks of hazards as drought and flood are have the prospective of being more recurrent from the modification of the environment resources and will demand apprehension considering the lower resilience of communities. The community, since the expressway will be fenced from both sides will have limitation of access for pastoral and other reasons of ordinary lives. The operation and construction of the road will as will pose safety risks to the community nearby.

Resource Consumption: Energy, water and other natural resources will be utilised. These will mainly compete against local peoples' consumption of the resources.

Security Risks: Without proper management, higher risks of security issues could disseminate. Nature of these risks could be from internal or external causes of events.

OHS Risks: Hazardous work sites, construction equipment and machinery, transport vehicles, lack of signs, etc..., will involve posing safety risks to workers.

Land Acquisition and Impact on Livelihood: Total farm area of 1148.97 hectares, 1148.97 hectares of grazing land and private trees will as well need to be cleared. Livelihood of local underserved communities relying on these lands will be at indirect risks. Impact to Properties: A total of 631 houses will be displaced for the expressway. The project will as well have impact on utilities, however, is likely lower. Specifically, the RAP prepared during the study of the project has presented the details of land acquisition and impacts to properties.

Impact on Local Underserved Communities: Indirect social impacts of to the culture of local communities will be potential concern. Most importantly Women and Vulnerable Groups will be in more of the likely strain. Labour employment, labour influx, GBV occurrences will as well be concerns of the project to the social environment.

Archaeological, Cultural or Historic Sites: As per the observations and study made to the project environment, there are no archaeological, cultural or historic sites of importance that would be affected or expected to have negative environmental influence. Yet, precaution measures are considered up on coming across any site of such significance, as stated in management measures.

Cumulative Impacts: Based on evaluation of CI for the ESIA, significant cumulative impacts are to be anticipated in relation to limitation of community access, impact on water, vegetation loss, erosion and sedimentation, land use alteration, noise and vibration, cultural and social impacts, community health were evaluated to be higher.

After identification and evaluation of potential impacts of the project, ESIA has formulated respective mitigation and management measures. Measures for biodiversity management, conservation of natural resources, restoration of ancillary sites, physical / engineering environmental protection measures, re-vegetation mechanisms, control of invasive alien species, GHG reduction, dust control, noise and vibration reduction, efficient use of energy,

resource and materials, reduction or minimising wastes, construction time site selection decision, preparation and work methodology measures, community temporary and permanent crossings grants, OHS measures, labour procedure management, emergency, fire precaution and community safety measures, GBV risk control, health and first aid facilities, training and capacity building, community engagement and communications, compensation and livelihood restorations are forwarded in detail. Furthermore, the ESIA has taken components of:

- Ancillary Works and Sites Management,
- Community Health and Safety Risk Management,
- GBV Risk Management,
- Resource Efficiency and Pollution Prevention and Management,
- Security Risk Management,
- Social Development,
- Occupational Health and Safety (OHS) Management, and
- Labour Procedure.

Accordingly, specific assessment and risk management plans have been prepared for each aspects of the project.

Environmental Management and Monitoring

In order to be effective environmental management implementation must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed and constructed and functions efficiently throughout its life. Accordingly, in the ESIA, management and monitoring plans to implement the mitigation measures are projected alongside estimated costs of mitigation activities and monitoring work. This included bio-engineering mitigation measures, monitoring activities, controlling the spread of HIV/AIDS and Malaria, and also training of environmental specialists. The environmental mitigation; monitoring and capacity building cost were estimated to be Ethiopian Birr 38,940,000 [Thirty Eighth Million Nine Hundred Forty Thousand].

Consequently, it is highly recommended to take these environmental considerations for the final design of the expressway. Overall feasibility of the road with all options of alignment and mitigation options need to be well considered. For the selected alignment and mitigation option, the detailed design of the road shall be well integrated with these environmental considerations.

Chapter 1. INTRODUCTION

1.1. Background

Environmental and Social Impact assessment (ESIA) is a systematic process to apply current scientific knowledge to check the social and environmental consequences of projects, policies and programmes and device strategies to mitigate their adverse impacts. Accordingly, this ESIA was prepared with the aims to predict the environmental impacts of the developmental activities at an early stage in project planning & designing to find ways and means to reduce their adverse impacts, shape projects to suit the local environment and present options to decision-makers.

The Government of Federal Democratic Republic of Ethiopia (FDRE) represented by the Ethiopian Roads Authority (ERA) has allocated funds through the Road Sector Development Programs (RSDPs) for Consultancy Services for Detail Feasibility Study and Preparation of Procurement Document of Meisso – Dire Dawa Expressway Project. The financing for the implementation of the project is to be, potentially, from the World Bank. For this reason, ERA has required the consultancy Services for Detail Feasibility Study and Preparation of Procurement Document for the mentioned project. The study, though a bid, was awarded to Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. in Joint Venture with Net Consult P.L.C.

This road will be part of the overall Adama _ Awash _ Meisso _ Dire Dawa Expressway networking to Addis _ Adama Expressway on the beginning side and making connection to Djibouti port at the end. The studies for the other sections have been carried out previously; where the current study is for the Meisso _ Drie Dawa Expressway.

As part of the service, the ESIA study for the planned Meisso – Dire Dawa expressway Road Project was carried out, which is presented in this document. The study is concerned with the detailed assessment of the issues and associated with impacts identified in the scoping phase for which additional understanding of the nature of the impact (biodiversity, air pollution, land take, noise levels etc.) and / or the sensitivity of the receiving environment or receptor and socio-economic conditions in the project area is required to make an informed decision.

The ESIA study will present and review legal documents and frameworks, the baseline environment, consultation to the public and local administrations, comparison of alternatives, potential environmental and social impacts, and proposed mitigations. The alternative analysis has taken three alternatives to compare best suitable route from different perspectives. The ESIA is conducted in detail scope to the selected alignment and mitigation mechanisms are forwarded.

This ESIA study has been carried out in line with the requirements of the terms of references, guidelines of the project client, Ethiopian Roads Authority (ERA) and also taken international framework and guidelines specifically the Environmental and Social Safeguard Framework (ESSF) of the World Bank. The issue to be addressed here is how environmental damage can be avoided or reduced so as to ensure that the road development initiatives and their benefits are sustainable. The directive of environmental management would be to achieve the greatest benefit presently possible for the use of natural resources without reducing their potential to meet future needs and the carrying capacity of the environment. Construction and development of road network occupies large area of land, consume material resources and human labour, which requires careful planning and monitoring of the activities so as to minimize the adverse impacts.

1.2. Objectives

The main purpose of ESIA in road development is to identify the positive and negative impacts of a proposed road project on the natural and social environment and then to formulate appropriate remedial / mitigation measures to avoid / minimize adverse negative impacts and to enhance beneficial impacts.

Specifically, the primary purpose of conducting an ESIA is to ensure that the environmental effects of the proposed road projects are adequately and appropriately addressed in the design and construction activities to be undertaken for the Construction. The specific objectives of the ESIA report are:

- Present basic baseline information on biological and physical environment of the project and identify sensitive environmental components;
- Introduce project area communities' ways of life, cultural, socio-economic and other circumstances;
- Carry out public and stakeholders consultation, to inform them on the project and take in their regards, concerns and suggestions on potential impacts of the project;
- Analyses of Alternative routes and design options;
- Identification and Analysis of potential environmental and social risks, mitigation measures and costs required for the feasibility, design and construction phases.
- Identify and incorporate applicable environmental protection provisions, occupational health and safety (OHS) requirements and social impact mitigation considerations in the Employer's Requirement;
- Provide all the necessary information for the Ethiopian Roads Authority (ERA), Regulatory bodies, and the financier to assess the proposed project in environmental and social terms;
- Incorporate social, health and safety, labour, GBV control, community health risk management provisions applicable to the road project construction; and
- Provide a base for further environmental and social risks management and propose monitoring mechanisms for time of construction.

1.3. Scope of Study

The Terms of Reference (TOR) prepared by the Client, ERA, and the ESSF of the WB calls for the assessment of impacts of the Road Project on the environment of the project area; and to identify the potential sources of environmental impacts. They also require the design consultant to forward the corresponding required mitigation measures for adverse impacts; to undertake public consultation and prepare Environmental Management and Monitoring Plans.

Road projects belong to development interventions that are expected to pose impacts (beneficial and adverse) on the environment. Therefore, to assess the potential impacts of the project on the environmental resources, it is necessary to identify and analyse the potential impact areas of the project. Thus, the ESIA study will deal with the identification, prediction and evaluation of the impacts of the proposed Road Project. Following the identification and evaluation of impacts, it also identifies and proposes measures aimed at avoiding or minimizing adverse impacts on the one hand, and enhancement measures of the beneficial ones on the other side.

The geographic scope of the study will be surrounding environment / corridor of the road including surrounding natural setting and settlement areas [rural settlements and major town in close vicinity] and beyond interconnected watershed areas and streams of the project site. These include, generally:

- Traversed Natural Environment, Settlements and Public/Private Properties;
- Other development Projects in the district that may bear cumulative Impacts;
- Sources of energy, water and other construction Materials;
- Construction technology and use of equipment related to the projects major activities; and
- The environment and social structures far from the project area that may be affected directly or indirectly (Watershed, biodiversity, community health, culture, access, etc.).

1.4. Project Location

The planed project, Meisso _ Dire Dawa Expressway, geographically lies in the central-eastern part of the country. This road under current study will be part of the overall Adama _ Awash _ Meisso _ Dire Dawa Expressway networking to Addis _ Adama Expressway on the beginning side and making connection to Djibouti port at the end.

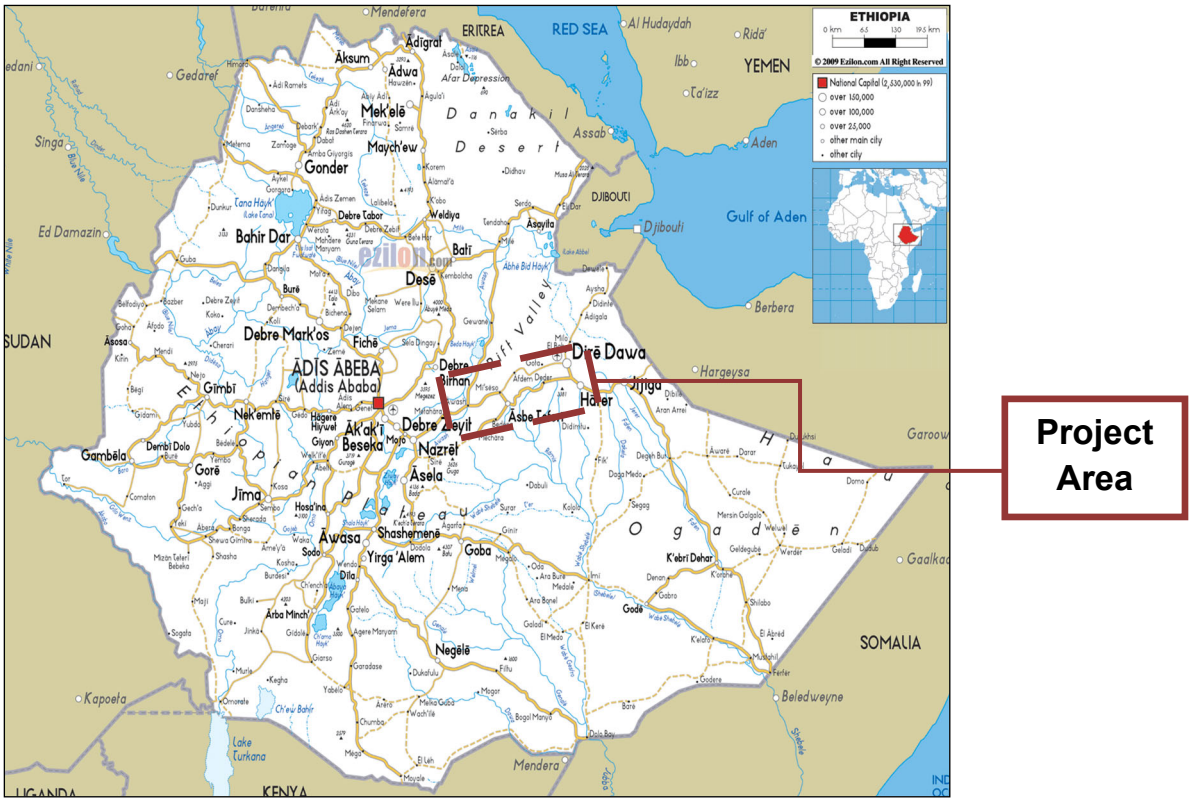


Figure 1.4-1: Project Location

The current project alignment crosses two regional states and one city administration. The commencement is at the north-eastern part Oromia regional state, in Meisso Woreda of West Hararge Zone, then to go in to Somali Regional Stae, wehre most of the project stretch lies in, within Meisso, Afdem, Bike and Erer Woredas of the Sitti Zone. Finally, it terminates in the northern part of Dire Dawa's city administration.

The project has control and intermediate points which are listed below.

Table 1.4-1: Control Points of the Project

Town (Village)	Location		Station (KM)	Remark
	Easting	Northing		
Miesso	691693	1021649	70+300	Project Biginning In Meisso Woreda, West Hararge Zone, Oromia
Dire Dawa	809309	1066449	206+800	Control Point and Project End In Dire Dawa City Administration

The assessment took a desk study and data collection of primary and secondary data from field physical assessment and data collection from local woreda bureaus, using prepared forms and questioners. Community & SHs consultations and were also carried out in different stages.

The project area is in Awash River Basin with climatic zone of Kolla /Hot-Warm/ characteristics. The alignment of the project crosses only flat to rolling terrains. Majorly, the land use is bush land vegetation with acacia woodland and few grazing areas. There are also farming practices, most prevalently, in the project beginning and end. Yet, the most dominant practice and activity of the project area communities is agro-pastoralism. The area has rural setting, crossing along local Somali and Oromo communities underserved communities, with lower infrastructure development, lower GHG and other pollutions and existing gravel road from Meisso to Erer and to Dire Dawa, with mild level of dust pollution.

The local community is dependent on natural resources of wood consumption for energies and utilisation of rivers in the project area for people's drinking water, animals' drinking water, and domestic uses. Natural hazards of drought, malaria and recent occurrences of locust disaster and COVID-19 epidemic were identified. Based on the assessment, security issues are prevalent from occasional ethnic tensions, where the local underserved communities usually address these concerns with indigenous conflict resolution methods. Major sensitive receptors related to the construction of the project are trees and shrubs, water resources, local underserved pastoral and farmer communities, vulnerable groups and project workers. Vulnerable groups in the project area are:

- Local underserved communities' pastoral and agricultural lifestyle and culture,
- Male and female community members more particularly elders, girls and women with in 5 Km radius of project camp, sub camps and active road construction work areas with influx of huge number of construction workers;
- All men and women working in the road project and more particularly women;
- Survivors of gender based violence, sexual exploitation and abuse;
- Contractor and consultants staff;

1.5. Project Description

The project is designed to AASHTO's Freeway standards for main road with total length of 141.8 KM, and DC-5 standard for Freeway and Link Roads, having a right of way (ROW) of 90 m.

The project will also involve link roads connecting to major towns, with width of 50 m Right-of-Way and will have a design class of DC5.Vehicular and Pedestrian Crossings will as well be provided, where the quantity of structures proposed in the design are 24 and 55, respectively.

The project is expected to construct 119 cross drainage structures. Ancillary works of material extraction, clearance for access road, establishment of camps, asphalt and crusher plants are to be part of the expressway construction.

1.6. Report Structure

This ESIA Report for the road project of both parts is, generally, summarized hereunder. It is organized with the following contents:

I. The first section, ***chapter 1***, is the introductory section containing issues such as project background, objectives and purpose of the Study, description of major project features and project activities likely to cause environmental and social impacts;
II. ***Chapter 2*** presents policy matters relevant to the project undertakings. That is, the Administrative, Environmental, Policy and Legal Frameworks are presented; Other than legal instruments it also discusses other reference materials used and administrative frameworks;
III. In ***chapter 3***, discusses the methodology followed during the ESIA study;
IV. The next section, ***chapter 4***, will describe the project, i.e. details of the scopes and activities of the project;
V. In ***chapter 5***, the existing baseline environmental and social conditions are depicted; This looks into the biological, physical and social conditions along the project area;
VI. In ***chapter 6***, deals with the alternative assessment for the project design study in aspects of location, design and the No-Project scenario;
VII. In ***chapter 7***, the identification of potential bio-physical and social risks (beneficial and adverse impacts), the sources of impacts and evaluation of impacts are described along with respective enhancement and mitigation measures for respective positive and adverse impacts;;
VIII. ***Chapter 8*** encompasses the environmental and social management plan is shown as a result of project location, design, construction and operation. In addition, environmental and social monitoring plan during construction phase is presented. This includes costs of Environmental Mitigation, Management and Monitoring are presented.
IX. In ***chapter 9***, contains the conclusions derived from the Study and major recommendations forwarded for the sustainability of the Project;

X. ***Chapter 10*** is the disclosure plan for the study results; and
XI. The last section, ***chapter 11***, lists key issues to be included in the bidding document.

Additional to the main body of the ESIA, some sections were dealt discretely in more depth and specific management plans were prepared accordingly. Hence, the ESIA will include specific plans of:

- The process and outcomes of the SHs and public consultations made;
- Ancillary Works and Sites Management Plan;
- Gender Based Violence Risk Assessment and Management;
- Social Assessment and Social Development;
- Community Health and Safety Management;
- Occupational Health & Safety Management;
- Resource Efficiency and Pollution Prevention and Management; and
- Security Management.

Chapter 2. POLICIES, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

2.1. General

It is indispensable that development programs and projects should comply with available policies, legislative and institutional frameworks and standards for proper execution and implementation as part of ensuring their sustainability. Knowledge of the policy and legal frameworks within which the project is going to be implemented would facilitate the project performance and helps to ensure sustainable development. There are several policy and legal documents both at federal and regional level as regards to environmental management and development projects such as the Project under consideration.

Understanding of policies and administrative structures, under which the project implementation and the environmental assessment and management study operates, would assist in the efforts made for sustainable development and natural resource conservation measures.

On this basis, this section discusses the National Development and Environmental Policies and Sectoral Strategies, Legislations and Guidelines, Institutional arrangements, land accusation, tenure rights and expropriation procedures that are relevant to the Project implementation.

2.2. Overall Policy and Legal Framework

The economic policy of the Federal Democratic Republic of Ethiopia (FDRE) is a market – based, agricultural led industrialization mode of economic development. The administrative structure is at federal as well as regional level with duties and responsibilities shared among them.

In light of the foregoing policy, the responsibilities of development activities are clearly delineated between Federal and Regional Governments based on the scale, characteristics and magnitude of the investment to be undertaken. Accordingly, management of main roads connecting two or more regions is under the jurisdiction of the Ethiopian Roads Authority (ERA), while the management of roads, rural and urban, within a region is the duty of the respective regional government.

The Environmental Policy of Ethiopia (EPE) was approved by the Council of Ministers in April 1997. Its preparation was based on the policy and strategy findings and recommendations of the Conservation Strategy of Ethiopia. The policy document contains elements that state the importance of mainstreaming socio-ecological dimensions in development programs and projects.

The National Conservation Strategy (NCS) which was developed through the consultative process over the period 1989-1995 takes a holistic view of natural, human made and cultural resources, and their use and abuse and seeks to integrate into coherent framework plans, policies and investment related to environmental sustainability. The document consists of five volumes i.e., the Natural Resource Base, Policy and Strategy, Institutional Framework, the Action Plan and Compilation of Investment Program.

A number of proclamations and supporting regulations were made that contain provisions for the protection and management of the environment that reflect the principles of the Constitution and EPE.

The following sections present policies relevant to the environmental assessment (EA) of the Meisso – Dire Dawa Expressway Project.

2.3. Constitution of the FDRE

The Constitution of the Federal Democratic Republic Ethiopia (FDRE), adopted in August 1995, forms the fundamental basis for enactment of specific legislative instruments governing environmental protection matters at national level. The Constitution has several provisions which have direct policy, legal and institutional relevance for appropriate implementation of environmental protection and rehabilitation action plans targeted to avoid, mitigate or compensate the adverse effects of development actions.

The Constitution thus contains a number of articles which are relevant to environmental matters in connection with development projects, as well as to the environment in general, and the prominent Articles relevant to the proposed Road Project include:

1. Article 43 gives the right to people to improved living standards and to sustainable development;
2. Article 44 states that all person have the right for a clean and healthy environment;
3. Article 44.2 indicates that interventions for public goods that cause the displacement of people or adversely affect the livelihood of the local population shall give the right to commensurate monetary or other means of compensation including relocation (resettlement) with adequate State assistance. This provision has a strong relevance for the resettlement action plan;
4. Article 92, which sets out national policy principles and objectives, includes the following significant environmental objectives:
    - Development projects shall not damage or destroy the environment,
    - People have the right to full consultation and the expression of views in the planning and implementation of environmental policies and projects that affect them directly, and
    - Government and citizens shall have the duty to protect the environment;
5. Article 40 states that ownership of both urban and rural land is vested in the State and the people and is common property which is not subject to sale or other means of exchange.

Ownership of Land under the Constitution of FDRE

The Constitution of the FDRE, in Article 40.3, states that land is a public property. There is no private ownership of land in Ethiopia. As per FDRE Constitution, rural or urban land could not be sold or mortgaged or transferred; people have usage right only. This right gives the user of the land, the right to use the land and the right to benefit from the fruits of her/his labour which may be crops, trees, etc. found on the land or any permanent works such as buildings etc.

Article 40.7 of the FDRE Constitution states that '*Every Ethiopian shall have the full right to the immovable property he builds and to the permanent improvements he brings about on the land by his labour or capital'*. If the land that is owned by an individual is expropriated by the government for public use, the person is entitled for compensation.

Article 44 No.2 of the Constitution of the FDRE states that:

"*All persons who have been displaced or whose livelihoods have been adversely affected as a result of state programs have the right to commensurate monetary or alternative means of compensation, including relocation with adequate state assistance*".

2.4. Policies and Strategies

2.4.1. National Environmental & Social Policies

2.4.1.1. Environmental Policy of Ethiopia

The overall policy goals of the Environmental Policy of Ethiopia (EPE) is described as *"…to improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human made and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs*".

The major guiding principles of the EPE are the following:

- Every person has the right to live in a healthy environment;
- Sustainable environmental conditions and economic production systems are impossible in the absence of peace and personal security. This shall be assured through the acquisition of power by communities to make their own decisions on matters that affect their life and the environment;
- Appropriate and affordable technologies which use renewable and non-renewable resources efficiently shall be adopted, adapted, developed and disseminated;
- When a compromise between short-term economic growth and long-term environmental protection is necessary, then development activities shall minimize degrading and polluting impacts on ecological and life support systems. When working out a compromise, it is better to err on the side of caution to the extent possible, as rehabilitating a degraded environment is very expensive, and bringing back a species that has gone extinct is impossible;

- Full environmental and social costs (or benefits foregone or lost) that may result through damage to resources or the environment as a result of degradation or pollution shall be incorporated into public and private sector planning and accounting, and decisions shall be based on minimizing and covering these costs;
- Conditions shall be created that will support community and individual resources to sustainably manage their own environment and resources;
- As key actors in natural resource use and management, women shall be treated equally with men and empowered to be totally involved in policy, programme and project design, decision-making and implementation;
- The existence of a system which ensures uninterrupted continuing access to the same piece(s) of land and resource creates conducive conditions for sustainable natural resource management;
- Social equity shall be assured particularly in resource use;
- Regular and accurate assessment and monitoring of environmental conditions shall be undertaken and the information widely disseminated within the population;
- Increased awareness and understanding of environmental and resource issues shall be promoted, by government officials and by the population, and the adoption of a "conservation culture" in environmental matters among all levels of society shall be encouraged;
- Local, regional and international environmental interdependence shall be recognized;
- Need for public consultation;
- Environmental impact assessments consider not only physical and bio-logical impacts but also address social, socio-economic, political and cultural conditions; and
- Need for environmental audit at specified intervals during the project implementation.

2.4.1.2. Conservation Strategy of Ethiopia

Since the early 1990s, the Federal Government has undertaken a number of initiatives to develop regional, national and sectoral strategies for environmental conservation and protection. Paramount amongst these was CSE, approved by the council of ministers, which provided a strategic framework for integrating environmental planning into new and existing policies, programs and projects. The CSE is approved by the Federal Government, and it is an important policy document. The CSE itself provides a comprehensive and rational approach to environmental management in a very broad sense, covering national and regional strategies, sectoral and cross-sectoral policies, action plans and programs, as well as providing the basis for development of appropriate institutional and legal frameworks for implementation.

The plan comprehensively presented the exiting situation within the country and gave priority actions plan on the short and medium term. In particular, it recognizes the importance of incorporating environmental factors into development activities from the outset, so that planners may take into account environmental protection as an essential component of economic, social and cultural development.Regional States were given the responsibility to prepare regional conservation strategies, detailing with the specific conditions and environmental issues prevalent in their territory, and outlining the ways in which problems were to be addressed. Following CSE, the Regional States have prepared Conservation Strategy document for their respective Regions.

2.4.1.3. Wildlife Policy

It is developed by the Ministry of Agriculture whose prime objective is the preservation, development and sustainable utilization of Ethiopia's wildlife resources for social and economic development and for the integrity of the biosphere. This is at present in draft form, and covers a wide range of policies and strategies relating, amongst others, to wildlife conservation and protected areas.

Based on international criteria, the protected areas of Ethiopia have been divided into four categories, each having its own laws and regulations. These areas are classified according to their management objectives and are designed to serve their own respective categories. The highest ranked are the National Parks, where strict legislation is applicable. These are followed by Game reserves, Sanctuaries and finally, controlled hunting areas. In Ethiopia there are a total of 10 National Parks, 11 Game Reserves and 3 Sanctuaries. In addition 18 areas have been designated as controlled hunting areas.

2.4.2. Water Resource Policy

The Ministry of Water Resources has formulated the Federal Water Resource Policy for a comprehensive and integrated water resource management. The overall goal of the water resources policy is to enhance and promote all national efforts towards the efficient and optimum utilization of the available water resources for socio-economic development on sustainable bases. The policies are to establish and institutionalize environment conservation and protection requirements as integral parts of water resources planning and project development.

2.4.2.1. Biodiversity Policy

The biodiversity policy, which was approved in 1998, provides guidance towards the effective conservation, rational development and sustainable utilization of the country's biodiversity. In general, the policy consists of comprehensive policy provisions on the conservation and sustainable utilization of biodiversity.

2.4.3. National Social Policies

2.4.3.1. National Policy on Population

Ethiopia developed its Population Policy in 1993. The rationale behind the policy is that with increased human numbers, the population carrying capacity of the land decreases. Forest cover is estimated to have declined from 40 to 3 percent. Large expanses of land with large herds of livestock are said "to play havoc with the environment". The policy has as its major goal:"The harmonization of the rate of population and the capacity of the country for development and rationale utilization of natural resources to the end that level of welfare of the population is maximized over time".

The general objectives of the population policy are:

- Closing the gap between high population growth and low economic productivity through planned reduction of population growth and increasing economic returns,
- Expediting economic and social development processes through holistic integrated development programs designed to expedite the structural differentiation of the economy and employment,
- Reducing the rate of rural to urban migration,
- Maintaining/improving the carrying capacity of the environment by taking appropriate environmental protection/conservation measures,
- Raising the economic and social status of women by freeing them from the restrictions and drudgeries of traditional life and making it possible for them to participate productively in the larger community,
- Significantly improving the social and economic status of vulnerable groups (women, youth, children and the elderly).
- The economic, social and political status of women is seen to have a direct bearing on the level of fertility in society. Early marriage for girls is seen as one of the factors that contribute not only to high fertility rates but also to high maternal, infant and child morbidity and mortality.
- Implementation of the Policy is seen as dependent on the functions of other ministries and departments as on the Population Department and the responsibilities of key ministries are given in this policy document.

2.4.3.2. National Policy on Women

The constitution of FDRE recognizes equal rights of women and men; however, the traditional societal structure keeps women in a very low position and vulnerable situation. Women occupy a very small percentage of key political and government decision making positions.

Harmful traditional practices are common in the country; about 80 percent of women have undergone Circumcision and other harmful traditional practices. Early marriage of young girls is a common occurrence among most cultures in Ethiopia. Some studies and reports suggest that violence against women is quite high and increasing every year. These trends, however, are gradually changing now days.

Ethiopian women also experience heavy work load and mainly domestic work. It is estimated that on average, women work 15-18 hours per day. Women also do not have access and control to resources. According to the 2003 Agricultural census, only 18.6% women among farming communities were able to have ownership of agricultural land. On the contrary, women among the pastoral communities could only own property if they could only have a male guardian.

The National Policy on Women was formulated in 1993, aimed to create appropriate structures within government offices and institutions to establish equitable and gender-sensitive public policies. The policy goals are: ensure women's right, create favourable environment for women, ensure the supply of basic services to women, and eliminate gender based discriminations.

The policy has four major objectives;

- Laws, regulations, systems, policies and development plans that are issued by the Government should ensure the equality of men and women, special emphasis should be given to the participation of rural women.
- Economic, social and political policies and programmes, as well as cultural and traditional practices and activities should ensure equal access of men and women to the country's resources and the decision making process.
- The central government and regional administrations should ensure that women participate in and benefit fully from all activities carried out by central and regional institutions.
- Development institutions, programs and projects should ensure women's access to and involvement in all interventions and activities.

In 2005, Women's Affairs Ministry was established to coordinate women's activities and translate the policy objectives.

In 2006, the Ministry of Women's Affairs issued the National Plan of Action for Gender Equality (NAP-GE) for the period 2006 – 2010. Its goal is "to contribute to the attainment of equality between men and women, in social, political and economic development".

The general objectives are:

- Enhanced rapid economic growth,
- Improved human development,
- Democratization and good governance, and
- Improved public institutional performance.

2.4.3.3. Health Policy of Ethiopia

Ethiopia's health policy was issued in 1993, with the aim of giving special attention to women and children, to neglected regions and segments of the population, and to victims of manmade disasters.

The priority areas of the policy are in the field of Information, Education and Communication (IEC) of health to create awareness and behavioural change of the society towards health issues, emphasis on the control of communicable diseases, epidemics, and on diseases that are related to malnutrition and poor living condition, promotion of occupational health and safety, the development of environmental health, rehabilitation of health infrastructures, appropriate health service management system, attention to traditional medicines, carrying out applied health research, provision of essential medicines, and expansion of frontline and middle level health professionals.

To translate the health policy into action, the Ministry of Health has developed a five year Health Sector Development Program (HSDP). Currently it is implementing HSDP III for the period from 2005/06 – 2009/10. HSDP lays an emphasis on service delivery and the quality of service, health facility rehabilitation and expansion, human resource development, pharmaceutical services; Information, Education and Communication (IEC), strengthening health sector management and management information system, monitoring, evaluation and research.

2.4.3.4. National Policy on HIV/AIDS

The HIV/AIDS pandemic is spreading worldwide and heating hard poor countries mainly. Sub Saharan Africa, with only 10% of the world population having 80% of the world HIV infection and AIDS cases. Among the Sub Saharan African countries, Ethiopia stands fifth in HIV/AIDS infection.

Ethiopia is one of the countries in the world that is facing HIV/AIDS pandemics, and about 3.5% of the population is said to be HIV/AIDS affected. HIV/AIDS has now become a major social and economic problem of a country. Having understood the magnitude of the problem, the Government issued HIV/AIDS policy in 1998.

The general objective of the policy is “to provide an enabling environment for the prevention and control of HIV/AIDS in the country”. The policy also urges government ministries and the civil society to assume responsibility for carrying out HIV/AIDS awareness and prevention campaigns.

The policy introduces and outlines the large social, psychological, demographic and economic impact that HIV/AIDS will be having and introduces a number of issues relating to HIV/AIDS.

These are:

- That HIV/AIDS is not only a health problem but also a developmental problem,
- That gender inequality contributes to the further spread of HIV/AIDS,
- That women, including women living with HIV/AIDS, need access to information and services regarding HIV/AIDS and to family planning provision to help them make reproductive choices and decisions,
- That the magnitude of the problem will need considerable resources and a multi-sectoral effort to control the HIV/AIDS epidemic,
- That there is a need for a holistic approach in the provision of care to people living with HIV/AIDS,
- That the human rights of people living with HIV/AIDS needs to be recognized,
- That HIV/AIDS has the potential for catastrophic impact.
- In 2000 National AIDS Council was established under the Chairmanship of the FDRE President; and in 2002 HIV/AIDS Prevention and Control Office (HAPCO) was established to address the problem.

2.4.3.5. Education Policy of Ethiopia

The Government's desire to improve the provision of quality education resulted in the formulation of the Education and Training Policy (ETP), In 1997 the Government of Ethiopia launched the first five year Education Sector Development Program (ESDP-I) within the framework of ETP as part of a twenty-year plan for the education sector. The main thrust of ESDP is to improve quality and efficiency and to expand access with special emphasis on primary education in rural and underserved areas, as well as the promotion of education for girls in an attempt to achieve universal primary education by 2015.

2.4.4. Road Sector Policies

ERA's Policy for HIV/AIDs Prevention & Control in the Work Places: The transport and construction sectors are among the most susceptible sectors for the spread of HIV/AIDS. In light of this, in June 2004, ERA has issued a policy for HIV/AIDS in workplaces, and a three-year strategic work plan for HIV/AIDS prevention and control. The policy acknowledges that HIV/AIDS pandemic is a reality in the workplace, and may have detrimental effects on the goals and objectives of the Authority. The policy is prepared with the objective of developing and implementing an effective workplace program.

Therefore, the authority:

- Commits itself to create a supportive and non-discriminatory working environment through dispelling of myths and stereotypes and by ensuring that infected employees are treated in the same manner as other employees,
- Seeks to minimize the social, economic and developmental consequences to the authority and its staff,
- Undertakes that management will provide resources and leadership to implement program for the prevention and control of the HIV/AIDS and sexually transmitted infections (STI),
- Commits itself to offering support, counselling and education services to infected & affected employees;
- Commits itself to establish and maintain an employee assistance program, and
- Insures sustainable resources for the prevention and control of HIV/AIDS.
- The ERA task force is responsible and accountable for all programs for prevention and control of HIV/ AIDS in the authority.
- The ERA's environmental monitoring and safety branch through the HIV/AIDS program coordinators is responsible for coordinating, implementing, monitoring and evaluating the policy provisions.

2.5. Legislations, Guidelines and Frameworks

2.5.1. National Legislations and Frameworks

There are several proclamations provided by the FDRE related to Environmental protection issues. Proclamations are provided and available both at federal and regional level, among these are:

Environmental Protection Organs Establishment Proclamation (Proclamation No. 295/2002):
The objective of this Proclamation is to assign responsibilities to separate organizations for environmental development and management activities on one hand, and environmental protection, regulations and monitoring on the other, in order to ensure sustainable use of environmental resources, thereby avoiding possible conflicts of interest and duplication of effort. It is also intended to establish a system that fosters coordinated but differentiated responsibilities among environmental protection agencies at federal and regional levels.

Road and Rail way sector Environmental Assessment Guideline, Federal CEFCC, 2004:
The guideline describes major environmental issues related to road and railway Projects. The guideline highlights major issues and potential impacts that should be taken into account during the preparation and assessment phases. It emphasizes that appropriate enhancement and mitigation measures should be integrated as early as possible, preferably in the project design.

Establishment of Ethiopian Roads Authority (Proclamation No. 80/1997):
The Ethiopian Roads Authority (ERA) Establishment Proclamation gives ERA the power to *"use free of charge, land and such other resources and quarry substances required for the purpose of construction and maintenance of highways, … and other required services; provided, however, that it shall pay compensation in accordance with the law of properties on the land it uses"* (Article 6.18).
Similarly, Article 6.17 of the Proclamation gives power to ERA to *"determine the extent of land required for its activities, in the adjacency as well as surrounding of highways, and the conditions of use of such land by others".*

This proclamation defines objectives of the authority, powers and duties of the authority, Organization of the authority etc.

Specific application to the road project:
For the current road project, the Ethiopian Road Authority is the body with the power to:

- → Take necessary measures to protect the environment on the implementation;
- → Determine design and standards of the road and also classify and designate the national road network;
- → Prepare, through qualified consultants, designs required for works; prepare design required for study and emergency works;
- → Maintenance of the road;

- → prepare, cause the preparation of and award works and consultancy contracts; cause the supervision to ensure that works are executed as per terms of their respective contracts, and supervise same;
- → Determine conditions for selection of consultants required for the design, supervision and any other works relating to the road;
- → Determine the alternatives of carrying out of works with its own force, through domestic or international tender;
- → Design traffic control posts and devises relating to the road;
- → Enforce vehicle weight and size regulations;
- → Conduct material research relating to roads, apply useful results;
- → Train human resources required for the development and maintenance of the road;
- → Determine the extent of land required for its activities in the adjacency as well as surrounding;
- → Own property; enter into contract; sue and be sued in its own name; and
- → Perform other duties as are required for the implementation of its powers and duties.

Environmental Pollution Control Proclamations No. 300/2002:

It sets Rules on Control of pollution, management of hazardous waste, chemical and radioactive substances, management of municipal wastes, outlines sectors that require environmental standard, environmental inspectors, incentives, rights to appeal, offences and penalty.

Specific application to the road project:

The construction implementation body shall observe:

Prevention of Pollution:

- → Shall not pollute or cause pollution to anyone or to the environment,
- → Install a sound technology that avoids or reduces, to the required minimum, the generation of waste and, when feasible, apply methods for the recycling of waste,
- → Clean up or pay the cost of cleaning up the polluted environment,

Management of Hazardous Waste

- → Take appropriate precaution to, prevent any damage to the environment or to human,
- → Obtain permit for t h e generation, keeping, storage, transportation, treatment or disposal of any hazardous waste,
- → Obtain permit for the importation, preparation, keeping, distribution, storage, transportation or use of a chemical categorized as hazardous or of restricted use,

Authorities:

- → The relevant Regional environmental agency may take an administrative or legal measure against a person who, in violation of law, release any pollutant to the environment,
- → All urban administrations shall ensure the collection, transportation, and, as appropriate, the recycling, treatment or safe disposal of municipal waste through the institution of an integrated municipal waste management system, and

→ When any activity poses a risk to human health or to the environment, the Authority or the relevant regional environmental agency shall take any necessary measure up to the closure or relocation of any enterprise in order to prevent harm.

Solid Waste Management Proclamation (No. 513/2007):

This proclamation aims to prevent environmental damage from solid waste while harnessing its potential economic benefits. It defines solid waste management as the collection, transportation, storage, recycling or disposal of solid waste. The proclamation indicates the need for involvement of the private sector for effective management and describes the safe transport of solid waste including hazardous waste (FDRE, 2007).

Specific application to the road project:

During construction of the current road:

→ Solid Waste Management shall be planned;
→ Each Region or urban administration shall set its own schedule and, based on that, prepare its solid waste management plan and report of implementation, hence, solid waste managements shall be in accordance to local administrations' system;
→ Ensure the installation of marked waste bins by streets and in other public places;
→ Ensure the collection of solid wastes from waste bins with sufficient frequency to prevent overflow; and
→ Contractor to deposit a legally valid bond or any other instrument to ensure the environmentally sound disposal of construction debris or excavated earth.

Environmental Impact Assessment Proclamation No. 299/2002:

This proclamation is promulgated in December 2002. The primary objective of this proclamation is to make ESIA mandatory for defined Categories of activities undertaken either by the public or private sector. The proclamation under its general provision Article –3, sub article-1 states that without authorization from the Authority (EPA), or from the relevant regional environmental agency, no person shall commence implementation of any project that requires environmental impact assessment as determined in a directive issued pursuant to Article-5 of the proclamation.

Article – 5 describes projects requiring Environmental Impact Assessment as follows:

- Every project, which falls in any category listed in any directive issued pursuant to this proclamation, shall be subject to Environmental Impact Assessment.
- Any directive provided under sub- article-1 of Article –5 should among other things, determine categories of; a) Projects not likely to have negative impacts and so do not require ESIA, b) Projects likely have negative impacts and thus require environmental impact assessment.
- ESIA-Guide lines have been prepared both at federal & regional level. These guidelines follow the conventional procedures adopted elsewhere in the world.

Specific application to the road project:

→ The project is required to carry out ESIA before the construction works,
→ Observe federal and regional guidelines in the practice of the ESIA, and
→ Accordingly, identify potential impacts of the perfect and address those impacts in providing mechanisms to minimise or avoid those impacts with the assessment.

Proclamation on Forest Development, Conservation and Utilization, Proclamation No. 1065/2018: was issued in January, 2018 for the sustainable development, conservation and utilization of forests in order to address effects of climate change, preventing soil erosion, desertification and loss of biodiversity, sustain agricultural productivity, ensure food security and enhance other benefits from forest developments. It applies to private, community, association and state owned forests. For each sort of ownership, the proclamation, stipulates the rights and obligations in forest developments.

It also provides incentives in forest development by the private and community ownerships. More on protected state farms it ensures demarcation, protection, providing benefits to local community inside and in periphery of the forest, and use for eco-tourism. It gives the power to implement the proclamation, giving access national forest information, providing support, development of system and standards, etc… to the ministry, where as it also gives power and duty of administrating forest land within a state / region, supporting development programmes, regulating, monitoring and evaluating developers, collect rates of royalty payment, etc… to the regional government.

Specific application to the road project:
During the construction of the current road, the government through relevant bodies will make sure to:

- → Protect the forest from invasive species, pests and diseases; and apply curative measures in case of occurrence of same;
- → Protect the forest resources from natural and man-made disasters;
- → Conserve and administer any protected forest; and
- → Rehabilitate and protect development plans on forest lands.

Ethiopian Water Resources Management Proclamation No.197/2000:
This Proclamation was issued in March 2000 and provides legal requirements for Ethiopian water resources management, protection and utilization. The aim of the Proclamation was to ensure that water resources of the country are protected and utilized for the highest social and economic benefits, to follow up and supervise that they are duly conserved, ensure that harmful effects of water use prevented, and that the management of water resources is carried out properly.

Specific application to the road project:
The project implementing body shall observe:

- → Plan and obtain permit to the construction on water bodies,
- → Control release or discharge of wastes into water resources, and
- → Discuss and resolve grievance and disputes on water resources with relevant governmental bodies.

Public Health Proclamation No.200/2000: refers to public health issues.

Specific application to the road project:

- → No discharge untreated liquid waste generated from septic tanks, seepage pits shall be released into water bodies, or water convergences,

- → Have verification for water supply service from springs, wells or through pipes,
- → Ensure the availability of occupational health services to the construction workers,
- → Collect waste in a especially designated place and in a manner which does not affect the health of the society,
- → Organize clean, adequate and accessible toilet facilities.
- → Report communicable diseases immediately to the nearest health service institution, and
- → Preparation, import, distribution, or making available to consumers any food which is unhygienic, contaminated, unwholesome or mislabeled and does not meet the standards of food quality is prohibited.

Rural Land Administration & Tenure Rights: Regarding land tenure issues, the Constitution of the Federal Democratic Republic Ethiopia (FDRE) of 1995, Article 40 Sub-Article 3, states that "The right to ownership of rural and urban land, as well as of all naturalresources, is exclusively vested in the State and in the peoples of Ethiopia. Land is a common property of the Nations; Nationalities, and Peoples of Ethiopia and shall not be subject to sale or other means of exchange".
Rural land use and Administration Proclamation NO.456/2005 describes; the right to hold and use rural land, acquisition and use of rural land, transfer and duration of rural land use right, obligation of rural land users. Restrictions on rural land use (land use planning and proper use of sloppy, galley and wetland/marshlands are included in the Proclamation.

Expropriation of Landholdings for Public Purpose, Payment of Compensation and Resettlement:Proclamation No.1161/2019: This Proclamation replaces the pervious Proclamation No.455/2005, on Expropriation of Landholdings for Public Purposes and Compensation Payment. In the new Proclamation No.611/2019, details why and how expropriation of landholdings for public purposes, payment of compensation, resettlement programmes and specific issues such as taking inventories of properties to be affected, valuation of properties; consultations to be made with all concerned stakeholders including project affected persons, mechanism to resolve conflicts, etc. are contained in the proclamation.

Specific application to the road project:-

- → Consultation to be made with all stakeholders and landholders who are to be displaced at least;
- → Expropriation of land for public purposes to be made on the basis of approved land use plan; urban structural plan; or development master plan;
- → Compensation payment for loss of properties, resettlement assistance for those who would be physically displaced,and support for livelihoods restoration as appropriates etc..,
- → Conduct inventory, amount and size of all compensable properties from displaced people or their legal representatives whose landholdings are determined to be expropriated;
- → Properties added after the expropriation notification is given to the land holder are not compensated; and
- → Pay compensation or provide substitute land before the displacement of people from their landholding.

For the detail implementation of what has been stipulated in the Proclamation No.1161/2019, Council of Ministers Regulation N0.472/2020 was issued 27th of July, 2020, to provide Expropriation of Land for Public Purpose and Valuation, Compensation and Resettlement. Even though the details of the regulation are contained in the document, some major points of the regulation which relevant to the expressway road project are indicted below and these are:-

- Consultation and consultation procedure on land expropriation;
- Taking inventories of properties/assets to be expropriated,
- Valuation committee establishment and valuation of properties/assets would be affected based on standards or formulas set by the Council of Ministers and National Regional State, Addis Ababa and Dire Dawa Administration;
- Disclosure of values of properties/assets would be affected due to the project affected persons, concerned government stakeholders and community;
- Notification of values of compensations to be made for loss of properties/assets;
- Provision of support and implementation of resettlement action plan including compensation payment;
- Removal of affected properties/assets, and utilities;
- Implementation of dispute resolution mechanisms;

Civil Code, Proclamation No.639/2009:

In Ethiopia, involuntary displacement due to expropriation is governed mainly by the Civil Code, proclamation No. 65/1960, and amended with proclamation NO/639/2009. In this code reasons and objectives of expropriation are clearly specified. According to articles of the Civil Code, expropriation is possible only for projects of public utility and only immovable assets could be expropriated. These regulations of the Civil Code are designed to protect private property and in the case of expropriation necessitated by public utility are unavoidable to make sure that it is co-ordinate with payment of legally sufficient compensation and proper communication with those whose immovable assets are to be dispossessed.

According to this Civil Code, anyone that can legally prove existence of real right over the immovable assets to be expropriated, qualifies or is eligible to receive legally sufficient compensation. Article 1474 of the Civil Code provides that compensation payment could be either in cash or in kind. Therefore, if any compensation is required in the processes of this project, it should be handled according to the above Civil Code and principles of compensation.

Proclamation No. 80/1997 Article 6.18 states that Ethiopian Roads Authority (ERA), use free of charge, land and such other resources and quarry substances required for the construction of highways, however, it has to pay compensations for the properties on the land it uses.

The Authority pays compensation for the property on the land.

- Dislocated farmers will be paid equivalent amount to the benefits they are supposed to get from their land had they were not displaced from their original.
- Compensation is paid for the property lost if new lands are occupied in places where no road has existed before or if the upgrading of the existing road requires new land out of the right of way. Compensation is paid for properties lost temporarily or permanently.
- When somebody builds residential houses for business within the right of way, these houses are considered to be illegal and no compensation will be paid when

demolished during road construction. The owners of the illegally built houses are allowed to remove their property before road construction starts and usually the owner is informed about one or two months before construction commences.

- The cost that may result due to the removal of transmission lines, distribution lines and related facilities of water supply, electric power, telecommunication and sewerage systems are compensated to the owner of these facilities. Trees of commercial values are considered valuable property and are compensated accordingly to their market prices.
- The crops that will be lost in case of detour or other temporary occupations of agricultural land will be compensated according to the price of the crop in market. In case where agricultural land is to be lost permanently compensation will be decided by the committee established by road authority for this purpose.
- The people who are displaced due to road upgrade or re-aligned sections of the existing road outside of the right of way, as well as those residing illegally inside it must be resettled.

Proclamation No. 1156/2019

This proclamation was made in the aim of ensuring worker-employer relations to be governed by basic principles of rights and obligations with a view to enabling workers and employers to secure durable industrial peace; sustainable productivity and competitiveness through cooperative engagement towards the all-round development of our country. The proclamation has segments specifying regulations of:

Contract of Employment: for of employment contract, duration of employment contract, obligations of parties modification of employment contract, and temporary suspension.

Termination of Employment Relations: for terminations on agreement, up on intentions of parties, by the employer, by the worker, wedge, compensations, unlawful termination, special contracts and termination notice.

Mode and Execution of Payment: for hours of work, leaves, young workers, occupational injuries and benefits.

Collective Relations: for relations and labour administration

Occupational Safety and Health and Working Environment

Specific application to the road project:

For the employer (contractor or consultant):

→ Contract of employment shall be stipulated clearly and in such manner that the parties

→ Contract shall specify the type of employment

→ Pay the worker wages and other benefits in accordance with this Proclamation or the collective agreement

→ Take all the necessary occupational safety and health measures and to abide by the standards and directives to be given by the appropriate authorities

→ Register containing the relevant particulars as weekly rest days, public holidays and utilized leave of the worker, health conditions of the employee except for HIV/ AIDS, and employment injury record and other particulars

→ Provide the worker, free of charge, with a certificate stating the type of work he performed, the length of service and the wage she was earning up on termination

→ Pay on basis of contract employment

→ Compel any worker to execute any task which is hazardous to his life

- → Comply with 8 hours of normal working hours
- → Respect leaves of public holidays, weekly rest, annual leaves, special leaves, union leaves, leave for special purpose maternity leaves and sick leaves
- → Women shall not be discriminated
- → Prohibited to assign women on works that may lead to dangerous
- → Prohibited to employ a person less than 15 years of age
- → Comply with the occupational health and safety requirements
- → Provide workers with protective equipment, clothing and other materials and instruct them of their use
- → Take appropriate steps to ensure that workers are properly instructed and notified concerning the hazards of their respective occupations
- → Register employment accidents
- → Ensure that the work place and premises of the undertaking do not pose threats to the health and safety of workers
- → Shall be liable, irrespective of fault, for employment injuries sustained by his worker
- → Provide basic medical services
- → Respect workers right to establish and organize Trade Unions or employers' associations, respectively
- → Respect procedures of disciplinary measures
- → Restrain from any abuse
- → Respect the right of labour to strike to protect their interests

For Both Parties:

- → Be in accordance with the contract of employment
- → Respect the worker's human dignity
- → Restrain from discrimination between workers
- → Restrain from sexual harassment or sexual assault at workplace
- → Observe procedures of termination
- → Provide prior notice for termination

For Workers:

- → Personally perform the work specified in his contract of employment
- → Follow instructions given by the employer
- → Handle with due care all equipment and tools
- → Inform immediately the employer on injuries
- → Except for HIV/AIDS test, refuse to submit himself for medical examination when required by law or by the employer for good cause;
- → Refuse to observe safety and accident prevention rules and to take the necessary safety precautions
- → Co-operate in the formulation of work rules to safeguard the workers' health and safety
- → Make proper use of all safety devices

Research and Conservation of Cultural Heritage Proclamation No.209/2000: a proclamation to provide for research and conservation of cultural heritage.

2.5.2. Frameworks and Guidelines of the World Bank

2.5.2.1. Environmental and Social Safeguard Framework (ESSF) of the World Bank

The World Bank has prepared its framework for Environmental and Social Framework / Policy in 2017 for projects it finances. It sets out the requirements that the Bank must follow regarding projects it supports through Investment Project Financing. The application of this policy is to enhancing the capacity of Borrowers' environmental and social frameworks to assess and manage the environmental and social risks and impacts of projects.

The purpose of the policy is so as it 'sets out the mandatory requirements of the Bank in relation to the projects it supports through Investment Project Financing'.

With this purpose in mind the document has set 10 (ten) standards to manage the risks and impacts of a project, and improve their environmental and social performance. List of the set standards and brief description of their scopes are as follows.

ESS 1	**Assessment and Management of Environmental and Social Risks and Impacts**	→ *Legal and Institutional Framework,* → *Project Description,* → *Baseline Data,* → *Environmental and Social Risks and Impacts,* → *Analysis of Alternatives,* → *Design Measures,* → *Key Measures and Actions for the Environmental and Social Commitment Plan (ESCP),* → *SH Consultations and Record of meetings, consultations and surveys.*	*Applicable*
ESS 2	**Labour and Working Conditions**	→ *Working conditions and management of worker relationships,* → *Protecting the work force,* → *Grievance mechanism,* → *Occupational Health and Safety (OHS),* → *Contracted workers,* → *Community workers,* → *Primary supply workers,* → *Environmental and Social Standard 3. Resource Efficiency and Pollution Prevention.*	*Applicable*

ESS 3	**Resource Efficiency and Pollution Prevention and Management**	→ *Resource efficiency,* → *Energy use,* → *Water use,* → *Raw material use,* → *Pollution prevention and management,* → *Management of air pollution,* → *Management of hazardous and nonhazardous wastes,* → *Management of chemicals and hazardous materials,* → *Management of pesticides.*	*Applicable*
ESS 4	**Community Health and Safety**	→ *Community exposure to health issues,* → *Safety of services,* → *Management and safety of hazardous materials,* → *Traffic and road safety,* → *Emergency preparedness and response,* → *Security personnel.*	*Applicable*
ESS 5	**Land Acquisition, Restrictions on Land Use and Involuntary Resettlement**	→ *Displacement,* → *Collaboration with other responsible agencies or sub-national jurisdictions,* → *Technical and financial assistance,* → *Involuntary resettlement instruments.*	*Applicable*
ESS 6	**Biodiversity Conservation and Sustainable Management of Living Natural Resources**	→ *Assessment of risks and impacts,* → *Conservation of biodiversity and habitats,* → *Legally protected and internationally recognized areas of high biodiversity value,* → *Sustainable management of living natural resources* → *Invasive alien species.*	*Applicable*
ESS 7	**Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities**	→ *Grievance mechanism,* → *Underserved traditional local communities and broader development planning,* → → *Stakeholder consultation and identification of cultural heritage,* → *Provisions for specific types of cultural Heritage,* → *Legally protected cultural heritage areas,* → *Commercial use of cultural heritage.* →	*Applicable*

ESS 8	**Cultural Heritage**	→ *Avoidance of adverse impacts,* → *Mitigation and development benefits,* → *Meaningful consultation tailored to indigenous peoples/Sub-Saharan African historically underserved traditional local communities,* → *Circumstances requiring free, prior and informed consent (FPIC),* → *Impacts on lands and natural resources subject to traditional ownership or under customary use or occupation,* → *Relocation of underserved traditional local communities from lands and natural resources subject to traditional ownership or under customary use or occupation.*	*Applicable*
ESS 9	**Financial Intermediaries**	→ *Environmental and Social,* → *Management System,* → *Stakeholder engagement.*	*Not Applicable*
ESS 10	**Stakeholder Engagement and Information Disclosure**	→ *Engagement during project preparation,* → *Engagement during project,* → *implementation and external reporting,* → *Grievance mechanism,* → *Organizational capacity and commitment.*	*Applicable*

2.6. Environmental, Health & Safety (EHS) Guidelines of The World Bank Groups

The World Bank Group, in order to address projects surrounding communities, stakeholders and the environment and meet requirements of sustainability, has developed Environmental, Health and Safety Guidelines in April 2007.

The guidelines have one section dedicated for environmental scopes with eight subsections within. Other specific guidelines are also available for OHS, Decommissioning, Community Health and also specific guidelines for specific development sectors / project types. The guidelines presented here have been used as a reference to the ESIA and also in preparation of the separate plans for OHS, Community Health and Efficiency of Resource Use.

Environmental Guidelines	***Air Emissions and Ambient Air Quality***	Minimizing, and controlling adverse impacts to human health, safety, and the environment from emissions to air.
	Energy Conservation	Guidance on energy management with a focus on common utility systems often representing technical and financially feasible opportunities for improvement in energy conservation.
	Wastewater and Ambient Water Quality	To avoid, minimize, and control adverse impacts to human health, safety, or the environment from potential to generate process wastewater and sanitary (domestic) sewage.

	Hazardous Materials Management	Classification and Management of Hazardous Materials
	Waste Management	Specific mitigation in the collection, transportation, treatment, or disposal of wastes.
	Noise	Prevention and Control of Noise pollution.
	Contaminated Land	Avoidance of contamination of land by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment.
Occupational Health and Safety		Eliminating, Controlling and Minimizing exposure to Health and Safety Hazards.
Community Health and Safety		Addresses issues arising in project life cycle and the impact beyond the life of the project.
Construction and Decommissioning		guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life-cycle, or due to expansion or modification of existing project facilities.
Environmental, Health, and Safety Guidelines for Toll Roads		Specific guidance to users on common EHS issues potentially applicable to all industry sectors. For complex projects, use of multiple industry-sector guidelines may be necessary.

2.7. International Conventions and Frameworks

In addition to national environmental legislations, the Federal Democratic Republic of Ethiopia (FDRE) is also a party to a number of regional and international conventions and protocols on environment. The government has established Ministry of Environment, Forest and Climate Change (CEFCC). This Ministry is designated as a focal point for the implementation of these conventions and protocols.

Accordingly; Article 9(4) of the constitution of the FDRE provides that once an international agreement is ratified through the accepted or established procedure, it is automatically become an integral part of the law of the land. Therefore; the following international conventions and protocols are relevant to the proposed project.

2.7.1. Framework Convention on Climate Change

This convention takes into account the fact that climate change has trans-boundary impacts. The basic objective of this convention is to provide for agreed limits on the release of greenhouse gases into the atmosphere so as to prevent the occurrence of climate change. It also aims to prepare countries to minimize the impact of climate change, should it occur. Ethiopia ratified this convention through proclamation No. 97/1994 on May 2/1994.

2.7.2. Convention on Biological Diversity

The convention on biological diversity has three goals. These are:

- Conservation of biodiversity;
- Sustainable use of the components of biodiversity; and
- Fair and equitable sharing of the benefits arising from the use of genetic resources.

The convention was ratified by Ethiopia through proclamation No.98/94 on May 31, 1994.

2.7.3. The United Nations Conventions to Combat Desertification

The objective of this convention is to combat desertification and mitigate the effects of droughts in countries experiencing serious drought and desertification, particularly in Africa. Ethiopia has ratified the convention through its proclamation No. 80/1997.

2.7.4. The Stockholm Convention

In the year 2002, Ethiopia fully accepted and ratified the Stockholm Convention on persistent organic pollutants by proclamation No. 279/2002 designed to ban the use of persistent organic pollutants. The CEFCC has the full mandate to implement these conventions at the national level.

2.8. Institutional and Administrative Framework

The Federal Democratic Republic of Ethiopia (FDRE) has ten National Regional Member States and two City Administrations. Powers and functions of the Federal Government are stated on Article 51 of the Constitution, and similarly, powers and functions of the National Regional States are stated on Article 52. Roles and responsibilities of governments at the Zone and Woreda are stipulated in respective National Regional States.

In regards to Miesso – Bike - Dire Dawa expressway road project implementation, requires the involvement and participation of Somali and Oromia National Regional States, Sitti Zone of Somali and West Hararghe Zone of Oromia. The duties and responsibilities of Woredas of, Miesso of Oromia; Mulu, Afdem, Gota – Bike - Erer and Meleka Jebdu Keble 01 of Dire Dawa Administration are also vital. In the case of Ethiopia, the lowest Administrative Unit which named Kebele Administration will have very decisive role in the implementation of the expressway.

2.8.1. The Commission for Environment, Forest & Climate Change (CEFCC)

The repealed Articles of Proc. No. 295/2002 stated above were transferred to the MEFCC with additional Articles related to forest management with issuance of Proc. No. 803/2013.

Among the duties and responsibilities of the CEFCC relevant to the project under consideration are:

- Coordinate measure to ensure that the environmental objectives provided under the Constitution and the basic principles set out in the environmental policy of Ethiopia are realized;
- Establish a system for environmental impact assessment of public and private projects, as well as social and economic development policies, strategies, laws and programmes;
- Prepare a mechanism that promotes social, economic and environmental justice and channel the major part of any benefit derived thereof to the affected communities to reduce emissions of greenhouse gases that would otherwise have resulted from deforestation and forest degradation; and
- Establish a system for the evaluation of the environmental impact assessment of investment projects submitted by their respective proponents by the concerned sectoral licensing organ or the concerned regional organ prior to granting a permission for their implementation In accordance with the Environmental Impact Assessment Proclamation.

2.8.2. The Ethiopian Roads Authority (ERA)

The Ethiopian Roads Authority (ERA) was established in 1951 through proclamation No.63/1963 as “Imperial Highway Authority” with responsibilities for the construction, improvement and maintenance of the Country’s major road network. However, the Organization has undergone through different areas of jurisdiction and the current entity was re-established with Proclamation No. 80/1997 with major responsibilities of initiating policies, determining design standards, road classification, short- and long-term plan preparation, preparation of feasibility studies and other studies as found appropriate, maintaining highways through appropriate body, contract management, enforce vehicle size and weight, training of manpower, determine the extent of land requirement for roads, uses free of charge material production sites, etc...The highest body in the management hierarchy is the Board of Management.

ERA's Legal Affairs Service Directorate: The Legal Affairs Service Directorate is accountable to the Director General of ERA. Some of the activities and responsibilities assigned for the Directorate consist of drafting, reviewing, analyzing and approving construction contract documents. Contract awarding with other assigned members of committee is the other responsibility of the Directorate. The Directorate develops and implements strategies for claims and dispute resolutions which serve as inputs to the ROW Management Teams and regional legal advocates.

Expressway and Special Projects Contract Administration Directorate: The directorate is accountable to the Deputy Director General for Construction Department of ERA. It is established with the mandate of contract administration of the expressway and special projects of the country.

The ESOSD: It was first established in January 1998 as Environmental Management Branch under the Planning and Programming Division of the Engineering and Regulatory Department. Then, it was changed into the Environmental Monitoring and Safety Branch and currently reformed to its own Directorate Unit, as Environment, Social and Occupational Safety Directorate (ESOSD).

It has major duties and responsibilities including: setting and implementing ERA's environmental guidelines in support of and in line with the national level requirements, playing the role of advisory, coordination and supervision aspects that are pertinent to the road environmental impacts and implication assessment, and co-ordination with the respective ERA district offices. In addition, it represents ERA at different levels in the areas of environment and road safety matters.

Right-of-Way Management Teams (ROWMT): Right-of-Way Management Teams are organized under each Regional Directorate. The ROW Management teams under ERA's Expressway and Special Projects Management Directorate is responsible for making available the required land for road/highway construction and maintenance, the establishment of materials sources (borrower pits and quarries) and camp sites and for implementation of Resettlement Action Plans (RAP). The Right-of-Way Management Teams are also responsible to identify and register all the PAPs and measure all affected properties and assets and also estimate its costs in liaison with the respective Wereda compensation and property valuation committees.

2.8.3. Different Levels of Regional Administrations

Regional Government: According to the Constitution of FDRE, Regional States have the duties and responsibilities for planning, directing and developing social and economic programs, as well as the administration, development and protection of resources of their respective regions. Hence, Oromia Regional State and Somali Regional State area regional government structures, where Dire Dawa is city administration of its own. The zone administrations (West Hararge zone and Sitti Zone) are also under this government structures. The regional administrations have the duties and responsibilities for planning, directing and developing social and economic programs, as well as the administration, development and protection of resources of their respective regions.

Wereda Administration: Wereda administration offices that are located along the project road corridor will have a major role and responsibility in the planning and implementation of the resettlement activities in their respective localities. One of the woredas traversed by the current project is in Oromia Regional State, where the other for are in Somali Regional State.

The environmental and social affairs are mainly contacted with the woreda administration and different bureaus structured in the woreda. The wereda will also be responsible in establishing Resettlement and Implementation Committee and the Property valuation committees; in coordinating the valuation process and facilitate compensation for PAP; in facilitating land-for-land compensation, facilitating the relocation sites and the restoration of services, and maintain data of properties removed from expropriated land.

Kebele Administration: Kebele administration units are the smallest unit of administration in Ethiopia and that has its own elected council and executive body. Kebele administration provides advice on the fairness; which will be core units in making contact with the community and in support to be made for vulnerable groups.

2.8.4. Environmental Protection, Land Administration & Use Authority

The EPA structure has been decentralized to the regions, up to woreda level. The Oromia and Somali regional state has established regional Environmental and Land Administration Authority structured in Agricultural Bureaus. This unit in the woreda will be main contact in follow up of environmental works, land preparation for ancillary sites and communicating the local community under each kebeles. Particular roles of the unit are stated in the following part.

2.8.5. Ministry of Labour and Social Affairs (MOLSA)

Overall the Powers and Duties related to labour rights and working conditions are given to MOLSA, under Proc. No. 471/2005. The ministry has the responsibility to encourage and support workers and employers to exercise their right to organize and collective bargaining, encourage bilateral forums between workers and employers, establish efficient labour dispute settlement mechanisms, create conducive conditions for the provision of efficient and equitable employment services, follow up the implementation of occupational health and safety standards, and register workers' and employers' unions.

2.8.6. Ministry of Health

Based on public health proclamation No. 200/00, the competent authority to oversee the implementation of the laws of Health Proclamations is the Ministry of Health and its regional counterparts. It is also clearly indicated that the competent authority shall appoint qualified and capable inspectors to implement the provisions of the proclamation.

2.8.7. Responsibilities and Relations of Organisations

In this section, organisations as Federal level organisations and bodies in ERA related to the environmental, social and OHS studies and implementations are summarised showing their responsibilities, in the following table:

No.	Organizations	Responsibility
1	Ministry of Transport	- Provide overall policy guidelines and coordination at Ministerial level and also provide adequate governance and management
2	Ministry of Finance and Economic Development	- Approval and signing of credit with World Bank. - Release and approval of fund for compensation
3	Ministry of Labour and Social Affairs (MOLSA)	- Regulate employee – employer relations, - Administrates labour dispute mechanisms, - Control the implementations of occupational health and safety standards.
4	Ministry of Health	- Administrates the implementation of the laws of Health Proclamations, - Administrates public health concerns.
5	The Commission for Environment, Forest & Climate Change (CEFCC)	- Appraisal and monitoring of the ESIA
6	ESOSD, of ERA	- Advising senior management and assisting in the decision-making process on all road sector environmental and social issues; - Review ESIA and RAP studies of project design for subsequent advise on fulfilling requirements and approval; - Review contractor's proposals for ESMP, site specific plans and proposed sites, and review along with the EMU and regional offices for advise and approval; - Ensuring that environmental and social issues are adequately addressed in connection with the activities of all ERA departments and divisions; - Ensure that Occupational Health and Safety concerns are addressed in connection with the activities of all ERA departments and divisions; - Carrying out or supervising EIAs and RAPs implementation for road sector projects, - Regularly review status, progress & issues encountered during the ESMP implementation;
7	ERA's Regional Directorate	- Re-establish Resettlement and Valuation committees at wereda level; - Responsible for the implementation of this Resettlement Action Plan; - Effect compensation payment for PAPs; Income restoration - Provide support for Vulnerable groups; - Monitor the restoration of public services / utilities affected by the construction works, such as, water supply, etc

No.	Organizations	Responsibility
8	Environmental Protection, Land Administration & Use Authority	- Formulate policies and strategies, programs or guidelines pertinent to environmental protection and follow up its implementation up on approval. - Implementation of the land administration and use proclamation, - Collection, making analysis and keeping record of data on natural resources and rural lands including social and economic situation of the region, - Regulate and follow up that any development activity is planned and implemented without damaging the environment and disturbing its balance, - Initiates laws and guidelines pertinent to the environmental protection for the government, and up on approval regulate, follow up and evaluate their implementation, - Monitors any damaging effects on habitat and divers living organisms, - Conducts capacity building and awareness creation programs as regards to environmental and natural resources conservation, development and protection. - The woreda level environment, land administration and use office directly involves on the day to day activities and services at the grass root level. The office has the following organizational structure.

And the overall relations Institutional Arrangements and Responsibilities and relations amongst the organisations is shown the chart below.

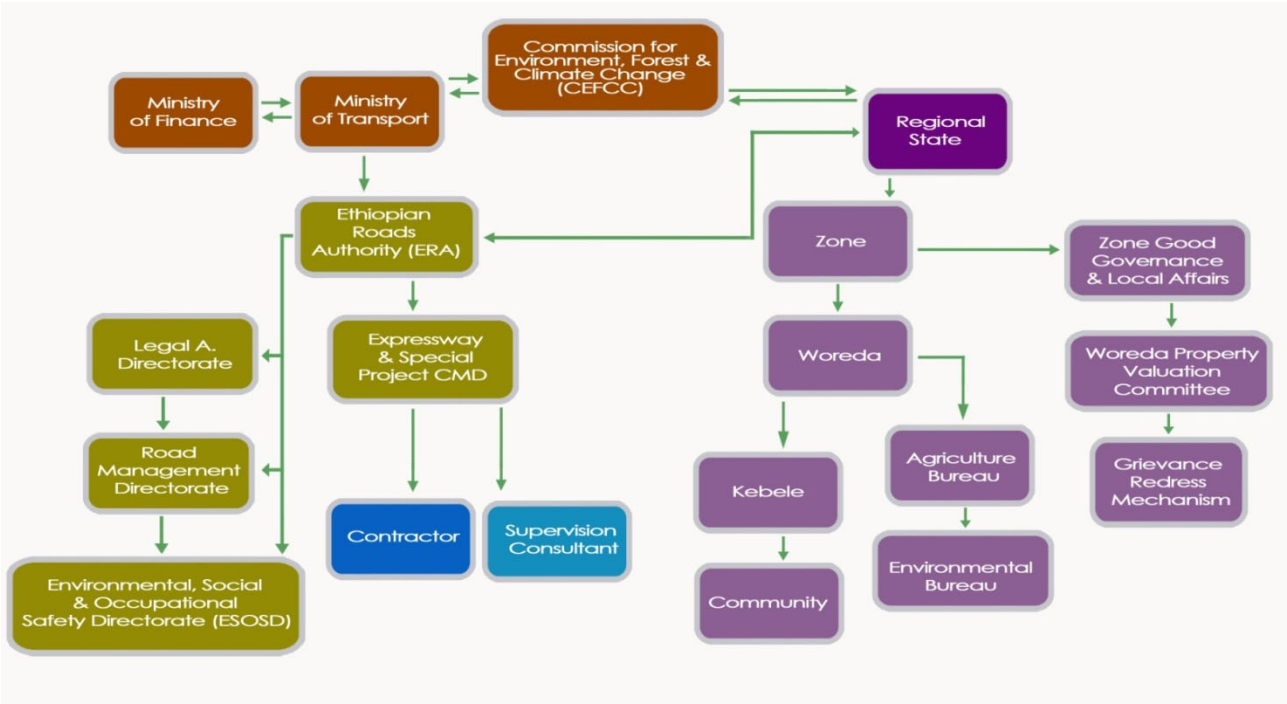


Figure 2.8.7-1: Institutional Arrangements and Relations Chart

2.9. Analysis of Legal Frameworks

Table 2.9-1: Analysis of National Legal Frameworks and the World Banks ESS Framework

No.	Section	Proclamations of Ethiopian Laws	World Bank's ESSF Requirements	Gaps Identified & Gap Filling
1.	***ESIA Assessment***	Ethiopian environmental impact assessment proclamation puts ESIA as mandatory for development projects. It requires conduct of projects social and environmental impact, ESIA, assessment with its guidelines.	The first standard of the ESS forwards the need for conducting ESIA for financed projects providing similar guide and indicative outlines.	Additionally, the ESSF, demands baseline emission, water quality, etc… assessment in further depth particularly for the project on subject.
2.	***Community Health and Safety***	Constitutionally and with other legal frameworks, people are granted with the right for healthy and safety environment. And the public health proclamation ratifies the need for control of different wastes, providing people with necessary sanitary and communication on health related issues.	The fourth part of the bank's framework is dedicated for community health similar addressing safety measures, traffic safety, lowering community risk to health and emergency issues.	None
3.	***Control of Pollution***	Environmental pollution control proclamation of Ethiopia prohibits pollution to any person on to the environment stating natures of waste types and hazardous wastes. In addressing specific management matters of environmental issues from the road project, legislations define 'pollution' or 'pollutants', however, clear regulations on pollution levels in terms of regions and type of work / project is not defined. This makes it hard to have criteria to set for management purposes.	WB's ESS in the fourth part also puts the need for prevention of pollution. It mandates the control and management for different types of, non-hazardous, hazardous, air, pollutants and pesticide use.	EH Guidelines of the WB Groups: the groups guidelines were adopted to set additional standards. More specifically, it has indicative standards for ambient pollutions. These standards were adopted in order to set standards for managing pollutants and accordingly monitor during construction.
4.	***Labour Rights***	Labor Proclamation of Ethiopia grants workers for favorable environment, occupational health and safety, rights to establish their respective associations and bans underage employment, forced labour, decimations or harassments of any kind.	ESS2 of the World Bank's framework promotes safety and health at work, protection of women workers, collective bargaining, fair treatment, nondiscrimination and equal opportunity and prohibits forced labor and child labor.	None

5.	***Occupational Health and Safety & Working Conditions***	Labour Proclamation Proclamation No.1156/2019 states that under article 95 employer shall take the necessary measure to safe guard adequately the health and safety of workers; it also states that the employer shall comply with the occupational health and safety requirements provided for in this Proclamation, take appropriate steps to ensure that workers are properly instructed and notified concerning the hazards of their respective occupations; and assign safety officer; and establish an occupational health and safety committee, provide workers with protective equipment, clothing and other materials and instruct them of their use, register employment accidents and occupational diseases and report same to the labour inspection service, arrange, according to the nature of the work, at his own expense for the medical examination of newly employed workers and for those workers engaged in hazardous work, as may be necessary with the exception of HIV/AIDS Unless and otherwise the country has obligation of international treaty to do so and ensure that the work place and premises of the undertaking do not pose threats to the health and safety of workers. Furthermore, the proclamation states the obligation of the works and prohibited acts.	ESS2: recognizes that the Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions. The ESS also urge occupational health and safety measures will be applied to the project. The OHS measures will include the requirements of this Section, and will take into account the General EHSGs and, as appropriate, the industry-specific EHSGs and other GIIP. The OHS measures applying to the project will be set out in the legal agreement and the ESCP. It also states that as OHS measures will be designed and implemented to address: • identification of potential hazards to project workers, particularly those that may be life threatening; • provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; • training of project workers and maintenance of training records; • documentation and reporting of occupational accidents, diseases and incidents; • emergency prevention and preparedness and response arrangements to emergency situations; and • remedies for adverse impacts such as occupational injuries, deaths, disability and disease. It also states that all parties who employ or engage project workers will develop and implement procedures to establish and maintain a safe working environment, including that workplaces, machinery, equipment and processes under their control are safe and without risk to health, including by use of appropriate measures relating to chemical, physical and biological substances and agents.	None

6.	***Expropriation of Landholdings***	The Federal constitution has paved the way for developments of land administration legal frameworks at federal and regional levels. Expropriation of Land Holding Proclamation No.1161/2019 of Ethiopia ratified for compensation for evicted from old possession, consultation to the land holders, expropriation of land for public purposes on the basis of approved land use plan, compensation and resettlement assistance compensation for the expropriated land.	Under the 5th standard of the framework, land acquisition, restrictions on land use and involuntary resettlement, endorses voluntary land acquisition with payment of full compensation, land rights, & payment for necessary transaction costs associated with asset replacement. It demands assisting displaced persons in their efforts to improve, or at least restore, their livelihoods and living standards. Further, it recognizes legal right or claim of people to the land or assets they occupy or use who have no recognizable	Comply with both.
7.	***Indigenous Peoples Vs Underserved Traditional Local Communities***	The Constitution of Ethiopia states all sovereign power resides in the Nations, Nationalities and Peoples of Ethiopia and does not distinguish between peoples. Ethiopia has also ratified International Human Rights to be applicable nationally.	The World Band under the 7th ESS of its safeguard framework, refers "Indigenous Peoples," "Sub-Saharan African Historically Underserved Traditional Local Communities" to imply exclusively to a distinct social and cultural group possessing distinct indigenous social and cultural group and recognition of this identity, collective attachment6 to geographically distinct habitats, ancestral territories, or areas of seasonal use or occupation, customary cultural, economic, social, or political institutions, distinct language or dialect, often different from the official language or languages or underserved traditional local communities.	It depends on the law of the land.
8.	**Security Management**	Constitution of the Federal Democratic Republic of Ethiopia Proclamation No. 1/1995 The proclamation elaborates on considerations of fundamental human right and freedoms and it states under article 13 that all Federal and State legislative, executive and judicial organs at all levels shall have the responsibility and duty to respect and enforce the provisions, the fundamental rights and freedoms specified in this Chapter shall be interpreted in a manner conforming to the principles of the Universal Declaration of Human Rights, International Covenants on Human Rights and international instruments adopted by Ethiopia.	ESS4: this standard states that when the Borrower retains direct or contracted workers to provide security to safeguard its personnel and property, it will assess risks posed by these security arrangements to those within and outside the project site. In making such arrangements, the Borrower will be guided by the principles of proportionality and GIIP, and by applicable law, in relation to hiring, rules of conduct, training, equipping, and monitoring of such security workers.	It depends on the law of the land.

		Furthermore, it detailed about human right on article 14 Rights to life, the Security of Person and Liberty it states that every person has the inviolable and inalienable right to life, the security of person and liberty. Similarly, article 15 elaborated the Right to Life stating that every person has the right to life. No person may be deprived of his life except as a punishment for a serious criminal offence determined by law. Article 16 also states about the Right of the Security of Person and it says everyone has the right to protection against bodily harm.	The Borrower will not sanction any use of force by direct or contracted workers in providing security except when used for preventive and defensive purposes in proportion to the nature and extent of the threat. The Borrower will seek to ensure that government security personnel deployed to provide security services act in a manner consistent with paragraph above, and encourage the relevant authorities to disclose the security arrangements for the Borrower's facilities to the public, subject to overriding security concerns. Furthermore, it states that the Borrower will : • make reasonable inquiries to verify that the direct or contracted workers retained by the Borrower to provide security are not implicated in past abuses; • train them adequately (or determine that they are properly trained) in the use of force (and where applicable, firearms), and appropriate conduct toward workers and affected communities; and • require them to act within the applicable law and any requirements set out in the ESCP. Finally, the Borrower will review all allegations of unlawful or abusive acts of security personnel, take action (or urge appropriate parties to take action) to prevent recurrence and, where necessary, report unlawful and abusive acts to the relevant authorities.	

Chapter 3. APPROACH AND METHODOLOGY OF THE ESIA

3.1. General

The study followed National guidelines on environmental impact assessment methodologies and procedures, ESIA- guidelines prepared by the Commission for Environmental, Forest and Climate Change (CEFCC) and current ERA-standard methodologies and procedures manual for the road project's impact assessment and ERA Quality Assurance Manual Vol. 5. Additionally, as the financing body for the project is the World Bank, it has followed the standards of the Bank, which is recently published as Environmental and Social Safeguard Frameworks (ESSF).

The methods used for the environmental consideration aspect include collection & review of relevant documents including policy & previous study documents, and literatures reviews of similar studies and park information. Data collection was done both from primary sources and secondary sources for base line environmental situation assessment. Site visits were made and site conditions observed starting at the project origin and up to the project end. And concerned regional / local administrations were contacted and consulted to have their say on the project, gather data, and get their perspectives on the development project alignment, impact and mitigation measures to be forwarded. Data analysis with undertaking the environmental impact consideration and stakeholder consultations was the final part.

The methodology to be adopted for the assessment is briefly described as follows:

3.2. Desk Study of Reference Documents

The most important policy documents include the Federal Constitution, Environmental Policy of Ethiopia, Environmental Impact Assessment Proclamation, Pollution Control Proclamation, Waste Management Proclamation, Labour Proclamation, Public Health Proclamation, etc. However, the project will mainly be reviewed in line with the national guidelines & requirements unless compelled to trigger International Safeguard Policies.

Review of current ERA Environmental guidelines, available previous studies on the socio-economic conditions of the project area, national and international policy documents were also collected and reviewed. Policy documents of donors, like the World Bank, AFDB safeguard operational policies, the national level environmental policies and guidelines, and other baseline references from the Regional offices.

The national government's policies and legal frameworks including; the Constitution of the Federal Democratic Republic of Ethiopia, environmental Policy of Ethiopia, soil data of Ethiopia, regional Atlas published by the Central Statistical Authority for the socio-economic data, national legislative procedures on expropriation of properties for the public purposes and compensation payment procedures. International conventions and multilateral agreement on different components of the environment which have been ratified by Ethiopia have been reviewed to

comply with the international legislation. The outcomes of the review were used to understand the legal requirements of ESIA, to describe the baseline conditions and identify issues that need due attention during field assessment, data collection and subsequent analysis. Additional international frameworks and guidelines were also reference to the ESIA study, particularly the ESSF of the WB and Environmental, Health and Safety Guidelines of the ESIA.

3.3. Scoping Process

The ESIA study began by environmental scoping process in which the limits and project influence areas were defined; activities to be undertaken were listed, and valued environmental components were identified and impacts to be studied during the assessment were preliminarily defined.

The scoping process involved consultation with stakeholders; including: regional government institutions, NGOs, community representatives and the communities that would assume Project Impact (Project Affected Persons/PAPs). Meetings and discussions were held at different levels of; Zonal and Woreda and Local Administrations.

3.4. Data Collection Process

3.4.1. Primary Data Collection

During the design study and the ESIA, a multi disciplinary environmental and social study team undertook site visit both during June, October & November 2020 . During site visit primary data collection was done for the assessment of environmental and social baseline situations along the project corridor.

Site visits were conducted by travelling along the potential routes proposed for the Meisso _ Dire Dawa Expressway. The three routes considered for the route selection process were evaluated during this stage. Observation was made with physical inspection at important environmental features like rivers, seasonal flood plain, forest, and socially important features as sources of water, livestock production and water supply areas, farming areas and settlements. An access was made through the Meisso _ Mullu _ Erer _ Dire Dawa gravel road side to the project alignment.

During these site visits, physical observation of the environmental & social settings of the alternative route corridor was done and inventory of the observations were noted.

The site visit also used for identification of sensitive Valued Environmental Components (VEC) as well as the existing socio-economic situation along the expressway route corridor and influence area; The site visit is supported by use of topographic maps and also taking pictures of environmental features falling in the project road influence area. GPS also used to locate/mark important crossing points for local people and animals.

3.4.2. Secondary Data Collection

This refers to data collected by external body, which are basically related to the study area and local community. Common sources of existing secondary data include data collected by government public services and local and regional administration offices. Types of data collected from these sources include Rainfall Data, Geographic Data, Settlements, Economic and Social Data, etc...

Specifically, types of data collected were		***Sources of these data were woreda, zonal and regional***
- Socio Economic Data - Climate Profile - Land Use - Farm and Livestock Productions - Existing and Planned Investments - Demography (Population, Patterns of Settlements, Religions, Ethnicities, etc...) - Economic Activities -	- Education Facilities and Access (Students in Rural / Urban Settings, Availability of Shools by Levels of Education, Students by Levels of Education, and Quality Indicative Ratios) - Health Facilities and Services (Facilities and Organisations by Location, Heath Professionals, and Coverage of Services) - Prevalence of Diseases Water Supply	Agriculture Bureau, Land Administration Bureau, Environmental Protection (Environment, Forest & Climate Change) Bureau, Health Bureau, Water Bureau, Education Bureau, Tourism Bureau, Women's Affairs Bureau, Investment Bureau and Education Bureau

Data were collected from Somali Regional State, Sitty Zone (Somali), Meisso Woreda (Somali), Afdem Woreda (Somali), Bike Woreda (Somali), Erer Woreda (Somali), West Hararge Zone (Oromia), Meisso Woreda (Oromia), Dire Dawa City & Melka Jebdu Kebele (Dire Dawa).

3.4.3. Additional Data Collection

In addition to the mentioned data, additional assessment was made from project area, for the preparation of the project specific community H&SMP, GBV, Social Assessment and Social Development Plan, OHSMP, Resource Efficiency and Pollution Prevention and Management Plan, and Security Management Plan. For this purpose, questioners were prepared to ask professionals on related awareness and practices.

Area of Additional Assessment	***Specific Data Acquired***
Community Health and Safety	- Institutes and Services for HIV/AIDS Prevention, - Institutes and Services for COVID-19 Prevention, - Institutes and Services for Family Planning, - Prevalence of Natural and Human Made Disasters, Emergencies and Responses, - Health and Safety Risks Identified from other Related Projects, and - Liaison and Challenges in Working in Community Health & Safety Related Issues of Other Projects.
Energy and	- Availability of Energy Services and Common Energy Sources of Local Community,

Pollution	- Presence of Major Pollutants in the Project Area, - Waste Collection and Disposal Practices, and - Environmental Risks from Waste and Pollution Identified from other Related Projects.
Gender and Gender Based Violence	- Awareness on Gender and Gender Biased Violence, - Presence of Services on Gender Mainstreaming and Activities, - Major Sources of Gender Biased Violence, - Most Vulnerable Groups, - Response and Supports to Victims, - Police Response Mechanist to Violence, - Judicial Response Mechanist to Violence, - Labour Working Conditions in Different Projects and Major Issues Identified, and - Liaison and Management Mechanisms and Practices.
Security	- Potential Security Threats - History of Violence, - Types / Sources of Violence, - Property Damages and Injuries to People, and - Control and Response Mechanisms.

3.5. Stakeholders and Public Consultation

EISA need to be an interactive and incorporating of stakeholders and community in order to have a comprehensive approach, inform and continually update about the project and to engage, seek and maintain active participation and support community, project-affected communities and their representatives throughout the various stages (appraisal, planning, implementation, follow up, monitoring and evaluation) of the project; and

During the field investigations:

- Meeting and discussions were held or conducted at woredas and zones along the route;
- Consultations with relevant stakeholders and community representatives were made on their knowledge and experiences of issues & problems related to the proposed road project and on their attitude towards the projects. Also on information and data available on issues related to the transport facilities and needs; and
- Stakeholders' opinion regarding environmental issues related to the proposed road project was assessed.

Public consultations within Miesso – Bike – Dire Dawa envisioned Expressway was carried out so far three times. The first one was made during June 2020. The second one was made in October 2020. The third one was made in November-December 2020.

The first field assessment and consultations were made with key Woreda Administration office staff members, while during the second field assessment, exhaustive consultations were made with all government stakeholders that included all concerned sector offices in all the Woredas Miesso (Oromia), Mayesso, Afdem, Bike, Erer and Siti Zone Administration of Somali National Regional State

During the third field assessment consultations were made with community representatives that were invited form all the Kebeles would be traversed by the expressway, and in particular, it included religious leaders, elders, women, youth, Kebele Chief Administrators, Kebele Manger and representative from Woreda Administration.

It was through such consultation made with concerned government stakeholders, particularly during the first reconnaissance study that identification of Woredas, Zones and National Regional States and Kebeles through which the expressway would be traversed were identified.

It was during the second and the third field assessment that formal and exhaustive consultations were made with all concerned government stakeholders of the Woredas of Miesso (Oromia); Mayesso; Afdem; Gota-Bike; and Erer; Sitti Zone of Somali National Regional State; West Hararge Zone of Oromia National State; and Dire Dawa Administration.

The major agendas for consultations and discussions with government stakeholders at the Woreda, Zone, National Regional State, Dire Dawa Administration level and with community representatives level were focused on:-

- Briefings about the expressway building from Miesso - Bike - Dire Dawa;
- Consultations and discussion on the positive and negative impacts of the expressway and mitigation measures to be taken to minimize the negative impacts to be occurred; and taking into consideration the experience gained from railway built from Djibouti to Addis Ababa;
- most of the discussions were carried out with reference to the New Railway built from Djibouti to Addis Ababa,
- To collection of socio economic and baseline data of each of the Woredas based on a format prepared and distributed to all the Woredas,

As to the results of consultations and discussions made,all the stakeholders from the Woredas, Zone, National Regional State, and community representatives expressed their opinion freely and indicated that the opening up a new expressway will have positive aspects to: -

- Reduce the burden of walking on foot or using lorries, heavy trucks, Isuzu and any transport facilities available when going to Miesso (Oromia) and then Adama, Addis Ababa etc.., or to the direction of Dire Dawa, Harare and other towns, etc..,
- Promote employment opportunities for youth and community within the area at large;
- Enhance development programs and business activities within the Woredas and the corridor are;
- Reduce travel time to go to Dire Dawa and other towns like Awash, Adama and even Addis Ababa.;
- Promote networking and communication among peoples;
- Enhance provision of social services for the pastoral and agro-pastoral communities etc..,

On the negative side of having expressway, based on the experiences they had befor and challenges they were encountered on Djibouti – Addis Ababa Rail Way , they have expressed their threats that:-

- Project affected persons would not be paid adequate compensation for the loss of their properties and assets,
- Adequate under pass or over pass roads for their livestock would not be constructed and this would hamper movement of their livestock in all directions;
- Local community members, youth, women and others who are able to work may not able to get employment opportunities, because the members of the communities' are considered as pastoralist and agro pastoralists who are not able to work on construction works;
- Mitigation measures designed to overcome environmental and social risks that may affect the population within the expressway may not be implemented as required; and;
- Related issues were raised, consultations and discussions were made, and responses were given by the ESIA team at all the Woredas where consultations were carried out.

Particularly, on the issues of would be affected properties and assets inventory taking; valuation and estimation for compensation payment to be made and on the process of compensation payment and dalliance, hot discussions were carried out. The ESIA team made responses to their questions informed them that all process related to compensations and compensation payments will be based on Proclamation No.1161/2019, A Proclamation to determine Expropriation of Landholdings for Public Purpose, Payment of Compensation and Resettlement; and Council of Ministers Regulation No. 472/ 2020.

Minutes of all the consultations and discussions made at different levels were taken and recorded and attached to this the ESIA report.

3.6. Alternatives Analysis

Following clients, ERA's, manual and the need of alternative considerations for ESIA studies, alternative alignments were proposed and MCA were conducted for environmental and other aspects' considerations. Three alignments were proposed and considered for the current project.

3.7. Specific Safeguard Assessments

- **Environmental Impacts Assessment:** made assessment of policies, legislations and institutional frameworks, review of project design and activities, studied baseline environmental characteristics, analysis of data, identified sensitive receptors, identified anticipated impacts (adverse or favourable), characterised impacts type, characteristics, duration, significance and extent, and developed Environmental Management and Monitoring Plans.
- **Social Impacts Assessment:** made document review, field visit on survey of land uses and social baseline conditions, data collection and analysis, identified socioeconomic problems, identification of key informants and SHs, conducted public and SHs consultations at different levels, survey of affected people and properties, formed social impacts, livelihood impacts, and resettlement action plan.
- **Underserved Community Assessment:** made document review, field visit on survey of land uses and social baseline conditions, data collection and analysis, identified socioeconomic problems, identification of key informants and SHs, conducted public and SHs consultations at different levels, identification & analysis of impacts on underserved communities, and preparation of development plan.
- **Community Health and Safety Risks Assessment:** made assessment of policies, legislations and institutional frameworks, review of project design and activities, assessment of field visit and secondary data, public consultations analysis, identification of health and safety risks, identified natural and human made hazards, analysis of risk significances & identification of necessary measures.
- **Occupational Health and Safety Risks Assessment:** used identification of essential legal provisions, frameworks and guideline requirements, and identification of project activities and scopes, identification of health and safety risks, evaluation and classification of risks and hazards and required OHS implementation plan, PPE equipments, precautions, procedures, reporting and communication systems.
- **Labour Procedure Plan:** conducted desk study on legal provisions, frameworks and guideline requirements, work conditions and organisational relations assessment field assessment, interview of key informants, analysis of potential risks and labour procedure requirements.
- **Gender Based Violence Assessment:** undertook desk study of legal and institutional frameworks, field assessment and conducted interview of key informants, identification of GBV risks, and preparation of management measures.
- **Resource and Pollution Assessment:** reviewed project activities including ancillary sites, identified project energy resource and material needs, recognize community dependence on resources, made field assessment, data collection and analysis of data on livelihood, available resources, presence of emission and pollution, identified potential pollutions, analysis of risk significance and preparation of management measures.
- **Security Risk Assessment: Assessment:** undertook desk study of legal and institutional frameworks, field assessment and conducted interview of key informants, review of security data, identification of potential risks and preparation of management, reporting and communication systems.

3.8. Mitigation Measures

Mitigation measures are measures envisaged in order to avoid, reduce and, if possible remedy significant adverse impacts that have resulted from implementation of undertakings. Implementation of mitigation measures follow the hierarchy given below:

- Avoid impacts at the source;
- Reduce impacts at source;
- Abate impacts at source;
- Abate impacts at receptor;
- Repair impacts;
- Enhance; and
- Compensate by different means.

3.9. Assumptions and Limitations of the Assessment

Naturally a relatively high level of project detail is required to undertaken an effective Environmental Impact Assessment process; yet, is hard to get accurate information of the future incidents and conditions that would influence the assessment assumptions and impact predictions. One aspect is the type and nature of construction machineries and methodology that will be used at time of construction, affecting the level of noise, vibration and pollution at time of construction in particular.

Unpredictable Natural Changes: Factor of Climate Change are unpredictable and erratic to predict the level of impact from the project in addition to changes in the climate. How climate change will affect (positively or negatively) the interactions between the project, the environment and communities over its lifetime including: the magnitude, likelihood, duration and reversibility of climate-related impacts alongside the risks of the project to the environment and communities.

The variance in the assumptions based on which the conclusions were drawn may differ quite substantially. This includes future Passenger/Flight Demand Forecasting, which is currently not available. Potential for amendments or new applications is another reason of uncertainty.

Management Efficiency: Management and mitigation implementation as well plays a great deal in the level of impact both at time of construction and service, in predicting future impact levels. It is only possible to develop a framework level with the information available. It is only possible to define management objectives to guide the development of specific management plans required for each project element as it comes on line.

Baseline: For the purpose of this document, it is assumed that the project will be implemented and construction will commence in few year time where the baseline assessed will be maintained till then.

Current surrounding land uses do not change, with exception of the committed development identified.

The design, construction and post-construction phases of the project will satisfy minimum environmental standards, consistent with contemporary legislations listed, mitigation measures proposed and additional practices and knowledge.

Construction will be attached to the planning permission that will control any disturbance during construction works.

Chapter 4. PROJECT DESCRIPTION

4.1. Project Location

The project Meisso – Dire Dawa road lies in the central-eastern part of the nation. Administratively it crosses across the two regional states of Oromia and Somali, and it ends in the northern part of Dire Dawa City Administration. The project begins at Meisso Woreda, in W. Hararge Zone in Oromia; where as in Somali regional state, it goes through the four woredas of Meisso, Afdem, Bike and Erer, which are in Sitty zone. The project then terminates in Melka Jebdu Kebele, in the administration of Dire Dawa.

4.2. The Need to Design the Expressway

Based on The Djibouti City – Addis Ababa Transit and Transport Corridor study of the UN, the corridor carries about 1,000 trucks per day, mostly six-axle truck/trailer combinations, with those carrying wet bulk — mainly fuel tankers — comprising about 35 per cent of the heavy goods traffic and the remaining 65 per cent consisting of dry bulk and container trucks. The Adama _ Awash section has fair and good pavement road. The terrain is reasonably flat, and the absence of hills means there is little to no rutting. The carriageway is narrow in most parts, but widens where it passes through towns. The existing road has a growing traffic capacity demand growing continuously, and also has low safety conditions.

The project road is expected to further improve market opportunities, provide access to improved and better social service facilities, create improved communication, improve the supply of agricultural inputs, enhance investment and employment opportunities, contribute to income generating activities, and improve the situation of women by creating better access to transport and other facilities to the local community. In addition to employment opportunities, creation of other income generating schemes would be one of the positive impacts for the local community.

4.3. Design of the Road

The project is designed to AASHTO's Freeway standards (AASHTO, A Policy on Geometric Design of Highways and Streets and ERA's Geometric Design Manual (ERA's Latest Version Geometric Design Manual). Based on the design standards for the project, the main road will have a total length of 141.8 km and DC-5 standard for Freeway and Link Roads, having a right of way (ROW) of 90m. There will be two lanes of 3.60 m width on each carriageway that means 2 x (2x3.6) which is equal to 14.4 m, 1.5 m wide inner hard shoulder, 3 m wide outer hard shoulder, 0.75 m wide outer soft shoulder in each side of the expressway, and 9 m median at the centre.

The route crosses the existing Mieso – Afdem – Bike – Dire Dawa Road segment three times. Hence, it will build vehicular crossings in these locations. Pedestrian, animal and railway crossings will as well be provided. The project also involves link roads to connect the expressway to the nearby towns at Meisso, Afdem, Bike and Erer towns.

4.4. Scope of Work

Spatial Scope

The geographic scope of the study will mainly be the project alignment and surrounding environment / corridor of the road including surrounding natural setting and settlement areas [rural settlements and major town of traversed] and beyond interconnected watershed areas and streams of the project site.

These include, generally:

- Traversed Settlements and Public/Private Properties;
- Other development Projects in the vicinity that may bear cumulative Impacts;
- Sources of energy, water and other construction Materials;
- Construction technology and use of equipment related to the projects major activities;
- The environment far from the project area that may be affected directly or indirectly (Water shade management, biodiversity etc.); and
- Construction material extraction sites and other ancillary working areas.

The special scopes of project impact based on level of impact are described as:

Direct Impact Zone: The direct impact zone will be the 90m width to be cleared for the road alignment and areas of ancillary works. This will involve clearing of natural environment along the corridor and paving it for the road use. The impacts in this particular zone are related to vegetation clearance, clearing of habitat areas, land (farming or grazing areas) acquisition and landscape alteration.

Buffer Zone: In the buffer zone are the shoulder environment and communities. Though they are not in the direct impact zone, they will significantly be impacted with impermeability to human and animals movement, waste disposal, health, air pollution, noise and vibration, soil contamination / compaction, etc…

Wider / Water Shed Zone: the impacts in wider watershed are areas, resources or communities not impacted directly, but will face indirect impacts as a result of impact in the ecosystem or watershed environment. These impacts will have different significance levels and be related to soil erosion, sedimentation, water contamination / pollution, water resource amount and pattern, etc…

Temporal Scope

The period for the design stage of the project is to be nine months, which including the mentioned design phase activates in the following section. The construction of the road is expected to be about 5 years, where the overall lifespan of the project including the service period is estimated in the range of 15 to 20 years, The activities to be occur his period are also discussed underneath. Accordingly, most of the adverse impacts identified in the ESIA are anticipated in this period.

The service period as well will involve adverse as well as beneficial implications. The road is expected to serve for 20 years, the duration and level of each impact in this period varies. Scope of impact areas in these periods are discussed here and also in Chapter 8, i.e. "8.6. Evaluation of Impacts".

Long-term Scope: The positive social and economic impacts including benefits in economic and transportation access improvement, better port access, and improved road safety are subject to local and national economy felt during the operation phases of the project road.

Impacts in the long run, yet, are not limited to benefits, but adverse impacts too. Significant environmental impacts to natural environmental components and communities are anticipated to live for long period, during service period. These include social impacts in livelihood alterations and limitations to movements.

Direct and adverse impacts like increased traffic accidents, pollution due to increased vehicle exhaust gases and transportation of hazardous material in transit, noise and road side litter can also be observable impacts during the operation phases of the road.

Medium Period / Duration Scope: some of the impacts, such as pollution to water or soil, are expected to be majorly occur during the construction period and continue afterwards, but will decrease significantly after completion of the project. And impacted environmental components could rehabilitate as well.

Short Period Scope: few of the impacts are subjected to shorter period. These are specifically both in beneficial (as for eg. employment opportunities) and adverse impacts as dust pollution, competition for water use, pressure on health facilities, and also occupational health and safety (OHS) aspects. The impacts in terms of duration, as mentioned, are discussed in Chapter 8, i.e. "8.6. Evaluation of Impacts".

Reference:

Temporal and distribution of impacts is presented in:

- ***Annex B –Temporal Scope & Distribution of Impacts.***

4.5. Project Activities

The road project work comprises of, design, construction, maintenance and operation activities. The design and feasibility study works mainly focus on site investigation and site surveying, material investigations, quarry and borrow site determination, assessment of existing environmental conditions and social structure.

The construction work activities include site clearing for widening the road width, excavation and grading, filling, compacting, improvements in drainage structures, waterways crossing, paving, quarry and borrow material development, establishing camps, garage site and material storage sites, temporary detour roads construction and maintenance.

The construction phase activity deploys a number of workforce, machinery and transport vehicles. The worker community deployed during the construction work includes both people coming from within and outside of the project area. Skilled and semi skilled manpower will be mainly from outside while unskilled labour force required will be recruited from the localities of the road project area. The major part of the workers would be temporary residents of the project area.

The construction activities can be categorized as principal and ancillary works, based on the character and magnitude of the work.

4.4.1. Design Phase Activities

Design – Based on ERA's standards the design for the expressway determining, width and other standards of the road and link roads.

ESIA- The ESIA study will conduct screening and identifying of impact and scopes, desk study of relevant documents, policies and legislations, data collection, stakeholders and public consultations, analysis of project alternatives, identification of impacts and analysis process, and also planning mitigation and monitoring. It will address environmental, social, and OHS aspects of the project.

Survey – Survey will be carried out along the route to be used for the design and will as will be used as input for the ESIA and the RAP document.

RAP – For the RAP the survey data along with market data from project areas will be in use to assess impacts on community and properties. Impacts in these aspects will be quantified and estimated in cost. Consultations from start, inception stage, to routes selection and after end of the RAP will be carried out. IT assess how the socio economic benefits from the project road will be distributed among different stakeholders overtime; and also assess the adverse impacts to be created due to the upgrading of the project road.

Feasibility Study -The purpose of the Feasibility Study is intent to present the details of traffic studies & analysis, economic evaluation & financial viability of various development options based on estimated project investment cost as per the preliminary investigations, analysis and design.

4.4.2. Design Measures

I. Identification of Construction Sites and Operations

Akin to the presented design stage activities in the section above, most of the design measures and operations to be carried out in the implementation stage of the expressway are identified and detailed in this chapter. The design stage has assessed the route corridor and identified potential alignments for the project and accordingly selected the one best preferred with multidisciplinary MCA analysis. Also, for the preferred alignment a ground survey was conducted to identify the exact influence area of the project. Accordingly, at this stage, the alignment of the project and features in the RoW are identified.

Additionally, necessary earthworks, slope protection works, requirement and sites for borrow, masonry water and sand, operations of asphalt ant crusher plant operations, cross drainage structures, crossings and link roads, energy and raw materials or resources, and generated wastes were identified.

With this, the consultant has came to evaluate and find out potential 8,128,548.52 m^3 of spoil generations, 951,564 m^2 of slope protection grassing work, 119 locations & designs of cross drainage structures, 4 water sources, 55 Pedestrian & Animal crossings, 24 vehicular crossings, 23 material (Sub-Base, Sub-Grade, sand, and rock) extraction sites, areas and volumes of material need. Based on the design impacted social and environmental components of the project area were assessed and respective risk minimisation and management measures were prepared.

II. Design Environmental Measures

Selection of Route Alignment: During the route selection, three potential routes were identified and selection of the preferred route was made based on environmental, social, and administrative preferences in the multidisciplinary MCA analysis. Based on the environmental analysis the first and second routes were pretty similar and had similar result where the third was not environmentally preferred. Socially, the first alignment was the most preferred route, the second being second preference with slightly higher social impacts. Economically, the first and second were preferred equally.

Administrative and community preference was also, another criterion. Based on the consultations with local administrative and communities, the public had urged highly for the route to be closer to the towns along the corridor, mainly, Mullu, Afdem, Erer and Bike. It was their regard that the closer the route to towns and link roads provided, the better they would benefit. Accordingly the second route option, which was close to the towns mentioned and the existing gravel road passing along the towns, given higher point in administrative criterion of the MCA. Finally, the MCA resulted favouring for the second alternative route, because though socials not preferred, it had better scores in environmental, engineering and administrative criteria. As a result, the design also fulfilled the requests of the local communities and administrations for the route to be aligned close to the closely towns. The design of the expressway, accordingly, was made to this alignment.

Identification of Public Demands: The Public & Stakeholder Engagement mainly informed the community and SHs on project information, recognised public consent and collected regards on project design, potential impacts and suggestions of mitigations. Based on the SHs engagement in consultations on the design with local administrative and communities, provision of crossings to local people, pastorals and animals was a critical issue. For this reason, the design considered the access limitation from the fenced expressway on local communities and their supplementary demand, to propose 55 Pedestrian & Animal crossings. Specifications on the standards and designs were also made. Additionally, at Meisso, Afdem, Bike and Erer towns along the road are proposed with standard link roads connecting them to the expressway and benefit from economic potential advantages.

Avoidance or Minimization of Ecological Impacts: In the aspect of ecological impact the design assessment considered the ecological conditions in the route selection. The design attempted minimal crossing over valued ecosystem, forest, parks, high biodiversity, crossed or nearby water resources, wetlands, recharge aquifer areas, erosion prone areas and valued landscapes. After proposing alternative routes, the same criteria were used quantifying and comparing impact in terms of length and proximity. With that prospect, the best options with lower potentials of environmental footprints were selected.

Selection of Ancillary Sites: As mentioned the project demanded *sub-base, sub-grade*, sand, rock and water sources; for which 23 material and 4 water locations were identified for the deemed need. The selection of these ancillary sites made consideration to further required sites to be further from any environmental and social sensitive areas. In selection of the sites lower social and environmental impact results were also in consideration.

III. Construction Implementation Stage Engineering Decisions

Ancillary Sites Selection (for Some Activities): In the design, close to precise data on demanded volumes and areas of material extraction at proposed ancillary sites were identified for the mentioned sub-base, sub-grade, sand, rock sources sites. Yet, some of the ancillary sites are to be located and proposed during the implementation stage, and not identified at this stage. Specifically, though the need for camp site, (asphalt and crusher) plant sites, and volumes of spoil were estimated the exact location and area are to be further investigated and proposed by the contractor during implementation, considering economic considerations & its management mechanisms.

During the ESIA study, however, these needs and operations were recognised and potential impact evaluation made due considerations. Respective mitigation and measures to be take to reduce environmental and social risks at the construction and operation stage are presented in the later sections, (i.e. chapter 7) dealing with impact identification and mitigation recommendations. Later, in the Environmental Management & Monitoring Plan (EMP) also incorporated the necessary Management & Monitoring measures and what roles the contractor, consultant, financier and ERA play in ensuring the implementation of suggested mitigation and instruments. Additionally, an Ancillary Sites Management Plan has been prepared (attached in Annex VI), specifically dealing with ancillary sites and activities in different stages.

Project Alignment: the consultant has opted the best preferred alignment for the Meisso _ Dire Dawa expressway, with the route being short as possible, economic, environmentally and socially more feasible, and made close to towns in the corridor fulfilling community demands. Yet, in the implementation stage, the detail design could reconsider the alignment with the same criteria, even though no major shift in the alignment is expected. The influence area and people are not expected to significantly differ as well.

Crossing Selection: the design has identified the demand for pedestrian and animal crossings. Following, this it has proposed crossings with their designs. Yet, in the implementation stage, the contractor and the client, ERA, are expected to further consult with the local community in identifying more needs and informing on the considerations and provisions of crossings. Hence, more detailed designs, numbers and locations of the crossings are to be decided in this stage.

4.4.3. Principal Construction Phase Activities

The Project Road will be constructed to an asphalt standard with 90 m width of RoW and the roads fenced; and hence, it involves different activities that may have different nature and magnitude of environmental impacts.

It is believed that project activity description will assist to visualize the location and extent of potential impacts of the project on the bio-physical as well as socio-economic environment of the area. On this basis, the principal project activities expected to be considered, among others, as causing either beneficial or adverse environmental impacts are:

I. Land Clearing and Grubbing;

The road alignment will be completely new route requiring clearance of 90 m width right-of-way. The roadway must be cleared of all vegetation and trees including their roots will be removed. Other than tree vegetations, farms and houses along the route will be cleared.

II. Camps and Workshops;

The Contractor will establish main construction camps at convenient location within specified sites along the road corridor. The facilities will include offices and residential accommodation for supervisory consultant staff and contractor workforce, workshops and vehicle maintenance facilities and storage areas. Subsidiary camps may also need to be established, with considerably reduced facilities and preferably away from residential and urbanized areas. One central main camp will be required for the respective consultant and contractor work forces. Potentially, some of these facilities are temporary to be demolished at the end of project and put back to their original land use. Specific locations for camps will be decided on implementation stage.

III. **Earthwork Operations**

The road construction works will involve earthworks comprising site clearance, paving, and excavations, embankment fills associated with vertical alignment adjustments to ease very depressed grounds and to improve sight distances and avoid water inundation. Excavated suitable materials will be used when possible in the works, otherwise will be removed and replaced.

High rise embankments are required at several locations, to protect the paved road from flooding damages and water inundation. At some locations retaining structures may also be required at steep sloped cut hill sides, at river crossings & to support the raised embankments, and to stabilize the fills. The project's earthwork summary appears to be as follows:

Table 4.4.3-1: Earthwork Summary of the Project

No.	Earthwork	Specific Activities	Unit	Rate	Volume (m^3)
1	Temporary Diversions for Traffic Management	Construction of diversions	km	142.00	6,384,320.00
2		Maintenance of Diversion	km	142.00	6,384,320.00
3		Reinstatement of Diversion	km	142.00	6,384,320.00
4		Traffic Management – half-width	km	-	-
5	Clearing and Grubbing	Clearing and grubbing	Ha	758.26	44,064,842
6	Roadway and Borrow Excavation Cut and borrow to fill	Cut to fill/embankment including the replacement of unsuitable materials, compacted to 95% of modified AASHTO density	m^3	236.12	50,000.00
7	Borrow to fill (including all specified borrow pit requirements under Division 4300):	Borrow to fill/embankment including the replacement of unsuitable materials, compacted to 95% of modified AASHTO density	m^3	41.39	717,216.89
8		Rock fill (as specified in sub-clause 4404)		251.67	
9	Cut to spoil	Common (normal or soft) excavation, excluding undercuts for the removal of unsuitable materials		111.49	4,988,561.15
10		Common (normal or soft) excavation for the removal of unsuitable materials		111.49	2,223,684.42
11		Rock (Hard) excavation		217.8	349,847.26
12		Improved Sub-grade			566,455.69

IV. Slope Protection Works

The terrain of the project route has only flat and rolling sections and has no identified locations with potentials of stability. Instability and mass movement of material is expected in material extraction sites (borrow and masonry sites), which are dealt in respective sections of sources of materials and impacts from ancillary works and sites. Slope protection works are, however, to be carried out in as landscaping and grassing works for embankments along the road. Quantity of the slope protection work anticipated is presented hereunder:

Table 4.4.3-2: Slope Protection Works

No.	Description	Unit	Quantity (m^3)
1.	Preparation of areas and planting of grass cuttings including top soiling and providing and applying chemical fertilizers.	m2	951,564

V. Access Road;

The road construction beyond the main alignment will demand clearing for of different land forms to provide access to inaccessible sites and ancillary sites of the project. Similar to detour roads, access roads will take vegetations, farmlands and grazing areas risking both environmental and social concerns / scales and will be temporary for construction period. Areas used for the purpose of access road are to be reinstated and put back to their original land use purposes.

VI. Road Sides Fencing;

Welded wire mesh fence will be installed on both sides of the road length. The fence will be placed to control entry or crossing of the roadways by vehicles, pedestrians or animals, maintaining safe permeable zone for traffic. Although fences have these benefits, they also can create movement barriers, fragment habitat, and cause significant impacts.

VII. Asphalt Plant Operations and Bituminous Layering;

The project road is under DC5 design standards therefore will involve asphalt plant operations and bitumen productions. The bitumen or bituminous mixture is to be on the road width and shoulders. This surfacing consists of nominal single size aggregate rolled into a bitumen layer, which will been sprayed on to a prepared surface.

VIII. Construction of Drainage Structures

According to the classification of ERA Bridge design manual 2013, Bridges are a structure with a total clear opening above 6m and a structure with a clear span opening less than that is a culvert. A small bridge is 6-15m, Medium bridge 15-50m, and a large bridge above 50m total length. Thus, according to the initial hydraulic size output the bridges in all the alternatives can be classified as small to medium span bridges.

The type of superstructures recommended is Reinforced Concrete bridges and all of the substructures are R.C abutments and piers. The total width of river crossing bridges has a width of 12.45m to fit the carriageway width of the expressway including the shoulder. The total numbers of designed crossing structures are 119.

Reference:

List of cross drainage structures with locations and sizes are presented in:

- ***Annex C – List of Cross Drainage Structures***

During operation, ditches are required to be maintained to ensure proper drainage at all times. Any necessary ditches and channels are expected to be constructed and maintained to ensure there is no damage to the roadway section.

IX. Crossings and Link Roads;

Since the expressway is aligned far from town centres and densely settled areas, link roads will be constructed to access those settlement areas and that can serve also as inlets outlets route for the expressway.

Link Roads

Link road to connect to nearby towns are proposed at Meisso, Afdem, Bike, Erer and Dire Dawa Towns. Link roads provided for the expressway road are:

Table 4.4.3-3: List of Link Roads

No.	Locations		Length (m)	Area for Access Road (Ha)
	Description of Location	Station (KM)		
1.	Meisso Town	67+800	1474.7	7.37
2.	Afdem Town	110+400	308.3	1.54
3.	Bike Town	130+500	369.7	1.85
4.	Erer Town	150+800	196.3	0.98
5.	Dire Dawa City	206+963		-

The link roads will have a carriageway width of 50 m Right-of-Way and will have a design class of DC5.

Vehicular Crossing

The route crosses the existing Mieso – Afdem – Bike – Dire Dawa Road segment three times.

Table 4.4.3-4: List of Vehicular Crossings

No.	Locations	
	Description of Location	Station (KM)
1.	Mainline Expressway with Roadway	205+350

The specific type of vehicular crossing either overpass or underpass can be decided on the detail study during construction of the project. However, for quantity estimation purpose vehicular crossings are considered as overpass. Additional to the main listed above, the total number of vehicular crossings will be 24. The bridges are reinforced concrete girder with total width of 3.6 m for single carriageways and 7.2 m for dual carriageways.

Pedestrian and Animal Crossings

The study has identified 55 Pedestrian & Animal crossings. Provided minimum vertical clearance (free board) is 5.3 m. Type of pedestrian crossing either overpass or underpass can be decided on site depend on site condition. However, for quantity estimation purpose two overpass pedestrian crossings are considered. Both of the overpass bridges are reinforced concrete girder. Additional crossing are also reserved for future demand during implementation phase of the project

Railway Crossings

The minimum clearance is 8m measured from top of rail to the soffit of the bridge. The span of the railway crossings proposed is 40 m Box Girder superstructure supported on Reinforced concrete abutment. The expressway will have only 1 railway crossing.

X. Borrows;

Burrow pit development will be one of the material sources required for sub-base construction of the express way along the road project, and may be needed for fill in sections where adequate spoil from cut to fill material is not available or quite impossible due to its quality. Sand will be extracted from potential sources too.

Table 4.4.3-5: Proposed Locations of Sub-Base and Sub-Grade Borrow Sources

No.	Station (KM)	Coordinates		Access	Land Use of Area	Volume of Extraction	Area for Access Road (Ha)
		Easting	Northing				
1.	67+076,Road Side	689233	1019579	Required	Scattered Bushes	200000	-
2.	78+072,Offset 142m,RHS	698120	1025795	Required	Scattered Bushes	200000	0.071
3.	97+117,Road Side	712524	1038016	Required	Scattered Bushes	20000	-
4.	104+011,Road Side	716771	1043325	-	Scattered Bushes	20000	-
5.	114+056,Road Side	723288	1050502	-	Scattered Bushes	25000	-
6.	115+037,Road Side	724086	1051074	-	Scattered Bushes	15000	-
7.	131+016,Road Side	738880	1056633	-	Scattered Bushes	25000	-
8.	137+009,Road Side	744387	1055234	-	Scattered Bushes	15000	-

Table 4.4.3-6: Proposed Locations of Sand Sources

No.	Station (KM)	Coordinate		Access	Land Use of Area	Volume of Extraction	Area for Access Road (Ha)
		Easting	Northing				
1	71+500 Offset 650 m	694004	1021616	Required	River		0.33
2	75+758 Offset 1.2 KM RHS	696629	1023445	Required	River		0.60
3	81+475, Road Side	700985	1027607	Required	Mulu		-
4	188+550, Road Side	791166	1065062				-

Table 4.4.3-7: Proposed Locations of Gravel Sources

No.	Station (KM)	Coordinate		Access	Land Use of Area	Volume of Extraction	Area for Access Road (Ha)
		Easting	Northing				
1.	110+640,Offset 273 m, RHS	720613	1048410	Required	Scattered Bushes	200000	0.14
2.	119+757,Offset 862 m , RHS	728649	1052649	Required	Scattered Bushes	120,000	0.43
3.	115+000,Offset 269 m, RHS	724188	1050835	Required	Scattered Bushes	150,000	0.13
4.	171+466,Offset 5.5 Km, RHS	774594	1057133	Required	Scattered Bushes	150000	2.75

5.	99+863, Road Side	714091	1040264	-	Scattered Bushes	20000	-
6.	118+762, Road Side	727477	1052653	-	Scattered Bushes	15000	-
7.	139+990, Road Side	746341	1053025	-	Scattered Bushes	25000	-
8.	182+054, Road Side	784765	1063865	-	Scattered Bushes	20000	-

XI. Quarry Sites;

To fulfil material demands, quarry sites at different sites along the road corridor will be placed by the consultant during the construction and any additional sites that may be required upon execution of the work will be determined by the contractor to meet further needs of the road construction work but it will be subject to the approval of the Engineer.

Table 4.4.3-8: Proposed Locations of Rock Sources

No.	Station (KM)	Coordinate		Access	Land Use of Area	Volume of Extraction	Area for Access Road (Ha)
		Easting	Northing				
1.	121+978, Offset 50 m RHS	730189	1054397	Required	Scattered bushes	200,000	0.03
2.	120+005,Offset 422m, RHS	728642	1053156	Required	Scattered bushes	100,000	0.21
3.	177+000,offset 50m,RHS	780226	1061792	Required	Nil	50000	0.3

XII. Crushing;

Stone quarrying is another activity for implementation of the project. This process involves rock extraction from the ground and crushed to produce aggregate, which is then screened into the sizes required for immediate use, or for further processing, such as coarse aggregate and coating with bitumen to make bituminous macadam or asphalt.

XIII. Detour Roads

The expressway will have a wide width of 90 m right-of-way. Moreover, the alignment has only flat and rolling terrains, making it easier to use the right-of-way width for construction and detour roads within the land acquired area. Hence, the project is anticipated to have no additional area of land to be used for the purpose of detour.

XIV. Construction of Pay Tolls;

Tolls are collected at toll booths, toll houses, stations, bars, or gates. The toll is a collection point for payment of road use. They are expected to fund authorities for future similar projects.

XV. Uses of Natural Resources, Energy and Raw Materials

Water for Construction Works

Water is required both for the construction activities and for the domestic uses of the workforce. Water is required for soil compaction in embankment, sub-grade and for concrete works. Searching for and identifying potential water sources is, therefore, essential tasks for the contractor.

Table 4.4.3-9: Proposed Locations of Water Sources

No.	Station (KM)	Coordinate		Access	Seasonality	Area for Access Road (Ha)
		Easting	Northing			
1.	80+742 C/L	700392	1027175	-	Perennial	-
2.	151+139 C/L	757112	1054320	-	Perennial	-
3.	158+144 C/L	761931	1059501	Kerkerale	Perennial	-
4.	117+000, Offset about 1KM RHS	726083	1051655	Requred		0.30

Construction Material Uses

As mentioned earlier, the construction work will demand the extraction of gravel, sand, sub-base and masonry materials. The details on the need of material sources and proposed locations and volumes are presented in former sections, i.e. (X.) Borrows and (XI.) Quarry Sites.

Energy Uses

For the construction energy supply the contractor is anticipated to use mainly fuel and electricity. Fuel will be used to the use of machineries and equipments, while electricity is used for lighting and utilities in camp accommodation, compound & offices and other higher demanding activities in workshop & construction including generators or welding machines.

Potential Waste Generation and Pollution

Different sources of hazardous or non-hazardous wastes are to be produced from the implementation of the project. Camp and its housing and office facilities would produce litters and wastes of different nature. Asphalt plants, workshops and other facilities have the potential to produce oil, lubricants, spares, metals, and other similar sources.

Reference:

Plan specifically for resource and energy efficiency and prevention management is presented in:

- ***Annex J – Resource Efficiency and Pollution Prevention and Management Plan***

XVI. Climate Change Abatement Activities

As the road corridor is desert, it highly prone climate change that more intensify adverse environmental and social impacts due to drought. Therefore, climate change and drought abatement is very important along the road corridor. Therefore, the contractor shall realize the climate change resilient economic strategy of the country through tree plantation in collaboration with NGOs, local government bodies to alleviate drought and combat desertification along the road.

XVII. HIV/AIDS Prevention and Control Activities

HIV and AIDS is one of the most serious threats of road construction project staff, labourers as well as the surrounding community. The risk of HIV infection at road construction sites is higher not only for the construction crew, but also to the local community dwelling along the road construction site. Hence, to tackle the threat from HIV spread, the construction project will involve activities of HIV/AIDS Prevention programmes.

The HIV Prevention programmes will include activities such as awareness creation campaigns, peer education, promotion and distribution of condoms, provide and/or creating access to HCT services, provide care and support service for employees living with HIV and other related activities.

4.4.4. Operation Phase Activities

During operation phase of the road, no new land occupation and no significant disturbance to the natural resource is expected. The operation phase activities include routine maintenances of damaged parts of the road, traffic flow regulations, clearing of obstacles and monitoring of development trends; and the effects of the road project on the surrounding environment. These activities shall be undertaken by the regular employees of the regional rural roads authority or ERA's district offices. The degree of skilled and unskilled work force deployed and the machinery required is also less during the operation phase of the project.

4.5. Project Right–Of-Way (ROW) Condition and Influence Areas

The road route corridor falls mainly in acacia woodland forest areas and farming areas. The terrain of the alignment is also dominantly rolling terrain, with about third of the section being flat. Passing along towns, it does not enter into central parts of town sections, as it passes along the outskirts of main towns and cities.

The expressway line has wide width of work, right-of-way, for 90 m of width. And the alignment of the road will totally be new, demanding new clearances.

Additional to the main road alignment, the road as mentioned will have link roads to connect to towns with 50 m right-of-way, vehicular crossings with width of 3.6 m for single carriageways and 7.2 m for dual carriageways, and 5.3m width of pedestrian / animal crossings.

As the road alignment has wide right-of-way width with moderately flat terrain, there will not be additional demand of detour lines. Yet, additional areas of land will be demanded for ancillary works, for the purposes of:

- Camp Sites,
- Borrow material for road embankment,
- Natural granular material for Sub base,
- Quarry stone for crushed aggregate and masonry works, and
- Sand source for concrete and mortar works.

Chapter 5. DESCRIPTION OF THE BASE LINE ENVIRONMENTAL CONDITIONS

The existing environmental conditions are briefly discussed to give the general overview of the baseline environmental situation, under this section, while that of route corridor condition is presented in a relatively detailed manner.

5.1. Physical Environment

5.1.1. Geographic Location

Geographically, the project Meisso _ Dire Dawa lies in the eastern part of the nation. Through its corridor the project route connects two regional states, Oromia, and Somali, and one city administration, Dire Dawa City Administration.

The first section of the road is within the Oromia Regional State, northern part of West Hararge Zone, intersecting one woreda, i.e. small section of Meisso Woreda. The commencing point of the project is just entrance to Meisso town within the Meisso Woreda. The town is located 297 KMs east of Addis Ababa, national capital, along the Addis _ Djibouti Trunk road, and 25 KMs north of Chiro town, zonal capital.

Through the northern outskirt of Meisso town, afterwards, it goes to enter into Sitti Zone of Somali Regional State, where most of the project stretch lies in. In Somali Regional State, the project crosses four woredas in the south west of Sitti Zone, namely: Meisso, Afdem, Bike and Erer Woredas. In the last section of the stretch it gets in to Dire Dawa City, in the Dire Dawa City Administration to terminate with a total length of 141.8 KMs just at the northern tip of the city. Cities / towns along the project route and traversed regional states, zones and woreda are presented in the table below.

Table 5.1.1-1: Regions, Zones, Woredas and Towns along the Project Route

No.	Region	Zone	Woreda	Towns	Remark
1.	Oromia	West Hararge	**Meisso**	Meisso	Project Beginning & Control Point, Woreda Seat
2.	Somali	Sitti (Shinile)	**Meisso**	Mullu	Intersected Town & Woreda Seat
3.			**Afdem**	Afdem	Intersected Town & Woreda Seat
4.			**Bike**	Bike	Intersected Town & Woreda Seat
5.			**Erer**	Erer	Intersected Town & Woreda Seat
6.				Hursu	Intersected Town
7.	Dire Dawa	Dire Dawa	**Dire Dawa**	Melka Jebdu	Project End & Control Point, Kebele 01 of Dire Dawa City

The project alignment, as it is an expressway road, does not enter into the central parts of the towns, yet, it goes in the outskirts of the towns in the northerly direction.

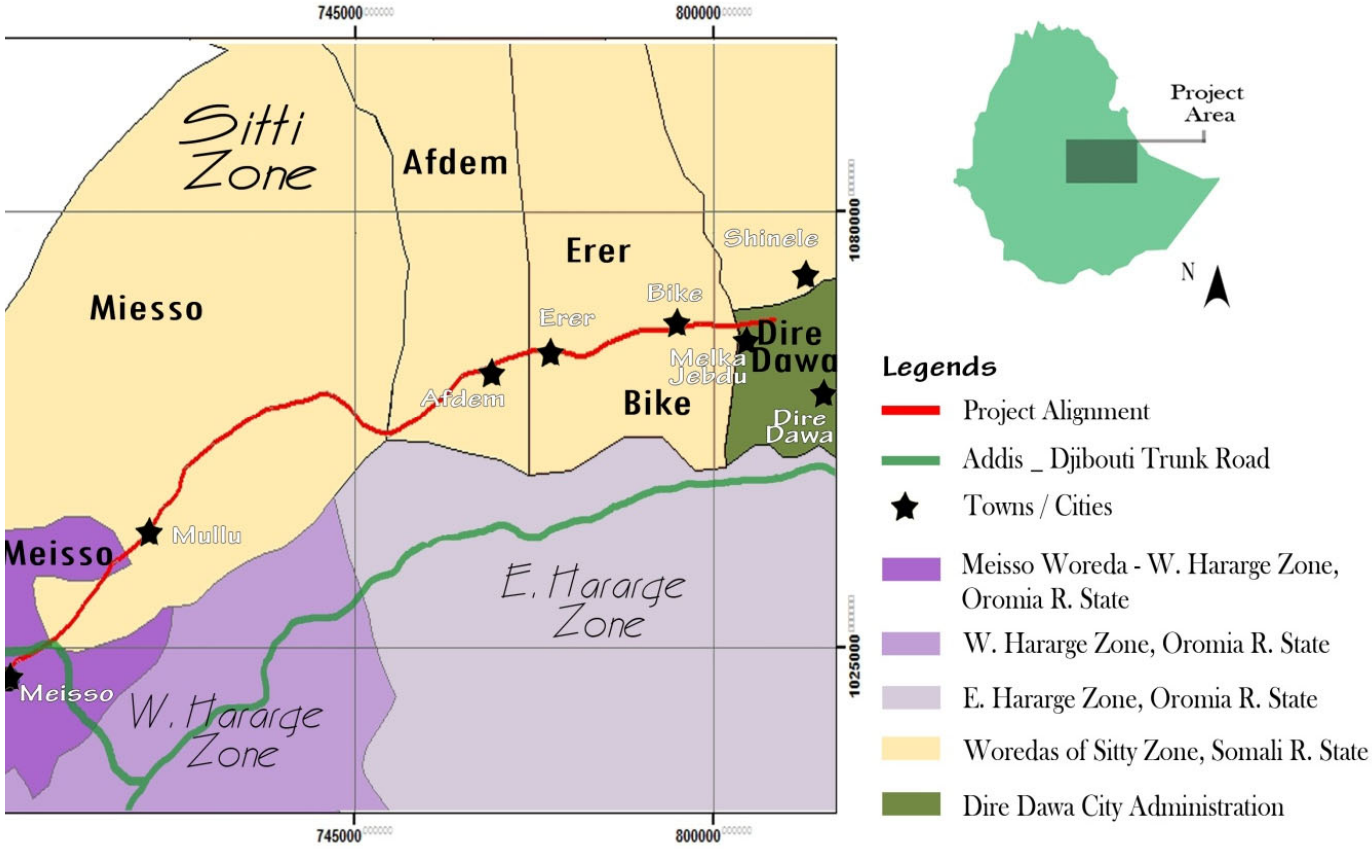


Figure 5.1.1-1: Project Location

5.1.2. Existing Road Infrastructure

The road corridor for the current project departs from the Addis _ Djibouti Trunk road after Meisso, following existing gravel road along the towns of Mulu, Afdem, Bike and Erer. The road is parallel to the trunk road to Djibouti. The current express way, in this section, is in close distance to this gravel road and goes parallel with it.

Figure 5.1.2-1: Gravel Road towards Mullu Town

Figure 5.1.2-2: Meisso River Crossing, along the Gravel Road, KM 74+000

The road has narrow width and poor quality where the river crossing has no proper structure. The section from Meisso to Erer is relatively of inferior quality and has lower traffic too. The section from Erer to end has more traffic and also has better quality.

5.1.3. Topography and Terrain

Topography

The project area dominantly falls under the climatic zone of Kolla /Hot-Warm/ characteristics. The elevation of the project near the beginning near at Meisso reaches 1394 masl. In the end section, Dire Dawa, it lowers a bit to 1276 masl.

Significantly dominant part of the project corridor has flat topography. However, few sections in adjacent corridor after Beky Town and going towards Erer, the topography comprises little mountainous section.

Figure 5.1.3-1: Flat and Rolling Terrains towards Mullu Town

Figure 5.1.3-2: Some Mountainous Terrains in Adjacent Corridor towards Erer Town

Terrain

The route alignment, specifically, has combination of flat and rolling terrains, with no stretches of mountainous or escarpment terrain.

Table 5.1.3-1: Terrain Classification of the Route

From	To	Length (m)	Terrain Classification
65+000	81+900.0	1690	Rolling
81+900.0	98+600.0	16700	Flat
98+600.0	174+900.0	76300	Rolling
174+900.0	187+000.0	12100	Flat
187+000.0	191+900.0	4900	Rolling
191+900.0	206+805.1	14905.1	Flat

Based on the engineering report, the project route, specifically, has only flat to rolling terrain, where quarter of the route (31%) has a flat terrain where the rest (69%) has rolling characters. There are no identifies sections with stability or potentials of sliding problems along the project alignment.

Table 5.1.3-2: Summary of Terrain Classification

Description	Total Stretch	
	Length (KM)	Length (%)
Flat	43.7051	31%
Rolling	98.1	69%
Mountainous	-	-
Escarpment	-	-

5.1.4. Climatic Conditions

Temperature

Based on collected climatic data collected from respective woredas, towards the project begging the temperature ranges between maximum 36 ° C and minimum 24 ° C, in Meisso Woreda of Oromia.

It gets warmer in the next section, towards Afdem with annual temperatures of 40 ° C maximum and 27 ° C minimum with an average of 33.5 ° C, where as in Erer Woreda it has a maximum of 38 ° C and minimum of 27 ° C annual averages, with an overall average of 33 ° C.

The mid section between the two woredas, in Bike Woreda, the temperature has a bit lower temperature exhibiting an annual average of 18 ° C, with 13 ° C and 23 ° C minimum and maximum annual average temperature scales, respectively.

Rainfall

Meisso woreda of Oromia, at beginning section, has annual average precipitation ranging in the amount of 500 mm to 700 mm minimum and maximum, respectively.

Rainfall is, relatively, higher in the woreda of Afdem; where it has about 750 mm annual precipitation. The range of minimum and maximum annual precipitation in this woreda ranges between 650 mm to 850 mm.

Towards the end of the project, precipitation goes lower with annual average minimum and maximum of 500 mm and 650 mm, with overall annual average amount of 575 mm. Further the daily maximum rainfall data from Meisso and Dire Dawa stations from the year 1992 to 2019 is presented below.

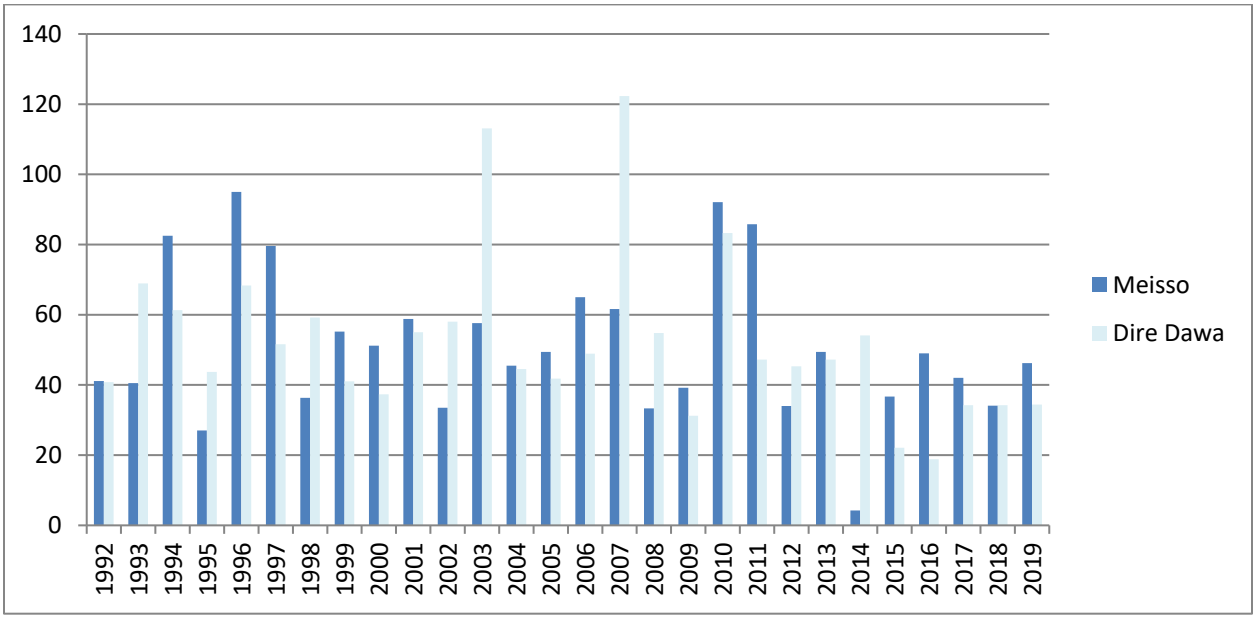


Figure 5.1.4-1: Daily Maximum Rainfall Data from the Year 1992 to 2019
(Meisso and Dire Dawa Metrology Stations)

5.1.5. Water Resources of the Route Corridor

The project corridor lies in the Awash Basin, starting in the basin's south-western part and runs to its south-eastern part. The project along its alignment crosses Awash River and other small and large tributary rivers of Awash.

Figure 5.1.5-1: Meisso River

Figure 5.1.5-2: Mulu River

The design of the current expressway is going to demand construction many bridges and other different drainage structures of pipe and box/slab culverts. Along the route, the project crosses major rivers of:

Meisso River	KM 74+500
Mulu River	KM 80+750
River	KM 94+000
River	KM 95+150
River	KM 96+300
River	KM 116+800
River	KM 128+300
River	KM 135+000
River	KM 136+300
River	KM 141+650

River	KM 142+850
River	KM 145+650
Gota River	KM 151+950
Erer	KM 156+300
River	KM 162+800
River	KM 169+300
River	KM 172+200
River	KM 198+850
Melka Jebdu River	KM 203+800

5.1.6. Geologic and Soil Characteristics

Geology

The corridor along the route has Volcanic Rocks geologic formations of different groups. The most predominant group from the Volcanic Rocks formations is the Afar Group Pleistocene – Oligocene – Miocene nature in almost full stretch of the road. The Ashangi Groups, within the same formation of Volcanic Rocks, are also present in the last section of Meisso – Somali Woreda as getting closer to Afdem Woreda.

Brief section just on last part of Erer Woreda and the northern part of Dire Dawa, in the last section of the road, the formation alters to Pleistocene formations with Holocene, Conglomerates, Sands, Clays and Reef Limestone groups.

Soil Type

The major dominant soil type of the project area is Lithosols soil type. The soil characteristics in the first section, in Meisso – Oromia and few section of Meisso – Somali woredas is Lithosols type. In the mid section of the road, second half stretch in Meisso – Somali woreda, the soil type turns in to Gieyic Solonchaks soil type. The next section of the corridor from Afdem to Dire Dawa alternates between Lithosols and Eutric Regosols soil characteristics.

Some portion of the Gieyic Solonchaks mainly in the section near KM 121+500 the soil was noted to be highly erodible and gully formations were observed.

Figure 5.1.6-1: Highly Erodible Soil Type, after Afdem town, near KM 121+500

Table 5.1.6-1: Sub-grade Soil Extension along the Route

No.	Stretch		Visual Soil Description	Expected Suitability as Roadbed	Excavation
	From (Km)	To (Km)			
1	65+000	65+712	Dark brown clay soil	Unsuitable	Normal
2	65+712	68+200	Reddish to brown silty clay	Suitable	Normal
3	68+200	68+874	Brown to Dark brown silty clay	Suitable	Normal
4	68+874	70+467	Rock	Suitable	Hard
5	70+467	71+077	Reddish to brown silty clay	Suitable	Normal
6	71+077	71+311	Rock	Suitable	Hard
7	71+311	71+724	Light Brown silty clay	Suitable	Normal
8	71+724	72+317	Rock	Suitable	Hard
9	72+317	74+000	Light brown silty clay	Suitable	Normal
10	74+000	84+994	Dark clay	Unsuitable	Normal
11	84+944	86+000	Brown Silty Clay	Suitable	Normal
12	86+000	87+950	Dark Clay	Unsuitable	Normal
13	87+950	89+021	Brown silty clay with gravel	Suitable	Moderate
14	89+021	89+808	Dark Clay	Unsuitable	Normal
15	89+808	92+000	Brown silty clay with same gravel	Suitable	Moderate
16	92+000	96+743	Dark brown silty clay	Unsuitable	Normal
17	96+743	99+782	Yellowish silty clay soil with some gravel	Suitable	Moderate
18	99+782	101+084	Dark brown silty clay	Unsuitable	Normal
19	101+084	101+732	Yellowish silty clay with fine gravel	Suitable	Moderate
20	101+732	103+903	Brown to Dark brown silty clay	Unsuitable	Normal
21	103+903	104+000	Rock	Suitable	Hard
22	104+000	107+000	Yellowish silty clay with fine gravel	Suitable	Moderate
23	107+000	112+300	Dark brown silty clay	Unsuitable	Normal
24	112+300	115+900	Yellowish silty clay with fine gravel	Suitable	Moderate

No.	Stretch		Visual Soil Description	Expected Suitability as Roadbed	Excavation
	From (Km)	To (Km)			
25	115+900	116+000	Light to dark brown clay soil	Unsuitable	Normal
26	116+000	120+900	Yellowish silty clay with fine gravel	Suitable	Moderate
27	120+900	121+400	Rock	Suitable	Hard
28	121+400	124+313	Yellowish silty clay with fine gravel	Suitable	Moderate
29	124+313	124+594	Dark Clay	Unsuitable	Normal
30	124+594	127+410	Yellowish silty clay with fine gravel	Suitable	Moderate
31	127+410	127+536	Rock	Suitable	Hard
32	127+536	133+900	Brown silty clay soil with fine gravel	Suitable	Moderate
33	133+900	136+500	Dark brown clay soil	Unsuitable	Normal
34	136+500	153+544	light Brown silty clay soil with fractured gravel	Suitable	Moderate
35	153+544	159+000	Dark brown clay soil intercalating with light brown clay soil	Unsuitable/Suitable	Normal
36	159+000	164+000	Brown silty clay soil with fine gravel	Suitable	Moderate
37	164+000	170+500	Dark brown clay soil intercalating with light brown clay soil	Unsuitable/Suitable	Normal
38	170+500	191+500	Brown silty clay soil with fine gravel	Suitable	Normal
39	191+500	202+000	Dark brown clay soil	Unsuitable	Normal
40	202+000	203+000	Light brown silty clay soil	Suitable	Normal
41	203+000	206+962	Dark brown clay soil intercalating with light brown clay soil	Unsuitable/Suitable	Normal

5.1.7. Land Use Land Cover along the Route

Land cover and use in the project corridor, as mentioned is dominantly, is of Acacia Woodland vegetation. There are also some grazing areas. The most important livelihoods are livestock farming and some arable farming (agro-pastoralism) where most of the population, more in the first section of the project in Sitti zone, is cattle breeders, mainly sheep and cattle, in less productive areas camels and goats. Grazing lands are important land cover to these local pastoralists in the area.

Farming activities are also present in some sections in Meisso Woredas of W. Hararge zone, in Oromia. In Sitti zone of Somali, farming activities are more present in Bike and Erer woredas, which are towards the end of the road project. Currently, lands are being handed over and being prepared for farming investment in Meisso woreda in Sitti, and hence farming land use is in rise in the areas near Mullu town.

Data collected on land use pattern from the Woredas of Miesso, Afdem and Gota-Bike through which the Expressway traverse indicates that the available land in each of the Woredas is used for various purposes among which grazing and crop production are the major ones.

Figure 5.1.7-1: Grazing Lands and Cattle Rearing, near Meisso Woreda of Sitti Zone

Figure 5.1.7-2: Woodland Vegetation Near Bike Woreda

The table below indicates the land use pattern in hectare (ha) in each of the Woredas that would be traversed the Expressway.

Table 5.1.7-1: Land Use Pattern of the Woredas

Land Use Types	Woredas			
	Miesso	Afdem	Bike	Gota-Bike
Cultivable (Ha)	50,829	50,000	1,934	150,000
Cultivated (Ha)	15,448	250	1,934	11,000
Grazing (Ha)	29,450	657,020	350	
Forest (Ha)	6,160	293	270	1000000
Bush & Shrubs (Ha)	22,360	1,237		750000
Water Body (Ha)		30		
Settlement Site (Ha)	8,732	567		

Source: Data Collected and Compiled from the Woredas, October-November, 2020.

5.2. Biological Environment

5.2.1. Environmentally Sensitive and Protected Conservation Areas

In the alignment traversed by the proposed expressway road route, there is no national park, wildlife reserve area no important fauna or forest area of protection.

5.2.2. Vegetation type

Terrestrial Flora Habitat

In general, the project region, in the areas of West Hararge zones of Oromia and Sitti Zone of Somali, is mainly made up of Acacia-dominated woodland, a highly fragile ecosystem adapted to semi-arid conditions with erratic rainfall, growing on a complex and vulnerable hydrological system. The ecosystem also includes Jatropha, Prosopis Juniflora, and Euphorbia Abyssinica.

Figure 5.2.2-1: Acacia Woodland in the Section from Mullu to Afdem Town

Figure 5.2.2-2: Similar Acacia Woodland in the Section from Bike to Erer

Just in Erer woreda, in the surroundings of Erer town, there is high farming activity of fruits such as orange and other perennial crops.

List of Flora Biodiversity

The terrestrial flora cover is composed of *Acacia nubica* Open Shrub Lands, Barren Land with Scarce *Caddaba rotundifolia and* Bushed Grassland Altered by Invading Species. Vegetation composition of the project corridor is dominated by *A. tortilis*, *A. nilotica, A. mellifera, A. seyal* with scattered *C. rotundifolia, C. furmosa*, *S. bagshawei, T. nilotica, D. glabra* and abundant *P. hysterophorus, C. rotundifolia and C. quadrangularis.* Grassland types of *C. dactylon, C. nlemfuensis, E. cilianensis, C. ciliaris, A. greenwayii, B. leersiodes, S. pumila* and *Sorghum arundinaceum are also present in the area.* Common and rare vegetation biodiversity types are presented hereunder.

Table 5.2.2-1: Flora Biodiversity

No.	Species Name	***Botanical Name***
1	*Amaranthus hybridus*	*Amaranthaceae*
2	*Balanites aegyptica*	*Balanitaceae*
3	*Balanites glabra*	
4	*Opuntia ficus* indica	*Cactaceae*
5	*Cassia italic*	*Caesalpiniodeae*
6	*Senna Alexandria*	
7	*Tamarindus indica*	
8	*Caddaba farinose*	*Capparaceae*
9	*Caddaba glandulosa*	
10	*Caddaba heterotricha*	
11	*Caddaba rotundifolia*	
12	*Parthenium hysterophorus*	
13	*Vernonia cinerascens*	
14	*Xanthium strumarium*	

No.	Species Name	Botanical Name
32	*Sorghum arundinaceum*	Gramineae
33	*Sporobulus ioclades*	
34	*Acacia horrida*	Mimosoideae
35	*Acacia mellifera*	
36	*Acacia nilotica*	
37	*Acacia senegal*	
38	*Acacia seyal*	
39	*Acacia tortilis*	
40	*Crotalaria spinosa*	
41	*Indigofera amorphoides*	Papilionoideae
42	*Dobera glabra*	Salvadoraceae
43	*Euphorbia tirucali*	
44	*Datura stramonium*	Solanaceae
45	*Solanum indicum*	

15	*Seddera bagshawei*	*Convolvulaceae*
16	*Seddera bagshawei*	
17	*Seddera hallieri*	
18	*Seddera hallieri*	
19	*Seddera latifolia*	
20	*Seddera latifolia*	
21	*Cyprus involucratus*	Cyperaceae
22	*Euphorbia tirucali*	Euphorbiaceae
23	*Andropogon greenwayii*	Gramineae
24	*Brachiaria leersioides*	
25	*Cenchrus ciliaris*	
26	*Chryspogon plumulosus*	
27	*Cynodon dactylon*	
28	*Cynodon nlemfuensis*	
29	*Dactyloctenium scindicum*	
30	*Eragrostis cilianensis*	
31	*Setaria pumila*	
46	*Solanum somalense*	
47	*Tamarix nilotica*	Tamaricaceae
48	*Grewia bicolour*	Tiliaceae
49	*Grewia erythraea*	
50	*Grewia tenax*	
51	*Grewia villosa*	
52	*Lantana camara*	Vitaceae

5.2.3. Fauna Resources

Fauna Presence
In the project corridor, along the mid section of the arid acacia forest there are some animals present. Fauna resources of larger animals as Gazelle, Gelada, Duiker (Bush Duiker), Wathog, and genet reside and migrate from place to place along the route. There are also smaller fauna such as Grass Rats, Rodents, (Gerbillus), and Fruit Bats (Megabats).

5.3. Emission, Noise and Vibration

5.3.1. Emissions and Air Quality

The route corridor traverses predominantly rural settings without significant sources of pollution such as factories and engineered road with vehicular traffic, there is no considerable outdoor air pollution. The recent railway line also utilises electric power and has no carbon emission.

The express way will enhance road access attracting more traffic to the corridor with higher emissions, but with better riding quality and speed of traffics which will reduce carbon emission per head for vehicles. Consequently, taking future economic demands and higher transportation of goods along the road the overall emission is expected to peak more. Additionally, the period will involve high level of dust formation for temporary period of the construction phase.

5.3.2. Pollution Prevalence

As, the corridor is mainly rural area and no many industrial and infrastructures are present, pollution prevalence is relatively lower. Pollution concerns, however, were identified from other similar projects in the pollution prevention assessment. In Erer woreda, it was noted that the newly constructed railway lined has a construction camp, and had pollution issues identified by the woreda. Concerns identified were from wastes of excess cement and fuels wasted / discarded, where they were not properly handled and disposed in uncontrolled manner in the environment.

Only few major towns along the project area have waste disposing landfill facilities. In Bike and Erer towns, pits are provided to collect and dispose wastes in a designated area.

5.3.3. Noise and Vibration

The expressway from Meisso to Dire Dawa is further from the main Addis _ Djibouti road. And the route traverses predominantly rural settings and small villages where the level of road infrastructure in the area is lower. Hence, noise and vibration from traffic is currently low. Current noise stems from only from vehicles using the existing gravel road, which not significant.

Based on the assessment, significant noise and vibration source was identified to be the recently constructed railway line. In some settlement areas, the railway line has noise disturbances and vibrations, which are more felt during the night time.

Yet, the construction period mainly will have high potentials of temporary noise and vibration potentials and noise as well during service of the road will potentially be superior to current. Even though no densely populated area or town is located along the route, as the route omits crossing along major town centres, construction period activates in some populated areas as village centres should observe working methods and schedules.

5.3.4. Dependence on Natural Resources

As mentioned, there are several rivers crossed along the project way, from Meisso to Dire Dawa. Rivers crossing the route are major sources of water supply to the local community in the project area.

The water resources from the rivers are sources of people's drinking water, animals' drinking water, and domestic uses.

Other than this some of them, as Erer River (KM 158+100) are utilised for irrigation purposes, especially, the second river at Erer has extensive use in the production of perennial crops, along the town of Erer.

Figure 5.3.4-1: Erer River (KM 158+100)

Electricity supply and access to fuel is too low along the project area. Electricity is available in only few kebeles and major twons. As a result majority of the local community is dependent on the urse of natural resources for energy consumption. Wood is the dominant source of energy in the form of raw wood or wood charcoal, where the raw use is even superior.

5.3.5. Natural Hazards and Vulnerability

5.3.5.1. Climate Change & Vulnerability

As Ethiopia is one of the world's most drought-prone countries, climate change poses a huge challenge to Ethiopia and its people. People frequently face increasingly unpredictable rains, and in some years the complete failure of seasonal rains. This, combined with an increasing population and conflict, may lead to greater food insecurity in some areas. Weather related impacts are observable in relation to

- High dependency on natural resources,
- Low adaptive capacity,
- High socio-economic vulnerability,
- Complex climate with significant variability in rainfall and temperature, and
- Frequent flooding disasters.

Effects of climate change differ locally, and effects scale on livelihoods, food and water security, ecosystems, infrastructure etc. also differ. The lowlands, in particular, are vulnerable to increased temperatures and prolonged droughts that may affect livestock rearing.

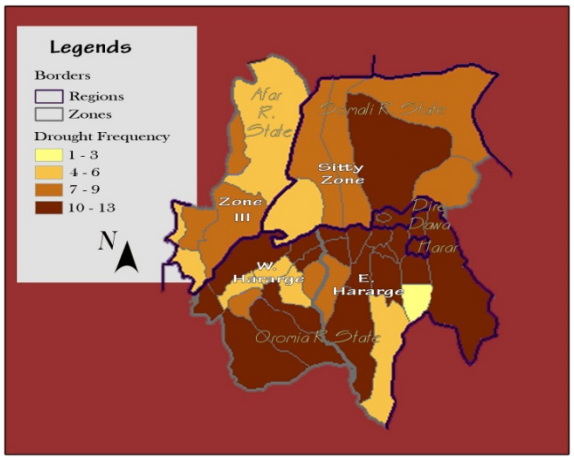


Figure 5.3.5.1-1: Drought Hazard Frequency (in Years 1974 – 2007) in Project Area

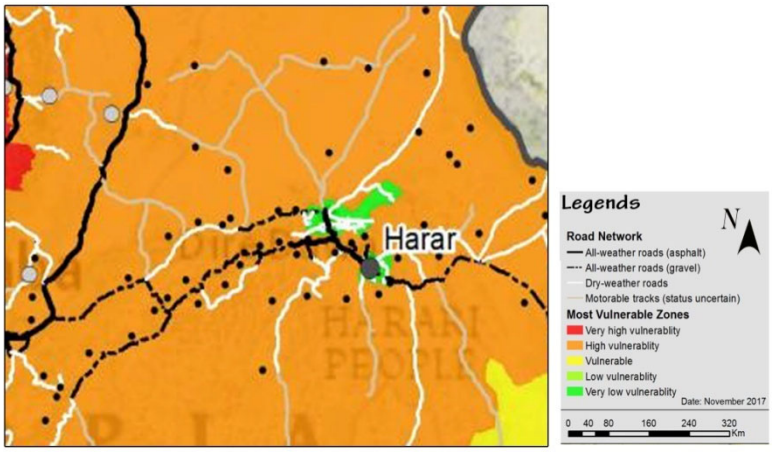


Figure 5.3.5.1-2: Overall Vulnerability to Climate Change Effects

According to African Community Access Partnership (AfCAP), the project area has a High Vulnerability to Climate Change Effects. In terms of drought frequency, the zone has frequent drought hazard, whereas the woredas of Afdem & Bike in Somali regional state has 4 to 6 years of moderately high vulnerability. And even the woreda Erer in regional state has very higher vulnerability to drought, with 1 to 3 years of frequency.

5.3.5.2. Flood Hazards

One of the frequent (natural) hazards in the project corridor is flooding. The lowlands of the project area experience flood risks of different level, from minor to high scale. Based on collected data from the project woredas flooding risk is higher towards the project end, in Erer and Dire Dawa. It has caused injuries to people, distruction of houses, facilities and farm production. In Hawele Kebele of Bike woreda flood has been frequent with similar damages to properties and impact to people. The scale is lower in the project beginning with sealonal and lower scales of impacts at Lege Meisso River and Legechiro area in Meisso Woreda of Oromia and in Meisso woreda of Somali.

One community health risk noted was due to the railway line's ditch structures. The ditches usually get blocked from silts and create ponds from runoff collected water. These water pond for some time and creates condition of breeding mosquitoes creating risks of malaria exposure the community.

5.3.5.3. Malaria Epidemic

Malaria is one of the most epidemic in Ethiopia an as well in project area. The project area is under designation of highland fringe areas between (located in the range of 1,500 – 2,500 meter elevation). These areas are affected by frequent epidemics,

Based on the disease prevalence data from the woredas, malaria comes as more frequent disease in the section from Afdem to Erer.

5.3.5.4. COVID-19 Epidemic

The corona virus has spread to the project area, similar to other parts of the nation. However, based on the data collected from respective woredas, testing for COVID-19 pandemic is not available in the woredas and the level of spread is not well known and not being followed.

It was known from the health surveys made for this study that testing for COVID-19 was only made as part of regional study and only few hundreds of samples taken as samples from each woredas. Based on the results of the study, the pandemic was noted to have spread, but was not very high. In each woreda the number of people who tested positive was less than 10 from taken 200 to 250 samples.

5.3.5.5. Locust Disaster

Desert locust disaster has recently been an emergency situation in ethiopia's different regions, including the project area. The occurrence and damage of farm and natural resource occurred from the desert locust has been prevalent in Meisso woreda of Oromia, Meisso, Afdem and BIke Woredas of Somali, and Melka Jebdu Kebele of Dire Dawa.

The disaster has caused loss of farm productions. The losses in different areas have different scales but the data on scale or quantity of loss is not adequate. Yet, it was noted that 25% of farm production loss has occurred in Meisso woreda of Oromia, and similarly caused loss of farm productions damaged grazing lands in the mentioned areas, where the scale has been relatively lower in the last kebele, Melka Jebdu.

5.3.5.6. Response to Hazards and Emergencies

Woredas do not have their own adequate emergency response units or organisations. The only office in response to disasters is the National Disaster Risk Management Commission (NDRMC). These offices in the woredas have usually one person working under them and are not equipped with necessary personnel and equipments. Hence, the overall response capacity is low. Response to hazards and emergencies are given from the regional and federal offices, mainly.

In response to flood and droughts response measures of support with supply of food aid and temporary shelter was being provided. Similarly, to response the locust disaster was underway with national and regional activities of pesticide application, mass mobilisation, giving awareness, traditional mechanisms of smoke application and spraying pesticides from aircrafts in some locations.

Measures have also been carried out against the spread of COVID-19 with awairness creation, supply of water and sanitary equipments or masks and placing regulations (as maintaining distances in public places or transportations). However, these activities have been challenged with low level of the supplied materials, low level of regular testing, misconception on the nature of the virus and peoples' growing reluctances over time.

5.4. Security Issues

Bases on assessment of security assessment in the project area it was noted thet, one ethnic group cross the boundary of the other ethnic following their cattle as a result conflict eruptions due to completion on resources such as water and pasture. This ethnic tension occasionally accompanied with looting and destroying properties from each other. this occasional security threat in the project area never targets any project workers. The other security issues in the project area may be regional grievant and protest near Meisso district and Dire Dawa due to different political issues and assassination iconic Artist Hachalu Hundassa.

The good practice in the area regarding conflict resolution is indigenous conflict resolution method the local community has practiced to solve the ethnic tension between Oromo and Somali communities. The Somali ‘’Ugazi’s and Oromo’s ‘’ Abba Gada’’ come together and discus about the issues, investigate the causes and amicably solve the problems and continue living together.

5.5. Socio Economic Environment

5.5.1. Location and Administrative Organization

The National Regional States have powers and functions given to them based on Article 52 of the Federal Democratic Republic of Ethiopia Constitution Proclamation No.1/1995. Among the powers and functions given to the National Regional States:- (a) to establish a State administration that best advances self-government, a democratic order based on the rule of law; to protect and defend the Federal Constitution;(b) to enact and execute the State Constitution and other laws; (c) to formulate and execute economic, social and development policies, strategies and plans of the State;(d) to administer land and other natural resources in accordance with the Federal laws; and (f) to enact and enforce laws on the State civil service and their condition of work; in the implementation of this responsibility it shall ensure that educational; training and experience requirements for any job, title or position approximate national standards; are some.

The supreme political and administrative power of the National Regional State is vested in the National Regional Council, and the National Regional Government reports to the National Regional Council. Based on authority and responsibility given to the National Regional Government, the National Regional Government establishes sectoral bureaus, commissions and authorities to formulate and execute economic, social and development policies, strategies and plans of the State.

Below the National Regional State lever, there is Zone level administration that is responsible for coordination, supervision and control of the different economic, social and development programs/projects activities carried out in the Woredas of the Zone and it reports to the National Regional State.

Woreda is the next government structure below National Regional State and its supreme organ is the Council that consist elected representatives from the Kebeles. Council representatives are elected by the people from their respective Kebeles; and are accountable to the Woreda population who has elected them.

Under the Woreda Council, there is Woreda Administration organ responsible for implementation of the National Regional State Constitution, enforcement of National Regional laws, policies, regulation and directives. For implementation of the different economic, social, security and development programs/projects different sector offices are established at Woreda level and all the different sector offices established report to Woreda Administration.

Below Woreda Administration, there is Kebele, which is the lowest administrative unit found at grass root level in the case of Ethiopia. Kebele chief administrator is appointed by Woreda Administration and he/she is supported by a technical person named Kebele Manager, an Employee by the Woreda. The chief administrator and the manager are responsible for the overall coordination and follow up of implementation of all the different developmental programs/projects, economic and social services provided in the Kebele. All the different economic and social development programs/projects implemented are supported by technical staff such as agronomist, animal health assistant, extension agent, plant protection agent, health extension workers etc.., are assigned at kebele level.

Therefore, engaging all the stated above government stakeholders (National Regional State, Zonal, Woreda and Keble Administrations) and community members within Kebele Administrationin any development intervention is very important.

Table 5.5.1-1: Regional States, Zones, Woredas and Kebeles Traversed

No.	Woreda	Kebele	Zone, Region	No	Woreda	Kebele	Zone, Region
1.	**Meisso**	Tokuma	West Hararge, Oromia	3.	**Afdem**	Dhalladu	Siti, Somali
		Dibala				Derila	
		Amaressa				Afdem Town	
		Chacholu		4.	**Gota Akababi (Gota Area)**	Gota	
		Chobe				Bike 01	
		Gurbo				Bukuli	
		Sadiga				Bike 02	
		Meisso Town				Khara Biyo	
2.	**Mayesso**	Somadaye	Siti, Somali			Bike 03	
		Kurfa Sowa		5.	**Erer**	Megal Ada	
		Muluwan				Erer 01	
		Mulutu				Erer 02	
		Kolmaye				Erer 03	
		Arma Dobe				Gode	
		Huluka Dobe				Gora Sole	
		Arkaye				Hurso	
				6.	Dire Dawa	Melka Jabdu	Dire Dawa

Source: Data Collected and compiled from Field Assessment, November, 2020.

As could be observed from the above table, the envisaged Expressway from Miesso to Dire Dawa, traverses, twoNational Regional States (Oromia and Somali) and six Woredas and 30 Kebeles. These are three Kebeles in Miesso(Oromia); seven kebeles in Mayesso; five Kebeles in Afdem; six Kebeles in Gota-Bike; six Kebeles in Erer Woredas of Siti zone of Somali and three kebeles of Dire Dawa Administration. The total Kebeles to be traversed all along the Expressway of 142km that starts from Miesso and ends up in Dire Dawa Administration are 30.

5.5.2. Demographic Data

The aggregated total projected population data for all the five Woredas and Melka Jebdu Kebele 01 for the year 2019/20 was found to be 579,773.The male population for all the five Woredas excluding Melka Jebdu Kebel 01 is 276,777(50.6%) while the female population is 270,464(49.4%). The details of population breakdown by Woreda are shown on the below.

Table 5.5.2-1: Demography of Project Woredas

No.	Woreda	Regional States	Population		
			Male	Female	Total
1	Miesso	Oromia	94,011	90,766	184,777
2.	Mayesso	Somali	49,289	47,481	96,770
3	Afdem		43,559	45,323	88,882
4.	Gota/Bike		34,229	36,696	70,925
5.	Erer		55,689	50,198	105,887
6	MelkaJabdu (Kebele 01)	Dire Dawa	Not identified	Not identified	32,532
Total			276,777	270,464	579,773

Source: Central Statistics Agency, 2019/2020 & from Melka Jebdu/ Kebele 01

According to the projected population data obtained from CSA (2019/2020), the total population living within the influence area Woredas of the Expressway is 579,773.

Based on data obtained from the three the Woredas Miesso, Mayesso and Afdem both for the total land area and population, it is computed that population density of the project influence area would be 4,75 hectares/person.

As indicated above, the lowland areas through which the envisaged Expressway traverses starting from Miesso up to the end of the envisaged expressway near at Melka Jabedu 01 Kebele is flat. The populations living within the envisaged Expressway road project corridor are pastoralists, agro-pastoralists and mixed farmers. For pastoralists, their settlement pattern is both scattered and also live in small groups in a family unit. When some family members move with their livestock in search of grazing areas and water, elders, women and children usually stay at a site selected for some years. Those family members who move with their livestock may also come back to their original site/location if adequate pasture for their livestock is available. Changing settlement site/location for those family members who stay at a settlement site may occur due to various reasons/ needs of the family and natural condition of the area.

Most of their residence areas/settlement sites look the ones shown on the figure below.

Figure 5.5.2-1: Settlement Pattern within the Expressway influence area of Miesso-Bike-Dire Dawa

Figure 5.5.2-2: Different type residence house within pastoralists settlement site

Agro-pastoralists and mixed farmers live both in scattered household units and also in clustered patterns. The figure 5.5.2-1 & 2 shown above indicates that pastoralists living in scattered settlement site.

Similarly, figure 5.5.2.-3 & 4 shown below indicates household units living in scattered pattern in different type of houses. The first one is residence house built with wooden materials and covered with corrugated iron sheet (CIS), while the other one below is covered with plastic.

Figure 5.5.2-3:Household Units with Wooden Materials and CIS

Figure 5.5.2-4: Household Units with Plastic

As to the other type of settlement pattern, the one shown below indicates households living in cluster, and this is shown here on figure 5.5.2-5.

Figure 5.5.2-5: Cluster Type of Settlement Pattern

Even though there are cluster types of settlement patterns within the same Kebele of the Expressway influence area, scattered types of settlements also exist. Figures 5.5.2-6 & 5.5.2-7, shown below indicates the scattered settlement pattern that exists within the influence area.

Figure 5.5.2-6: Cluster Types of Settlement Patterns

Figure 5.5.2-7:Scattered Settlement Pattern

The type of housing units that exists both in the rural and urban areas within the Expressway corridor vary in their style and associated with purpose, types of construction materials and beneficiaries. In view of this, most of the housing units are constructed from wood and mud wall and covered with corrugated iron sheet roofs. Some of the houses are covered with plastic wall and also roofing.

As observed during field visits made to the Expressway corridor area all along the Woredas traversed, and particularly in the rural Kebels, the settlement patterns of households are generally in scattered manner. But in urban areas, settlement patterns are highly clustered. As to the urban areas/sites within the corridor of Miesso - Bike - Dire Dawa the envisaged Expressway traverses/crosses some parts of Woreda towns such as Miesso, Afdem, Bike-Gota and , Erer. The design of the expressway also indicates that most of these towns would be connected to the expressway with link roads.

5.5.3. Ethnic Composition and Religion of the Population

Based on primary data collected from each of the Woredas using data collection format, detail Ethnic Groups (EGs) that are currently living within each of the Woredas and their Religion are presented below.

Table 5.5.3-1: Ethnic and Religious Composition of Community in the Woredas

Ethnic Group Proportion (%)				**Religion** Proportion (%)			
Ethnic Group	**Meisso (%)**	**Gota-Bike (%)**	**Afdem (%)**	**Religion**	**Meisso (%)**	**Bike (%)**	**Afdem (%)**
Oromo	90		0.7	Muslim	90		99.7
Amhara	4		0.3	Orthodox	7.9	0.5	0.3
Somali	3	80	99	Protestant	2	0.3	
Argoba	2			Catholic	0.1		0.1
Gurage	1	20		Muslim	99		
				Other			0.1

Source: Data Compiled from the Woredas within the Expressway Influence Area, November, 2020

Regarding ethnic groups living within the Woredas of the Expressway influence area, particularly in Miesso Woreda of Oromia region, the data collected from the Woreda indicated that 90 per cent of them are Oromo. Amhara ethnic group is the second largest living in Miesso Woreda with 5 per cent of the population. In Meisso Woreda of Oromia, Somali population is 3 per cent; Argoba is 2 per cent; and Garage is 1 per cent.

In Somali Woredas of Afdem and Gota-Bike, the largest ethnic group living in the Woreda is Somali/Issa ethnic group with 99 and 80 per cent respectively. In Afdem woreda, Oromo and Amhara ethnic groups are, 0.7 and 0.3 per cent respectively. For Bike-Gota, the second largest ethnic group is Gurage with 20percent of the Woreda population.

In terms of the religion of the population living within the Expressway influence area, Muslim is the dominant one. In Meisso Woreda of Oromia Muslims are 90per cent. Similarly in Afdem Woreda Muslims are 99.7 per cent and in Bike-Gota 99 per cent.

As to Orthodox Christian followers, they are about 0.5percent; in Miesso about 7.9percent; in Bike-Gota they are about 0.5percent; and in Afdem about 0.3percent. Protestant Christian followers within the corridor are recorded to be 2 percent in Miesso Woreda of Oromia.

The most spoken languages in the Woredas of the Expressway influence area are Oromifa for Meisso; and for all the four Woredasof Mayesso/Mulu, Afdem, Bike-Gota and Erer is Afa-Somal/Somali language.

One of the critical issue/ ethnic tension usually exists among the different ethnic groups engaged in pastoral and agro-pastoral activities is conflict on grazing areas and water resources usage and ownership of natural resources(land for grazing and water)for survival of livestock. In adequacy of grazing areas and water for livestock, particularly during dry season and also when there is shortage of rainfall is the main integer of conflicts among the different ethnic groups living within the Expressway influence area. Livestock raid and area expansion for natural resources usage are also identified as critical problems.

5.5.4. Household Economy

The mainstay of the population living within Miesso – Bike - Dire Dadwa Expressway influence area is based on agriculture that comprises livestock rearing and cereal crops production.

5.5.5. Crop Production

In terms of crop production, large areas of land used for crop production are found in Miesso Woreda of Oromia, with a total hectare of 15,448. In Somali Woredas of Gota-Bike and Afdem where adequate data were obtained, it is indicated that 1934 and 250 hectares of land are respectively used for crop production.

The major crops grown in Meisso Woreda of Oromia are Sorghum, Maize, Hair Coat Bean and Figure Millet. In the case of Gota-Bike and AfdemWoredas, Sorghum, Maize, Sesame, Hair Coat Bean and Figure Millet are grown in both Woredas; and in particular, in Gota-Bike Woreda horticulture crops such as Onion, Tomatoes, Carrot, Orange, Banana, Mango, Papaya and pepper are produced.

In the case of yield of cereal and horticulture crops per hectare, the data obtained from the above stated Woredas for the last three years on average indicates to be as shown below.

Crops Grown, Average Yield in Qts/Ha for the Last Three Years & Major Problems Encountering Productivity of Crops are presented hereunder.

Table 5.5.5-1: Crops Grown, Average Yield in Qts/Ha

Woreda	Type of Cereal &Horticultural Crops Grown	Average Yield of Crops in Qts/Ha for the Last 3 Years	Major Identified Problems for Low Level of Production
Meisso	Sorghum	7.0	Erratic Rainfall, Pests & Insects affecting crops, Low level of Agricultural Inputs usage, Low level of agricultural extension practices
	Maize	6.0	
	Millet	5.0	
	Hair Coat Bean	3.0	
Afdem	Maize	37.0	
	Sorghum	17.33	
	Sesame	5.0	
	Millet	5.33	
Gota-Bike	Sorghum	22.5	
	Maize	22.5	
	Onion	27.5	Pests & Insects affecting crops
	Tomatoes	27.5	
	Carrot	500	
	Orange	241	
	Banana	100	
	Mango	500	
	Papaya	76	
	Pepper	50	

Source: Data Collected from Woredas and Compiled, October-November, 2020.

5.5.6. Grazing Area

According to the data collected from the Woredas that would be traversed by Miesso – Bike-Dire Dawa Expressway the largest land area which is 686 820(81.3%) hectares is used for grazing. Similarly, the data collected on the mainstay of the population in the Woredas indicated that over 70per cent of the population depends on Pastoralism, five per cent on Agro-Pastoralism and five per cent on Mixed Farming. The data collected from the same Woredas, on the population living on off-farm activities is found to be only 20 per cent. Therefore, it could be concluded that 80 per cent (70% on Pastoralism, 5% of Agro-Pastoralism and 5% on Mixed Farming) of the households who live with the Woredas, depend on livestock rearing and use a huge grazing area land.

5.5.7. Livestock Rearing

Livestock rearing within Miesso- Dire Dawa Expressway project corridor is the major activity for the livelihoods of population. Among the pastoral, agro-pastoral and mixed farming communities of Ethiopia and particularly lowland areas, the purpose of livestock rearing is beyond means of livelihoods.

Pastoralists, agro-pastoralists and even those who are engaged in mixed farming tend to keep a large number of livestock for different purposes that may include, source of food for family members, risk averting means in case of drought and diseases that affects number of livestock and sign of a high social prestige (among the pastoral communities. The one who has a large number of livestock is considered as richest person among the pastoral and agro-pastoral communities.

Based on the data collected from the Woredas that would be traversed by Miesso - Dire Dawa Expressway, the type and number of livestock that exists in each of these Woredas are presented below.

Table 5.5.7-1: Type and Number of Livestock

Livestock Type	Number In Woredas		
	Meisso	**Afdem**	**Gota/Bike**
Cow	61,543	125,325	22181
Heifer	38,461		
Calve	30,767		
Bull	15,385		
Ox	7691	90,473	11500
Camel		166,130	
Donkey	18,008	16,582	4255
Sheep	46,781	250,050	55723
Goat	106,748	39,527	
Poultry	112,764	5304	821
Beehives(Modern) Traditional	36 1434	10	
Beehives (Traditional)		18	5
Total	439,618	693,419	38,762
Major Challenges for Livestock Rearing	Shortage of animal feed and water for livestock during dry season	Nomadic Pastoralism system that has been going on for centuries; Conflict on gazing area & water; and recurrent drought due to climate Change	Shortage of water/ rainfall; movement of pastoralists from place to place in search of water and for grazing; and conflict with other neighbouring ethnic groups on grazing areas and water sources.

Source: Data Collected from Expressway Influence Area Woredas and Compiled, October-November, 2020.

As could be observed from table 5.2.10-1 above, the livestock population including poultry and beehives that exists in each of the Woredas indicated above are, 693,419 for Afdem; 439,618 for Miesso (Oromia) and 38,762 for Gota-Bike.

Cattle, ruminants, camel and poultry are used for food at home consumption and also sold to fetch cash income for the pastoralists, agro pastoralists and mixed farmers. In the case of Miesso and some Woredas of Somali where cereal crops production is practiced, oxen are used for ploughing. Donkeys are used to transport goods and materials.

The major source for direct cash income for the pastoralists, agro-pastoralists and mixed farmers are mainly from sales of agricultural products, livestock and livestock products. Collection of fuel wood and trees and selling at urban areas to get cash income is also practiced as observed during the social assessment made in each of the Woredas. For transaction of various goods and services, there are small and large market days operating at each of the Woreda Towns of Miesso, Afdem, Gota-Bike and Erer on fixed days of the week.

5.5.8. Other Source of Income & Developments

As indicated above, 20 per cent of the populations living within the Expressway influence area depend on off-farm activities that include, petty trade, remittances from relatives, sharing of food and cash among themselves as a social support system which is mainly based on Somali culture, illegal trading of goods and materials etc…

The Expressway that starts from Chacholi Kebele in Miesso Woreda of Oromia ends up in Boren Kebele near Melka Jabdu (Kebele 01) of Dire Dawa Administration. The entirely expressway road project traverses lowland areas of Soti Zone of Somali that are identified as underserved areas/communities.

The Expressway corridor area could be characterized as where there is low level of awareness in business development activities, low level of skill development and experience in income generating schemes, absence of private sector development to absorb the growing number of unemployed youth, non- existence of adequate transport facilities, good standard road and adequate market centres for marketing livestock. Except at Miesso Town (Oromia) and Erer(Somali) towns there are no banks and other micro-financial institutions within the influence area of the expressway. In the current condition there are industrial activities of as the recently established Dire Dawa industrial zone, about 7 KM from the end of project. Towards Erer, near KM156 + 500, extensive irrigation farming of perennial crops is also present.

5.5.9. Food Security

Based on the data obtained from the Woredas that are within the influence area of the Expressway, all of the Woredas of Miesso Oromia Region and Mayesso, Afdem, Gota-Bike and Erer of Somali Region are food in secured Woredas.

As indicated above, these Woredas are categorized as underserved woredas; and added to that the woredas are prone to drought – moisture stress and could not produce adequate crops that sustains agro-pastoralists and mixed farmers for a year within the influence Woredas. Traditional methods of livestock rearing that could not break the cycle of poverty; low level of infrastructure (road, water supply system for livestock and human population, lack of adequate market centres etc..,) exacerbates the situation of population living within the influence area of the Expressway. Population growth that is not tantamount with production of agricultural crops and livestock production and productivity is critical issue.

Due to this, productive safety net development program (PSNDP) which is focused on provision of support in kind/cash or in both has been carried out in the woredas that are with the influence for decades.

5.5.10. Culture and Social Structure

5.5.10.1. Description of the Social Structure

The community in the project area is organized on the basis of clan and lineage structure. In each individual person in his community belongs to one clan group, and the relationship between members of the same clan group is very strong that all the members adhere and respect its norms and values.

The clan council is the highest political and administrative body that is responsible for the implementation of social and political activities inside the clan's territory. Each clan group has its own authority and autonomy inside its territory.

5.5.10.2. Marriage

Like in many Muslim areas, the marriage system in the community in the project corridor is also polygamous. As long as he is considered as a wealthy in the community, a man could marry up to four wives, and his wives also live next to each other in the same village. Usually, there are two ways to marry a woman. These are arranged marriage and selecting a wife by himself. However, the arranged marriage is more acceptable in the community.

Marriage is mostly carried out in certain months of the year and the commonly known months of marriage are February, April and May, and each marriage ceremony takes of up for a month of festive. If divorce happens, the women has a right to take all the gifts she received when she was married and entitled to take half of the properties developed after marriage. However, women have no right to share land after divorce.

5.5.10.3. Harmful Traditional Practices

Child circumcision: Child circumcision is considered as a social norm and tradition. It All boys and more than 87% of girls are circumcised and it is one of the social and cultural events, which is given a very high social value and consideration. In Oromia, circumcision of children is known as absumaa.

However, there are times when circumcision of girls might be carried out as early age as the eighth after birth. FGM is practiced regardless of religion. However, Muslim groups are more likely to practice. The reason for FGM in Oromia, and Somali is similar. The practice is mainly carried out to preserve virginity which is taken as a pride for family and to protect premarital sex.

Abduction: Harmful Traditional Practices (HTP) that exists among ethnic groups in the project area and has impacts on women and gender issues. Among the different HTPs that exist within the region, adduction is one. Abduction is the illegal carrying away of women for marriage or rape. This type of marriage is made without the knowledge and acceptance of the girl. The study made on Harmful Traditional Practices for Ethiopia Health Centre Team (2005) indicated that 41 percent of the marriage is done through abduction.

During the discussion with community representatives, it was learnt that abduction has been declining. However, abduction is still practiced not by force but by enticing girls by giving some gifts and by promising they will marry them shortly but in practice, most of these enticing were cheating of girls for sex.

Polygamy: Polygamy is a system of marriage especially Muslim community when a man marries more than a wife. Muslim religion do not discourage when a man marries up to four wives as long as he is wealthy in the community.

Levirate Marriage: It is a system of marriage when a widow is culturally expected to marry brother of her deceased husband. This type of marriage has been mainly practiced by the communities all woredas in Oromia and Somali.

5.5.10.4. Social Support Mechanisms

The social support in Oromia, and Somali is similar. The three regions in the project area are known in the social support mechanism they provide each other. A man could always rely on his kinsmen and clan members in case of difficulty and problems. The kin of a man would support him and give him security whenever he faces difficulties and provide him support with valuable assets mainly camel and cattle. For example, when the family face some serious challenges, the clan members provides camels, cattle and many other gift. Such mutual support and care for the poor through the traditional institutions. These institutions have been working for generations and are highly important or instrumental for reducing risks.

5.5.10.5. Death

When a person is passed away, the family of the deceased and his kinsmen spend in Oromia and Somali for 7 and 3 days of mourning respectively. After a month also there will be a prayer ceremony for the deceased. If the deceased is a man, his wife would mourn for 4 and ½ months and she would not also put butter on her head as she used to do it in normal times. In Somali and Oromia, when a person passed away, they slaughter such as cattle, camels goats on the first day and on the seventh day. This is known as Sedeka in Muslim communities and people who come for mourning are invited. If a deceased man has children, his brother would marry his wife if she is willing. This is to keep children together and to protect them any abuse by others.

5.5.10.6. Property Ownership and Inheritance

Property ownership and inheritance in the three regions of the project area is similar. There is no private ownership of resources such as water, land, forest area and grazing land. These resources belong to all the members of the clan in its territory. Inside a clan territory there is no private ownership of land or other communal resources such as grazing land and water resource. Hence, all clan members have equal access and user right to the resources that are found in its clan territory. However, with the growth of agro pastoralism, and also with the development and establishment of permanent settlements and urban centers the present property ownership system and the attitude towards communal management of resources is reported to show slight change.

The inheritance system in the three regions favors men and not women. Women do not have the right to claim for inheritance of their family like that of men. A woman is eligible to inherit only half as much as her brother's inheritance amount. If a women is married, she has no right to inherit property from her family.

5.5.11. Prevalence of Gender Based Violence (GBV)

It was learnt that women have no or little control over resources and have limited power in decision making and they are victims of many forms of GBV such as domestic violence, child marriage, FGM and many more. The existing situation of the community in general and girls and women in particular calls for some interventions to reduce these challenges. It is anticipated that with the high influx of construction workers to the project area, the situation might be worsen.

The prevalence of GBV in the project area is high. However, the reported figures are lower than 20% of the total GBV cases. In other words, more than 80% of the cases are not reported. The key informants explained that many incidents of GBV happened every day here and there but not reported. The first reason is that parents hide the violence cases in fear of being marginalized by the community. Second, many GBV cases are resolved by elderly people, religious and clan leaders and not reported. Third, some of the reported cases goes directly to the courts. As a result, neither women affairs nor health offices had the full data of GBV.

The key informants explained that FGM, rape, abduction, early marriage and arranged/forced/ marriage has been relatively decreasing. The major reason key informants raised were increasing awareness of the community compared with the past.

Based on the assessment made, in the year 2020, 500 cases of GBV were reported in Meisso (Oromia) with natures of Rape, early marriage, emotional abuse such as insult and child labour. In Sitti Zone of Somali rape and domestic violence / beating were majorly reported in the same year. In Melka Jebju, at the project end, 302 cases were registered with cases of rape trials and domestic violence / beating. The total data shows that the total cases registered, in the mentioned year, was 954 cases where overriding number of cases, 923 (96.75%) of these cases, were on women, and the rest 31 (3.25%) cases were on men.

5.5.12. Vulnerable Groups

Adequate data/information on vulnerable groups living within the expressway influence Woredas of Miesso, Afdem, Bike and Melka Jebdu could not be found. In some of these Woredas, there are no sector offices responsible for following up and providing required support to vulnerable groups, recording their numbers and the type of their vulnerably.

Net Consult has taken census of the population within the influence area of the expressway and after this data is processed the number and types vulnerable groups living within the influence area of the expressway will be identified and will be reported in the resettlement action plan to produce.

5.5.13. Labour Conditions

Labours from neighbouring or far communities are employed to different activities and projects in the area. During such relations with employer labour risks to GBV, child labour, lower awareness of rights and obligations are noted.

5.5.14. Social Service Institutions

The development of education, health, pure water supply and sanitation, transportation and communication networks, waste disposal management, recreational, urban and rural development etc.., services are important interventions for the attainment of the overall social development in a given country.

Cognizant of this fact, various development efforts have been going for scaling up social service development facilities in different National Regional States of Ethiopia. On this section of Environmental and Social Assessment (ESA) study report, the status of social service institutions that are developed within Miesso – Bike- Dire Dawa Expressway influence area is assessed and presented as follows.

5.5.14.1. Educational Services

A. Educational Institution

Educational institutions such as first cycle, full first cycle, secondary and preparatory schools are established within the envisaged Expressway influence area and providing social objectives of increasing the stock of knowledge that would enrich the culture; elevate scientific outlook of students; and help to raise/increase productivity and output.

In this regard, the availability of educational institutions, their performances in meeting the above stated objectives in each of the Woredas and challenges the educational institutions are encountering are presented as followings.

B. Number and Level of Educational Institutions

The number and level of educational institutions established in each of the Woredas of the Expressway influence area is shown below.

Table 5.5.14.1-1: Number and Level of Educational Institutions

Woreda	1st Cycle (1-4)	1st Full Cycle (1-8)	School from (Grade 5-8)	Secondary School (Grade 9-10)	Preparatory School (11&12)	Kinder-garten	Total Number of Schools
Miesso	24	50	26	2	1	2	105
Afdem	29	3	3	1	1		37
Gota-Bike	8	3	7	2	1	5	26
Erer	4	14	0	2	2	2	24
Total	65	70	36	7	5	7	192

Source: Data Collected from Woreda Education Offices and Compiled, October - November 2020

As could be observed from the table above, the aggregate numbers of schools from grade 1-8 in all the Woredas within the Expressway influence area are 171, and that of the senior secondary school are 5. As to preparatory schools, it could be said that there are at least one in each of the Woredas, but two at Erer. As could be observed from the above table, secondary schools (9-10) and preparatory (11-12) schools are established at Woreda level.

C. Students Enrolment in School

Data obtained from each of the Woredas that Miesso- Bike –DiredDawa Expressway traverses indicates that a total of 43,064 students were enrolled in 2019/2020. The detail breakdown of number of students enrolled in schools by educational level during the 2019/2020 is presented below.

Table 5.5.14.1-2: Number of Students Enrolled in each Woredas

Woreda	Level of Schools	Number of Students Enrolled		
		Male	Female	Total
Miesso	Primary(Grade1-8)	15584	9946	25530
	Secondary (Grade9-10)	1015	440	1455
	Preparatory(Grade 11-12)	537	204	741
Bike-Gota	Primary(Grade1-8)	1551	1222	2773
	Secondary (Grade9-10)	60	73	133
	Preparatory(Grade 11-12)	171	121	292
Afdem	Primary(Grade1-8)	2710	1788	4498
	Secondary (Grade9-10)	100	72	172
	Preparatory(Grade 11-12)	118	48	166
Erer	Primary(Grade1-8)	3170	2773	5943
	Secondary (Grade9-10)	537	255	792
	Preparatory(Grade 11-12)	405	164	569
Total		25958	17106	43064

Source: Data Collected from Woreda Education Offices and Compiled, October -November, 2020

According to the data collected and compiled from the Woredas, students population that were enrolled in schools during last academic year of 2019/2020 were registered to be 43,064 among which 17,106 (39.7%) were female students while 25,958(60.3%) were boys.

In the case of students enrolment both in secondary and preparatory schools were very low for some of the Woredas such as, Bike-Gota (425 students for both Grade 9-10& 11-12); and Afdem (338 students for Grade 9-10 &11-12). Difficulties of daily travelling of students to secondary and preparatory schools located at Woreda level, and then going back to their respective homes in the after noon's is identified to be one of the major problem.

In terms of quality education provision and particularly regarding educational development indicators that prevail in each of the Woredas within the Expressway influence area found to be as shown below in the following table.

Table 5.5.14.1-3: Quality of Education Development Indicators in the Woredas

Indicators	Miesso			Afdem			Gota-Bike			Erer		
	Grade level			Grade level			Grade level			Grade level		
	1-4	1-4	5-8	1-4	1-4	5-8	1-4	1-4	5-8	1-4	1-4	5-8
Pupil Room Ratio	1:78	1:78	1:55	1:80	1:60	1:70	1:50	1:50	1:50	1:80	-	1:75
Pupil Teacher	1:76	1:76	1:46	1:80	1:60	1:70	1:50	1:50	1:50	1:80	-	1:75
Pupil Book Ration	1:2	1:2	1:1	1:2	1:2	1:2	1:3	1:3	1:3	1:2		1:2

Source: Data Collected from Woreda Education Offices and Compiled, October -November, 2020

Among the different education quality development indicators, pupils' room ratio is one, and as could be observed in the table above, pupil's room ratio in all schools from grade 1-4 was found to be from 50 to 80 pupils per room. This was about 71 pupils per room on average and that is above the national standard of 45 pupils per room. In terms of grade level from 1-4, average pupils teacher ratio was about 65 pupils per teacher and that was also above the national standard of 45 pupils per teacher. As to pupils' book ratio, it was 1:2 and this was also above the national standard of 1: 1.

Similarly, pupils room ratio, pupils teacher ratio and pupils text book for all schools in the Woredas of the corridor from grade 1-8 on average found to be 64 pupils per room, 59 pupils per teacher and pupils text book was 1: 2. Pupils per room, and pupils per teacher and pupils per text book were above the national standard of 45 pupils per room, 45 pupils per teacher and 1:1 text book.

D. Challenges in Learning and Teaching

Data and information obtained from Woredas that would be traversed by Miesso – Bike- Dire Dawa Expressway indicates that the process of learning and teaching at schools are challenged by different factors that are inherent to the lowland (kola & Bereha) areas of the envisaged Expressway. Among the different challenges that inhabits smooth learning and teaching process in the Woredas are: - hot climate that rises up to 40 degree centigrade some times; scarcity of basic needs such as food, clothing and water supply etc.., particularly at household

level; shortage of facilities such as adequate class room, desk, chair, water supply at schools, in adequate latrines that are also not separated for boys and girls students.

In addition to the above, the data collected from the Woredas also indicated that there are shortages of teachers and text books in most of the schools.

5.5.14.2. Health Services

A. Establishments

According to the data collected from Woredas within Miesso – Bike- Dire Dawa Expressway influence area, health institutions (HIs) established are shown in Table 5.2.13.2-1.

Table 5.5.14.2-1: Number of Health Institutions Established in the Woredas

Type of Health Institution	Miesso	Afdem	Gota-Bike	Erer
Health Post	29	11	6	17
Health Centre	3	1		4
Clinic	8			5
Rural Drug Shop	3	5	2	5
Hospital	1		1	

Source: Data Collected from the Woredas within the Expressway Influence Area and Compiled, October - November 2020

As could be seen from the table above, within the influence area of the expressway, there are only two hospitals, one at Miesso and the other one at Gota-Bik; four health centres at Erer, three at Miesso and one at Afdem.

In terms of health service coverage, each Woreda reported to be 100 per centfor Miesso; 90 percent for Gota-Bike; 71 per cent for Erer and 60 percent for Afdem. In the case of family planning coverage it is reported to be 68 percent for Erer; 30 percent for Miesso, and 15 percent for Afdem.

B. Health Professionals

Regarding the number of health professionals assigned in each of the Woredas and providing services, the data collected from each of the Woredas and compiled indicated as shown in the table below.

Table 5.5.14.2-2: Health Professionals by Number & Gender

Type of Profession	Miesso		
	Male	Female	Total
Medical Dr. (All type)	6	2	8
Health Officer	5		5
Sanitarian	3	1	4
Lab. Technician	3	2	5
Health Ext. Workers		82	82
Total	**17**	**87**	**104**

Type of Profession	Gota-Bike		
	Male	Female	Total
Medical Dr.(All type)	7	1	8
Nurse(All type)	26	13	39
Health Officer	2	1	3
Sanitarian	2	2	4
Health Ext. Workers	4	15	19
Total	**41**	**32**	**73**

	Afdem		
Nurse(All type)	5	2	7
Health Officer	2	-	2
Lab. Technician	1	-	1
Health Assistant	1	-	1
Health Extension Workers	8	6	14
Total	**17**	**8**	**25**

	Erer		
Medical Dr.(All type)		1	1
Nurse(All type)	16	14	30
Health Officer	9	3	12
Sanitarian	2		2
Lab. Technician	5		5
Health Extension Workers	16	17	33
Total	**48**	**35**	**83**

Source: Data Collected from Woredas within Expressway Influence area and Compiled, October-November, 2020

The aggregate numbers of health professionals assigned at health institutions established within the Woredas of the Expressway influence area are 285 among which 162 are female, while 123 of them are male. In terms of professional persons assignment Miesso has the highest (104), while in Afdem Woreda has the lowest with 25 health professionals.

C. Ten Top Diseases within the Project Influence Area

Data collected on ten top diseases that are prevalent within the expressway influence are identified to be the following once shown in the table underneath.

Table 5.5.14.2-3: Ten Top Diseases Prevalent within the Woredas

Woreda	Type of Diseases
Miesso	(1) Pneumonia,(2) Amboise's (3) Giardiasis, (4) Typhoid fever,(5) UTI, (6) Trauma,(7) Dyspepsia ,(8) Helmenthiasis, (9) Acute Tonsillitis, (10) Otitis .m.
Afdem	(1) Diarrhea,(2) Pneumonia, (3)Malaria, (4)AURTI,(5)Dis, (6) Helmenthiasis, (7) U.T.I, (8) Otitis exteomia, (9) Anemia,(10) Amboise's
Gota-Bike	(1) Typhoid fever,(2) U.T.I (3) Pneumonia, (4) Malaria, (5) Dyspepsia, (6) Anemia, (7) URTI(8) Diarrhea, (9), Artitis (10) others
Erer	(1) Pneumonia,(2) Anemia,(3) U.T.I, (4) Malaria, (5) Diarrhea, (6) AGE,(7) Dyspepsia,(8) Common Cold, (9) AVRTI, (10) Tonsillitis

Source: Data Collected from Woreda Health Offices and Compiled, October-November, 2020

As could be observed from the table above, among the ten top diseases that are identified in all the Woredas, Pneumonia, Diarrhea, Malaria, Dyspepsia, Traumatic shock, U.T.I and Anemia are registered in all the Woredas. In addition to the above ten top diseases identified and registered in each of the Woredas that Miesso – Bike -Dire Dawa traverses, prevalence of HIV/AIDS are registered in some of the Woredas such as Miesso and Erer. In the case of Miesso, 102 and in Erer 26 cases of HIV/AIDS were reported.

5.5.14.3. Water Supply

The major sources of water supply for the population living in the Woredas of Miesso, Afdem and Gota-Bike that are traversed by the envisaged Miesso- Bike- Dire Dawa Expressway, are identified to be protected spring, deep well, hand pump and motorized system. Based on to the data collected from each of the Woredas would be traversed by the expressway and compiled, the following water supply system identified, and the details are presented on Table 5.2.13.3-1 below.

Table 5.5.14.3-1: Number and Type of Improved Water Supply Scheme

Type of Scheme	Number in Miesso	Number in Afdem	Number in Gota-Bike
Deep Well	18		
Protected Spring		2	6
Hand Pump		6	11
Motorized System		7	5
Protected Spring			
Hand Pump			
Motorized System			

Source: Data Collected from Woreda Health Offices and Compiled, October-November

As could be observed from the above table, the major source of water supply for the population living within the Woredas are Protected Spring (33); Deep Well (18); Hand Pump (17); and Motorized System (7).

According to the data obtained from all the Woredas within the influence area of the Expressway, coverage for clean water supply varies from Woreda to Woreda and the record indicates that for Miesso 46 percent; for Afdem 39 percent and for Gota-Bike 21 percent. These figures indicate that there is a huge gap between the one that exist and the required one.

5.5.15. Transport Service and Communication

I. Miesso – Mulu – Afdem Road Section

Miesso – Mulu – Afdem part of the road that takes to Dire Dawa starts from the outskirt of Miesso town located in West Hararghe Zone of Oromia National Regional State and then stretches to Afdem Woreda.

This part of the road under discussion is totally about 38km among which from Miesso to Mulu it is 11km; and from Mulu to Afdem is 27Km. It is entirely an earth road that is rough and not used for public transport. Only Four Wheel Drive Car, Isuzu, Heavy Truck, Pick Up and Motor Cycle are used. This earth road is mostly used by individual business persons/traders, Non-Government Organizations (NGOs), Ambulances and Red Cross Cars.

However, persons wish to travel to and from/ Afdem, Mulu, Miesso, Awash, and then to other towns relay on those who are willing to give ride/lift or charging for providing transport service using heavy trucks when available.

Adequate data/information on the availability of other rural roads that connects the different rural kebeles with Mulu and Afdem Towns could not obtain. Data/information obtained from Afdem Woreda indicated that there are foot paths that connect Rugi, Ashi, Danlahelay and Fodoba Shubkebeles with Afdem Woreda Town.

II. Afdem- Bike-Erer-Melka Jabdu

The road from Afdem to Erer and then to Melka Jabdu/Keble 01 of Dire Dawa is upgraded gravel road, and there is a public transport service daily between Erer and Dire Dawa. But according to information obtained from Afdem Woreda Administration, there is only once in a week that public transport service is provided between Afdem and Dire Dawa. In addition to the existence of public transport service, 4 Wheel Drive Car, Isuzu, Heavy Truck, Pick Up and Motor Cycle are used between Afdem- Bike-Erer and Dire Dawa. As to the distance from Afdem to Bike it is 25km; from Bike to Erer 31.7 km, and from Erer to Melka Jabdu/Kebel 01, it is 42km.

On the other hand, adequate data/information on rural roads those were constructed and meant to connect rural kebeles with Woreda towns are not found. As understood from consultations and discussions made with concerned government stakeholders and community representatives during environmental and social assessment, it was indicated that population living in rural areas and coming to Woreda towns for various purposes such as marketing and social gathering walk on foot. For transporting goods and materials, the rural population use pack animals such as donkey and camel.

Regarding communication facilities, fixed line telephone, wireless telephone and mobile/cellular telephone services are available.

5.5.16. Vulnerable Groups

Adequate data/information on vulnerable groups living within the expressway influence Woredas of Miesso, Afdem, Bike and Melka Jebdu could not be found. In some of these Woredas, there are no sector offices responsible for following up and providing required support to vulnerable groups, recording their numbers and the type of their vulnerably.

Net Consult has taken census of the population within the influence area of the expressway and after this data is processed the number and types vulnerable groups living within the influence area of the expressway will be identified and will be reported in the resettlement action plan to produce.

Vulnerable groups in the project area are:

- Local underserved communities' pastoral and agricultural lifestyle and culture,
- Male and female community members particularly girls and women with in 5 Km radius of project camp, sub camps and active road construction work areas with influx of huge number of construction workers;
- All men and women working in the road project particularly women;
- Survivors of gender based violence, sexual exploitation and abuse;
- Contractor and consultants management staff;

5.5.17. Archaeological, Cultural or Historic Sites

Secondary data collected using formats from all the Woredas within the influence area of the expressway and information collected during consultations made with all concerned stakeholders at Woreda, zone, regional and community dinnot indicated that there are Archaeological, Cultural or Historical Sites within the expressway corridor. In addition, when population census survey, identification of properties/assets would be affected and inventories taken during the last December 2019 and January 2021 could not indicated if there are Archaeological, Cultural or Historical Sites that would be affected due to the envisaged Miesso-Bike-Dire Dawa Expressway.

As to the existence of graveyard within the influence area of the expressway, during consultations made at different levels with different stakeholders this issue were raised and it was believed that there would be graveyards within the influence area of the expressway. Furthermore, as the survey carried out to identify properties/assets existing within in the influence area of the expressway, it is already identified that there are some graveyards within right of way (ROW).Regard graveyards that are found within the ROW, proper mitigation measures will be taken in moving and laying such graveyards at appropriate place with consultation of concerned stakeholders and claimants.

Chapter 6. ANALYSES OF ALTERNATIVES AND JUSTIFICATIONS/ ENVIRONMENTAL CONSIDERATIONS

6.1. Alternative Analysis

The analyses of alternatives in this case consider the following aspects;

- Alternative routes;
- Alternative design options (design standards); and
- Alternative of road project implementation Vs the No project scenario.

6.2. Methodology of Alternative Analysis

The desk review includes engineering, social, environmental and economic aspects. The reviewed documents are collected from different sources including ERA, Ministry of Water & Energy, the Ethiopian Institute of Geological Surveys, the Ethiopian Mapping Agency, the Ministry of Agriculture, the Ministry of Finance and Economic Development, the Ethiopian Environmental Protection Authority and the regional states' governments. The main documents collected are listed below:

- ✓ Topographic maps scale 1:250,000 and 1:50,000
- ✓ Geological map of Ethiopia, scale 1:2,000,000
- ✓ Terrain satellite imageries developed by SRTM and Google Earth
- ✓ Land use and land cover map, scale 1:1,000,000
- ✓ Hydro-geological map, scale 1:1,000, 000
- ✓ Meteorological statistics
- ✓ ERA and EPA ESIA procedural guidelines
- ✓ Population statistics - demographic details of all towns and villages along the alignment
- ✓ Costs of road materials and various items of road work
- ✓ Type of soils and availability of construction materials
- ✓ Past traffic data
- ✓ Socio-economic conditions, past and present, as well as plans/projections for future of the weredas traversed by corridor of routes' alternatives.

Using information extracted from the desk study alternative road corridors, which fulfill the requirements of ERA's design manuals, has been identified. The road corridors are further refined and preliminary potential alternative routes were formulated.

Identification of alternative routes involves the following tasks:

- Data compilation and desk review of available documentation
- Corridor demarcation and preliminary identification of alternative routes based on secondary data.

After the preliminary identification of the routes, field assessment has been conducted by the project study team. The objective of the surveys was the direct acquisition of information aimed at confirming or amending the secondary data used for preliminary identification of alternative routes. To this end the team has carried out the following activities:

- Inspection of critical stretches from the point of view of gradients
- Inspection of major river crossings
- Confirmation on the nature of soils described by soil maps
- Overview on land use patterns along the routes
- Preliminary assessment of environmental aspects of the routes
- Preliminary assessment of social impacts and stakeholders views
- Liaison with weredas administration.

Accordingly, the study proposed three alternative alignments to compare for the current project. The alternative routes were compared with environmental criteria and ranked with Environmental Aggregate ECA Risk.

The methodology used for the environmental comparisons of the alternative routes is carried out following ERA's Route Selection Manual, 2013. Preliminary Technical Evaluation was first made with six criteria; i.e. Effects on National Parks, Water Resources, Air Quality, Agricultural Land, Topography and Potential for Erosion.

Similarly, further analysis of the comparison was made following the manual taking Environmentally Critical Area Analysis. With this, five ECA criteria are provided with weight.

Table 6.2-1: Environmentally Critical Area Values

ECA Number	Environmentally Critical Area	ECA Value
ECA I	National Parks, Primary Forests, Areas of High Biodiversity and Endangered Species	5
ECA II	Recharge Areas for Aquifers, Protected Water Bodies and Wetlands	4
ECA III	Prime Agricultural Land	3
ECA IV	Areas of High Landscape Value/Scientific Interest	3
ECA V	Areas Prone to Erosion and Desertification	1

Impacts anticipated from all alternative routes were measures with these criteria, to find the Aggregate ECA Risk Number results of each. Finally, these results are converted in to 20% value to be then used in MCA calculation. The MCA at this final stage took multidisciplinary approach incorporating Five (5) results: i.e. Engineering, Social Environmental, Economic and Administrative results.

6.3. Description of Alternative Routes

The project during this design study has proposed three alternative routes. Alternative 1 and 2 have close corridor to each other, alternative 2 mainly differing from the first from KM 91+300 to 103+200 and from KM 133+900 to 157+800. The third alternative takes RHS after KM 63+300 until it reaches Dire Dawa. The alternative routes are presented hereunder.

Alternative Route - 1	This route basically runs along and the road from Awash to Dire Dawa via Bike but as much as possible takes shortcuts becoming more directional which makes it the shortest of all alternatives. It has a total length of about 202.8 KM starting from Awash and ending up on the Dire Dawa – Dawalle Highway. Moreover, this corridor is also followed by Addis Ababa – Dire Dawa railway line.
Alternative Route - 2	This route basically runs along and the road from Awash to Dire Dawa via Bike as well but doesn't takes shortcuts becoming in most cases parallel and/or near to the existing road and railway lines which makes it a bit longer than alternative one but much shorter than alternative three. It has a total length of about 206.8km starting from Awash and ending up on the Dire Dawa – Dawalle Highway. Moreover, this corridor is also followed by Addis Ababa – Dire Dawa railway line.
Alternative Route - 3	This route basically runs along and the road from Awash to Dire Dawa via Chiro. It has a total length of about 283.8 KM starting from Awash and ending up on the Dire Dawa – Dawalle Highway. This option is the longest option with about 81km lengthier than that of alternative 1. Moreover, this corridor is followed by Addis Ababa – Dire Dawa railway line up to Meisso for about km 66 but departs to the right and follow the existing road corridor which is via Chiro, Hirna and Kulubi.

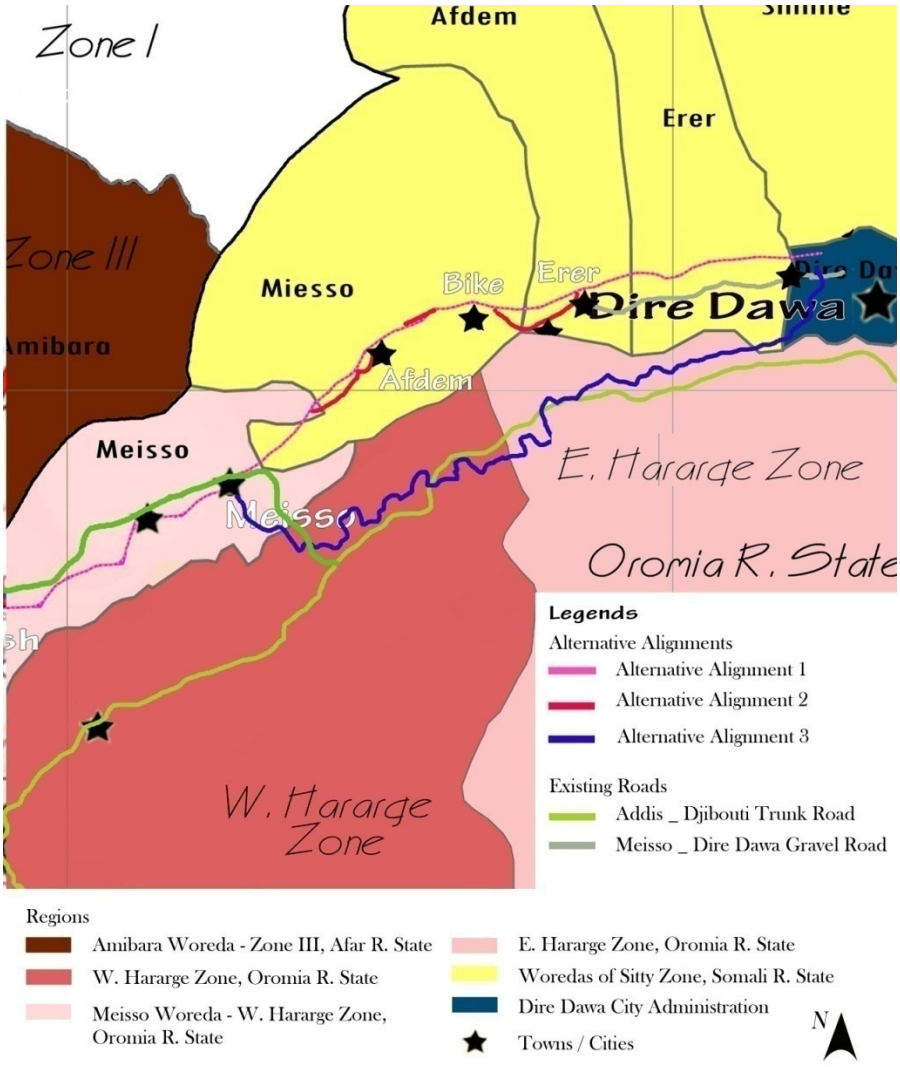


Figure 6.3-1: Plan View Alternative Routes

Table 6.3-1: Comparison of Alternative Routes' Length and Terrain

Description	
Total Length	
Route 1	202.8 KM
Route 2	206.8 KM
Route 3	283.8 KM
Terrain Classification	
Route 1	
Flat	24.3%
Rolling	75.7%
Mountainous	-
Escarpment	-
Route 2	
Flat	29.4%
Rolling	70.6%
Mountainous	-
Escarpment	-
Route 3	
Flat	5.4%
Rolling	35.8%
Mountainous	50.5%
Escarpment	8.4%

6.4. Environmental Alternatives Analysis

6.4.1. Preliminary Environmental Technical Evaluation

On this basis, the following major environmental impacts were considered, following ERA's manual, for evaluation of the proposed route alignments:

Table 6.4.1-1: Preliminary Technical Evaluation of Alternative Routes

No.	Parameters	Alternatives		
		Alt 1	**Alt 2**	**Alt 3**
2	**Environmental (Bio-Physical) Factors**			
2.1	Effects on National Parks	-	-	-
	Effects on Other Conservation Areas and Wildlife Reserves			
	Effects on Areas of High Bio-Diversity and Potentially Endangered Species	-	-	-
2.2	Impacts on Water Resources (pollution) and Sedimentation	Moderate	Moderate	High
2.3	Potential for Air Pollution	Moderate	Moderate	High
2.4	Prime Agricultural Land Affected	Low	Low	V. High
2.5	Potential for Erosion	Moderate	Moderate	High
2.6	Topography (difficulty for construction and potential for land degradation mainly through erosion to be initiated)	Low	Low	V. High
Summary		**Preferred Route**	**Preferred Route**	**NOT Preferred Route**

6.4.2. Multi-Criteria Analysis: ECA Analysis Approach

Based on consideration of potentially vulnerable environmental receptors and with the introduction of the concept of the Environmental Criteria Area (ECA) Values comparison is done as follows to the proposed alternatives.

Table 6.4.2-1: Depicts the Basic Features and Extent of Severity of Impacts on the ECAs

Factors		Alternatives		
		Alternative 1	**Alternative 2**	**Alternative 3**
Length, KM		**250.88**	**250.18**	**371.5**
Severity of Impacts [Based on Table 8.4 and 8.5 of Route Selection Manual]	ECA I	Moderate	Moderate	Low
	ECA II	Moderate	Moderate	High
	ECA III	Low	Low	V. High
	ECA IV	Low	Low	V. High
	ECA V	Moderate	Moderate	High

On the other hand, making use of the table above that contains the significance factors to be applied and provided in the Route Selection Manual (RSM), the significance of expected impacts on the respective ECAs is shown in beneath.

Table 6.4.2-2: Significance Factors Applied

ECA Type	Reversibility of Impact	Cumulative or Non-Cumulative	Duration of Impact	Scale of Impact
ECA I	Irreversible	Non-Cumulative	Long Term	National
ECA II	Reversible	Non-Cumulative	Medium Term	Regional
ECA III	Reversible	Non-Cumulative	Medium Term	Kebele
ECA IV	Irreversible	Non-Cumulative	Long Term	Kebele
ECA V	Reversible	Cumulative	Short Term	Woreda

Table 6.4.2-3: Alternatives with Factors Significant

ECA Type	Alternatives		
	Alternative 1	**Alternative 2**	**Alternative 3**
ECA I	Low	Low	V. Low
ECA II	Moderate	Moderate	High
ECA III	Low	Low	V. High
ECA IV	Low	Low	V. High
ECA V	Moderate	Moderate	High

PROBABILITY	SIGNIFICANCE				
	Very Low	**Low**	**Moderate**	**High**	**Very High**
Unlikely	None	None	Minimum	Moderate	High
Probable	None	Minimum	Moderate	High	Very High
Definite	Minimum	Moderate	High	Very High	Critical

Figure 6.4.2-1: Environmental Risk Matrix

Table 6.4.2-4: Alternatives with Levels of Risk

ECA Type	Alternative 1	Alternative 2	Alternative 3
ECA I	Minimum	Minimum	None
ECA II	Moderate	Moderate	High
ECA III	Moderate	Moderate	Critical
ECA IV	Minimum	Minimum	Very High
ECA V	Moderate	Moderate	High

Finally, based on the approach the final ECA Risk Numbers are calculated and presented in the next table.

6.4.3. Aggregate ECA Risk

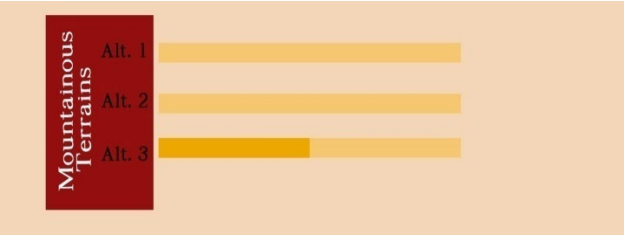
Table 6.4.3-1: Aggregate ECA Risk Numbers

Environmental Risk		Alternative 1						Alternative 2						Alternative 2					
		ECA						ECA						ECA					
		I	II	III	IV	V	Total	I	II	III	IV	V	Total						Total
		ECA Value						ECA Value						ECA Value					
		5	4	3	3	1		5	4	3	3	1		5	4	3	3	1	
Level	**Score**																		
None	0						**0**						**0**	0					**0**
Minimum	1	5			3		**8**	5			3		**8**						**0**
Moderate	2		8	6		2	**16**		8	6		2	**16**						**0**
High	3						**0**						**0**		12			3	**15**
Very High	4						**0**						**0**				12		**12**
Critical	5						**0**						**0**			15			**15**
Total							**24**						**24**						**42**

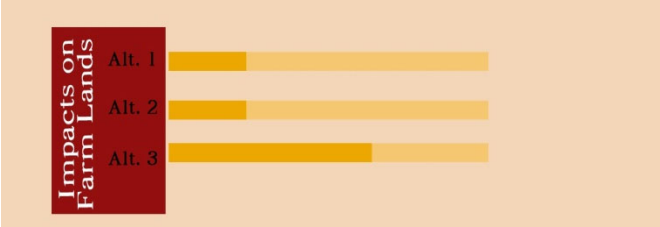
6.4.4. Environmentally Preferred Option

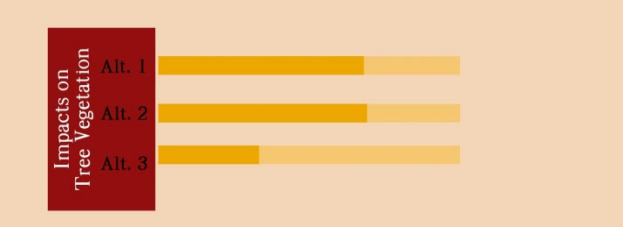
Pretty much alternative 1 and 2 cross over similar environmental corridor and have similar characteristics in most criteria. The two alignments differ only from KM 91+300 to 103+200 in Meisso Woreda and from KM 133+900 to 157+800 near Afdem and Erer border, alternative 2 offsetting to the RHS in both sections.

The two alternative have only flat and rolling terrains, where the third alternative have much sections of mountainous terrains for about 134 KMs. Accordingly, the third alternative has high potentials of erosion and high alteration of landscape values.



The third alternative has a better performance in aspect that it minimises traversing in tree vegetation areas, where the impact on vegetation is high for the other two alternatives.





Even though, alternative 3 has less section in vegetation areas, the corridor it crosses near the main Addis_Harar trunk road is highly dominated with farming activities. Hence, the third option has significantly high impact on farm lands.

In summary, based on most criteria related to terrain, landscapes, erosion, farm, hydrological related impacts the impact from the third alternative is very high. For this reason this route is not environmentally feasible.

The impact from vegetation clearance is high for alternative 1 and 2. Yet, in general the two alternative routes have similar characteristics and less impact, and are equally preferred.

6.4.5. Results of the ECA Analysis Approach

From the comparison made under this approach, Table 6.3.4-1 above has resulted in Aggregate ECA Risk Numbers of 24, 24, and 42 for alternatives 1, 2 and 3, respectively.

These aggregate scores then converted into a score for use in the route selection Multi-Criteria Analysis (MCA) by using the [general] formula:

MCA Score = Weight x [80 – ECA1 - ECA2 - ECA3 - ECA4 - ECA5]/80

Where:

Weight= the weight (proportion) given to environmental component in the total (aggregate) evaluation; and

MCA Score= the converted scores of each Alternative to the weight given to environment.

On this basis, the actual scores corresponding to the weight are obtained as follows:

Alternative 1: MCA Score = 20 x [80 – 22]/80 = 14.5 and

Alternative 2: MCA Score = 20 x [80 – 24]/80= 14.5

Alternative 3: MCA Score = 20 x [80 – 42]/80= 9.5

From the above equations, as the [environmental] weight is constant in all cases, the route with the least score in Table 6.3.4-1 results in equally the highest MCA Score for Alternative 1 and 2: (14.5); and thus, the two routes are environmentally preferred equally.

6.4.6. Environmental Results of Alternative Analysis

As presented in this document environmental Alternative Alignment for the expressway, Awash _ Meisso _ Dire Dawa section was carried out. There were three alternative routes proposed for comparison. Alternative 1 and 2 start at the end of Adama _ KM 60 (exit of Awash town in Afar), Bordede town (KM 19+500), Asebot (KM 58+800) and Meisso town (KM70+300) in Meisso Woreda of W. Hararge of Oromia and goes to Sitty Zone of Somali Regional State crossing Mullu (KM 80+900) in Meisso Woreda, Afdem town (KM 107+100) in Afdem Woreda, Bike town (KM 133+900), Erer town (KM 153+000) in Erer Woreda, and then enters to Dire Dawa City(KM 202+734), Dire Dawa City Administration, crossing along outskirts of all towns.

Alternative 2 only differs from alternative 1 from KM 91+300 to 103+200 in Meisso Woreda and from KM 133+900 to 157+800 near Afdem and Erer border, alternative 2 offsetting to the RHS in both sections.

The third alternative starts at the end of Adama _ KM 60 (exit of Awash town in Afar), Meisso town in Meisso Woreda of W. Hararge in Oromia and goes in similar alignment as alternative 1 till KM 63+300. Afterwards it takes to the RHS in parallel to Addis _ Harar (Addis _ Djibouti) trunk road in W. Hararge and W. Hararge Zones of Oromia Regional Satate, crossing the outskirts of Chiro, Boreda, Karamile, Kobo, Chelelenko, Kulebi, and finally enters in to Dire Dawa City (KM 22+723), Dire Dawa City Administration

Based on the environmental route selection, following ERA's Route Selection Manual 2013, in most criteria related to terrain, landscapes, erosion, farm, hydrological related impacts the impact from the third alternative is very high. For this reason this route has significantly higher impact scale and it is not environmentally preferred.

Aggregate ECA Risk with weigh Values	**Alternative 1**	**Alternative 2**	**Alternative 3**
	14.5	**14.5**	**9.5**

The impact from vegetation clearance is high for alternative 1 and 2. Yet, in general the two alternative routes have similar characteristics and less impact, and are equally preferred.

6.5. Social Assessment

This section deals with comparison of routes with respect to the social assessment aspects.

Weights given for Route Selection for Dual Carriage Truck Expressway from Meiso – Afdem – Bike –Dire Dawa form Social Aspects points of view is as follows.

Table 6.5-1: The Scores Given for each of the Alternatives

Criteria	**Alternative Routes and Scores**		
	1	**2**	**3**
Community Access	1	1	1
Development Potential	3	3	2
Public Transport	2	2	1
Resettlement	3	2	1
Severance	3	2	2
Cultural Heritage	4	4	2
Road Safety	3	2	1
Air /noise pollution	1	1	1
Total	**20**	**17**	**11**

As could be observed from the table above, Route 1 has got the highest score, route 2, the second highest score and Rout 3 is the least score.

In the case of Route 1, it traverses all the capital towns of Meiso, Afdem, Bike and Erer Woredas of Sitti Zone of Somali Region. Gota and its surrounding areaare known for its production of fruits and vegetables in Somali National Regional State. Route 1 is also the shortest one when compared with Route 2.

Route 2 and Route 1 are very much similar, except that Route 2 bends to the South after passing Bike town and then connects to Route 1 at Erer Town. The bending to South increases the length of the Expressway which does indicated significant positive impact both in social and economic aspects.

In the case of Route 3, it takes the same Route starting from in Gumbi Bordode Woreda and then from there it shifts to Chiro Town direction following the existing Asphalt Road that takes to Dire Dawa, Eastern Haraghe Zone of Oromia, Harar, Jigjiga Town and Somali National Regional State. Route 3, Expressway is assumed to traverse towns such as Chiro, Arba Rakate, Baroda, Hirna, Kobo, Kulubi and at last Dangago rural village from where it shifts to left and then goes to Dire Dawa. Route 3 Expressway is estimated to be the longest distance to Dire Dawa when compared with those two Routes (Route 1 and Route 3). Since there is already Asphalt Road along the assumed Route 3 Expressway alignment the social and economic benefit of the Route 3 is insignificant. In fact constructing expressway along the existing alignment creates competition between the two, the existing Asphalt Road and the new Expressway to be constructed.

6.6. Engineering Route Selection Alternative Analysis

The overall characteristic of the alternative routes, from the geotechnical property and evaluation criterial point of view, are (but not limited to):

- Geological formation
- Problematic soil
- Land Slide Hazard
- Excavation type
- Foundation Condition
- Gully formation
- Seismicity
- Marshy or Water logged area

Some criteria are common to all alternative routes which are not worth comparing and the remaining ones have different criteria from the hazard, workability and economy of road construction.

6.6.1. General

In order to trace out one possible feasible corridor, the given control points which were fixed in three alternatives has to be evaluated from major waterway crossings, cross drainage structures and their broad structural system such as span arrangement, superstructure, substructure and Foundation.

Accordingly, the predetermined structure size and type, on each alternative were examined and compared excluding the proposed structures on the shared corridor. On the basis of this analysis, those routes which were regarded as feasible, and which would meet the objectives of the project were shortlisted and ranked from Engineering and Economics point of view as well.

The preliminary assessment considered the minor drainage structures as a whole and bridge structures particularly in the alternative routes. The short-listed routes and the cross-drainage structures differ from each other in number and type. The second alternative is nearly an offset of the first one, as a result the crossing structures are in these two alternatives are closely similar. While the third alternative thoroughly follows the other alternative alignment till town Meisso then diverts to the south East direction to Asebe Teferi town and goes at the base of the mountains close to the existing Asebe Teferi- Hirna -Diredawa road segment. The crossing structures locations are relatively defined and the total number of crossing structures reduces from the other alternatives as the proposed road crosses the streams before splits or spread out in the flatter section.

Comparing these criteria is thus found of paramount importance to evaluate the routes; hence, summary of comparison of the four alternative routes is presented hereunder.

Table 6.6.1-1: Summary of Comparison of Alternative Routes

SN	Comparison Criteria	Score of Risk for Stability out of 100%		
		Alternative Route 1	**Alternative Route 2**	**Alternative Route 3**
1.	Land Slide, Marshy area (Geotechnical Hazard)	95%	95%	25%
2.	Bridge Foundation	50%	55%	65%
3.	Hard Excavation	98%	98%	25%
4.	Gully Formation	68%	70%	75%
5.	Expansive soil	65%	68%	75%
6.	Dispersive Soil	45%	45%	80%
7.	Geological faults	80%	80%	40%
8.	Seismicity	60%	60%	75%
Average		**70%**	**71%**	**58%**
Weight out of 6		**4.2075**	**4.28**	**3.45**
Priority in terms of safety (degree of freedom from Geological Hazards)		**2**	**1**	**3**

6.6.2. Cross Drainage Structures

The number and type of cross drainage structures have been identified in each alternative as a first principle to judge the alternative routes. The first route is composed of 73 bridges, 91 slab/box culverts and 15 reinforced concrete pipes. while the second route comprises 67 bridges, 85 slab/box culverts and 16 reinforced concrete pipes. In the third substitute proposal the number of major structures/bridges significantly reduces to 46 and the slab/Box culverts to 55, though the number of Reinforced concrete pipes drops by 3 from the second alternative.

However, most of the crossing structures in this alternative is on a mountain stream with a steep gradient, in which their swift flow rate often transports large quantities of rock, gravel, soil, wood or even entire loges with the streams. Therefore, an additional clearance height, protection on the inlet and outlet assemblies and dissipating structures on the steep gradient is expected.

Table 6.6.2-1: Summery of Crossing Structures in the Alternatives

	Bridge	**Slab/Box**	**RCP**	**Total**
Alternative 1	73	91	15	179
Alternative 2	67	85	16	168
Alternative 3	46	55	12	113

Though the overall look of the crossing structures shown in the above table resulted from the total road length of the alternatives, the main difference in number and type of structures are in the road sections after Mieso town. Before that the proposed alternatives nearly share the same path; and the number of structure and type are closely similar.

According to the classification of ERA Bridge design manual 2013, Bridges are a structure with a total clear opening above 6m and a structure with a clear span opening less than that is a culvert. A small bridge is 6-15m, Medium bridge 15-50m, and a large bridge above 50m total length. Thus, according to the initial hydraulic size output the bridges in all the alternatives can be classified as small to medium span bridges.

Table 6.6.2-2: Total Span of Major Structures in the Alternatives

Alternative	**Overpass Bridge Total Span**	**Major Crossing Structures Total Span**
1	126 m	1086 m
2	126 m	976 m
3	462 m	649 m

6.6.3. Overpass and Underpass Structures

In the areas where grade separation is required due to the intersection of railway or roadway transportation arteries a structure that crosses over another road or railway should be constructed. Moreover, in areas where the expressway traverses with higher mobility of people and farm animals a separate underpass solely should be used as a passageway.

In this regard, Alternative 1 and 2 crosses the existing Awash- Mieso – Afdem – Bike – Dire Dawa Road segment three times. While the alternative 3 crosses the Sebeta-Meiso-Dewele Railway once and the Awash-Mieso – AsebeTeferi – DireDawa Road ten times. Therefor a total of 11 overpass bridges which should be built at the intersections of the existing railway and roadway transportation arteries that allows for the free flow of traffic on different levels is required for the third alternative.

Moreover, alternative three passes relatively in a developed areas and adjacent to a number of towns Like Chiro, Hirna, Boreda,Chelenko and Kulubi which may need a provision of higher number of pedestrian and animal crossing. While the other two alternatives are aligned in areas where less mobility of people and animal exists and crosses limited number of towns and villages, in which the requirement of a separate underpass for pedestrians is not as in the third alternative.

The dimension of the pedestrian underpass can be determined in considerations of geometrical requirement of pedestrian passage, topography, economy and safety parameters. For safety reason waterway and pedestrian underpass should be provided separately and a frame bridge or box bridge with sufficient exit and entry facilities may be crucial in making as attractive as possible.

Figure 6.5.1.-1: Traverses of alternatives near the towns and villages

6.6.4. Bridge Sites

According to the initial hydraulic size determination all of the major structures in each alternative the majority of the crossing structures falls in the category of small to medium span bridges whereas some in large span category. And In selecting the location for small or medium sized bridges, decision has to be reached between the easiest river crossing and the shortest road alignment. The choice of location then becomes an economic decision. Whereas for large span Structures the most economic bridge site and the one that has potentially the longest service life is a location that:

- Is on a straight reach of the river
- Is beyond the disturbing influence of larger tributaries
- Has well defined banks
- Has reasonably straight approach roads
- Permits as perpendicular a crossing as possible
- Has a good foundation condition

The major crossing locations of the first two alternatives have very similar characteristics due to their placement on the plateau's or rift valley plain sections. Whereas alternative three, it is located along the toe of the rift escarpment and lies on the back of the mountains for most of its path. Therefore, the majorities of the rivers in alternative three are beyond the disturbing influence of larger tributaries and have defined banks of river. However, this option has excessive cut depth which in some cases may reach nearly 200m, and could possibly require to shift structures location in addition to the protection need at the edge of the road except in very competent materials such as solid rock. On the other hand, Fill sections manifest as elevated sections of a roadway or cut section exists to balance the earth volume. The following points can be considered as a drawback for crossing structures in alternative three.

- Instability of culvert location due to the high cut or fill depth. The probability of getting live stream crossings, low areas, gentle slope and impoundment area is less due to this fill or cut of the road section.
- The culvert can be located as to change the existing stream alignment and be not aligned to give the stream a direct entrance and exit. Abrupt changes in direction at either end may reduce the capacity and a larger structure could be compulsory.
- Bends within a culvert can be introduce and a requirement of large road side structures for water conveyance may require for those section with box cut sections and long barrel length for high fill sections.
- The outlet velocity of a culvert, measured at the downstream end of the culvert, is usually higher than the maximum velocity that a natural channel can withstand without experiencing significant erosion of the bed and/or banks. Most culverts require adequate inlet and outlet protection (typically cascaded wall, riprap or a stilling basin), and this is a frequently overlooked issue during design.

Nearly all of the bridge crossing locations in the first and second alternatives seems to have a potential to be relocated for a better output. But, due to the traverse of the third alternative in a mountainous area, not many options can be found which satisfies both the geometry and bridge site requirement.

To the extent of this study, the major crossing structures in first two alternatives have close similarity in terms of straight reach of river, banks of the rivers, disturbing influence of branching rivers, and horizontal and vertical geometry. Though the third alternative route gains advantage over the first two in terms of the number of structures and spans, the gradient of the approach roads and the virtually closed option of alternate crossing site location take some of its value.

6.6.5. Site Conditions

According to the information obtained from the field observation and topographic maps the local terrain and the river conditions of the major crossing structures are thoroughly comparable in the first and second alternatives.

Virtually, all of the bridges have the potential to have straight reach of river at the crossing locations. Braided river often found on the flood plains where the sediment yield of the catchments is very high in Alternative 1 and 2. However the crossing location can be taken away from the disturbing influence of these areas. Else it may require to widen the given span or extensive river training to stabilize or keep the channel shape and reduce the bridge span to an economical design.

The morphology of a river channels are a function of environmental conditions, including the composition and erodibility of the bed and banks of the rivers. In the first two alternatives a dispersive soil formation and collapsible river banks; which can be easily eroded was observed nearly in all of the major crossing structures till km 135+000. Moreover, the sediment load moving through the channels and the rate of deposition is higher than the third alternative which has a steep channel and relatively firm banks of river. After km 135+000 the river morphology changes gradually and rock river-bed observed in most of the crossing structures.

None of the rivers are navigable rather most of them are seasonal and meandering which migrate downstream. Meander progression can require river training at bridges or erosion protection at the toe of embankments or both. However, the crossing locations in the first two options have better chance to be readjusted in due consideration of the geometry and other engineering parameters. Else considering the above measurement is obligatory. Erosion and deposition around bends hasn’t been observed in alternative 3.

On the other hand, the assessment of earthquake risk should be considered in route selection, and it may have an important bearing when long lengths of alignment encounter active faults or where large structures, including major bridges might be required to be constructed in the vicinity of active faults and seismically active zones.

In view of this the, shape and feature of the land surface the alternatives routes have very similar characteristics except the third one which differs as a result of shifting to the hill side. Thus, the design and the engineering measurement to be taken will be comparable for the minor and major drainage structures.

6.6.6. Broad Structural System

Selecting the superstructure type depends on several factors: cost, span lengths, depth of structure (relates to road profile and vertical clearance), bridge curvature, and speed of construction. While there are many structure types used for local bridges.

The reflection of the preliminary hydraulic size output shows all of the Bridges falls in a category of small to large span bridges with a probability of being a single span structure mainly. In such case frame structure and the usual bridge type which uses reinforced concrete girder as a means of supporting its deck can be certain structures. Falsework formed reinforced concrete deck slabs or Reinforced concrete box girder shall be considered if the hydraulic size requirement is small and other engineering parameters allows.

Structural systems whose maintenance is expected to be difficult should be avoided. In this case the choice of structural system may not be such different for the proposed alternate routes.

When selecting the portion of the bridges that supports the superstructure and distributes all bridge loads, factors such as geotechnical investigation which cannot be determined at this stage should be known clearly. However, in consideration of the vertical grade only reinforced concrete or masonry substructure can be used. This earth retaining and pillar structures will support the superstructure and the roadway at the beginning, middle and end of the bridges.

Therefore, in terms of the broad structural system, the first two alternatives may have closely similar structural elements and construction techniques. While the third option could require extensive study as a result of the high depth and the shape of the valley which needs to be bridged.

6.6.7. Cost Estimate

Costs associated with the Drainage structures are estimated and benefit/cost ratios calculated. In view of the potential discrepancies inherent in using satellite DEM data, any route option alignment must be deemed to require modification during later detailed design activities following a ground survey. As a consequence, although cost estimates based on such satellite imagery can be used for the comparison of selected options and their drainage structures, they will be prone to error, sometimes significantly. A second option is to derive global costs for road construction in different types of terrain (i.e. flat, rolling, mountainous and escarpment) from ERA's construction database. Major drainage can be estimated on the basis of estimated square meters of deck and minor drainage on estimated linear meters of each culvert cross-section type.

6.7. Decision on Route Selection form Multidisciplinary MCA

The crossing locations in the alternative have a close comparison in terms of engineering point of view. In such case a life cycle cost analysis can be used as a method to assess the total cost of a project in terms of Drainage structures. It is a simple tool to use when a single project has different alternatives that fulfill the original requirements.

In this case a Deterministic analysis can be done by measuring a decision matrix to find the most cost-effective route in terms of drainage structures.

Table 6.7-1: MCA Results of Alternative Routes

Primary Criteria	No.	Secondary Criteria	Max. Score	Alternative 1		Alternative 2		Alternative 3	
				Data	Score	Data	Score	Data	Score
Engineering	1.1	Road Length	9.00	202.80	9.00	206.80	8.83	283.80	6.43
	1.2	Terrain	5.00						
		Flat (%)	5.00	24.30	1.22	29.40	1.47	5.40	0.27
		Rolling (%)	3.33	75.70	2.52	70.60	2.35	35.80	1.19
		Mountainous (%)	1.67	0.00	0.00	0.00	0.00	50.50	0.84
		Escarpment (%)	0.00	0.00	0.00	0.00	0.00	8.40	0.00
	1.3	Earthworks (Birr x 106)	4.00	2372.74	3.84	2276.24	4.00	43165.20	0.21
	1.4	Pavement (Birr x 106)	3.00	10312.81	2.97	10220.90	3.00	12756.00	2.40
	1.5	Culvert and Bridges (Birr x 106)	4.00	2757.37	2.46	2119.72	3.21	1698.64	4.00
	1.6	Availability of Materials (G/M/P)	4.00	M	3.00	M	3.00	M	3.00
	1.7	Geo-hazards (F/I/M)	4.00	I	2.80	I	2.9	I	2.3
	1.8	Cost (Birr x 106)	7.00	18012.24	6.63	17055.95	7.00	66976.78	1.78
	Sub-Total		**40.00**		**34.44**		**35.72**		**22.47**
Social	2.1	Community Access (G/M/P)	1.00	P	1.00	P	1.00	P	1.00
	2.2	Development Potential (G/M/P)	3.00	G	3.00	G	3.00	M	2.00
	2.3	Public Transport (G/M/P)	2.00	M	2.00	M	2.00	P	1.00
	2.4	Resettlement (F/I/M)	3.00	F	3.00	F	2.50	M	1.00
	2.5	Severance (F/I/M)	3.00	F	3.00	F	2.50	F	2.00
	2.6	Cultural Heritage	4.00	F	4.00	F	4.00	I	2.00
		(F/I/M)							
	2.7	Road Saf (G/M/P) ety	3.00	G	3.00	G	3.00	P	1.00
	2.8	Pollution (L/M/H)	1.00	M	1.00	M	1.00	M	1.00
	Sub-Total		**20.00**		**20.00**		**19.00**		**11.00**

Environmental		From Section 7.3	20.00		14.50		14.50		9.50
	Sub-Total		**20.00**		**14.50**		**14.50**		**9.50**
Economic	4.1	Viability Section 8)	7.00	10.0%	7.00	10.0%	7.00	9.0%	6.30
	4.2	Road User (G/M/P) Benefit	3.00	G	3.00	G	3.00	G	3.00
	Sub-Total		**10.00**		**10.00**		**10.00**		**9.30**
Administrative	5.1	Sustainability (G/M/P)	5.00	G	4.50	G	5.00	P	2.00
	5.2	Strategic Impact (G/M/P)	5.00	G	5.00	G	5.00	G	5.00
	Sub-Total		**10.00**		**9.50**		**10.00**		**7.00**
Total			**100.00**		**88.44**		**89.22**		**59.27**

Legend : F/I/M Few/Intermediate/Many
G/M/P Good/Moderate/Poor
L/M/H Low/Moderate/High

Based on the assessment carried out, Alternative 2 of Section from Awash to Dire Dawa is the most preferred route and thus selected for further study.

6.8. The Road Project Vs the "No Project" Scenario

The project, Meisso _ Dire Dawa Expressway Road has significant social benefits and creating better link between Djibouti port and the capital Addis Ababa. The corridor is vital economic line connecting the central part of the nation to the port. The corridor has high traffic following the existing growth and demands of the nation the existing road.

The existing road has a growing traffic capacity demand growing continuously, and also has low safety standards. Hence, the current expressway project will provide better the mobility within the Project Area, from Djibouti port to Addis and vice versa. The carriageway is mostly outside or in the outskirt of towns, minimizing land acquisition and property damages in major settlements.

On the contrary however, the implementation of the Project would also pose adverse environmental and social impacts when compared to the *"Do-Nothing*" Alternative. However, proceeding with the implementation will have the benefits, i.e.:

- ⇒ Improved riding quality of the road, the movement of people and goods would be enhanced with reduced travel time and cost;
- ⇒ The zonal, woreda and regional administration and connectivity within the woredas of Oromia, Afar and Somali and bordering regional states of Amhara and Harar will be greatly enhanced;
- ⇒ It would greatly facilitate humanitarian work in times of crises and emergency services;
- ⇒ As accessibility increases, it contributes to increased access (of women in general and girls in particular) to several social services like schools, health centres and markets;

⇒ The performance of this sector is likely to experience the greatest gain upon improvement of the road since majority of the population derive their livelihood form agriculture;

⇒ Additionally, the traffic jam and interferences by none motorized of transport and pedestrians will be avoided and traffic accidents due to that factor will be reduced, and it will have better traffic safety.

Therefore, with implementation of proposed mitigation measures for the impacts (by the contractor) and proper follow-up (by the supervision consultant), the Alternative to upgrade the exiting road is a beneficial option especially taking into consideration the enhancement of livelihood of people in the area.

Chapter 7. ENVIRONMENTAL AND SOCIAL RISKS IDENTIFICATION AND EVALUATION

7.1. General

Road construction and traffic operations, if undertaken without a proper understanding of the relationships inherent in environmental function, can be accompanied by serious disruptions to the environment, from which it may take a long time to regain equilibrium. In human terms, this may mean that generations must function in a debilitated environment and suffer many possible associated socio-economic hardships and financial losses.

In this section of the report, the potential significant impacts of the project on the physical, biological and socio-economic environment will be discussed while the corresponding appropriate benefit enhancement or mitigation measures will be identified and recommended for the adverse impacts considered being major/moderate in the next section. Environmental consideration in the proposed road project design can go a long way to avoid/reduce many of the identified adverse impacts. Therefore, compensation & restoration measures need to be made for impacts that can't be mitigated with road design like land & property expropriation and unavoidable clearing of vegetation in the road RoW corridor & construction sites.

The following sections present: i) the general impact category and characteristics; ii) the general duration and scale of impacts; iii) the overall impact identification; iv) overall impact evaluation; v) specific beneficial impacts; and vi) specific adverse impacts due to the Project under consideration.

7.2. Impact Category and Characteristics

Environmental impacts caused by road development projects can be categorized into three major impact types. They are direct impact, indirect impact and cumulative impact types.

7.2.1. Identification of Impacts

Like many other development projects, the Meisso _ Dire Dawa Expressway will have its own positive and negative social and environmental aspects. However, the impacts occur due to different activities of the Project during construction and operation phases; and are different in their nature, magnitude, duration, etc.

7.2.2. Category of Impacts

I. **Direct Impacts:** include mainly impacts that are caused by the road construction like soil and land surface disturbances, vegetation clearance and material removal activity related to the various construction and operation activities. The major adverse direct impacts of the proposed road project are those related to land-take and establishment of the ROW and these include loss of productive agricultural land, soil erosion, loss of vegetation, disruption of settlements and public services.

II. **Indirect Impacts:** are chain effects or impacts that result from the road construction indirectly or at distant locations from the construction corridor. These include induced development in the project area and at roadsides, water quality deterioration as a consequence of the vegetation clearance and soil erosion upstream of water sources, increased deforestation for production of charcoal, cultural influences related to opening up of the area to tourists and interaction with external ways of life and so on. These impacts are normally observed during the operation phase of road projects.

Water quality deterioration and water shortages at downstream areas due to project implementation and related ecosystem changes can also be part of the indirect impacts experienced at farthest distances from the project area.

III. Cumulative Impacts:

Cumulative impact consists of an impact that is created as a result of the combination of the project evaluated in the EIA together with other projects causing related impacts. These impacts occur when the incremental impact of the project is combined with the cumulative effects of other past, present and reasonably foreseeable future projects. These are related to adverse environmental impacts on vegetation loss, water quality, erosion and sedimentation may occur if the present poor conservation measures continue along with implementation of other projects with similar impacts. Also, they are connected to social impact from land take, cultural impacts, and limitation of community access. Types and natures of cumulative impacts are:

Linear Additive Changes: are distinguished by a series of small, incremental additions to, or loss or removals of materials or resources. Each addition or removal has the same effect as the previous increment.
Amplifying or Exponential Changes: are a series of incremental additions or removals from a seemingly limitless storage (e.g., pollution from carbon emission). Each increment of change has a greater effect than the previous one so that system response increases over time.
Discontinuous Changes: involve incremental additions or removals that are assimilated until a threshold is reached. Each increment of change that exceeds the threshold results in a response.
Structural Surprises: refer to a process whereby increments of local and slow environmental changes gradually accumulate so that spatial scales are increased and temporal scales are intensified (i.e., slow to rapid rates). The result is a syndrome of various effects on system structure.

7.2.3. Duration and Scale of Impacts

Major direct impacts on the natural environmental components are caused mainly during the construction phase. Adverse impacts like soil and water resources degradation, vegetation clearance leading to soil erosion, material removal and consumption from quarry and borrow pits etc... are caused during the construction period.

In addition, socio-economic impacts like displacement of people, expropriation of properties and other losses of income that negatively affect the livelihood of the affected people, etc occur during the project construction period.

The simple matrix (shown as in Table below) attempts to depict the anticipated (beneficial as well as adverse) impacts as a result of undertaking different components of the Meisso _ Dire Dawa Expressway Road Project on various components of the environment.

Table 7.2.3-1: Matrix for Impact Identification of Possible (Major) Impacts

Impact on:	***Major Project Components During:***						
	Construction					***Operation***	
	Camps, Quarries & Borrow pits	***Clearing, Grubbing & Access Roads***	***Earth work***	***Structures***	***Pavement***	***Traffic Mgmt.***	***Maintenance***
Beneficial Impacts							
Creation of Better Income and Poverty Reduction	X						X
Employment Opportunity	X	X	X	X	X	X	X
Potential Risks on Physical and Biological Environmental							
Impact on Water Resources	X	X	X	X	X		X
Impact on Soil Resource	X	X	X	X			X
Alteration to Physical Environment, Land Uses and Landscapes	X	X	X				X
Impact on Vegetation / Biodiversity	X	X	X	X			X
Impact on Fauna	X	X	X				X
Air Pollution (Emission and Dust Pollution)	X	X	X	X	X	X	X
Impact from Noise and Vibration	X	X	X	X	X	X	X
Waste Generation	X	X	X	X	X		X
Impact from Pesticides Use			X				X
Impacts from Ancillary Sites	X	X	X				X
Impact on Energy and Raw Material Resources	X	X	X	X	X		X
Impact Related to Natural Hazards and Community Health	X	X					X
Occupational Health and Safety Risks	X	X	X	X	X	X	X
Security Risks	X		X				X

Impact on:	*Major Project Components During: Construction*					*Operation*	
	Camps, Quarries & Borrow pits	*Clearing, Grubbing & Access Roads*	*Earth work*	*Structures*	*Pavement*	*Traffic Mgmt.*	*Maintenance*
Impact on Socio Economic Environment							
Impact on Properties and Resources	X	X					X
Social Environment and Livelihood	X	X	X				X
Impact on Underserved Local Communities	X	X					X
Impact on Culture	X	X					X
Impact on Women and Vulnerable Groups	X	X					X
GBV Risks	X	X					X
Impacts on Labour	X	X					X
Pressure on Local Health Facilities	X	X					X
Impact on Community Access & Safety	X	X					
Impacts on Archaeological, Cultural or Historic Sites	X	X					X

7.3. Beneficial Impacts of the Project

7.3.1. Increased Mobility and Reduced VOC

- **Potential Benefits**

One of the benefits of providing the expressway will clearly better the mobility within the Project Corridor, from Djibouti port to Addis and vice versa. That is, due to improved riding quality of the road, the movement of people and goods would be enhanced with reduced travel time and cost.

In addition, due to the improved infrastructure, the vehicle operating cost (VOC) would be expected to be reduced contributing to the household (HH), local as well as the national economy. When the construction of the Expressway is completed the vehicle maintenance and operational costs would be greatly reduced.

- **Potential Benefits**

7.3.2. Induced Economic Development

As the Meisso _ Dire Dawa Road is constructed (so that accessibility and mobility are enhanced and hence VOC and travel time are reduced), people from the Project and or elsewhere will be attracted to the Area for investment; and this will positively contribute to growth in the micro- as well as the macro-economy.

The performance of this sector is likely to experience the greatest gain upon improvement of the road since majority of the population derive their livelihood form agriculture. With the anticipated efficient, reliable and cheap transport, the following are likely to be achieved.

- Quick and easy transport of perishable farm products such as vegetables and fruits to from the low land areas to the highlanders markets and livestock like goat and food grains from highlanders to the lowland area too.
- Cutting down on losses associated with late delivery of perishable products fruits and fresh vegetables.
- Acreages under production especially of horticultural crops could potentially increase
- Cheaper and available farm inputs and ease in provision of veterinary services to farmers
- Improved marketing of agricultural products, thus higher prices, particularly vegetable and fruits and Livestock.

7.3.3. Creation of Better Income and Poverty Reduction

- **Potential Benefits**

In addition to employment opportunities, creation of other income generating schemes would be one of the positive impacts for the local community. There could be income opportunities to be created to residents in the project area during construction works. Businesses such as shops, catering services (or small bars and restaurants) located along the project road and near the construction camps could earn additional income due to the presence of large number of construction workers.

The expressway will demand refreshment and other services, which will open new business opportunities for the locals. Business opportunities will include fuel station, vehicle repair shops, supermarkets, cafe, medical store, restaurants, motel, etc..

The opportunity for generation of income may continue during the project operation phase as long as availability & provision of other services like water supply, electricity etc. prevails along the new route. The existing services & infrastructure may be improved along the link roads contributing to improvement of local economy. For instance, improvement in the transport infrastructure facilitates the transportation and supply of modern agricultural inputs such as fertilizers and improved seeds that will increase [the low] productivity in the case of current traditional methods of agricultural practices (including irrigation) in the area.

7.3.4. Improved Social Services

The zonal, woreda and regional administration and connectivity within the woredas of Oromia and bordering regional states of Amhara and Afar will be greatly enhanced. The project road is expected to further improve market opportunities, provide access to improved and better social service facilities, create improved communication, improve the supply of agricultural inputs, enhance investment and employment opportunities, contribute to income generating activities, and improve the situation of women by creating better access to transport and other facilities to the local community.

Improved infrastructure is often accompanied by changes in social amenities and lifestyle including quality of life. There will be improved access to major institutions like schools, health facilities, markets and administrative centres. In addition, the functionality of these institutions will be enhanced.

7.3.5. Facilitate Humanitarian Aid

- **Potential Benefits**

Being drought prone the area of the road corridor, construction of the proposed projects would greatly facilitate humanitarian work in times of crises and emergency services like supply of foods and other services during famine, for emergency services prevention and control of epidemic diseases, etc.

7.3.6. Transport and Gender

It is well recognized that, to address the disproportional male employment in transport, the RSDP promoted employment opportunities for women. It encouraged contractors to recruit in the local community for labour, and to hire women when possible. The program found an increase, varying by district, in employment of women in road maintenance and constructions tasks. Overall, however, the number of women employed remained relatively low.

As accessibility increases, it contributes to increased access (of women in general and girls in particular) to several social services like schools, health centres and markets. That is, the transport and related burden on women decreases; and as they benefit from increased access, the role they play in the community increases with increased efficiency.

The impact due to the construction of the project road is expected to be significant on women living in the direct and indirect influence area. The major impact could be creation of employment opportunities in the road construction work and also following after its completion. Women in road projects could work in different capacities, such as, as daily labourers, time keepers, store keepers and in similar other activities during the project implementation.

Experiences from past road construction works show that contractors fail to provide equal employment opportunity to women mainly considering that women might not be active and efficient like men. This wrong assumption needs to change and that women should be given equal employment opportunity in those areas which they deem to be fit since there are several activities that do not require physical capacity of women or do not affect their health conditions. The construction works could also improve the income generating activities that are carried out by women. In most places in the country, it is common to see that income generating activities such as, catering services, coffee and tea shops, kiosks and bars are managed and run by women; and in some areas it is particularly run and managed by female-headed households. Hence, women engaged in these activities could earn increased income through sales of goods and services to the construction workers.

7.3.7. Improved Traffic Safety

Traffic accident and traffic jam on the existing high way is significant, and it is costing human life, properties, animals and wildlife significantly. The implementation of the project would improve the road condition through upgraded design and improved pavement surfacing. On the other hand the traffic jam and interferences by none motorized of transport and pedestrians will be avoided and traffic accidents due to that factor will be avoided, provided that the proposed mitigation measures and benefit enhancement measures are incorporated in the design and construction of the road.

- **Recommended Enhancement Measures**

The local woreda and city administrations shall support the local people to participate in potential businesses in providing suitable working places, providing electricity and water lines, developing a plan and integrating businesses, and support in business plans and services development. Administrations shall support the local businesses to attract the traffic to the available services.

Since, the development of expressway roads in Ethiopia are in premature stages, in some cases, local people and administration, view the express way as an infrastructure that only barriers communities in two sides. It gets mistaken as it it will not provide fair benefit to the local project area community.

The expressway directorate, within ERA hence, in addition to the local administrations has to endeavour to engage local community in business opportunities and lead them on how to benefit from the business opportunities. With this aim, the directorate needs to aware people on the business opportunities and guide them on how they can integrate their business plan to the expressway, as a result, benefit the local community and provide quality services to the traffic.

7.3.1. Enhanced Import / Export and Customs Control

- **Potential Benefits**

The potential economic benefits accruing to the facilitation of trade are significant. The access providing better Import / Export road infrastructure will have Port efficiency, the customs environment, the regulatory environment, and enhanced impact on flows of traded manufactured goods, predicting an increase of national income from higher export and import transactions.

In addition to the export and import transactions the infrastructure will have potential benefits for better customs control and result on significant cost savings in customs administration and enforcement, while improving import duty collection.

- **Recommended Enhancement Measures**

The benefit of quality road, mobility and reduced VoC are direct benefits of the project, which need to be maintained after construction period to maintain the benefit so other indirect benefits from quality road and enhanced mobility.

In order to provide a sound infrastructure that enhances mobility during its design life, the sustainability of maintenance of the road after completion must be ensured for prolonged service life with adequate comfort and safety. This is with local community and administration protecting the infrastructure and the government conducting necessary maintenance works.

7.3.2. Employment Opportunity

- **Potential Benefits**

The relation between transport and poverty reduction is manifested, among other aspects, through creation of employment opportunity for the local communities along the road corridor; and this, in turn, contributes to the effort to reduce poverty at different level.

The road project under consideration, especially during construction, will therefore create employment opportunities for the local people in general and women in particular where the latter will be engaged in petty trade in and around construction sites contributing to increment in the respective HH incomes.

- **Recommended Enhancement Measures**

It is recommended that the contractor must give preference to the local labour in positions or vacancies that are suitable for the latter with special consideration in encouraging women to be engaged in the construction as labourers and similar positions (and hence generate income for the HH) in and around construction sites. The provision of employment opportunities to the local people also contributes to the sustainability of the Project (as it in turn acquires social acceptability).

7.4. Assessment of Potential Environmental Risks

Possible impacts on physical environment include impacts on soil such as soil erosion, soil pollution or contamination, impacts on water resources (including disruption of downstream flows, increased sedimentation, water pollution), impacts on landscape quality, impacts on slope stability (like land-sliding), air pollution (esp. dust emission), and noise pollution.

7.4.1. Impact to Water Resources

The hydrologic resources of the area are to be impacted in two aspects. This is first direct impact to the resource itself, in its amount and availability. The other is pollution tot the water crossing or running along the road.

7.4.1.1. Impact on Resource

Potential Impacts

Source of Impact: Diversion of Water Course During Construction of Cross Drainage Structures, Change in Water Course Amount and Line, and Consumption of Water for Construction.

Evaluation of Impact: the impact could be direct or indirect, widespread in its nature, long-term, and irreversible. It occurs during construction and operation phases of the Project.

Modification to the natural water flow, of surface and sub-surface water, drainage patterns and volumes are to be intercepted or manipulated along and across the alignment. The ground water aquifers and recharge patters may be influenced as well. These would influence additional soil erosion, flooding, siltation of streams, etc…

The road construction may intensify consumption and competition for water resource that could raise conflict of interest with the local community.

It will also divert the storm water that was entered into the ponds along the road side as the storm water will be collected into the road side ditches. Hence this will negatively impacted the water harvesting potential of the local community and the impact is long lasting that limited to the local with moderately significant.

The water resource of the area could be impacted as: severe damage to key characteristics, features or elements and storm water runoff and run-on from utility corridors, road and pads.

Direct impact to the ground water is expected from activities such as earthworks and deep cuts. In, the construction of the road altering water flow and land uses would influence the availability and level of ground water.

Recommended Mitigation Measures

Impacts directly impacting availability of water and competition of use are recommended to be reduced with:

- → Reducing demands on water resources (e.g. by the recycling of flow back waters);
- → Arrange for alternative water supply sources when project water requirement (construction, camp sites) interferes with requirement of local demand, consider water harvesting from ponds construction, transport from available areas, drill & water quality analysis to confirm suitability for water supply purpose; Consult with locals on the use, amount and location of construction water sources,
- → Spreading abstractions to multiple sources;
- → Directing abstractions towards lower sections of catchments (higher-order streams);

→ Avoiding abstractions from ecologically sensitive catchments and streams; and
→ Timing operations to avoid overlap between maximum demand periods and low-flow conditions.

7.4.1.2. Surface and Ground Water Pollution

Potential Impacts

Source of Impact: storage of petrol diesel, oil and lubricants, bitumen, and solvents; disposal of used oil, lubricants and solvents; asphalt plant; use of bitumen; camps; earthwork and slope stabilization; stockpiling of materials; spoil and construction waste disposal; quarries and borrow pits.

Evaluation of Impact: Impact on water resource and pollution will be naturally networked to areas beyond project corridor, yet impacts could be lower with proper work methods.

Water resource (ground and surface water), is one of the sensitive receptors. Regarding pollution to water the main sources could be due to poor waste management in camps, garages, equipment washing sites, asphalt plant sites, crusher sites, earthwork operations, etc. Especially the waste (pollutants) from toilets, garages (used oil, grease, etc.) asphalt plant sites and equipment washing yards (oil and grease in combination with the water used for washing) are highly dangerous if join the water bodies (both ground and surface water) as there are people and livestock depending on the polluted water resource. The conceptual comparison between surface and ground water bodies reveals that ground water is polluted in a much slower rate than surface water; but it also takes more time to get purified as it exists in [sub-surface] aquifers.

Similarly, due to earth work and generated spoil material water resources are exposed to high level of pollution from the construction and sedimentation. As discussed, the alignment is close to rivers in some section with mountainous terrains, which will exacerbate the impact.

Storm water is main factor to increase pollution into water courses. It includes any surface runoff and flows resulting from precipitation, drainage or other sources. Typically storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding stream beds and banks.

Contamination of ground water resource is another concern, in the environment. Different sources in construction or service period could contaminate the resource as use of bitumen, pavement surface the highest, use of pest sides and contamination of the surface water.

• Recommended Mitigation Measures

General

To minimize the effect of the Project on water resource, the following mitigation measures are required:

- When considering road runoff, relevant pollutants and their limiting concentrations need to be identified. Discharges from roads must not lead to deterioration in the classification status of the receiving surface water body;
- During construction, use only “clean” fill material around watercourses, such as using quarried rock containing no fine soil to prevent siltation & sedimentation of water sources in downstream area;
- The water quality deterioration caused by pollution from oil products and chemicals can be minimized with timely maintenance of leaking machinery parts and good housekeeping practices in garages, campsites and at refuelling stations by the contractor;
- The road design shall include physical & biological measures (grasses, riprap, and other devices in water channels, as well as dispersal structures in main drains) to reduce speed of runoff and erosive effect;
- Consider construction of settling base so as to remove silt, pollutants, and debris from road runoff water before it discharges in to stream drainage;
- Spoil soil should be timely collected and cart away at designated disposal sites. Spoil soil should not be disposed or accumulated at river banks, close to the streams, lakes reservoir, and at water ways and flood routes;
- Camps and garages, and associated sanitary facilities should be located away from sensitive ecological sites and away from water sources and river crossings;
- Quarry sites and/or borrow pits, supposed to be rehabilitated at the end, may be left open to serve as temporary storages for water for agriculture or livestock. However, the perimeters of such quarry sites and borrow pits should be fenced for the safety of people (especially children) and animals.

Wastewater and Ambient Water Quality

- Understand the quality, quantity, frequency and sources of liquid effluents in its installations. This includes knowledge about the locations, routes and integrity of internal drainage systems and discharge points;
- Plan and implement the segregation of liquid effluents principally along industrial, utility, sanitary, and storm water categories, in order to limit the volume of water requiring specialized treatment. Characteristics of individual streams may also be used for source segregation;

- Assess compliance of their wastewater discharges with the applicable: (i) discharge standard (if the wastewater is discharged to a surface water or sewer), and (ii) water quality standard for a specific reuse (e.g. if the wastewater is reused for irrigation).
- Water use efficiency to reduce the amount of wastewater generation;
- Process modification, including waste minimization, and reducing the use of hazardous materials to reduce the load of pollutants requiring treatment;
- Assimilative capacity of the receiving water for the load of contaminant being discharged wastewater if discharge is to surface water;
- Intended use of the receiving water body (e.g. as a source of drinking water, recreation, irrigation, navigation, or other).

Liquid Effluent Quality - Discharge to Surface Water

Discharges of process wastewater, sanitary wastewater, wastewater from utility operations or storm water to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality.

Additional considerations that should be included in the setting of project-specific performance levels for wastewater effluents include:

→ Compliance with recommended standards for sanitary wastewater discharges or, in their absence, the indicative guideline values applicable to sanitary wastewater discharges shown in table below;

Table 7.4.1.2-1: Indicative Values for Treated Sanitary Sewage Discharges

Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Oil and Grease	mg/l	10
Total Suspended Solids	mg/l	50
Total Coliform Bacteria	MPN[b] / 100 ml	400[a]
Notes: [a] Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. [b] MPN = Most Probable Number		

Source: International Finance Corporation (IFC) Guidelines for Environmental, Health and Safety – Wastewater and Ambient Water Quality

→ Meet the pre-treatment and monitoring requirements of the sewer treatment system into which it discharges;

→ Not interfere, directly or indirectly, with the operation and maintenance of the collection and treatment systems, or pose a risk to worker health and safety, or adversely impact characteristics of residuals from wastewater treatment operations.

Storm water Management

In order to reduce the need for storm water treatment, the following principles are recommended:

→ Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge;
→ Surface runoff from process areas or potential sources of contamination should be prevented;
→ Where this approach is not practical, runoff from process and storage areas should be segregated from potentially less contaminated runoff;
→ Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds);
→ Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of storm water runoff where the majority of potential contaminants tend to be present;
→ When water quality criteria allow, storm water should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
→ Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas;
→ Sludge from storm water catchments or collection and treatment systems may contain elevated levels of pollutants and should be disposed in compliance with local regulatory requirements, in the absence of which disposal has to be consistent with protection of public health and safety, and conservation and long term sustainability of water and land resources.

7.4.2. Impact on Soil Resource

7.4.2.1. Soil Erosion

- **Potential Impacts**

Source of Impact: earthworks, spoil material, quarries and borrow pits.

Evaluation of Impact: the impact could be direct or indirect, widespread in its nature, long-term, and irreversible. It occurs during construction and operation phases of the Project.

Soil is an important component of the natural environment, and is a primary important for many biological and human activities, including agriculture. Its protection in relation to road development deserves considerable attention.

In relation to the above discussed earthworks, natural soil materials will potentially lose their attachment and will be loose due to the work. This will introduce high level of erosion from the route corridor, which will be aided by the terrain and runoff to be transported.

As stated in previous sections after Afdem town, near KM 121+500, Dispersive or Erodible Soil Formation was observed along the route.

During construction, soil erosion can be a serious environmental problem at any section(s) of the project as the alignment traverses different landscapes. The water concentrated in side ditches and diverting drains will cause severe erosion resulting in deeper and wider gullies in the ditches and diverting drains themselves and at downstream areas. During site visit of the road corridor we could not much effort by all the woredas' made for soil and water conservation activities.

Loss of topsoil and impairment of natural soils caused by earthworks, operation of heavy machinery, quarries and borrow pits, and establishment of construction facilities (workers camps and workshops) is the main soil erosion issue of concern for the proposed project.

Earthworks for construction of carriageways and structures like bridges and culverts, and land clearing for establishment of the contractor's site facilities will remove the topsoil and expose it to runoff water erosion. In addition to these direct effects, in the case of embankments, the upslope extension of erosion gullies can affect lateral drainage works and pavement margins. In the case of cuttings, this can also affect upslope agricultural land outside the right-of-way. Material eroded from both cuttings and embankments, blocks drains and impairs their function.

Effects on soil resource are largely expected in form of mass transport to downstream on mountainous sections of the construction activity. As substantial amount of cut and material spoil formation are to be created in these sections, high level of material would be subjected to wash off, slides and erosion. As these excavation works are to decrease amount of vegetation in the construction width or more, the soil erosion is possibly even made larger. Productive soil utilized for maintaining vegetation or farming.

- **Recommended Mitigation Measures**

With the expectation of erosion on embankments of the Road Project, it is recommended (to minimize the impact due to erosion) that:

- Grassing must be effected on cut as well as embankment slopes as required;
- To provide gabion retaining wall on the left side of the roadway in mentioned parallel gully sections;
- Cut-off drains must be provided wherever required;
- Turn-out ditches should be properly spaced to avoid scouring in farm lands;

- Energy dissipaters must be installed in ditches and waterways (gullies) formed by discharges from culverts as required. The energy dissipaters mainly include: check dams, rip raps and scour checks;
- Material extraction sites should be properly reinstated (as per the requirements in the Specifications) after use,
- Topsoil from ancillary sites shall be cleared carefully and be stored for time of reinstatement,
- Limit disturbance to natural vegetation above cut slops. As permanent installation apply slope stabilizing mechanism such as retaining walls. wire basketry, gabions etc. at this risky locations,
- Remove all dangerous and loose stones from cut faces,
- Re-vegetate unstable slopes as soon as possible after excavation.

7.4.2.2. Soil Contamination

Potential Impacts

Source of Impact: storage of petrol diesel, oil and lubricants, bitumen, and solvents; disposal of used oil, lubricants and solvents; asphalt plant; use of bitumen; camps; earthwork and slope stabilization; stockpiling of materials; spoil and construction waste disposal; quarries and borrow pits.

Evaluation of Impact: It is an indirect and localized impact; but results in a long-term effect as it is not an easily replaceable natural resource (requires geologic period to regenerate).

Beside water pollution, soil could also be contaminated due to the above pollutants and the contamination progresses to join the groundwater resource. The area at the end of the project is very dense agricultural area which utilizes irrigation water, and would be directly impacted if pollutants not properly controlled.

Contaminated lands may involve surficial soils or subsurface soils that, through leaching and transport, may affect groundwater, surface water, and adjacent sites. Where subsurface contaminant sources include volatile substances, soil vapor may also become a transport and exposure medium, and create potential for contaminant infiltration of indoor air spaces of buildings.

Not significant, but some level of pollution from hazardous chemicals of oil, lubricants, fuel, and other forms are anticipated mainly from campsites and their disposal sites. These pollutions are, yet, fairly manageable with effective cautions at time of construction.

The sealing of the soil surface by compaction leads to the destruction of the soil physical properties and its various functions. Besides the loss or impairment of soils due to the above discussed activities, soils in the impact zones can be impacted as a result of disposal of waste materials from road cuts and other excavation works, and disposal of wastes from contractor's camps and used oils and lubricants and spills of oils and fuel from engines of vehicles

and diesel operating machinery as well as accidental spillage. Pollution of soils can result from waste waters, sewage and cleaning of equipment, storage and handling of hazardous substances.

- **Recommended Mitigation Measures**

Hazardous wastes such as oil and grease in combination with water at machinery and vehicle washing sites must be treated in such a way that the oil and grease are separated (in basins) and the waste water, with acceptable quality, are disposed to the environment. In other words, washing of vehicles and plant in or adjacent to any water source should be specifically prohibited; all washing should be carried out at designated areas away from water sources.

Contamination of land should be avoided by preventing or controlling the release of hazardous materials, hazardous wastes, or oil to the environment. When contamination of land is suspected or confirmed during any project phase, the cause of the uncontrolled release should be identified and corrected to avoid further releases and associated adverse impacts.

Contaminated lands should be managed to avoid the risk to human health and ecological receptors. The preferred strategy for land decontamination is to reduce the level of contamination at the site while preventing the human exposure to contamination.

To determine whether risk management actions are warranted, the following assessment approach should be applied to establish whether the three risk factors of 'Contaminants', 'Receptors', and 'Exposure Pathways' co-exist, or are likely to co-exist, at the project site under current or possible future land use:

***Contaminant(s)*:** Presence of hazardous materials, waste, or oil in any environmental media at potentially hazardous concentrations.
***Receptor(s)*:** Actual or likely contact of humans, wildlife, plants, and other living organisms with the contaminants of concern.
***Exposure pathway(s)*:** A combination of the route of migration of the contaminant from its point of release (e.g., leaching into potable groundwater) and exposure routes (e.g., ingestion, transdermal absorption), which would allow receptor(s) to come into actual contact with contaminants.

7.4.3. Land Use and Landscape Alteration

- **Potential Impacts**

Source of Impact: earthworks, not properly reinstated quarries and borrow pits, spoil and construction waste disposal.

Evaluation of Impact: the impact could be direct or indirect, widespread in its nature, long-term, and irreversible. It occurs during construction and operation phases of the Project.

The route does not have many mountainous sections, yet, there will be significant earthworks along the route and more on ancillary sites for material extractions. This earthwork is to alter the landscape and natural mass stability. With the mountainous terrain and surrounding the mass movement will expose some sections to instability.

Landscape alteration will as well be a potential impact from auxiliary works of material extraction and waste material dumping.

- **Recommended Mitigation Measures**

Alteration to landscape and stability need to be mitigated with:

- As permanent installation apply slope stabilizing mechanism such as retaining walls. wire basketry, gabions etc. at this risky locations,
- Limit disturbance to natural vegetation above cut slops,
- Install cut-off drains above cut slopes,
- Remove all dangerous and loose stones from cut faces,
- Re-vegetate unstable slopes as soon as possible after excavation,
- Carryout proper site selection for spoiling and other ancillary works and follow proper procedures as approving from the engineer and woreda administrations,
- Reinstate all borrow and spoil sites with efficient work to acceptable levels.

7.4.4. Risk on Natural Biodiversity

7.4.4.1. Risks on Vegetation Biodiversity

- **Potential Impacts**

Source of Impact: clearing RoW, width expansion for higher road standard and for maintaining smooth curves, camp construction, detours, haul roads, quarry, and borrow pits;

Evaluation of Impact: The impact of the Project on flora resource is direct and localized; and occurs during construction phase. If the impact would not be kept to the minimum and mitigation measures are not taken immediately, it will have a long-term impact such as adversely affecting the micro-climate.

As stated the project corridor in particular has no reserve conservation area, park, or etc..., or significantly valued vegetation.

Vegetation removal is expected to be relatively pronounced especially in the Acacia forest cover from Meisso to Erer. Similarly, the road, as it clears wide area of land, will clear shoulder vegetations along the route. The expected clearance area for the road will be 156.83 Ha of land.

According to data obtained using Satellite Imagery, a total of 156.83 hectares of forest land exists within the expressway influence areas. The size of the forests found in the different Woredas of the influence area presented below.

Table 7.4.4.1-1: Risks and Impacts on Forest

S/N	Location		Extent of Impact	Area (Ha)
	National Regional State & Zone	Woreda		
1	Oromia, W. Hararge	Miesso	Loss of forest land in hectares	29.08
2	Somali, Siti Zone	Mayesso	Loss of forest land in hectares	78.73
4	Somali, Siti Zone	Afdem	Loss of forest land in hectares	1.78
Total				156.83

Source: Data Collected Using Satellite Imagery, November, 2020.

The entire forest area of 156.83 hectares of land found in different Woredas of the influence area of the expressway would be affected due to cutting and clearing the forest areas for construction of the expressway road project. Wild animals and habitats living in the different batches of forest found in different Woredas would be lost.

- **Recommended Mitigation Measures**

Although there are no primary forest areas along the route corridor and within the RoW of the Project Road, the scattered and rows/groups of trees along the Road should be preserved, to the extent possible, by means of:

- Proactive design that minimizes the number of trees to be removed;
- Construction practice that minimizes the construction width;
- Appropriate selection of sites (of camps, workshops, etc.) with minimum removal of vegetation, if there are any;
- Limiting the width of haul roads and detours to practicable minimum;
- Refraining (of workers) from tree felling especially for fire wood; and
- In case of trees inevitably removed, they should be replaced by planting suitable varieties of trees to the local climate; and the Supervision consultant should monitor the survival of the seedlings (to a stage where they would not die out).
- The contractor shall make before commencement of vegetation stripping, is recommended to assign a Biodiversity Specialists who will conduct pre-construction checks, to help avoid accidental injury or death to sensitive species such as ground nesting birds, reptiles, amphibians and bats.
- Accordingly, the specialist shall map out, rare species, sensitive habitat, less sensitive sites, etc… and prepared a specific biodiversity management plan to be followed during construction period.
- The construction activities need to minimize impacts on notable species and loss, fragmentation, alteration, disturbance and disruption of sensitive habitats.

- Where any such habitats or species is present impacts may be mitigated with different approaches as scheduling works to a less sensitive time of year or the use of appropriate species translocation to nearby suitable habitats.
- Workers shall be made aware of the ecological sensitivities of the areas and will be trained in mitigation for unforeseen events, including the presence of uncommon habitats and species.
- Areas of high wildlife presence, if identified, need to be indicated through appropriate signage along access roads where potential exists for vehicle/wildlife collision.
- Pits and excavations from the construction works including at ancillary sites are required to be filled in re reinstated as soon as possible following works.
- Wherever possible the felling of significant/mature trees will be avoided and connectivity between areas of forest habitats will be maintained.
- Careful management of networks of ditches and polders so as to provide alternative habitats for species; in order to bring the land to its original state.
- Replanting shall be carried out in ancillary sites, where former land uses were vegetations, and in selected sites to compensate the vegetation loss due to the project. Sites for tree planting and types of species need to be identified along with the local woreda environmental bureau.

7.4.4.2. Invasive Alien Species

Potential Impacts

Intentional or accidental introduction of alien, or non-native, species of flora and fauna into areas where they are not normally found can be a significant threat to biodiversity, since some alien species can become invasive, spreading rapidly and destroying or out-competing native species.

Recommended Mitigation Measures

The contractor shall not intentionally introduce any new alien species (not currently established in the country or region of the project) unless this is carried out in accordance with the existing regulatory framework for such introduction.

- Proper authority shall be contacted and an approval to any new species to be planted shall be earned;
- All introductions of alien species need be subject to a risk assessment to determine the potential for invasive behaviour;
- A site wide ban on bringing vegetation or soil from outside the site area to prevent dispersion of non-native invasive species;
- Before full use of new species they need to be planted in a controlled environment to see behaviours and impacts;

- During use of such species, After approval and trial, they need to be regularly monitored to monitor long-term effects.

7.4.4.3. Impact to Fauna

Potential Impacts

Source of Impact: loss of habitat, accidental or deliberate killing by machinery/vehicles, poaching

Evaluation of Impact: it is an indirect impact with local and long-term effect when their habitats are adversely affected. It could be a direct impact in the case of poaching and accidental killings. The impact occurs during construction and operation phases of the Project.

Fauna are directly impacted by disturbance leading to migration and being killed or indirectly by disturbance or loss of habitats.

Direct Impact

Impact may be due to the Project work force in the form of poaching and accidental killings [of the wildlife] by the Project or the through traffic. As well, wild lives would be indirectly affected by the clearance of vegetation and dust during construction and irritation from sound both during construction and operation.

Indirect

Main indirect impact to fauna is modification of habitats. Modified habitats are areas that may contain a large proportion of plant and/or animal species of nonnative origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.

Recommended Mitigation Measures

Recommended measures to address potential impacts on fauna are:

- No quarry site, borrow site or any kind of camp should not be located along the conservation area;
- During construction the management of the conservation area and woredas' environmental protection bureau should be consulted and shall be worked with their coordination to protect the wild lives;
- The construction work force must be given awareness discouraging poaching; and
- Drivers and operators must be given trainings and awareness on safety (notably on defensive driving) in general and accidental killing of wildlife in particular.

7.4.5. GHG Emissions

- **Potential Impacts**

Source of Impact: Operation of construction equipment such as crushers, asphalt plants, and stationary equipment like generators; transport and stockpiling of soil and sand (heavy vehicles); and light to heavy transport vehicles.

Evaluation of Impact: it is an indirect and long-term impact taking place during construction and operation phases (of course the sources are not the same in both phases)

Sources of the pollution types could be different as:

Point Sources: stationary, identifiable sources of emissions that release pollutants to the atmosphere. These could be from stationary plants as material crushing sites.
Fugitive Sources: emissions that are distributed spatially over a wide area and not confined to a specific discharge point. Fugitive emissions have the potential for much greater ground-level impacts per unit than stationary source emissions, since they are discharged and dispersed close to the ground. The two main types of fugitive emissions are Volatile Organic Compounds (VOCs) and particulate matter (PM). Other contaminants (NOx, SO2 and CO) are mainly associated with combustion processes, as described above.
Mobile Sources: emissions from different potential sources which are mobile and the point of pollutant releasing area could be different over time. Vehicles and machineries are the main ones. Emissions from vehicles include: CO, NOx, SO2, PM and VOCs.

Air quality and pollution will have two aspects, as the road construction will have high earthworks and works with soil materials, potentially, there will be high dust formation. However, compared to the current gravel road the road during service period will have no dust pollution.

On the other hand, with the carbon pollution from traffic, the current road condition has low quality for traffic to utilise more fuel and induce more pollution per head, which will be lower with the better quality of the road in the end. However, with realisation of the project, the route will attract incomparably higher volume of traffic, and the overall carbon release will be very high during the service period.

Air pollution during construction is going to result from higher vehicles and machineries. Additionally, a problem of dust formation is predictable at excavations, crushing activities and haulage. Mass destruction of vegetation with clearing work mainly, as stated, in mountainous section is going to contribute to the air pollutions level locally and nationally.

Moreover, as higher vehicle will be introduced to the area more emissions of pollutants, chiefly CO_2 is to increase.

The main products of the combustion of motor fuels are carbon dioxide (CO_2) and water, but inefficiencies and high temperatures inherent in engine operation encourage the production of

many other pollutants of varying effect. The major pollutants of significance to roadside air quality in vehicle emissions are the following.

Particulate Matter (PM). These are common pollutants involved in fugitive emissions are dust or particulate matter (PM). This is released during certain operations, such as transport and open storage of solid materials, and from exposed soil surfaces, including unpaved roads.

Ozone Depleting Substances (ODS). Several chemicals are classified as ozone depleting substances (ODSs) and are scheduled for phase-out under the Montreal Protocol on Substances that Deplete the Ozone Layer.

Greenhouse Gases (GHGs). Are gases that absorb and emit radiant energy within the thermal infrared range. Primary sources of GHGs include Carbon Dioxide (CO2), Methane (CH4), Nitrogen oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur Hexafluoride (SF6).

Nitrogen oxides (NO_X). Most of the NO_X in vehicle emissions are in the form of NO (nitric oxide), which is a by-product of fuel combustion under conditions of extreme heat and pressure, typical of combustion chambers. Once released from the tailpipe, NO is oxidized to NO_2 In conjunction with SO_2, NOx play a major role in the formation of acids in the atmosphere. NOx also react with hydrocarbons in the presence of sunlight to produce photochemical smog.

Hydrocarbons (HC). These are produced by the incomplete combustion of fuel and by its evaporation. Their production is strongly influenced by fuel composition. Hydrocarbons include hundreds of organic chemical substances, the most notorious of which are benzene and ethylene. Hydrocarbons combine with NOx to produce photochemical smog.

Carbon monoxide (CO).Carbon monoxide is one result of incomplete combustion. Diesel engines produce far lower emissions of both CO and HC than do gasoline engines.

Sulphur dioxide (SO_2).The emission rate of SO_2 is directly linked to the sulphur content of the fuel. Diesel engines produce more SO_2 than do gasoline engines. In conjunction with NO_X, SO_2 is involved in the formation of acids in the atmosphere.

Purficulufes. *This* diverse group consists of carbon nuclei onto which various compounds are adsorbed. Typical particulates include suspended airborne particles from diesel fuel combustion, materials produced by tire, brake and road wear, and dust.

Lead (Pb). Added to gasoline to raise the octane rate and help lubricate engine components, lead enters the atmosphere as a fine dust which is easily dispersed and settles on any available surface.

• Recommended Mitigation Measures

The following mitigation measures shall be considered to lower impact on air;

Control of Emissions
Emissions from different sources should be minimized to the lowest possible levels;

- Enhancement of energy efficiency;
- Promotion, development and increased use of renewable forms of energy;
- Limitation and / or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy (coal, oil, and gas). Construction machinery should be checked, well maintained and adjusted as required;
- Emissions shall be limited and controlled as they do not result in pollutant concentrations that reach or exceed relevant ambient quality. The current WHO Air Quality Guidelines are recommended as standard of emission levels control.

Table 7.4.5-1: Recommended Ambient Air Quality

WHO Ambient Air Quality Guidelines					
Types of Pollutants	**Averaging Period**	**Guideline value in g/m³**	**Types of Pollutants**	**Averaging Period**	**Guideline value in g/m³**
Sulfur dioxide (SO2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)	Nitrogen dioxide (NO2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM10	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)	Particulate Matter PM2.5	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)

Source: International Finance Corporation (IFC) Guidelines for Environmental, Health and Safety – Environmental, Ambient Air Quality Guidelines (Adopted from WHO)

- Avoid:
  - The burning of materials such as tires, plastic, rubber products or other materials that create and produces heavy smoke, nuisance odour and toxic gases.
  - Disposing of any volatile chemical to the air;

- Burn waste and/or garbage in designated areas and away from nearby villages;
- Repairing defective vehicles and replacing older vehicles with newer, more fuel efficient alternatives;
- Open burning of solid wastes, whether hazardous or non- hazardous, is not considered good practice and should be avoided, as the generation of polluting emissions from this type of source cannot be controlled effectively;

- Use of materials and quarries that contain relatively soft (generally sedimentary) aggregate particles, lack of adequate quality control, particularly in provision of true crusher dust instead of clayey, silty fines and fine sand (from lack of crusher pre-screening);
- Increased use of precast pressurised concrete bridges rather than the typical composite construction bridges.
- Ensuring early and more frequent maintenance.

7.4.6. Dust Pollution

Potential Impacts

Different activities and sites of the project, as construction earthwork, vehicles and machineries movements, transportation of materials, access roads, material extraction and crushing have high potentials of propagating dust formation. Mainly the impact is anticipated during construction period. However, in the operation period the dust formation will be lowered to almost none.

Recommended Mitigation Measures

- Drivers should be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits;
- Restricting traffic speeds to reduce dust pollution during construction period;
- Use of dust control methods, such as covers, water suppression, or increased moisture content for open materials storage piles, or controls, including air extraction and treatment;
- Use of water suppression for control of loose materials on paved or unpaved road surfaces. Oil and oil by-products is not a recommended method to control road dust.
- Application of water to reduce dust in settlement areas;
- Crushing and concrete batching plants operations should be take place in locations away from major settlement areas.
- Near settlement/villages construction roads should be watered on scheduled time interval depending weather conditions.

7.4.7. Noise and Vibration

Potential Impacts

Source of Impact: Operation of construction equipment such as crushers, asphalt plants, and stationary equipment like generators; transport and stockpiling of soil and sand (heavy vehicles); light to heavy transport vehicles; and blasting at quarry sites, and service period traffic.

Evaluation of Impact: these are more indirect and short term impacts mainly concerned with construction period.

The construction activity involves multiple heavy duty operations of excavation, crushing, and so on, which are likely to have immense vibration and sound pollution potentials, adding other vehicles during construction too. These are greatly to manifest in settlement areas, and as the project site is not great habitat of wildlife resource these issues area to be imposed to human beings. Construction at these sensitive locations can be controlled to minimise impact in these aspects.

Excessive noise results in disruption and annoyance and potential hazard to human populations, on towns along the road. That is, sites such as schools, hospitals, religious places, etc. are vulnerable to noise. In addition, sick people at home could adversely be affected (disturbed) by high level of noise due to construction machinery.

Currently noise and vibration is observed mainly from the railway line. Yet, the road is expressway line with high road traffic vibration and noises will be high in service period. During the operational phase of the expressway, these impacts are to be present and cumulative impact is expected.

- **Recommended Mitigation Measures**

Noise and Vibration mitigation measures of the following shall be applied:

- Except for underground works activities producing excessive noise level near settlements should be restricted to day time.
- Equipment normally producing high levels of noise should be suppressed and screened when working within a distance of 200 meters from any settlement, clinic, religious places or other sensitive noise receptors;
- Defective noise control devices have to be repair or replace on time;
- Construction workers exposed to destructive noise should be provide with adequate hearing protective facilities.

Prevention and Control

The preferred method for controlling noise from stationary sources is to implement noise control measures at source. Methods for prevention and control of sources of noise emissions depend on the source and proximity of receptors. Noise reduction options that should be considered include:

- Selecting equipment with lower sound power levels;
- Installing suitable mufflers on engine exhausts and compressor components;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Siting permanent facilities away from community areas if possible;

- Taking advantage of the natural topography as a noise buffer during facility design;
- Reducing project traffic routing through community areas wherever possible;
- Developing a mechanism to record and respond to complaints.

Noise Level Guidelines

Noise impacts should not exceed the levels presented in the table below, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 7.4.7-1: Noise Level Guidelines

Receptor	One Hour LAeq (dBA)	
	Daytime 07:00 - 22:00	**Nighttime 22:00 - 07:00**
Residential; institutional; educational	55	45
Industrial; commercial	70	70

Source: International Finance Corporation (IFC) Guidelines for Environmental, Health and Safety – Noise

7.4.8. Waste Disposal

Potential Impacts

Source of Impact: Wastes could be generated from different sources in the Project sites including earthworks, camps, garages, clinics and other construction sites. Such wastes are sanitary or domestic wastes, other solid wastes (apart from domestic wastes), clinical wastes and other hazardous wastes (other than clinical wastes).

Evaluation of Impact: the types of impacts due to wastes are different in their magnitudes, duration, nature, area coverage, etc. depending on the type of waste and receptors under consideration.

A *waste* is any solid, liquid, or contained gaseous material that is being discarded by disposal, recycling, burning or incineration. The by-products disposed as wastes could be in different forms:

Solid (non-hazardous) Wastes: generally include any garbage, refuse. Examples of such waste include domestic trash and garbage; inert construction / demolition materials; refuse, such as metal scrap and empty containers and residual waste.
Hazardous Waste: shares the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed.
Liquid Wastes: Sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial operations needs to be evaluated on a case-by-case basis to establish whether it constitutes a hazardous or a non-hazardous waste.

The impacts of wastes stated above could be in the form of soil erosion, water pollution, soil contamination, air pollution and all impacts leading to detrimentally affecting the environment and human health.

At the operation level, the water and sediments from the runoff from road paving and related appurtenances (car parks, service areas, parking areas, etc.) can be very contaminated and cause a significant negative impact on the quality of the environment (surface water, groundwater, soil, river and sediments). These will involve impacts of loss of recreational and aesthetic value, bank erosion and variation in the quality of surface water and groundwater.

- **Recommended Mitigation Measures**

General

Facilities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements. Effective planning and implementation of waste management strategies should include:

- Review of new waste sources during planning, siting, and design activities, including during equipment modifications and process alterations, to identify expected waste generation, pollution prevention opportunities, and necessary treatment, storage, and disposal infrastructure;
- Collection of data and information about the process and waste streams in existing facilities, including characterization of waste streams by type, quantities, and potential use/disposition;
- Establishment of priorities based on a risk analysis that takes into account the potential EHS risks during the waste cycle and the availability of infrastructure to manage the waste in an environmentally sound manner;
- Definition of opportunities for source reduction, as well as reuse and recycling;
- Definition of procedures and operational controls for on- site storage;
- Definition of options / procedures / operational controls for treatment and final disposal;
- Waste management and provision of waste handling facilities at garages, camp sites and at working places should be ensured by the contractor through establishing water supply sanitary & waste disposal facilities, like pit latrines, cesspools and solid waste land fill sites;
- There shall as well be designated waste collecting area / barrels for specific types of wastes (hazardous, plastic, metal, etc…) Wastes from these and oils need to have disposal mechanisms too, after collection.

Waste Prevention

Processes should be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated in accordance with the following strategy:

- Substituting raw materials or inputs with less hazardous or toxic materials, or with those where processing generates lower waste volumes;
- Instituting good housekeeping and operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off-specification, contaminated, damaged, or excess to plant needs;
- Instituting procurement measures that recognize opportunities to return usable materials such as containers and which prevents the over ordering of materials;
- Minimizing hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste to be managed.
- Process Safety Information: Procedures should be prepared for each hazardous materials and include:
  - Compilation of Material Safety Data Sheets (MSDS),
  - Identification of maximum intended inventories and safe upper/lower parameters, and
  - Documentation of equipment specifications and of codes and standards used to design, build and operate the process.

Overfill Protection

Overfills of vessels and tanks should be prevented as they are among the most common causes of spills resulting in soil and water contamination, and among the easiest to prevent. Recommended overfill protection measures include:

- Prepare written procedures for transfer operations that includes a checklist of measures to follow during filling operations and the use of filling operators trained in these procedures;
- Installation of gauges on tanks to measure volume inside;
- Pumping less volume than available capacity into the tank or vessel by ordering less material than its available capacity;

Control Measures

A critical aspect for controlling accidental releases of liquid hazardous materials during storage and transfer is the provision of secondary containment. Specific mitigation measures include:

- Transfer of hazardous materials from vehicle tanks to storage in areas with surfaces sufficiently impervious to avoid loss to the environment and sloped to a collection or a containment structure not connected to municipal wastewater/storm water collection system;
- Where it is not practical to provide permanent, dedicated containment structures for transfer operations, one or more alternative forms of spill containment should be provided, such as portable drain covers (which can be deployed for the duration of the operations), automatic shut-off valves on storm water basins, or shut off valves in drainage or sewer facilities, combined with oil-water separators;
- Storage of drummed hazardous materials with a total volume equal or greater than 1,000 liters in areas with impervious surfaces that are sloped or bermed to contain a minimum of 25 percent of the total storage volume;

- Provision of secondary containment for components (tanks, pipes) of the hazardous material storage system, to the extent feasible;
- Conducting periodic (e.g. daily or weekly) reconciliation of tank contents, and inspection of visible portions of tanks and piping for leaks;
- Use of double-walled, composite, or specially coated storage and piping systems particularly in the use of underground storage tanks (USTs) and underground piping. If double- walled systems are used, they should provide a means of detecting leaks between the two walls.

Recycling and Reuse

In addition to the implementation of waste prevention strategies, the total amount of waste may be significantly reduced through the implementation of recycling plans, which should consider the following elements:

- Evaluation of waste production processes and identification of potentially recyclable materials;
- Identification and recycling of products that can be reintroduced into the manufacturing process or industry activity at the site;
- Investigation of external markets for recycling by other industrial processing operations located in the neighbourhood or region of the facility (e.g., waste exchange);
- Establishing recycling objectives and formal tracking of waste generation and recycling rates;
- Providing training and incentives to employees in order to meet objectives.

Transportation

On-site and Off-site transportation of waste should be conducted so as to prevent or minimize spills, releases, and exposures to employees and the public. All waste containers designated for off-site shipment should be secured and labelled with the contents and associated hazards, be properly loaded on the transport vehicles before leaving the site, and be accompanied by a shipping approval that describes the load and its associated hazards.

Waste Storage

Hazardous waste should be stored so as to prevent or control accidental releases to air, soil, and water resources in area location where:

- Waste to be stored in a manner that prevents the commingling or contact between incompatible wastes, and allows for inspection between containers to monitor leaks or spills. Examples include sufficient space between incompatibles or physical separation such as walls or containment curbs;
- Store in closed containers away from direct sunlight, wind and rain;
- Secondary containment systems should be constructed with materials appropriate for the wastes being contained and adequate to prevent loss to the environment;
- Provide adequate ventilation where volatile wastes are stored.

Septic Systems

Septic systems are commonly used for treatment and disposal of domestic sanitary sewage in areas with no sewerage collection networks, Septic systems should only be used for treatment of sanitary sewage, and unsuitable for industrial wastewater treatment. When septic systems are the selected form of wastewater disposal and treatment, they should be:

- Properly designed and installed to prevent any hazard to public health or contamination of land, surface or groundwater;
- Well maintained to allow effective operation;
- Installed in areas with sufficient soil percolation for the design wastewater loading rate.
- Installed in areas of stable soils that are nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

Treatment and Disposal

If waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed of and all measures should be taken to avoid potential impacts to human health and the environment.

- On-site or off-site biological, chemical, or physical treatment of the waste material to render it non- hazardous prior to final disposal;
- Treatment or disposal at permitted facilities specially designed to receive the waste;
- wastes; properly designed, permitted and operated landfills or incinerators designed for the respective type of waste; or other methods known to be effective in the safe, final disposal of waste materials.

Road Paving

- Paving in dry weather to prevent runoff of asphalt or cement materials;
- Use of proper staging techniques to reduce the spillage of paving materials during the repair of potholes and worn pavement. This may include covering storm drain inlets and manholes during paving operations; using erosion and sediment control measures to decrease runoff from repair sites; and utilizing pollution prevention materials (e.g. drip pans and absorbent material on paving machines) to limit leaks and spills of paving materials and fluids;
- Reducing the amount of water used to control dust, and using sweeping practices rather than washing. Collecting and returning swept material to aggregate base or disposing as solid waste, as described in the General EHS Guidelines;
- Avoiding the generation of contaminated runoff from cleaning of asphalt equipment by substituting diesel with vegetable oil as a release and cleaning agent; containing cleaning products and contaminated asphalt residues; scraping before cleaning; and conducting cleaning activities away from surface water features or drainage structures.

Construction Phase

- Management of construction site excavation materials according to the recommendations of the EHS Guidelines for Construction Materials Extraction and the General EHS Guidelines;

Road Resurfacing

- Maximizing the rate of recycling of road resurfacing waste either in the aggregate (e.g. reclaimed asphalt pavement or reclaimed concrete material) or as a base;
- Incorporating recyclable materials (e.g. glass, scrap tires, certain types of slag and ashes) to reduce the volume and cost of new asphalt and concrete mixes.

Miscellaneous Wastes

- Collecting road litter or illegally dumped waste and managing it according to the recommendations in the General EHS Guidelines. Provision of bottle and can recycling and trash disposal receptacles at parking lots to avoid littering along the road;
- Manage herbicide and paint inventories to avoid having to dispose of large quantities of unused product. Obsolete product should be managed as a hazardous waste as described in the General EHS Guidelines;
- Collecting animal carcasses in a timely manner and disposing through prompt burial or other environmentally safe methods;
- Composting of vegetation waste for reuse as a landscaping fertilizer;
- Managing sediment and sludge removed from storm drainage systems maintenance activities as a hazardous or non-hazardous waste (see General EHS Guidelines) based on an assessment of its characteristics.

Painting Activities

- Management of all removed paint materials suspected or confirmed of containing lead as a hazardous waste;
- Use of a system to collect paint waste when removing old paint containing lead. For a simple scraping operation, ground-covering tarps may be sufficient. For a blasting operation, an enclosure with a negative pressure ventilation system may be necessary;
- Grinding of removed, old road surface material and re-use in paving, or stockpiling the reclaim for road bed or other uses. Old, removed asphalt may contain tar and polycyclic aromatic hydrocarbons and may require management as a hazardous waste.

Moving Equipment and Traffic Safety

- Development of a transportation management plan for road repairs that includes measures to ensure work zone safety for construction workers and the traveling public;
- Establishment of work zones to separate workers on foot from traffic and equipment;
- Reduction of maximum vehicle speeds in work zones;
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety apparel and proper

illumination for the work space (while controlling glare so as not to blind workers and passing motorists).

Management Actions

- *Management of Change*: These procedures should address: The technical basis for changes in processes and operations, OHS, modification to operating procedures, authorization requirements and trainings.
- *Compliance Audit*: A compliance audit is a way to evaluate compliance with the prevention program requirements for each process.
- *Incident Investigation*: Incidents can provide valuable information about site hazards and the steps needed to prevent accidental releases.
- *Employee Participation*: A written plan of action should describe an active employee participation program for the prevention of accidents.
- *Contractors:* There should be a mechanism for contractor control which should include a requirement for them to develop hazard materials management procedures that meet the requirements of the hazardous materials management plan.
- *Training*: Project employees should be provided training on Hazmat management.

7.4.9. Generation of Hazardous Wastes

Potential Impacts

Hazardous wastes particularly bitumen, oil, lubricants, and spares of machineries and vehicles are potential wastes of the project. Sites for such sources involve construction sites, workshops, waste treatment, disposal, transportation and storage, stores. These impact, ultimately, have the risk of polluting water resources, soil resources and also risk the health of worker and communities residing in the area.

Recommended Mitigation Measures

General

Hazardous wastes should always be segregated from non- hazardous wastes. If generation of hazardous waste cannot be prevented through the implementation of the above general waste management practices, its management should focus on the prevention of harm to health, safety, and the environment, according to the following additional principles:

- Hazardous wastes such as oil and grease in combination with water at machinery and vehicle washing sites must be treated in such a way that the oil and grease are separated (in basins) and the waste water, with acceptable quality, are disposed to the environment. In other words, washing of vehicles and plant in or adjacent to any water source should be specifically prohibited, all washing should be carried out at designated areas away from water sources;
- Works involving hazardous wastes and oils need to be carried out in a paved surface;

- Spilled oil and lubricants at the storage area and at the workspaces need to be collected / cleared alongside the contaminated soil immediately. They need to be safely disposed in a control environment;
- Understanding potential impacts and risks associated with the management of any generated hazardous waste during its complete life cycle;
- Ensuring that contractors handling, treating, and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the relevant regulatory agencies and following good international industry practice for the waste being handled;
- Establishing hazardous materials management priorities based on hazard analysis of risky operations identified through Social and Environmental Assessment;
- Where practicable, avoiding or minimizing the use of hazardous materials.;
- Preventing uncontrolled releases of hazardous materials to the environment or uncontrolled reactions that might result in fire or explosion;
- Using engineering controls (containment, automatic alarms, and shut-off systems) commensurate with the nature of hazard;
- Implementing management controls (procedures, inspections, communications, training, and drills) to address residual risks that have not been prevented or controlled through engineering measures.

Hazard Assessment

The level of risk should be established through an on-going assessment process based on:

- The types and amounts of hazardous materials present in the project. This information should be recorded and should include a summary table with the following information:
  - Name and description (e.g. composition of a mixture) of the Hazmat,
  - Classification (e.g. code, class or division) of the Hazmat,
  - Quantity of Hazmat used per month,
  - Characteristic(s) that make(s) the Hazmat hazardous (e.g. flammability, toxicity).
- Analysis of potential spill and release scenarios using available industry statistics on spills and accidents where available;
- Analysis of the potential for uncontrolled reactions such as fire and explosions;
- Analysis of potential consequences based on the physical- geographical characteristics of the project site, including aspects such as its distance to settlements, water resources, and other environmentally sensitive areas.

Release Prevention and Control Planning

- Training of operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training;
- Implementation of inspection programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valve systems, containment infrastructure, emergency shutdown systems, controls and pumps, and associated process equipment;
- Identification of locations of hazardous materials and associated activities on an emergency plan site map;
- Documentation of availability of specific personal protective equipment and training needed to respond to an emergency;

- Documentation of availability of spill response equipment sufficient to handle at least initial stages of a spill and a list of external resources for equipment and personnel, if necessary, to supplement internal resources.

Storage

Hazardous waste storage activities should also be subject to special management actions, conducted by employees who have received specific training in handling and storage of hazardous wastes:

- Provision of readily available information on chemical compatibility to employees, including labelling each container to identify its contents;
- Limiting access to hazardous waste storage areas to employees who have received proper training;
- Clearly identifying (label) and demarcating the area, including documentation of its location on a facility map or site plan;
- Conducting periodic inspections of waste storage areas and documenting the findings;
- Preparing and implementing spill response and emergency plans to address their accidental release (additional information on Emergency Plans in provided in Section 3 of this document);
- Avoiding underground storage tanks and underground piping of hazardous waste.

Operation Period

Replanting cleared areas and slopes is can be performed, and also lower effects of contamination and sedimentation from runoffs. Maintenance of the road shall consider waste reduction techniques recommended to lower risks of polluting ambient water and soil resources.

Community Awareness and Engagement

In minimizing of potential risks from hazardous wastes, awareness, notification and involvement would be necessary with the local community. The community needs to regularly be informed on potential risks, risk assessment studies, management procedures of minimizing and handling hazardous wastes, etc… with understandable manner and providing means for the public to forward its feedbacks.

Informing people at potential risks on the nature and extent of operation, possible effects, the prevention and control measures in place, appropriate behavior and safety measures at time of accident, decisions concerning hazardous installations and development of community emergency preparedness will be necessary to ensure lower risks.

Reference:

Plan specifically for resource and energy efficiency and prevention management is presented in:

- ***Annex J – Resource Efficiency and Pollution Prevention and Management Plan***

7.4.10. Use of Pesticides

Potential Impacts

Source of Impact: Prevention of malaria, reduce or repel insects, weeds, rodents, fungi or other organisms.

Evaluation of Impact: the impact could be direct or indirect, widespread in its nature, long-term, and irreversible. It occurs during use in construction phases of the Project.

Pesticides are toxic by design, designed to kill, reduce or repel insects, weeds, rodents, fungi or other organisms that can threaten community health and the environment.

Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects, and non-target plants. Pesticides can reach surface water through runoff from treated plants and soil. Contamination of water by pesticides is widespread.

In the aspect of health they have the potential to pose a potential risk to humans causing vector-borne diseases and polluting the environment. Workers in contact to the pesticides in store, sprayers, mixers, loaders are also potentially exposed to the risks.

Recommended Mitigation Measures

Where projects involve recourse to pest management measures, it is suggested to give preference to integrated pest management (IPM) or integrated vector management (IVM)19 approaches using combined or multiple tactics.

- Taking into account the proposed use and the intended users;
- Restrict use any pesticides or pesticide products or formulations unless such use is in compliance with the EHSGs;
- Restrict use any pesticide products that contain active ingredients that are restricted under applicable international conventions or their protocols;
- Ensure that all pesticides used will be manufactured, formulated, packaged, labeled, handled, stored, disposed of, and applied according to relevant international standards and codes of conduct, as well as the EHSGs;
- Activities that may lead to significant pest and pesticide management issues, where significant Pesticides use is necessary, the contractor may be required to prepare a Pest Management Plan (PMP).

7.4.11. Adverse Impact due to Camp Sites and Other Ancillary Works

Potential Impacts

During construction phase, there are different adverse impacts emanate from construction of camp site such as induced soil erosion & sedimentation leading to subsequent deterioration of water quality, dust, and noise pollution, respiratory illnesses related to dust pollution, compaction of soil; traffic accident on local community and workforce, Solid waste (household wastes &spoil material),competition for electricity, land use change; disfiguring of landscape; spillage of oils, lubricants and other chemicals are adversely impacts the environment. Thus, there could be adverse impacts stemming from inappropriate management of waste disposal, air pollution, competition for water and electricity around these camp sites.

Establishment of Camps	Camp sites along facilities of offices and residential accommodation for supervisory consultant staff and contractor workforce, workshops and vehicle maintenance facilities and storage areas will be demanded for the project. One impact from camps will be generation of wastes from facilities. And other than that, the camp establishment will demand acquisition of lands. For the purpose of the sites vegetation clearance and land takes from farmers and communal grazing areas is potential impact. Camp sites' locations are not identified at this stage, where the contractor is expected to propose for potential sites during project commencement.	***Duration:*** *Temporary (for construction period of 5 years with potential extension in condition of project delay)*
Operation of Asphalt Plant	It is obvious that the operation of asphalt plant poses adverse impacts on the workforce, local community and ambient air quality. Similarly, asphalt plant locations are to be proposed by the contractor, hence, be identified and approved accordingly.	***Duration:*** *Temporary (for construction period of 5 years with potential extension in condition of project delay)*
Use of Explosives	Blasting activities may cause accidental explosions and affect surrounding populated areas and workers. Furthermore, it may damage or affect the security of the area in addition to the adversely impacting physical as well as psychologically the local community in which the blast will takes place. Besides potential accident and injuries, explosives will demand store facilities outside of camp and other facilities with similar land acquisition potentials. Stores for explosives, also, are not currently identified, to be proposed for approval and use during project commencement.	***Duration:*** *Temporary (for construction period of 5 years with potential extension in condition of project delay)*

Spoil Area	Spoil areas could create potential environmental risks of erosion and stability problems. Additionally, the sites will demand area of land to acquire. The total area needed from spoil areas is 162.6 Ha. Yet, the locations will be proposed during the construction period.	***Duration:*** *Permanent* ***No. of Sites:*** ***Volume:*** *8,128,548.52 m^3* ***Area:*** *162.6 Ha* ***Land Use:***
Borrow Pits	Extraction of Sub-Base & Gravel materials are another activities demanding land acquisition. Sub-Base source sites are 8 with 11.67 Ha of land. On the other hand, gravel sources sites will be 8 with 23.3 Ha of land to take. Based on the assessment, areas identified for these activities are covered with Scattered Bushes to be potentially cleared. Impact of vegetation clearance is expected to be temporary, considering the sites are to be reinstated back to synchronized grade and material to the ambient environment and re-vegetation carried out. Other than land take, borrows will have potentials of creating spoil material and creating environmental risks of erosion and stability problems.	***Sub-Base Sources*** ***Duration:*** *Temporary (for construction period of 5 years with potential extension in condition of project delay)* ***No. of Sites:*** *8* ***Volume:*** *520000 m^3* ***Area:*** *11.67 Ha* ***Land Use:*** *Scattered Bushes* ***Gravel Sources*** *Duration: Temporary (for construction period of 5 years with potential extension in condition of project delay)* ***No. of Sites:*** *8* ***Volume:*** *700000 m^3* ***Area:*** *23.3 Ha* ***Land Use:*** *Scattered Bushes*
Quarry Sites	Impacts anticipated from these area are related to land acquisition, landscape alteration, erosion formation, social impact, etc... Quarry sites are usually not in farm or grazing land, yet, the landscape alteration is usually too high. Crushing operations are anticipated to pose impact of high dust, noise and vibration. The total numbers of potential sites are 3, where one is bare land and the other two covered with bush land taking 30000 m^2 of vegetation cover. Land acquisition for the crusher plant is expected to be temporary until completion of the project. Yet, the sources are expected to have significant land form alteration to be hard to recover. For this reason, the sites as sources are expected to be permanent during this risk assessment.	***Area for Material Source*** ***Duration:*** *Permanent* ***No. of Sites:*** ***Volume:*** *350,000 m^3* ***Area:*** *5.7 Ha* ***Land Use:*** *Scattered Bushes* ***Area for Plant*** ***Duration:*** *Temporary (for construction period of 5 years with potential extension in*

		condition of project delay)
Access Roads for Ancillary Sites	In order to access ancillary sites (camps, plants, borrows and water sources) access roads are acquired. These roads will demand land acquisition, similar, to other sites; where the land take will be temporary for period of construction.	***Duration:*** *Temporary (for construction period of 5 years with potential extension in condition of project delay)* ***No. of Sites:*** ***Area: (Total)*** *15.83 Ha* ***Land Use:*** *9.22 Ha of Farm Area* *6.88 Ha of Scattered Bush Land*
Wastes Generated	Solid wastes may be generated during construction material excavation, construction and maintenance of the road and associated structures. Significant quantities of rock and spil material may be generated from earth moving during construction activities. Solid waste generation during operation and maintenance activities may include resurfacing waste (e.g. removal of the old road surface material), road litter, illegally dumped waste, or general solid wastes from rest areas, animal carcasses, vegetation waste from right-of-way maintenance; and sediment and sludge from storm water drainage system maintenance.	***Duration:*** *Temporary (for construction period of 5 years with potential extension in condition of project delay)* ***No. of Sites:*** *4* ***Uses:*** *Drinking Water Source and Irrigation*
Water Use for Construction Works	Construction activities of the project are expected to use water sources during construction period of time. Potential sources were identified and proposed at this design stage, where potential sources are 4 in project crossed natural streams with two requiring access roads. Water use will be having utilisation of the resource with anticipated impacts of potential reduction to the availability of the resource. As presented in previous section, water resources in these locations are being utilised for drinking water sources for people and animals and for the use of irrigation. Consequently, this will have competition on the resource with the local community.	

Reference:

Risk assessment and respective mitigation and management plan specifically for ancillary sites is presented in:

- ***Annex F – Ancillary Works and Sites Management***

Recommended Mitigation Measures

❖ General Mitigation Measures

Impacts at offset sites could be minimised using the following the general measures of:

- The construction contracts need to have clauses to the effect that ancillary sites and access roads are deemed to be part of the site, so that the powers and authority of the engineer extend to them in the same way as to other areas where works are being undertaken,
- The construction contracts should contain a clause requiring the contractors to prepare detailed Site Environmental Plans (SEPs) for approval by the engineer, prior to commencement,
- Up on selection of sites, not identified at the design stage, the contractor shall propose a site with a specific site plan and shall be approved by the engineer;
- site plan and mitigation plan shall be prepared showing the location and proposed extent of the sites and volume of material exploited / dumped, access road areas and any other facilities which may be installed, land holdings and land covers, measures of management and reinstatement, Use of land and resources shall consider economical uses with minimising impact other than the necessary area and material;
- Further sites during selection from sensitive environments, and areas potentially demolishing and disposal problems that could result both in economic losses and environmental damages to the surrounding area,
- Identify RoW obstruction and land acquisition and compensate to land owners with appropriate procedures as specified in earlier section,
- After RoW identification limit activities to the minimum possible extent and avoid surpassing in to unnecessary area by any means,
- Ensure not to impact any environment outside boundary or damage any properties outside the RoW and compensate for any occurring damage,
- Strip topsoil and stock within the RoW of the area and apply during reinstatement The relevant stakeholders including the woreda environmental protection offices must be involved in site selection and screening and to demarcate and fix the boundary of disturbance for quarry material production;
- Stockpile topsoil no higher than 2 m to avoid compaction, and seed to reduce dust, soil erosion and suppress weed growth,
- The engineer and the environmental inspector of the engineer have the responsibility to give instructions and assistance to the contractor in ancillary sites management and rehabilitation activities.
- ERA's ESOSD should also monitor periodically the material site performances and mitigation measures underway,
- After reinstatement of sites acquired for temporary use the engineer, representative of ERA and environmental experts of the Woreda shall evaluate the reinstatement of sites and hand over to landowners accordingly.

Specific to ancillary activities and sites the following measures are recommended:

❖ **Mitigation Measures at Camp Sites**	
Site Selection and Preparation	• Approval and supervision during site selection and work activities, • Use prefab material that can be easily dismantled; • Pave critical areas of the plant to minimize dust emissions;
Management	• Provide efficient waste collection and storage facilities, • Aware workers about environment, sanitation and health, • Camp site shall be fenced all around the compound;
Decommissioning	• Reinstate the site as soon as possible in a manner confirming to the natural appearance, • Re-vegetate at decommissioning.
❖ **Mitigation Measures at Asphalt Plant and Operation**	
Site Selection and Preparation	• Where feasible, stockpile topsoil and subsoil separately. • Pave critical areas of the plant to minimize dust emissions
Aggregate / Material Stockpiles	• Apply water to at least 80% of surface area for all open storage stockpiles or when there is evidence of wind driven dust, OR • Apply temporary covering, OR • Apply chemical stabilizers, OR • Erect 3-sided enclosure with less than 50% porosity which extends to the top of the piles.
Conveyors and transfer points	• Cover conveyors, OR • Apply water sprays or mist • Limit vehicle entrained dust from unpaved roads by controlling traffic volume, speed, access, etc. • Cover all haul trucks
Paved and unpaved roads	• For unpaved roads, water spray with chemical suppressants OR water daily, more often if dusting occurs • For paved roads, water flush and vacuum sweep daily or as necessary if dusting occurs.
Mobile Batch Dryers and Drum Mixers	• Fabric Filter (Outlet Concentration - 20 mg/m^3) OR • Wet Scrubber (Outlet Concentration – 90 mg/m^3)
Stationary Batch Dryers and Drum Mixers	• Fabric Filter (Outlet Concentration - 20 mg/m3) OR • Wet Scrubber as an alternative for rural plants (Outlet Concentration – 90 mg/m^3)
Mixing Tower and Screens	• Capture and duct to Fabric Filter (Outlet Concentration – 20 mg/m^3) OR • Wet Scrubber (Outlet Concentration – 90 mg/m^3)
Drums and Dryers	• Temperature control for burner and dryer/drum operation to minimize odor complaints • Annual burner check and calibration
Load-Out, Storage Silos, Asphalt Storage Tanks	• Cover trucks with tarpaulin and cleanup spillage • Enclose silo openings OR vent storage silos to drum/dryer
NOx, CO, organic compounds	• Select plant based on burner design to minimize the pollutants • Follow good operation and maintenance regime for the burner • Finetune burner at least once a year
Decommissioning	• Rehabilitate the disturbed areas as soon as possible after construction is

	completed. • Remove and dispose solid wastes to an approved site,
❖ **Mitigation Measures at Spoil Areas**	
Management	• Dumping sites should be systematically identified to avoid also erosion-prone soils and groundwater sources. This can minimize the possibility of adverse effect on soil fertility and water quality. • Abstain from exceeding a maximum height of 5 m, • Synchronise dumping of spoil material to the area with the natural topography and later reinstatement work, • Ensure not to impact any environment outside boundary or damage any properties outside the RoW and compensate for any occurring damage, • Maintain few meters of buffer zone from RoW along the boundary for reinstatement work,
Decommissioning	• Reinstate the site as soon as possible in a manner synchronising to the natural appearance, • Re-vegetate at decommissioning.
❖ **Mitigation Measures at Quarry and Crushing Plant and Operation**	
Site Selection and Preparation	• Sites shall be further from Physical & Cultural Resources (PCRs) sites like dense forest areas, wildlife habitat, settlement sites, social and cultural service areas and heritage sites, • Production area must be screened /determined/ in consultation and with the approval of the supervision consultant and ERA's ESOSD,
Management	• Other protective measures like protecting the nearby farmland during blasting activities are to be undertaken. In this case there is a possibility of using physical barriers to protect the scattering of rocks on the crops.
Decommissioning	• Reinstate the site as soon as possible in a manner synchronising to the natural appearance, • Re-vegetate at decommissioning.
❖ **Mitigation Measures at Borrow Sites**	
Management	• The shaping and reinstatement of the borrow pit shall be done in such a way that the borrow pit will be properly drained whenever practicable and where required earth banks will be placed to divert any surface water away from the borrow area, • The left over spoil soil should be collected and kept aside for rehabilitation of the site at later stage of the work. Spoil soil should be shaped and compacted to avoid erosion and leakage to the river banks, water bodies or on dense vegetation covered ground, • Abstain from exceeding an excavation beyond 3 m depth,
Decommissioning	• The pit may be used as water storage after small technical adjustments are made so that water will be available in the dry season for cattle if required, in consultation to woreda administrations,
❖ **Mitigation to Risks from Water Use Competition**	Addressed in section 7.4.1.1.
❖ **Mitigation to Risks from Spoil Areas**	Addressed in section 7.4.11.

❖ **Mitigation to Risks from Access Roads**	
	• Access road selection needs to consider minimising impact on agricultural and vegetation area as possible. • The access road need to be reinstated to make the land available for vegetation growth. • The access road need to be cleaned of scattered rocks and the edges of the adjacent farmland can be re-cultivated.
❖ **Use of Explosives**	• Store any explosives and chemicals in a safe place; • Make notification during blasting activities; • Explosives are to be stored in a tightly locked secure metal container well away from either the working face or manned areas;the future also handling and use of explosives shall continue in like manner; • Post adequate number of guards at safe distances; • Evacuate all people and animals from the area; • Have safe cover & warned; • Locate good blaster commanding field; • Warning signs, prearranged blasting times, or warning sirens; • Prepare & execute a proper blasting plan & good blast design; • Make sure that the burden is proper and that enough collar distance is used.

Reference:

Risk assessment and management plan specifically for community health and safety is presented in:

- ***Annex G – Community Health and Safety Risk Management Plan***

7.4.12. Impact from the Use of Energy, Resources and Raw Materials

Potential Impacts

Source of Impact: Energy and fuel consumption for machineries and vehicles, and workshop activities, electricity utilisation for camps, offices and accommodations, machineries and vehicles, workshop activities, stores and compounds.

Evaluation of Impact: these are more indirect and short term impacts mainly concerned with construction period.

For fuel supply, the contractor will be using its own source. It will potentially construct underground fuel tanks at camp sites and supply them by transporting in it own supply with fuel tracks. It will not be recommended there to use wood or charcoal for energy.

Hence, potential competition against main energy sources of local community. Still, as fuel resources consumption is not environmentally friendly practice in worldwide and high foreign currency demanding nationally, we'll efficient use of fuel shall be maintained to use to the lowest necessary level.

Electricity, as mentioned will be used for lighting and utilities in camp accommodation, compound & offices and other higher demanding activities in workshop. The source will be from Ethiopia Electric Utility (EEU). The EEU is state-owned power company supplying national electricity line. As an alternative source generators are expected to be used as discussed above.

Therefore, the electricity demand will be in competition with the national current low supply. The present level of project areas' supply based on the assessment is too low as it is. Consequently, as the source will be from the same with the available project area lines, inefficient or misuse of this energy will be unfriendly to the environment and impacts local electricity supply.

- **Recommended Mitigation Measures**

To minimize excess use of energy and resources, it is recommended to take the following measures.

Consumption of Water	• Reducing demands on water resources, • Arrange for alternative water supply sources, • Directing abstractions towards lower sections of catchments and avoiding sensitive areas, • Reuse and Recycling, • Optimization and Control: with flow control, timing and monitoring, • Water use based on consultation to community and Woreda Bureaus.
Material Use	• Incorporate clauses to the effect that borrow pit sites and access roads, etc..., • Plan and implement efficient raw material use, • Restricted borrow material and area of use, • Regular monitoring.
Energy Efficiency	• Enhancement of energy efficiency, • Preference to use renewable forms of energy, • Burn waste and/or garbage in designated areas and away from settlement, • Follow recommended WHO standard of emission levels control.

7.4.13. Impact Related to Natural Hazards and Community Health Risks from Spread of Diseases

7.4.13.1. Drought Risks

Potential Impacts

As indicated on the baseline environmental description, drought is a recurrent hazard in the project area. The project implementation is related, moreover, with alteration of water resources availability, amount and nature of flow due to the construction. Also water consumption for construction purposes will be in competition against the local water resource and community use, ultimately augmenting the natural risk.

Drought can affect the communities and the environment in different ways, i.e. direct impact to the environment and social impact up on economic and social activities, since water is such an important part of so many of everyday activities. The environment could be in further strain from shortage of water, and Plants and animals depend on water would be impacted. Local farmers utilising streams along the project would experience lower water supply losing farm productivity and related economic incomes. Health problems related to low water flows and poor water quality will have the potential of widening too. As the locals are mainly pastorals, their dependence on water resources for source of drinking water for their animal would be at further risk that may lead to other indirect impacts on lifestyle and livelihood.

Recommended Mitigation Measures

- The implementation of the project shall refer to the recommendations given for mitigation impact on water resource with efficient use of water, reducing demands, timing to avoid utilization at low flow rates, spreading abstractions and arranging alternative water supplies.
- Plan water consumption and manage utilization in accordance to the required lower efficient use.
- On the four proposed water source locations of the project, the contractor shall conduct regular measurement of flow to maintain base flow adequate for regular water consumption of the local communities and the natural environment.
- Integrate with woreda level livestock and agricultural bureaus to monitor impacts and improve work methodologies and management.
- Identify needs and convenient location with local bureaus and communities to provide water harvesting spots in outlets of drainage structures.
- Mainstreaming Drought Risk Management (DRM) and integrating environmental and climate-based safeguards into the regional development frameworks.
- Data analysis Quantifying and valuing the economic impacts of drought on local farmers and pastorals to take required responses.

- Assist farmers and pastorals in small scale irrigation farming and water harvesting mechanisms and capacity building to sustain their livelihoods.
- Providing awareness on water utilization and adaptation to drought risks and environmental changes.
- Promote regional economic diversification.

7.4.13.2. Flooding

Potential Impacts

The flooding of a road induces two levels of consequences: on the one hand, people may be injured and vehicles may be destroyed; on the other hand, the disruption of traffic may have severe indirect consequences.

Road development in floodplains alters the floodplain hydraulics and affects the related aquatic ecosystems.

The road construction will have potential fluvial flooding problems in the villages along the lowlands in particular. Drainage outlets have the potential to impact houses and farms in the shoulder too.

Recommended Mitigation Measures

Recommended measures to reduce flooding are:

- Provision of adequate drainage structure so as to maintain the normal flow direction and attempt to maintain uniform water distribution over surfaces at downstream side of catchments. This can reduce flow concentration to specific direction that can result in flooding effects and erosion, helps uniform recharge of water sources (both ground and surface sources) and wetland/marshland areas;
- Drainage discharge point should be carefully identified and located to avoid downstream damages;
- Provide energy dissipaters at the discharge outlets;
- Provide adequately extended drainage line away from farmlands and properties at down side;
- Awareness creation and capacity building for downstream farm community to construct and make use of water harvesting structures/ facilities by tapping the discharge from road side drainages;
- Technical assistance and design provisions to enable collect runoff at the outlet of the drainage structures;
- The construction of bridge & other major earthwork works around water sources should consider soil erosion protection measure, and have to be scheduled during dry seasons to minimize the entry of soil material into the rivers by flooding and runoff water.

7.4.13.3. Spread of Diseases

- **Potential Impacts**

Community health is potentially to be at risk due to the project implementation, due to different reasons. One aspect is that the project will introduce large number of people to the project area during the construction and service period. This will hence contribute larger number and connectivity of people, creating communicable disease propagating environment. These include exposure to the recent COVID-19epidemic, amongst other communicable diseases.

Other spread of disease is from wastes or construction activities that threaten the lives of the community in the project area. These impacts include, among others, water borne diseases and respiratory diseases (from dust and other emissions).

Risks of transmittal are also commonly associated with poor labour camp condition. Unsafe water sources and unhygienic conditions (lack of toilet and washing facilities) bear the risk of additional and often endemic diseases, such as dysentery, diarrhea and cholera.

- **Recommended Mitigation Measures**

General Measures

Generally, the client will be expected to:

- Incorporate contractual clauses for the contractor to avail health facility / clinic and professionals at construction camps;
- Incorporate contractual clauses for the contractor to effect stated measures on the CH&SMP to ensure control of health and safety risks at construction area;
- Provide consultant for the works of HIV/AIDS prevention works; and
- Incorporate contractual clauses with regard to HIV/AIDS for the consultant to be assigned.

The contractor is responsible to:

- Establish clinic facility along with necessary resources and personnel to be available on sites;
- Provide first aid attendants for the facility as well as medical equipment suitable for the personnel, type of operation, and the degree of treatment likely to be required prior to transportation to hospital;
- Shall establish network with health institutions (local Government, NGOs, Community Based Organizations, Faith Based Organization, Association, etc) working in the project area; and
- The Contractor shall maintain health and injury records and make such reports.

These general measures are also taken to contribute on reducing pressure on Local Health Facilities. More detailed measures recommended to be followed by the different bodies during the project implementation are discussed in the next sections.

Other Specific Measures

- Providing surveillance and active screening and treatment of workers;
- Testing and training health workers in prevention and disease treatment;
- Undertaking health awareness and education initiatives, such as, implementing an information strategy to reinforce person-to-person counselling addressing systemic factors that can influence individual behaviour as well as promoting individual protection, and protecting others from infection;
- Conducting immunization programs for workers in local communities to improve health and guard against infection;
- Promoting collaboration with local authorities to enhance access of workers families and the community to public health services and promote immunization.

Measures to Control COVID-19

- Have posters and billboards raised to ensure informing workers and personnel near construction works and camps on prevention measures;
- Continuous testing of staff and awareness creation;
- Informing engineer, local health facilities and other relevant bodies on person testing positive for the corona virus;
- Testing of new staff, visitors, or staff who stayed off site when entering back to project area and camps;
- Programmes educating project personnel and area residents on risks, prevention, and available treatment;
- Avail sanitary equipments and educate on washing hands;
- Avail hand washing equipment on entrances to offices, camps and other facilities;
- Providing basic prevention materials, i.e. clinical face masks, sanitizers, soap, etc…;
- Ensure availability of water at camps, accommodations and offices;
- Informing workers and community near the project on national updates from the Ministry of Health and Institute of Public Health with posters, notices on board and awareness programmes.

Measures to Control Waster Vector Diseases

- Implementation of integrated vector control programs;
- Identifying areas and activities that will pose risks of vector-borne disease the project area community and plan activities in reduction of risks;
- Monitoring communities during high-risk seasons to detect and treat cases;
- Following safety guidelines for the storage, transport, and distribution of pesticides to minimize the potential for misuse, spills, and accidental human exposure;

- Distributing appropriate education materials;
- Collaborating with public health officials and local health institutions.
- Ensure sanitary improvements and elimination of breeding habitats close to human settlements;
- Elimination of unusable impounded water;
- Increase in water velocity in natural and artificial channels;

7.4.13.4. Risk of Malaria Spread

Potential Impacts

The project is located in an area of high risk for transmission of malaria (especially with higher risks towards the end), and the incidence of contracting malaria is quite high. Where natural drainage flows are to be impeded, construction may cause localized floods. Borrow could also be great sources of malaria spread, creating artificial ponds.

Recommended Mitigation Measures

Observation to the following measures is recommended in minimising risks of malaria:

- Adequate drainage and crossing structures, as well as pumping, has to be used to avoid flooding during construction,
- Use only approved borrowed areas and fill borrow pits immediately after completion of use,
- Regular Inspection of sites shall be in place to monitor potential sites of malaria spread and other sanitary problems,
- Providing and promoting use of repellents, clothing, netting, and other barriers to prevent insect bites;

7.4.13.5. Spread of HIV/AIDS and STDs

Potential Impacts

The trend in HIV/AIDs prevalence indicates that higher prevalence rate is recorded in densely populated urban centres, and in areas with higher transactions as compared to the less accessed areas of rural woredas. Increase in population flow, incoming workforce, passer by business men and tourists can have potential for exposing the community to higher rate of prevalence.

Road construction and other similar type of construction works are considered to be having high potential (due to their mobility) for the spread of communicable diseases, such as Sexually Transmitted Diseases (STD) and HIV/AIDS. The spread could be from the construction workforce to the local population and vice versa.

This is partly true because construction workers are mostly young and sexually active group of the population and are mobile, and have more income than the local population to spend. This will attract sex workers and bar owners to come to the nearby towns to camp sites and start such businesses. Hence, the increase in the number of sex workers and alcoholism are believed to contribute to the spread of STDs and HIV/AIDS. Impacts from the construction camps will be severe if camps are built close to the local settlement areas and may contribute more to the spread of communicable diseases such as STD and HIV/AIDS.

- **Recommended Mitigation Measures**

To prevent such a grave consequences, all the necessary care and awareness creation campaigns should be planned and implemented for the project at hand. The awareness should be given for both construction workforce and local community. The awareness creation program for community residing in the road construction project influence area should be planned before hand and should be started months before actual start of the construction work or before mobilization of the workforce to the area so that people would be aware and protect themselves.

Prepare awareness creation plan to address the problem and spread of STD and HIV/AIDS among project workers and local communities.

- Provide education for local communities regarding the spread of HIV/AIDs and STDs in public places, schools, and through community clubs and groups,
- Work closely with local health service giving institutions to control the spread of STD and HIV/AIDS,
- Provide care and support for HIV/ AIDS affected groups,
- Free distribution of condoms both male and female type,
- Produce leaflets and road side posters about HIV/AIDs.

Reference:

Risk assessment and management plan specifically for community health and safety is presented in:

- ***Annex G – Community Health and Safety Risk Management Plan***

7.4.14. Occupational Health and Safety Risks

7.4.14.1. Potential Risks of OHS

- **Potential Impacts**

Source of Impact: Hazardous work sites, construction equipment and machinery, transport vehicles, lack of signs (informative and warning)

Evaluation of Impact: it a direct with short or long-term effect depending on the accident or health impact. It occurs both during construction and operation phases.

The construction and operation of campsite activities involves a number of activities that might cause physical, chemical and biological hazards. The physical hazards include trap, entangle / collapse hazard, eye hazard from solid particles, materials, blazing and welding operations, head hazards from falling objects, overhead loads and sharp projections, foot hazards from penetration of sharp objects, electrical hazards, objects cutting hazards, fumes and burning hazards, noise and vibration hazards and fire hazard. The chemical hazards include absorption Hazards on body parts, ingestion hazards, and inhalation hazards. The biological hazards include clinical waste, wastewater and solid waste hazards.

There will be occupational safety and health issues for the construction workforce caused by accidents (operating machinery, falling in ditches, etc.) and poor hygiene in construction camps. During the construction works, accidental discharge or spillage caused by inflammable, toxic, explosive and chemical substances could create health risks on the work force.

Occupational health and safety issues associated with the road construction and operation of roads primarily include the following:

Physical Hazards

Road construction and maintenance personnel, as well as landscaping workers maintaining vegetation in the rights-of-way, can be exposed to a variety of physical hazards, principally from operating machinery and moving vehicles but also working at elevation on bridges and culverts. Other physical hazards (e.g. exposure to weather elements, noise, contact with overhead power lines, falls from machinery or structures, and risk of falling objects) are the peculiar one.

Chemical Hazards

Chemical hazards in road construction, operations, and maintenance activities may be principally associated with exposures to dust during construction and paving activities; exhaust emissions from heavy equipment and motor vehicles during all construction and maintenance activities; potentially hazardous dust during earthworks, construction material excavation, dust blown to prepare the route for asphalt, dust from crusher site and asphalt fume during asphalt plant preparation and diesel fuel used as a release and cleaning agent for paving equipment.

Noise

Construction and maintenance personnel may be potentially exposed to extremely high levels of noise from heavy equipment operation and from working in proximity to vehicular traffic. As most of these noise sources cannot be prevented, control measures should include the use of personal hearing protection by exposed personnel and implementation of work rotation programs to reduce cumulative exposure.

Communicable Diseases

Communicable diseases pose a significant public health threat to construction workforce. Communicable diseases of most concern during the construction phase due to labour mobility are sexually-transmitted diseases (STDs), such as HIV/AIDS. As far as construction work forces are within sexually active age and far from their family within the construction camps, they are adversely impacted by communicable disease such as STD and/or HIV/AIDS during construction and maintenance phases.

7.4.14.2. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the campsite construction and operation using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides the details on how hazards classification is determined using the two variables risk classification matrix. Classification of hazards were analysed using a scale from 1 to 5 level, risk increasing respectively.

- **Recommended Mitigation Measures**

Traffic Management

Traffic safety problems will be minimized by implementing the following mitigation measures.

- Develop and strictly following a well-designed work program and traffic management plan (TMP) that would consider local conditions like the normal traffic, terrain, weather and socio-economic conditions,
- Provide appropriate information on the location of risky areas to potentially affected local residents and prohibiting such areas for safety reasons, e.g. borrow pits and quarries, and stone crusher and asphalt mixing plant sites, and
- Provision of awareness creation for the local population in traffic safety measures at public meetings, social gatherings, schools, etc.
- Construction of pedestrian, animal and vehicular over or under passes on the identified and proposed sites through consultation with local community representative where high density of animal movement to drink water and grassing lands;
- Assesses further accessibility problems and provide proper solution by constructing necessary structure (under or over pass).
- Awareness creation should be undertaken to the local communities to guide their animals to use the constructed animal pass until their animals adapted to use the pass.

Safety Measures

The following mitigation and precaution measures are suggested to overcome the adverse impacts on the workforce.

- The contractor by all means take maximum care in applying the internationally accepted standards and recognized occupational health and safety guidelines.
- Consider appropriate care for storage of chemicals and explosives and provision of training to workers handling it to avoid inhalation of chemicals and easily be exposed to it.
- The contractor is also required to provide workers with protective clothing and equipment and create awareness on safety issues;
- At the same time the contractor is also responsible to create awareness among the local community on the hazardous nature of chemicals and explosives used during the construction works.

- Contractor shall provide clinic at construction camp and first aid kits at workshops, active construction sites and also inside vehicles.

Additionally, the recommended management practices to prevent and control physical hazards on the workforces include but not limited to the followings.

Moving Equipment and Traffic Safety

Development of a traffic safety management plan for road construction and repairs that includes measures to:

- Ensure work zone safety for construction workers and the travelling public;
- Establishment of work zones to separate workers on foot from traffic and equipment by:
- Routing of traffic to alternative roads when possible;
- Closure of lanes and diversion of traffic to the remaining lanes as the road is wide enough (e.g. rerouting of all traffic to one side of a multi-lane highway);
- Where worker exposure to traffic cannot be completely eliminated, use of protective barriers to shield workers from traffic vehicles, or installation of channeling devices(e.g. Traffic cones and barrels) to delineate the work zone;
- Regulation of traffic flow by warning lights, avoiding the use of flaggers if possible;
- Design of the works pace to eliminate or decrease blind spots;
- Reduction of maximum vehicle speeds in work zones;
- Training of workers in safety issues related to their activities, such as the hazards of working on foot around equipment and vehicles; and
- Safe practices for work at night and in other low-visibility conditions, including use of high-visibility safety clothing and proper illumination for the workspace (while controlling glare so as not to blind workers and passing motorists).

Elevated and Overhead Work Safety

The area around which elevated work is taking place should be barricaded to prevent unauthorized access. Working under personnel on elevated structures should be avoided; hoisting and lifting equipment should be rated and properly maintained, and operators trained in their use. Elevating platforms should be maintained and operated according to established safety procedures including use of fall protection measures; equipment movement protocols (e.g. movement only when the lift is in a retracted position); repair by qualified individuals; and installation of locks to avoid unauthorized use by un trained individuals; ladders should be used according to pre-established safety procedures for proper placement, climbing, standing, as well as the use of extensions.

- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures;
- inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others;
- Establishment of criteria for use of100percentfallprotection (typically when working over 2 meters above the working surface, but sometimes extended to 7meters,depending on the activity);
- The fall protection system should be appropriate for the structure and necessary movements, including ascent, descent, and moving from point to point; Installation of fixtures on bridge components to facilitate the use of fall protection systems;

- Safety belts should be not less than 16 millimetres (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident;
- When operating power tools at height, workers should use a second (backup) safety belt.
- The recommendations to overcome or minimize adverse impacts from chemical hazards specific to road projects include:
- Use of millers and pavers with exhaust ventilation systems and proper maintenance of such systems to maintain worker exposure to crystalline silica (millers and grinders) and asphalt fumes (pavers) below applicable occupational exposure levels;
- Use of the correct asphalt product for each specific application, and ensuring application at the correct temperature to reduce the fuming of bitumen during normal handling;
- Maintenance of work vehicles and machinery to minimize air emissions;
- Reduction of engine idling time in construction sites;
- Use of extenders or other means to direct diesel exhaust away from the operator;
- Ventilation of indoor areas where vehicles or engines are operated, or use of exhaust extractor hose attachments to divert exhaust outside;
- Provision of adequate ventilation in tunnels or other areas with limited natural air circulation;
- Installation of tollbooth ventilation and air filtration systems; Use of protective clothing when working with cutbacks (a mixture of asphalt and solvents for the repair of pavement), diesel fuel, or other solvents;
- Use of dustless sanding and blasting equipment and special containment measures for paint removal activities;
- Avoiding the use of lead-containing paint and using appropriate respiratory protection when removing paints (including those containing lead in older installations) or when cutting galvanized steel.

Disease Control

To manage vector borne diseases the contractor, in close collaboration with community health authorities, can implement an integrated control strategy for mosquito and other arthropod-borne diseases that might involve:

- Prevention of larval and adult propagation through sanitary improvements and elimination of breeding habitats close to human settlements;
- Elimination of unusable impounded water;
- Increase in water velocity in natural and artificial channels considering the application of residual insecticide to dormitory walls;
- Implementation of integrated vector control programs promoting use of repellents, clothing, netting, and other barriers to prevent insect bites;
- Use of chemoprophylaxis drugs by non-immune workers and collaborating with public health officials to help eradicate disease reservoirs;
- Monitoring and treatment of circulating and migrating populations to prevent disease reservoir spread collaboration and exchange of in-kind services with other control programs in the project area to maximize beneficial effects;

- Educating project personnel and area residents on risks, prevention, and available treatment;
- Monitoring communities during high-risk seasons to detect and treat cases.

Reference:

Risk assessment and management plan for specifically OHS is presented in:

- ***Annex I – Occupational Health & Safety Risk Management Plan***

7.4.15. Security Risks

7.4.15.1. Potential Risk

Potential Impacts

Internal Security Risks

These security risks are caused by the illegal, unethical, or inappropriate behavior of project construction personnel or those directly affiliated with it. The most common security risks in the road construction industry are:

- Employee theft;
- Disrespect to the local community culture and believe which leads to conflict between workers and local community
- Workplace violence and labor unrest, potentially with associated sabotage.
- A security response might result in risks to employees or other individuals.

External Security Risks

External security threat are caused by the actions of people outside the construction project who seek to take advantage of opportunities presented by the construction development and activities of the Meisso - DirreDawa expressway project to influence the Government or construction contractor due to grieve they have .
These may include common criminal activity; disruption of the project asset for economic, political, or social objectives; and other deliberate actions that have a negative impact on the effective, efficient, and safe operation of the construction proposed project.

The source of security risks can be categorized into three areas:

- **Event** – an event is an important happening or incident impacting on the entity's ability to function such as a natural event like storm or an emergency event such as fire.
- **Threat** – a threat is a declared intent to inflict harm on entity personnel or property.
- **Activity** – an activity is an action by one or more people likely to have a negative impact on physical security (eg protest activity in the vicinity of road construction site). Therefore, based sources of security risks mentioned above, the external security risks identified during risk assessment in the road corridor are listed as bellow:
  - Common crime such as theft of project asset;
  - Border conflict ;
  - Conflict on water and pasture;
  - Regional protest;
  - Religious based conflict;

- . Escalation of violence based on grievance.
- Local conflict between clans of the same ethnic

7.4.15.2. Security Risk Analysis and Evaluation

For security risk analysis and evaluation the approach involves two factors was followed. First is the probability which is the measure of certainty that an event, or risk, will occur, i.e. taking occurrence rates of frequent, likely, occasional, seldom and improbable.

The second approach followed is estimate of the impact on the project. This can be a somewhat subjective assessment, but should be quantified whenever possible. The severity was similarly given a rating from 1 to 5, risk increasing respectively.

Security Risk can be presented in variety of ways to communicate the results of analysis to make decision on security risk control. Security risk analysis that uses likelihood and severity in qualitative method, presenting result in a risk matrix is a very effective way of communicating the distribution of the risk throughout a construction site and ancillary facility areas.

- **Recommended Mitigation Measures**

Communications

Communications with employees and contractors will be critical to ensuring a safe work environment during construction of the project. Each employee and contractor who is working at the Project will be required to carry a two-way radio. Cell phone coverage may be limited in the some project area, so alternative forms of communication will be needed. The two-way radios supplied to employees and contractors will be capable of:

- Providing immediate emergency instruction to personnel; and
- Notifying proper personnel of a security incident.

Construction Security

To reduce security risks during construction, public access to the Project will be limited. The contractor will be required to provide a final site security management plan for construction, which will be developed by the contractor selected to construct the expressway. Preparation of the final site security plan will begin immediately following selection of the contractor within mobilization period and the final plan will be provided to the ERA and World Bank.

Fencing & Gates

Fencing is the first layer of security at all of contractor and consultant camp and sub camp sites with standardized on above 2m fencing, using tension wire in lieu of bars, placing fence barbs up, and securing the bottom of the fencing below grade. Access points/gates are secured through one of the following methods: Manually opened and secured with a heavy duty approved pad lock, electronically accessed with card credential, or electronically accessed with remote gate fob. All perimeters and access points are monitored 24/7 by CCTV or contracted security guards.

Exterior Lighting

Exterior lighting has been strategically placed throughout the (Utility) to emphasize and highlight perimeters, gate and Guard Post access points, entry points into buildings, and areas of interest.

Security Guards

The construction contractor will employ experienced security guard from the local community in collaboration with woreda security official for the technical help during employment process. Guards are stationed at the contractor's camp sites, machineries and other project facilities. Additionally, "patrol" guards are assigned to conduct security checks of the contractor's properties. Furthermore, guards will perform the following activities:

- **Boundary Security:** the security guard will maintain control of the comp sites, storage areas and machineries' boundary and protect people from accessing except authorized persons through erecting-control points.
- **Access-Point Operations:** the security guards will check and screen anybody get into the camp and facility sites as he or she equipped firearm or not, if somebody armed firearms with the recognition of government and asked to get into the camp site, the guard will ask the person to submit the firearm with his/her identification card to the guard and receive guest permission card to enter. Similarly, vehicles will be checked and screened in the same manner at the entrance gate.

Law Enforcement Support

Ethiopian Roads Authority has developed strong partnerships with the law enforcement agencies in the country such as Federal police, ministry of defense, regional and woreda level police offices. These agencies support the Ethiopian Roads Authority's security mission through collaborative training & exercises, observation patrols, response to incidents, and proactive meetings along the proposed expressway project corridor.

- **Security Patrols:** the special police in each woredas in collaboration with federal police assigned to the area will patrol the project corridor at the daily bases in each woredas to check and supervise the security situation of the area.
- **Materials Storage and Control:** explosive materials that proposed to be used for the construction purpose such as blasting will be managed by Federal level security official before it transported to the project site. That means the contractor will approach the security office through ERA for the selection of storage site, transport and use. Accordingly, federal security office will investigate and screen the proper site for the storage and then after the security officer considered that the selected site is save from security point of view, approval letter will be given to the contractor to construct storage on the site selected. Finally, the explosive will be brought to the storage under the guard and supervision of federal police. Detailed explosive management plan will be prepared by the contractor and ERA in collaboration with supervision consultant will follow up the implementation; and this will be done in accordance with appropriate national laws and

regulations and relevant good international industry practice, including the World Bank Group Environmental, Health and Safety Guidelines.

- **Information and Communication:** information gathering organizing and dissemination will be handled by the cooperation work of local, zonal, regional and federal levels security officials.
- Woredas level security official will have closely relation with the contactor's security management official to categorize, handle, and control sensitive information. Then, woreda security officials again communicate with higher hierarchy security officials such as zonal, regional and federal level to handle sensitive security issues immediately before it pose any damage on the human life and contractor's asset.
- **Firearms Security:** Ethiopian Roads Authority recognize and has strong stand that road construction project shall be secular that means any one of the project workers should not armed firearm except a persona has full permission from authorized authority on-site. Private guards will be given firearm if its necessity will be believed for the purpose of guarding the projects property by each woredas administration police. Implementation procedures will be decided by police officials during handover of the firearm.
- **Special Situations:** during large-scale events such as criminal activity, demonstrations, civil disorder and/ or border conflicts that require interventions by public security which is not specifically associated with the project; the security management committee will communicate with the public security official and decided how they control the events without any damage happened on the project guards, properties and workers life.

Incident Response

The public securities who are working in the road corridor will respond to an incident happened in a manner that respects ethics human right police, in compliance with national laws and acceptable international laws. The responsibility of the incident response will be depends on the risk level and it consequence; if the incident will be beyond the capacity of the region, the federal police will respond. But if the incident can be controlled with capacity of the local police, the regional police officials will respond. Furthermore, if the risk level will demand the defence force to control and stabilize the security risk ministry of defence will responsible for the incident response.

Reference:

Assessment of security risks and specific management plan is presented in:

- ***Annex K – Security Risk Management Plan***

Table 7.4.15.2-1: Calculated Security Risk Value of the Road Corridor

Security threats identified	Likeli hood (L)	Meisso					Meisso-somali					Afdem					Gota Beke					Errer					Dire Dawa				
		Severity (S)					Severity (S)					Severity (S)					Severity (S)					Severity (S)					Severity (S)				
		1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Crime such as theft of project asset	5																														
	4			12					12					12					12					12						16	
	3																														
	2																														
	1																														
Border conflict ;	5																														
	4																														
	3				12					12									9										9		
	2												4																		
	1																					1									
Conflict between clans of the same ethnic.	5																														
	4																							12							
	3																														
	2																														
	1	1					1					1					1										1				
Religious based conflict	5																														
	4																													16	
	3																														
	2	2																													
	1						1					1					1					1									
Escalation of violence based on grievance	5																														
	4																													16	
	3				12																										
	2																														
	1						1					1										1									

Reference:

Assessment of security risks and specific management plan is presented in:

- ***Annex K – Security Risk Management Plan***

7.5. Impact on Socio Economic Environment

7.5.1. Over all Social Risks and Impacts on Land

Potential Impacts

Despite the above stated positive social benefits and other intended socio-economic advantages, the construction of the road, like any developments, has significant negative impacts on socio-economic environments. It traverses through different landscapes, environments, and areas with different interests, such as human settlements, public infrastructures, farm holdings and other important resources.

As indicated above in Miesso - Bike- Dire Dawa Expressway project has a total length of 142 KM with a width of 90 meters. Based on this, the total land area required for construction of the Expressway is expected to expropriate a total area of 1278 hectares. The total Kebeles to be traversed by this expressway are identified to be 30; and the names of these Kebeles, the Woredas, the Zones and National Regional States they are located in are indicated.

To find out the extent of social risks and impact that would be created due to the expropriation of a total area of 1278 hectares of land; and loss of properties/ assets, residence houses, grazing areas, crop land, natural resources such as forest, woodland, shrubs etc.., due to the Expressway, would be identified through the survey census collection made and on the process to be completed. When such detail social survey taken would be completed, actual social risks and impacts that could occur will be assessed, analysed and mitigation measures to be taken would be prepared and presented in Land Acquisition, Restrictions on Land Use and Involuntary Resettlement report to presented.

7.5.2. Impacts on Residence Houses

Potential Impacts

According to data obtained using Satellite Imagery (SI) within the entire Expressway of 142 KM that starts from Miesso and ends in Boren Kebele near Melka Jebdu(01Kebele) of Dire Dawa Administration, a total of 631 residence houses would be affected due to the Expressway(this figure could be changed when inventories of properties taken during the census survey is processed and finalized). The details are shown below on 7.5.2-1.

Table 7.5.2-1: Social Risks and Impacts on Residence Houses

S/N	Location		Extent of Impact	Number
	National Regional State & Zone	Woreda		
1	Oromia, West Hararge	Miesso	Loss of residence houses covered with CIS roof in Number	121
	Oromia, West Hararge	Miesso	Loss of residence houses covered with Thatched roof in Number	240

2	Somali, Siti Zone	Mayesso	Loss of residence houses covered with CIS roof in Number	98
	Somali, Siti Zone	Mayesso	Loss of residence houses covered with Thatched roof in Number	42
3	Somali, Siti Zone	Afdem	Loss of residence houses covered with CIS roof in Number	37
	Somali, Siti Zone	Afdem	Loss of residence houses covered with Thatched roof in Number	28
4	Somali, Siti Zone	Bike &Erer	Loss of residence houses covered with CIS roof in Number	7
	Somali, Siti Zone	Bike &Erer	Loss of residence houses covered with Thatched roof in Number	25
5	Dire Dawa	M/Jebdu (K01)	Loss of residence houses covered with CIS roof in Number	22
	Dire Dawa	M/Jebdu (K01)	Loss of residence houses covered with Thatched roof in Number	11
Total Houses				631

Source: Data Collected Using Satellite Imagery, November, 2020.

As could be observed from table 7.5.2-1 above, 631 residence houses would be affected due the Expressway to be constructed from Miesso – Bike - Dire Daw Dawa. All the housing units would be affected are residence houses whose roofs are covered with CIS and Thatched/Plastic roofs.

The detail numbers of the residences houses would be affected are 361 (121 CIS & 240 Thatched) in Miesso; 140 (98 CIS & 42 Thatched) in Mayesso; 65 (37 CIS & 28 Thatched) in Afdem;32 (7 CIS & 25 Thatched in Bike-Erer) and 33 (22 CIS & 11 Thatched) in MelkaJabdu. Overall, the above 631 identified residence house would be affected due expressway road project from Miesso - Bike- Dire Dawa to be constructed. As a result, these residence houses would be demolished, and households and their family members would be displacement form their residence areas, and need to be resettled in anew area/location to be identified. Loss of social networks among the displaced households and traditional system of supporting each in case of social problems would be disrupted.

7.3.1. Impacts on Livelihood and Income

- **Potential Impacts**

The construction of the project road will affect the livelihood and income of some households located in the direct influence area (mainly located in the town sections) negatively. Some households that are located within the direct influence area will lose their businesses and income while their houses are being demolished due to the opening up of a new expressway within the area. This is also true for those households who live with the ROW but not losing land due to the road project. There would be also households or persons who live within the road project area but do not own land or others properties/assets to be affected.

Regarding this, FDRE constitution No. 1/1995, the Proclamation No.1161/2019, a Proclamation to determine Expropriation of Landholdings for Public Purpose, Payments of Compensation and Resettlement; and Council of Ministers Regulation No.472/2021 do not provide eligibility criterion to be supported or paid compensation. In case of the World Bank ESS5, it provides that project affected persons who have no recognizable legal right or claim to own land or assets they occupy or use would be able to get compensation. This is one of the gaps that are identified to exist between the policy of the FDRE and that of the World Bank ESS1.

- **Recommended Mitigation Measures**

❖ **Compensation Measures**

For all those residence houses found within the width of 90 meters of the expressway and would be fully affected and demolished, compensation payment for the loss of building at replacement cost would be effected based on Proclamation No.1161/2019, a Proclamation to determine Expropriation of Landholding for Public Purpose, Payment of Compensation and Resettlement; and Council of Ministers Regulation No.472/2020, Regulation to provide Expropriation of Land for Public Purpose and valuation, Compensation payment and Resettlement would be implemented.

In addition to compensation payment to be made at replacement cost based on Proclamation No.1161/2019 and Council of Ministers Regulation No.472/2020, assisting the displaced persons to restore their livelihood status with the provision of technical and martial support is emphasised.

Compensation payment for all types of residence houses would be affected due to Expressway would be calculated based on Proclamation No.1161/2019 and Council of Ministers Regulation No.472/2020.

In addition to compensation payment would be estimated for payment of those residence houses would be affected, transporting parts of housing materials demolished to be reused in building new residence houses, payment of moving allowances for properties, materials required for reconstruction of new residence houses and related costs would be estimated, identified and paid for those households affected .

Detail cost breakdown including the amount of compensation to be made for those would be affected residence houses and other related costs would be estimated and paid. Support to be made for income restoration for vulnerable households and transitional allowances for implementers and supporters would be estimated and paid.

❖ **Livelihood Restoration**

Minimize the impact due to the widening of the RoW by improving the engineering design and making particular precaution to minimize the impact in the town sections. This is mainly because it is in the town sections that the impact will be observed on businesses.

In order to maintain or upkeep the living standards of those households who would be affected by the loss of their farmland and income due to expressway , appropriate measures are required to be taken to ensure that, would be affected small and large scale farmland holders are fully compensated. The procedure and mode of compensation payment to be made will be based on Proclamation No. 1161/2019, and Council of Ministers Regulations No.472/2020.

Over all, for the implementation of mitigation measures stated above that include loss of residence houses and mitigation measures; loss of farmland and mitigation measures; loss of tree loss of trees, perennial tree crops and mitigation measures; loss of grazing areas and pastures; loss of utilities and other properties and assets would be affected due to the expressway, issues of handling involuntary resettlement and others will presented in a resettlement action plan (RAP) to be prepared and delivered.

Reference:

Details of land acquisition, compensation and other livelihood restoration plans are presented in the Resettlement Action Plan (RAP) document.

7.3.2. Impacts on Private and Large Scale Farmland

Potential Impacts

Based on the findings obtained using Satellite Imagery a total of 50 hectares of smallholding farm areas, 2 hectares of large scale farm areas, 81 hectares of forest land and 1148.97 hectares of grazing, bushes and shrubs areas would be affected due to the envisaged expressway. Expropriation of land for construction of the expressway triggers, physical and economic displacement, loss grazing areas, loss of crops, loss of fruits & trees, removal of residence houses and other structures, and relocation of public utilities. The summary of the impact that could be occurred due to the Expressway on private farmland, forest, grazing area, shrubs and bushes are presented on the tables shownbelow. In particular,

Table shown below indicates summary of social risks and impacts that could occur on private and large scale farmland.

Table 7.3.2-1: Social Risks and Impacts on Private and Large Scale Farmland

S/N	Location		Extent of Impact	Number
	Region & Zone	Woreda		
1	Oromia, W. Hararge	Miesso	Loss of private farmland in Ha	127.2
2	Somali, Siti Zone	Mayesso		21.2
3		Afdem		21.3
4		Bike & Erer		7
5	Dire Dawa	M/ Jebdu (K01)		1
Total				177.7

Source: Data Collected Using Satellite Imagery, November, 2020.

As could be observed from the table above, total of 177.7 hectares of farm land owned by smallholder farmers would be expropriated, and those farmers who loss such area of farmland would not be able to produce agricultural crops on which they depend for their family livelihood. In addition to smallholder farmers who would be affected by the loss of 177.7 Ha of farmland, two large scale famers owning a total 96.51 Ha of farmland would be affected due to the expressway. In aggregate, a total farmland area of 274.21 Ha would be affected, and cereal / horticultural crops which could have been produced and used for consumption or market would not be produced. Due to this loss of income of smallholder farmers and large scale producers could occur.

As indicated above on table, a total of 177.7 hectares of would be affected due to the expressway to be constructed from Miesso – Bike - Dire Dawa. These farmlands owned both by small and large scale farmers are used for producing different cereal and horticultural crops on which they depend for their livelihoods and cash income generating.

7.3.3. Social Risks and Impacts on Grazing Land, Bushes and Shrubs

- **Potential Impacts**

The large majority of the population living within the expressway influence Woredas of, Miesso, Mayesso, Afdem, Gota-Bike, and Erere are Pastoralists, Agro pastoralists and mixed farmers. Most of them depend on livestock rearing, and their livestock depend on grazing. According to the data collected using Satellite Imagery, a total of 1148.97 hectares of grazing would be lost due to the expressway project road to be constructed starting from Miesso Bike - Dire Dawa with a length of 142km. The loss of such huge area of grazing land within the influence woredas due to the new expressway project road would create shortage of grazing area which also results in decreasing the number of livestock and livestock products such as milk and other by-products even though it would not be significant. Similarly bushes and shrubs currently exist within the expressway influence area currently used for construction materials, fuel wood and other purposes would be cleared, and loss of such bushes and shrubs would affect the livelihood of the population living within the influence of the project road.

Data collected using Satellite Imagery could not identified trees and perennial crops such as orange, papaya, lemon, mango, guava, sugar cane etc.., that exist within the expressway influence area, particularly in Woredas of Gota-Bike and Erer. However, observation made during environmental and social assessment within the influence area of the expressway, particularly, in Kebeles of Gota, Biyo Kululu, Erer, GaraSole, Gode, etc.., indicated that trees and perennial crops that would be affected by the expressway are observed.

- **Recommended Mitigation Measures**

Even though the type and number of trees, tree crops and fruits would be affected by the expressway could not be identified by their types and size for compensation estimation, it is clear that these trees, tree crops and other horticultural crops would be affected by the expressway road project and compensation payment are required to be effective.

7.3.4. Impacts on Public Utilities

- **Potential Impacts**

Public utilities, though not many, will be affected due to the construction of the project road include overhead telecommunication and electricity poles and cables and irrigation crossings on the existing road.

The measurements taken to consider compensation of utility lines covers those services visualized during the survey of the RoW. However, it is expected that there may be many more underground lines and distribution lines which could only be identified by the concerned service authorities and offices.

- **Recommended Mitigation Measures**

The environmental and social assessment team made adequate observation on public utilities such as High Electric Power Tensions and concrete electric poles that are stretched within the influence area of the expressway when visited the areas. However, data collected using Satellite Imagery could not identify the number of High Electric Power Tensions and concrete electric poles that would be affected due to the expressway.

As indicated above, survey on residences houses, grazing areas, farmland, forest, trees, horticulture crops, other properties and public utilities would be affected by the expressway is being collected by Net Consult P.L.C. ,surveyors and as soon as the survey is completed updated environmental and social impact assessment and preparation of mitigation measures would be carefully planned and implemented.

7.3.5. Impact on Underserved Local Communities

- **Potential Impacts**

The terms “Underserved Local Communities” are social groups with a social and cultural identity distinct from the dominant society that makes them vulnerable to being disadvantaged in the development process. It is referred as "indigenous peoples" by the World Bank. (The definition & term used to refer Underserved Local Communities or the approach they are affected by development projects is a controversial issue).

Given that Underserved Local Communities are often poor and does not privilege similar advantages they are prone to changes in their social environment. They are affected by the economic, social and cultural changes, and become more prone to social impacts.

- **Recommended Mitigation Measures**

Mitigation and development benefit mechanism shall be inclusive of the Underserved Local Communities. These measures need to be observed in order to reduce impact to these people:

- Promote effective project design and construction, to build local project support or ownership, and to reduce the risk of project-related delays or controversies;
- Identify impacts including mitigation of Underserved Local Communities;
- Carry out consultation to Underserved Local Communities;
- Minimize cultural impacts with opportunities for culturally appropriate and sustainable development benefits;
- The determination, delivery, and distribution of compensation and shared benefits to affected Underserved Communities shall take account of the institutions, rules and customs; Various factors including the project context and the vulnerability of affected Underserved Local Communities shall determine how they are affected.

Reference:

Detail assessment of project area underserved communities and plan for social development is presented on Social assessment and Social Development Plan document.

7.3.6. Impact on Culture

- **Potential Impacts**

The underserved communities in the locality of project corridor have their own fashion of social structure, marriage, religious and cultural norms, social conflict resolution and support mechanisms. Introduction of the new infrastructure and number of workforce to the local community would pose the risk to culture dilution or cultural conflict. These would include conflicting norms, religious practices, harmful practices, practices of GVB and introduction of drug uses.

- **Recommended Mitigation Measures**

- Understand and arrange contractual commitments to respect social factors for temporary employees.
- Workers should be briefed on behavioural issues as relates to local cultural and attitudes and made aware of conducts and respects to be accorded to the community's social life;
- Locate camps away from sensitive sites like villages and town centres;
- Contractor shall aware his work force to not involve in any sexual and drug abuse;

- If the worker committed sexual abuse and escaped from the area, the contractor has to be responsible to bring him to the court; and
- The contractor may appeal local authorities to shut any shop involved in drug abuse in construction area and around camp sites.

7.3.7. Impacts on Women and Vulnerable Groups

Potential Impacts

The adverse social impacts that will be created due to the construction of the project road shall affect women more than men. Among the social impacts, resettlement/relocation of PAPs may lead to the breakdown of social networks and this has direct impact on women more than men. Women rely and depend on community and social networks for their emotional, family and practical supports. Most of the women's business is also home-based and relocation could mostly affect Women's earning than Men's.

In road construction works, women always do not receive equal employment opportunities; and the contractors, in most cases, tend to employ men rather than women, and female workers do not obtain particular attention due to their biological and physical condition. Hence, the discrimination against women will negatively affect those women who want to work in the road construction work.

The negative impacts of the project Road Construction on women include;

- Increased risk of exposure to sexually transmitted diseases and unwanted pregnancies;
- Price increase of consumer goods due to the coming of large number work force to the area in particular will make FHH vulnerable to economic crisis;
- Most construction companies prefer to employ only men, and this will lead to unequal treatment of women during employment of the construction work force;
- Sexual harassment and labour exploitation against women.

Recommended Mitigation Measures

Provide equal employment opportunity for women and men. Since the different social impacts are reflected more on women than men, there is a need for women to be consulted concerning the construction of the project road and also regarding the proposed mitigation measures for the negative impacts.

Local authorities have to ensure that women receive equal treatment in the compensation payment and in relocation / rehabilitation measures like that of their male counterparts.

In the project road, compensation payments and other related measures made for PAPs shall be done equally for women and men; and it shall also take into consideration the interest of women.

- Building and rebuilding of residential houses,
- Transferring and transporting of household items and materials to the newly constructed residential houses or businesses,
- Provision of appropriate and adequate toilet and sanitation facilities,
- In situations of involuntary dislocation, provision of free and compulsory education should be one of the first amenities to be developed, along with housing and sanitation,
- Female staff should be assigned by the concerned Woreda Administration to work with and assist women in all aspects of resettlement activities, including implementation of income restoration programs. Involve women's groups in resettlement management and operations, job creation, and income generation. Consideration of gender issues is crucial in the implementation of resettlement and rehabilitation programs,
- Special needs and requirements of women must be considered and addressed in all program aspects—site selection, site and housing design, provision of civic infrastructure, access to service, provision of land and housing title, payment of compensation, and income restoration,
- Ensure that the process of land acquisition and resettlement does not disadvantage women;
- Ensuring that land titles and compensation entitlements are issued in the name of both spouses;
- Reducing women's workloads by providing, for example, standpipes, hand pumps, grinding mills, woodlots, fuel efficient stoves, ox carts, and plows;
- Improving health services by providing training for village midwives, primary health care centres, child spacing/family planning counselling, clean water supply, and sanitation training;
- Improving family services by providing immunizations, child care for wage earning women, primary schools, inputs for food-crop production, and housing; and increasing incomes by setting up credit groups, skills training, and access to markets;
- Improving educational opportunities (providing literacy and numeracy training, promoting girls' education);
- Improving access to productive assets (credit, legal reform);
- Improving participation in decision making (support for women's interest groups); and
- Promoting equal opportunity for women's employment.

Moreover, vulnerable households who live in their own houses and affected due to the upgrading of the project road shall be given assistance and support by Woreda and kebele administrations. PAPs who may be HIV/AIDS positive and Persons Living with HIV/AIDS (PLWHA), disabled persons and elderly if relocated will be provided with special support and care because of the nature of their illness, age, mental or physical weaknesses they may be facing. World Bank policy requires restoration of the economic and social base, and assistance

to vulnerable groups to improve their status. The challenge for the very poor may be to identify sustainable living and income-generating options that are acceptable and workable for them.

7.3.8. Risks of GBV

- **Potential Impacts**

With the lower level of gender awareness, the cultural trends with lower rights of women and records of many GBV cases in the project area, the introduction of the development activity is anticipated to put more pressure on women and increase number of gender based issues.

Large influx of workers may increase the demand for sex work as women and adolescent girls may consider construction workers as a means of livelihood. The project will also bring many new people to the locality and creates lots of gender based relations and concerns. Abusive behaviour can as well occur among local communities or among workers around the project site.

- **Recommended Mitigation Measures**

Risks of GBV are recommended to be battled with these measures:

- Conduct awareness raising trainings on gender and GBV or SEA to construction workers, and raise awareness of workers about national laws on sexual harassment and gender based violence (GBV)
- Provide psychosocial medical and legal services including protection for survivors of GBV/SEA through referrals with service providers;
- Develop GBV action plan with accountability and response framework with relevant stakeholders;
- Provide Gender sensitive camp facilities to project staff (Separate showers, toilets at reasonable distance), not dark;
- Introduce a worker code of conduct as part of employment contract including sanction measures for non-compliance;
- Collaborate with relevant stakeholders in the project area in prevention and mitigation of GBV;
- Create internal and external grievance management system to address all forms of GBV with the principles of confidentiality, non- judgmental and effective referral to services;
- Work closely with media to disseminate GBV prevention and mitigation information to public at large.

7.3.9. Impacts due to Influx of Labour

- **Potential Impacts**

The influx of workers due to the availability of job opportunity created may lead to a number of adverse social and environmental impacts on local communities.

The exact number of project workers which will be engaged in relation to the project is, currently unknown. It is roughly estimated that the total number of workers for the construction of the express way would be roughly 3300workers in its peak seasons. The project is also expected to give priority to employ local people (community workers and workers who will join the project from different parts of Ethiopia). Llocal workers to be about 90% of the total construction workers. This will contribute to create job opportunities in the project area. The project is also expected to hire highly qualified expats and this will be about 5% of the total construction workers. It is expected that this will help to transfer new technologies, skills and knowledge the construction industry in Ethiopia. Out of the total construction workers, it is estimated that the project will create job for 300 skilled, 200 semi-skilled and 600 unskilled workers.

- **Recommended Mitigation Measures**

The following measures are recommended:

- Awareness creation and educational programs to be organized for workers on their responsibilities and rights.
- Workers need to be employed and managed following national regulations, and need to be monitored for implementation during construction by consultant / client.

7.3.10. Impacts from Labour Employment

- **Potential Impacts**

It is believed that work force in any organization is the most valuable asset. It is assessed that key labor risks would be associated with health and safety risks related to the construction activities. Risks of labour also involve traffic accidents, underage employment, forced labor, HIV/AIDS and COVID 19 and other viral disease, conflict between among project staff or against local community, inadequate payments, gender based violence and unlawful penalties or termination of employments.

Recommended Mitigation Measures

To mitigate labour related risks the following measures are highly recommended.

- Employment and termination of employment contracts shall oblige to the national law (Legislation No. 1156-2019);
- Based on the legislation the contractor shall develop its own project specific code of conduct to be followed during construction of the expressway project;
- Ensure proper payment and lawful leaves;
- Prohibit employment of underage (persons under the age of 18);
- Workers shall be provided with employment agreement and code of conducts;
- Workers shall be briefed on induction up on employment about their rights, obligations and project code of conducts;
- The contractor shall ban of discrimination of any kind, GBV, harassments, ov and follow up appropriate conducts;
- Treat women equally in employment and payment but limit assignment of women in heavy duty operations;
- Contractor shall ensure provision of financial resources and support compliance to occupation health and safety requirements for all workers, & ensure that workers dress appropriately;
- Ensure provision of financial resources and trainings to prevent spread of HIV and AIDS;
- Contractor should ensure equitable access to limited natural sources (e.g. water points) to avoid conflicts with local communities;
- Where possible, the contractor should ensure employment of local work forces especially where unskilled labor is required to mitigate social risks.

Reference:

Assessment of Labour Risks and specific management plan is presented in the Labour Procedure document.

7.3.11. Pressure on Local Health Facilities

Potential Impacts

This may include limiting rural livelihood options or generating new economic opportunities, and increasing access to infrastructure or putting stress on existing services. As a result, the impact of the project on well-being and poverty is complex, and relatively little is known about how communities perceive these changes.

The health facilities which are located in the Woredas along project road lack the required number of medical staff, equipment, drug and related services. This being the picture about the local health facilities, the presence of additional population in the area, i.e., the construction workers, will put pressure on local health facilities. Such type of pressure could reduce the effectiveness of the health services as far as the local populations are concerned.

- **Recommended Mitigation Measures**

The contractor to establish his own well equipped clinic and provide health service to the construction workforce.

- Make Ambulance services available for the construction workforce.
- The contractor's clinic needs to work closely with local Government health facilities.

7.3.12. Impact on Community Access & Safety

7.3.12.1. Limitation of Community Access

- **Potential Impacts**

Pedestrians' animals and none motorized access are at greatest risk of serious injury from collisions with high speed vehicles on the expressway. Children are generally the most vulnerable due to lack of experience and knowledge of traffic related hazards, their behaviour while at play, and their small size making them less visible to motorists. Being the road passes through rural setting where high cattle movement intended to cross the expressway from one side to the other side of the road to their grazing lands.

Furthermore, being the proposed road is express way, it will be fenced to avoid traffic accidents, this further create defragmentation of wildlife in area, disrupts working conditions of the farmers, interrupts social cohesion as it bisects the community into two.

- **Recommended Mitigation Measures**

Temporary Crossings & Walkways

- Temporary pedestrian / animal crossings need to be located in demanded places;
- Crossings need to have enough width and clearly delineated;
- Provide safe sidewalk to community and animals in settlement areas in working areas;
- Provide adequate access roads and stairs to residents while working in town areas;
- Provision of safe corridors along the road alignment and construction areas, for pedestrians and animals during construction;
- Installation of barriers (e.g. fencing, plantings) to deter pedestrian access to the roadway except at designated crossing points;

- Installation and maintenance of speed control and traffic calming devices at pedestrian crossing areas;
- Installation and maintenance of all signs, signals, markings, and other devices used to regulate traffic, specifically those related to pedestrian facilities or bikeways;

Permanent Pedestrian and Animal Crossings

The study has identified 55 Pedestrian & Animal crossings. Provided minimum vertical clearance (free board) is 5.3 m.

Hence,

- Construction of the expressway shall comply with recommended standard and enough crossings to pedestrian and animals;
- Type of pedestrian crossing either overpass or underpass can be decided on site depend on site condition;
- Carry out public consultations in specific types and locations of crossings construction,
- Consultations shall also identify if there are additional demands on the numbers, types and proximity from the community for consideration and respond as appropriate during the implementation.
- Based on recent experiences of expressway constructions, due to this limitation in access to crossings, communities would be forwarding grievances or there will be demand of too many crossings. The project area communities, for Meisso _ Dire Dawa Expressway project, practice dominantly pastoral lifestyles, and hence this issue will be more evident. Consequently, to lower these grievances and allow more access, consideration of access route to the crossings in either sides of the roads is recommended. A narrow of about 3 m route could be cleared adjacent to the road side in the exterior of the fences, based on consultations and consent up on implementation.

7.3.12.2. Risks of Emergency and Community Safety

Potential Impacts

Community safety issues during the construction & operation of roads are expected to be concerns,

Pedestrians' animals and none motorized access are at greatest risk of serious injury from collisions with high speed vehicles on the expressway. Children are generally the most vulnerable due to lack of experience and knowledge of traffic related hazards, their behaviour while at play, and their small size making them less visible to motorists. Dust formation could lower visibility to increase risks of accidents too. Local people could be victims of other forms of emergencies as fire and other catastrophe that could be caused due to the construction activities.

Construction activities related to heavy duty machineries and heavy duty activities, excavation of pits on the road alignment and ancillary sites have high risks as well.

During the operation of the road, the expressway will be fenced from both sides of the road limiting crossing over the road. Pedestrian and animal are to be provided with efficient crossings. Hence, the isolation of pedestrian and traffic is going to make accidents at lower level of risks. Yet, there would be unlawful trespassing over fences and also higher traffic attracted to the towns and along the link roads to create some levels of risks.

- **Recommended Mitigation Measures**

In order to maintain safety in the project area and minimise risks of safety, fire hazards and emergency the following measures are recommended:

I. Emergency Response	
Planning	• Contractor to prepare specific emergency response plan based on the ESIA and the CCH&SMP; • Response plans associated with their tasks; • Informing the public and emergency response agencies; • Documenting first aid and emergency medical treatment; • Taking emergency response actions; • plan should include procedures for using, inspecting, testing, and maintaining emergency response equipment; • Reviewing and updating the emergency response plan to reflect changes and ensuring that the employees are informed of such changes.
Assembly Area	• Assemble and clearly list the relevant emergency telephone contact numbers for staff and brief staff on the required procedures; • Assign emergency assembly areas in camps, accommodation, workshops, offices and other facilities; • In temporary work places assign temporary emergency assembly areas like the supervisor's vehicle and ensure awareness on communication procedures;
Training and Records	• Provide education to personnel of the project about safety procedures and emergency; • Register injuries, emergencies and their causes as they happen and also inform to client, engineer and woreda.
II. Fire Hazard Management	
	• The company should consider the described lower level of local fire fighting capacity and whether equipment is available for use at the facility in the event of a major emergency or natural disaster; • If insufficient capacity is available, fire fighting capacity should be acquired that may include pumps, water supplies, trucks, and training for personnel; • Identify areas vulnerable to fire hazards; • Fire prevention and fire-fighting equipment preparation; • Ready sand and fire extinguisher near fuel stations; • Post safety procedures on how to use fire-fighting equipments and protocols especially in fire prone areas; • Aware staff on fire exit drills; • Safe storage of fuel and other flammable objects.

III. Management of Vehicular and Pedestrian Traffic

- The contractor shall prepare and Implement Traffic Management Plan (TTMP);
- Ensure providing of diversion roads and maintenance that can accommodate vehicle volumes;
- The diversion roads will be regularly wetted down three times a day to minimize dust generation;
- Directional signage shall be installed in construction sites, to direct and guide vehicular and pedestrian traffic in construction sites and on the surrounding road network;
- Traffic controllers and physical barriers to be installed to manage local traffic, pedestrians and other road users;
- Sign installation on approaches to the construction site to complement the project information signs;
- Traffic speed needs to be limited on approaches to active construction sites; The speed limit on the Site and access roads shall be 10km/h for construction vehicles and 20km/h for light vehicles;
- Assign flagmen in areas with visibility problems or other necessary locations;
- Flagman shall be provided with red and green flags and must wear retro-reflective vest;
- Sign installation shall be well managed to synchronize with work activities and needs to be regularly monitored and maintained;

Road Sides Fencing

- Welded wire mesh fence to be installed on both sides of the road length as per the requirement of the design;
- The fence shall be placed to control entry or crossing of the roadways by vehicles, pedestrians or animals, maintaining safe permeable zone for traffic;
- Public needs to be well aware of not crossing side fences and strictly use provided crossings.

Public Engagement & Notification

The CCH&SMP intended to be applied during the construction phase shall be in consultation with members of the local community, the local authority, local health institutions, and relevant SHs;

The public shall be notified of the works, health risks and traffic management arrangements via: community meetings. General information regarding the Project road will be provided to parties affected by the work and regular communication will be organized in liaison with established community groups to ensure effective and regular communication is maintained throughout the development period regarding programming and construction activities.

Communication could be carried out with alarm systems, supplying telephone call lists, speakers at selected sites, information sharing on details of emergencies and protection measures.

Medias and agencies shall have efficient communication and shall be used for the project appropriately. It is recommended to train and assign local spokesperson to handle such communications via the media, government, and other agencies. press releases with relevant information could as well be ensured to release related emergency and health information.

With the aim of efficient communication it is recommended to us alarm bells, visual signs with ensuring efficiency with regular (monthly) testing of alarm systems, and installing a back-up system for communications on-site with off-site resources.

Training and Updating
In order to have recommended practices maintained in project implementation Training programs and practice exercises will be good tools. With this a training plan shall be developed by the contractor to have training programmes addressing fire fighting, emergency contacts, emergency procedure, spill response, evacuation and strategy.

Reference:

Risk assessment and management plan specifically for community health and safety is presented in:

- ***Annex G – Community Health and Safety Risk Management Plan***

7.3.13. Impacts on Archaeological, Cultural or Historic Sites

Potential Impacts

As per the observations and study made to the project environment, there are no Archaeological, Cultural or Historic sites of importance that would be affected or expected to have negative environmental influence.

Yet, in the course of construction Archaeological, Cultural or Historic sites could be found. If no precaution is taken they are prone to be damaged. They could be impacted due to negligence to protect them or report them to designated authorities or they can be directly impacted / destroyed by the construction works.

Recommended Mitigation Measures

In time of encountering important findings such as valuable historical and archaeological sites:

- Locate culturally, & historically significant sites prior to construction.
- Work shall be halted and relevant authorities shall be notified, principally by the contractor immediately in the event of accidental discovery of archaeological remains or any other artefacts of national or international interest.
- Protect and avoid as far as possible culturally conserved sites
- Preserve any archaeological findings encountered up on excavation.

- Arrange orientation program and training of machine operators on work procedures, and discipline at physical and cultural heritage sites. They need also to be oriented on recognizing types and characteristic of such heritages and means to identify them while undertaking excavation operations. It is also essential that the operators trained on site management procedures to be followed, particularly if a PCR encountered is not movable.
- Liaison and make arrangements with the regional bureau of culture and tourism for the training and orientation of the workers and to cooperate by timely responding to reported findings.
- Report to the relevant bureau up on finding of unregistered heritages as soon as possible, before making any change to its location and feature.

7.4. Sensitive Receptors along the Project ROW

Sensitive Receptors along the expressway project are identified. Accordingly, major receptors with respective impacts are Tree and Shrub Vegetations, Water Resources, Farm and Grazing Areas, Local Pastorals, Underserved Communities and Vulnerable Groups. Further the next table summarises the sensitive receptors and related impacts.

Table 7.4-1: Summary of Project Sensitive Receptors

Sensitive Receptor	Impact	Remark
Trees and Shrubs	- Removal of Vegetation	*Mainly From KM 88 to 121, From KM 125 to 150 and From KM 154 to 183*
Wildlife	- Loss of Habitat - Limitation of Access	*Minimal*
Water Resources	- Decrease in - Amount - Contamination - Change in Flow	*Majorly Crossed Streams*
Soil Resources	- Contamination - Erosion	*Majorly Ancillary Sites*
Farm Lands & Grazing Areas	- Change of Land Use - Land Take	*From KM 65 to KM 68, From KM 82 to KM90, From KM 148 to 156 and From 183 to 186*
Pastorals and Farmers	- Loss of Land - Impact on Livelihood	
Local Community and Local Underserved Community	- Limitation of Access - Health Risks (inc. HIV/AIDS, COVID-19, Waterborne Diseases, etc...) - Emergencies - Safety Risks	
Vulnerable People	- Impact on Livelihood	
People & Government	- Impact on Public Utilities	*Mainly in the outskirts of Meisso, Mullu, Afdem, Erer, Bike, Gota, Hurso and Melka Jebdu*
Workers	- Safety Risks - Accidents	

	- Health Risks (inc. HIV/AIDS, COVID-19, Diseases, etc...) - Emergencies	
Passengers	- Safety Risks - Accidents	

7.5. Evaluation of Environmental Risks

On the basis of impact evaluation method in the Methodology section of the Report, the possible (beneficial and adverse) impacts resulting from the project under consideration are summarized in this section.

During evaluation of impact occurrence and scale, mitigation implementation was put in to consideration. Mitigation measures were divided in to three scenarios, on efficiency of implementation.

Table 7.5-1: Scenarios for Consideration of Mitigation Implementations Levels

Consideration	**Mitigation Scenarios**		
	Scenario A	**Scenario B**	**Scenario C**
Efficiency of Implementation	No or Poor Mitigation Implementation	Average Mitigation Implementation	Efficient Mitigation Implementation
	(Considering there is no or poor scale of implementation is put in place)	*(Considering mitigation measures are put in place but medium efficiency / level of implementation)*	*(Considering mitigation measures are put in place with full efficiency of implementation)*

7.5. Evaluation of Project Impacts

In terms of evaluating project and cumulative impacts, severity of the impact and extent of the impact were in consideration taking from low to high scale of anticipated impact, as presented in the table below.

Impacts are scaled as follows:

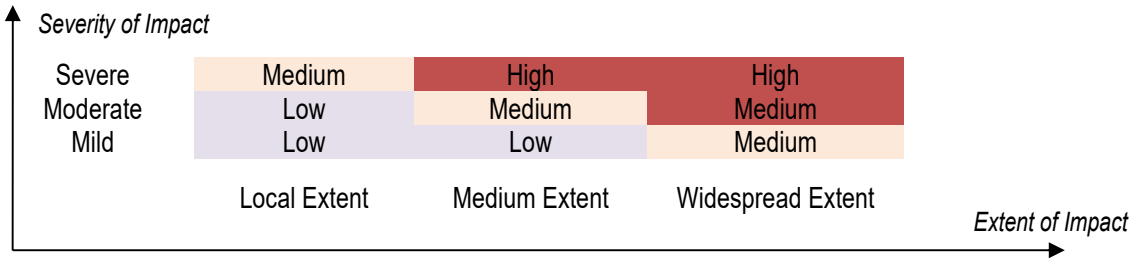


Figure 7.5-1: Evaluation of Project Adverse Impacts

The following table presents evaluation matrix for anticipated project impacts.

Table 7.5-1: Evaluation of Project Impacts

Impacts	***Type***		***Effect***		***Geo. Extent***		***Duration***		***Period***		***Mitigation Consideration***			***Reversibility***	
	Beneficial	***Adverse***	***Direct***	***Indirect***	***Local***	***Widespread***	***Short***	***Long***	***Construction***	***Operation***	***Pre-Mitigation***	***Post-Mitigation***	***Outcome***	***Reversible***	***Irreversible***
Beneficial Impacts															
❖ Increased Mobility and Reduced VOC	X		X		X	X		X		X	H	H	SLB		
❖ Induced Economic Development	X			X	X	X		X		X	H	E	BSH		
❖ Creation of Better Income and Poverty Reduction	X			X	X			X		X	M	H	BSH		
❖ Improved Social Services	X			X	X			X		X	M	H	BSH		
❖ Facilitate Humanitarian Aid	X			X	X			X		X	M	M	BMH		
❖ Transport and Gender	X	X		X	X			X	X	X	M	H	BSH	X	
❖ Improved Traffic Safety	X	X	X		X			X	X	X	H	H	SLB	X	
❖ Enhanced Import / Export and Customs Control	X			X		X		X		X	E	E	SLB		
❖ Employment Opportunity	X		X		X		X		X		M	H	BSH		
Potential Environmental Risks															
Impacts on Physical Environment															
• Impact on Water Resources															
○ Resource		X	X	X	X	X	X	X	X	X	M	L	RHR		X
○ Pollution		X				X	X	X	X	X	M	L	RHR	X	
• Impact on Soil Resource															
○ Erosion		X	X	X	X			X	X	X	M	L	RHR		X
○ Contamination		X	X		X		X		X	X	M	M	RMR	X	

• Alteration to Physical Environment, Land Uses and Landscapes	X	X	X		X			X	X		M	L	RHR		X
Impacts on Biological Environment															
○ Impact on Vegetation / Biodiversity		X	X	X	X			X	X		H	M	RHR		X
○ Impact on Fauna		X	X	X	X			X	X	X	L	L	SLR		X
Air Pollution															
○ Emissions		X		X		X		X	X	X	C	M	RMR		X
○ Dust Formation	X	X	X		X		X		X		M	L	RHR	X	
Impact from Noise and Vibration		X	X		X			X	X	X	M	L	RHR	X	
Waste Generation		X	X		X			X	X	X	H	L	RHR	X	
Impact from Pesticides Use		X	X		X		X		X		M	L	RHR	X	
Impacts from Ancillary Sites	X	X	X	X	X			X	X		C	M	RHR	X	X
Impact on Energy and Raw Material Resources		X		X	X		X		X		M	L	RHR	X	
Impact Related to Natural Hazards and Community Health															
• Drought Risks		X		X		X		X	X	X	H	M	RHR	X	X
• Flood Risks		X		X		X		X	X	X	H	M	RHR	X	X
• Spread Diseases		X		X		X		X	X	X	H	M	RHR	X	X
• COVID-19 Epidemic		X		X		X		X	X	X	H	M	RHR	X	X
• Spread of Malaria		X		X		X		X	X	X	H	M	RHR	X	X
• Spread of HIV/AIDS and STDs		X		X		X		X	X	X	H	M	RHR	X	X
Occupational Health and Safety Risks		X	X		X		X		X		H	M	RHR	X	
Security Risks		X		X	X			X	X	X	H	M	RHR	X	
Impact on Socio Economic Environment															
Social Environment and Livelihood															
Impact on Properties and Resources															
• Impacts on Private and Large Scale Farmland		X	X		X			X	X		H	M	RHR	X	

• Impacts on Livelihood and Income	X	X	X		X			X	X		M	L	RHR	X	
• Impacts on Residence Houses		X	X		X			X	X		M	L	RHR	X	
• Impacts on Grazing Land		X	X		X			X	X		M	L	RHR	X	
• Impacts on Public Utilities		X	X		X			X	X		H	M	RHR	X	
Impact on Underserved Local Communities	X	X		X	X			X	X	X	M	L	RHR	X	X
Impact on Culture		X		X	X			X	X	X	M	L	RHR	X	X
Impact on Women and Vulnerable Groups		X		X	X			X	X	X	M	L	RHR	X	
GBV Risks		X		X	X			X	X	X	H	M	RHR	X	X
Impacts on Labour															
• Labour Influx	X	X		X	X		X		X		L	L	SLR	X	
• Labour Employment	X	X	X		X		X		X		M	L	RHR	X	
Pressure on Local Health Facilities		X		X	X		X		X		L	L	RMR	X	
Impact on Community Access & Safety															
• Access		X	X		X			X	X	X	C	M	RHR	X	
• Safety	X	X	X		X		X	X	X	X	H	M	RHR	X	
Impacts on Archaeological, Cultural or Historic Sites		X	X		X			X	X		N	N	SLR		X

Legend:

Level of Impact				**Mitigation / Enhancement Outcome**			
Beneficial		**Adverse**		**Beneficial Impacts**		**Adverse Impacts**	
N	None	**N**	None	**SLB**	Same Level of Benefit	**SLR**	Same Level of Risk
L	Low	**L**	Low	**BMH**	Benefit Moderately Higher	**RMR**	Risk Moderately Reduced
M	Moderate	**M**	Moderate	**BSH**	Benefit Significantly Higher	**RHR**	Risk Highly Reduced
H	High	**H**	High				
E	Eminent	**C**	Critical				

7.6. Assessment of Cumulative Impacts

7.6.1. Potential Cumulative Impacts

The construction of the expressway, as mentioned, will potentially have the anticipated impacts discussed above. Yet, the magnitude of the impacts is to ascend when considered in combination with other infrastructures and impacts. The area where crossed by the project is dominantly rural area with lower development activities, and in this regard, the main aspect to form cumulative impact is expected to be from the recent construction of the railway line. The railway was constructed aligned in close offset from the current project's alignment. Cumulative impacts are also considering future developmental activities.

i.) **Impact on Community Access:** The railway line has crosses over the community in the project area bisecting the communities on sides. Major impact in this aspect, yet, will be from the expressway, as the road on both sides is to be fenced, restricting access of people and animal across the alignment. As the communities in the area are defined as pastorals, this will have impact of access limitation to movements related to cattle production, to access grazing lands and water sources.

ii.) **Vegetation Loss:** Vegetation cover will be cleared along the route for the construction of the railway line and the expressway. Current project, as mentioned, will demand acacia wood forest area to be cleared. Comparatively, the railway line has very less width and vegetation clearance. However, the impact on vegetation loss will be cumulatively significant.

iii.) **Water Quality:** Water quality deterioration is expected to have cumulative impacts from current project and other similar activities.

iv.) **Erosion and Sedimentation:** From similar activities of the expressway, railway and other infrastructure constructions, activities as land clearing, earthworks and ancillary site activities are to cause more erosion prone areas and ultimately increase sedimentation to water resources.

v.) **Noise and Vibration:** similar impact is expected to be cumulatively grow in terms of noise and vibration from the construction and operational activities.

i.) **Land Use Alteration, Land Take and Tenure:** The railway line in combination to the expressway will similarly, change the land uses along the RoW of the route and ancillary sites. Areas being utilised for farming and grazing will be acquired, for most to be permanently altered, and few to be temporary change. The expressway from Meisso to Dire Dawa will take 1148.97 hectares of grazing land and 274.21 hectares of farmland from local pastorals and local farmers.

The major area is expected to be on the pastorals and farmers within the obstruction limit. Considering the overall farmland and grazing lands in each woreda, the gross land takes and impact on production will not be too grave. Yet, the communities in the alignment and shoulders will be highly impacted, where the influence area from the two projects in similar corridor. Impact on income and livelihood will similarly be in the community specifically in this corridor.

ii.) **Cultural and Social Impacts:** Social impacts on local underserved community lifestyle, culture, women and vulnerable groups will cumulatively be significant. The impacts in this regard will be intensified from the construction of the expressway.

iii.) **Community health & safety:** Community health and safety concerns are to be another cumulative aspect of impact. The railway line currently is in service stage, where it has many records of accidents on people and animals. Considering the expressway is fenced and the traffic control is observed, the safety risks during operation is lower but highly present in period of construction.

Health risks from waterborne diseases, malaria, HIV/AIDS and other communicable diseases is to be also intensified as the projects and related workforce is introduced to the area. The projects cumulatively will create suitable area for propagation of STDs and ponds causing the reproduction of malaria.

7.6.2. Evaluation of Cumulative Impacts

During evaluation of cumulative impacts three scenarios were taken with the current, other existing and future projects.

Table 7.6.2-1: Scenarios for Evaluation of CI

Scenario I	Scenario II	Scenario III
Expressway Project Under Assessment	***Other Existing Projects***	***Implementation of Future Projects***
- Meisso _ Dire Dawa Experssway Project	- Existing High Scale Farms in Erer and Bike woredas - Existing Gravel Road - Dire Dawa Industrial Park	- Future Lower Grade Roads - Extension of Farm Investments (In Meisso) Woreda - Potential Businesses to be Induced with the Expressway in the Linked Towns

The following table presents significance and scope of the anticipated cumulative impacts:

Table 7.6.2-2: Evaluation of Cumulative Impacts

Nature of Potential Impacts	CI Type	Scenario			Severity
		I	II	III	
Potential Environmental Risks					
Impact on Water Resources	AE	L	H	H	H
Impact on Soil Resource	AE	L	L	L	L
Alteration to Physical Environment, Land Uses and Landscapes	LA	M	M	H	M
Impact on Vegetation / Biodiversity	LA	M	M	H	H
Impact on Fauna	LA	L	L	L	L
Air Pollution	AE	L	M	M	M
Impact from Noise and Vibration	AE	L	M	M	M
Waste Generation	AE	L	M	M	M
Impact on Energy and Raw Material Resources	DIS	L	M	H	H
Impact Related to Natural Hazards and Community Health	SS	M	M	H	H
Occupational Health and Safety Risks	AE	L	M	M	M
Security Risks		M	M	H	M
Impact on Socio Economic Environment					
Impact on Properties and Resources	LA	M	M	M	M
Impact on Underserved Local Communities	AE	M	M	M	M
Impact on Culture	LA	M	M	M	M
Impact on Women and Vulnerable Groups	LA	M	M	M	M
GBV Risks	AE	M	M	H	M
Impacts on Labour	AE	M	M	H	M
Pressure on Local Health Facilities	DIS	L	L	M	M
Impact on Community Access & Safety	AE	L	M	H	H

Legend:

Level of Impact	**N**	**L**	**M**	**H**	**C**
	None	Low	Moderate	High	Critical
Type of CI	**LA**	**AE**	**DIS**	**SS**	
	Linear Additive	Amplifying or Exponential	Discontinuous	Structural Surprises	

Chapter 8. ENVIRONMENTAL MANAGEMENT & MONITORING PLAN (EMP)

8.1. General

The principal goal of this ESIA is to achieve an appropriate balance in the environmental protection of the project area, corridor along the proposed routes and its immediate surroundings. It is achieved through enhancement of Project benefits and avoidance or mitigation of potential adverse impacts associated with the Project. Towards this goal, an environmental management is recommended to be implemented for efficient performance.

In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels, which itself should be aimed at providing a high level of quality control, leading to a project which has been properly designed and constructed and functions efficiently throughout its life. Site specific construction related activities, construction labour issues, and resettlement and compensation management issues prior to implementation of an environmental management and monitoring plan. Some of these management issues are sectoral in nature, requiring outside participation of other Government authorities or the private sector.

8.2. Environmental Management

Environmental management plan specifies mitigation and monitoring actions with time frames, specific responsibilities assigned and follow-up actions defined. Major negative impacts and proposed mitigation measures have been out-lined in the above sections. Implementations of these measures have to be carried out at different stages of the road construction & operation phases.

Management will very largely be concerned with controlling impacts which may result from the actions of the Contractor, through enforcement of the construction contract clauses related to protection of the environment as a whole and of the components within it. In this respect, it is important to recognize that successful mitigation of construction impacts can only be achieved if the environmental protection measures, as set out in the construction contract, are properly enforced.

8.2.1. Pre-Construction Phase Management Plan

Engineering Design: Based on the recommendations/requirements presented in this ESIA the engineering design needs to consider the following aspects; minimize the disruption or relocation of large number of households by the road project; implement appropriate and cost effective mitigation measures as proposed in this ESIA but not limited to minimize the adverse environmental & social impacts;

Preparation of Tender Documents: To ensure the proper implementation of environmental and social avoidance/mitigation measures as well as all safety/health issues, sufficiently detailed, environmental and social articles and clauses have to be formulated and become an integral part of the works contract, thus providing a contractual basis for an effective

supervision and control of the proposed measures. Compliance monitoring of the environmental requirements will be based on itemized and specified qualitative and quantitative parameters.

The construction contract document should give due consideration and clearly specify measures to be taken in case of none compliance to environmental clauses and conditions as specified.

Implementation of RAP and Compensation for PAPs: During the construction phase, a prior notice, not less than three months is given to local authorities and Project Affected Persons if they are going to be relocated/ loose part of their assets.

Compensation is carried out according to the RAP for crops, trees, houses, and other affected properties located on permanently and temporarily dispossessed farm land. The responsible bodies shall include, Woreda Administration Offices, Environmental protection and land administration offices, agriculture offices and municipalities.

ERA's ROW agent will facilitate the compensation processes and assist the committee.

ERA's ROW Management Team shall be the responsible body to conduct the final valuation of compensation of all affected properties. The compensation committee to be established at woreda level will finalize/approve the relocation, compensation amount(s) to be paid for each PAP as presented in the RAP document.

Prior to contractor mobilization and the commencement of construction, environmental management will be concerned with the following principal groups of activities:

- Ensuring that all government and funding agency requirements and procedures relating to ESIA are complied with.
- Implementation of land and property acquisition procedures including the payment of compensation.
- Relocation & compensation for Utility services in the ROW, especially in urban centre s, to avoid service disruptions and complaints from user community.
- Preparation of monitoring action plan and get it approved by the engineer.
- Identification and approval for camps, garage sites and spoil soils disposal sites, etc.

As the project promoter, ERA will be responsible for submitting the EIS to the CEFCC for evaluation according to internal procedures.

8.2.2. Construction Phase Management Plan

Most of the project environmental management activities will be carried out during the construction phase, since this is when most impacts can be expected to arise. Management will very largely be concerned with controlling impacts which may result from the actions of the Contractor, through enforcement of the construction contract clauses related to protection of the environment as a whole and of the components within it. In this respect, it is important to recognize that successful mitigation of construction impacts can only be achieved if the environmental protection measures, as set out in the construction contract, are properly enforced.

Other Specific Management Plans

Overall primary responsibility for construction supervision and contract management, and, therefore, for environmental management during construction, will lie with the Engineer as defined in the construction contract. However, certain powers and authority relating to day-to-day supervision will be delegated by the Engineer to the Resident Engineer (RE). The RE will have executive responsibility for ensuring that all site environmental management and monitoring aspects are dealt with promptly and properly.

It is recommended that an Environmental Specialist (ES) be appointed as a member of the construction supervision team. The Environmental Specialist would be responsible for reviewing and commenting on environmental aspects of work plans prepared by the contractor during the mobilization period, as well as in developing site environmental management procedures etc. in collaboration with the RE. During the actual construction period, the ES would provide advice and assistance to the Engineer and the RE, as and when required, on all aspects of environmental management. He would also be responsible for periodic overviews of environmental monitoring during the construction period and would report directly to the Engineer.

The environmentalist assigned as a site supervision staff will be responsible for environmental management and monitoring, and their role in the management chain is crucial if effective impact control is to be achieved.

The RE will be responsible for establishing procedures and mechanisms for effective environmental management and monitoring and will ensure that these are fully incorporated in, and integrated with, the overall construction supervision and monitoring framework. This aspect will cover matters such as the development of checklists of key points which will be monitored on a routine basis during construction and reporting mechanisms for ensuring that appropriate remedial action is taken, should monitoring reveal that this is necessary.

Particular attention will be paid to establishing procedures whereby emergency action can be taken by the site environmentalist staff in the event of the contractor acting in a manner which may cause immediate and significant environmental damage, for example problems associated with interruptions to water supply, or contamination of land, groundwater or surface water through inappropriate handling of contaminating substances, cause forest fire or poachers in the sensitive forest and wildlife areas etc.

During the first year of construction, inputs from the environmentalists would be higher than during subsequent years (3 - Man Months in the first year and 2 man month/year in the following years is planned as per the TOR).

ESOHSMD of ERA is required to make periodic inspection of the performances and give advice on issues requiring rectifications as the construction progresses.

ESOHSMD staff or assigned sub consultant shall supervise all issues contained in the Environmental and Social management Plan;

- Implementation of mitigation measures for the negative impacts;
- Safety and health requirements;
- HIV/AIDS and STD control measures;
- Temporary land requirements and reinstatement
- Implementation of reinforcement measures for the positive impacts;
- Implementation of pre-operation requirements.

The contractor's obligations shall include the assignment of at least two of his senior staff as Environmental Officer and Safety/Health Officer, well experienced in their respective assignments, on issues to be monitored by the supervising engineer. Contractor's staffs are also recommended to attend training and briefing on the negative environmental & social impacts and on its mitigation and avoidance measures.

8.2.3. Post-construction Phase Management Plan

Following the commissioning of the project road, awareness and education activities should be provided on road safety and other negative social impacts. ERA's ESOHSMD, Local authorities, Police men, NGOs and the contractor shall be responsible for the introduction and implementation of the awareness and educational activities.

Continued enjoyment of the benefits arising from implementation of the project will only be achieved if effective routine and periodic pavement, earthworks and drainage system maintenance is carried out in a timely manner. Environmental management and monitoring in this respect will be the responsibility of the Operations Department of ERA, with implementation being carried out either by the department itself or by contractors. The Environmental and Social Management Team within ERA is expected to play an overall supervisory roll. The details of environmental management plan are described as in Table below.

On this basis, the tables below encompass the impacts predicted, proposed mitigation measures, responsible body for the mitigation measures and the estimated cost of mitigation measures (where applicable) as a result of project location, design, construction and operation.

Table 8.2.3-1: Schedule of Environmental Management and Responsibilities

No	Project Phase	Potential Environmental & Social Impacts	Proposed Mitigation Measures	Institutional Responsibility	Cost Estimates (ETB)
1	Design/ Pre-construction Phase	▪ Land Acquisition & Right -Of –Way clearance Public Utilities Displacement	- Carefully Consider & include environmental and social factors in the design; and - Include appropriate environmental clauses into the construction contract document	o Design consultant o ERA	*Part of the design cost, allowance for ROW Agent(included under RAP)*
		▪ Stimulation of new construction in the ROW to obtain fraudulent compensation.	- Prohibit new and additional construction within the ROW agreed up on as of the date considered to be final (cut of date) by the registration for RAP	o Local administration	*Normal administrative cost*
			- Inform the community about the project objectives, project related impacts and associated planned remedial measures - Compensation and resettlement programs shall be arranged and settled prior to commencing construction activity	o Compensation committee composing of; - ERA –ROW agent, Local administration, the affected group, Community representatives and NGOs active in the area.	*Daily allowances for compensation committee; and Compensation for property loss (as estimated and included under RAP report).*
		▪ Vegetation Clearance	- Re Vegetation in place of important vegetation - Try to avoid dense forest covered sites not to designate as material production, access road, camps etc. - Defined access road is used during design and study - Limit vehicle movement only on paved access roads, avoid activities causing forest fire and oil spills at sensitive habitat sites during surveying.	o Design consultant	*Re Vegetation in place of important vegetation 900,000* *Part of the design cost to minimise impact by work methodology*

2	**Construction**	▪ Consumption of Water	- Reducing demands on water resources, - Arrange for alternative water supply sources, - Directing abstractions towards lower sections of catchments and avoiding sensitive areas, - Reuse and Recycling, - Optimization and Control: with flow control, timing and monitoring, - Water use based on consultation to community and Woreda Bureaus.	o Contractor o ERA o Woreda, Env'l Bureau	*Part of the design cost to minimise impact by work methodology*
		▪ Soil and water contamination and soil compaction	- Timely cart away surplus spoil soil. - Maintain leaking equipment and vehicle parts, Avoid fuel & oil spillages while refilling, collect and properly treat used oil and - Clean Up of Hazardous Wastes at Sensitive are and Work Places like Shops - Exercise proper waste management and disposal practices at camps, garages and at work places. - Limit vehicle movement to road carriage width - Up on completion of works; rehabilitate compacted soil along access roads, detours and at material production sites by scarifying to loosen. - Controlled, planned and monitored techniques of bitumen prime application not to pollute area outside of target area and expose water and soil contamination;	o Contractor	*Part of the design cost to minimise impact by work methodology*
		▪ Change in landscape - Land slide and slop instability problem may encounter at ancillary sites, bridges construction and at material production sites. - Erosion hazards	- Avoid Slide susceptible sites for use as construction material extraction area. - Plant trees and grass cover graded and steep slops. - Rehabilitate excavated ground up on completion of works - Surplus excavated top soil shall be stored and used to rehabilitate degraded grounds - Provide adequate drain pipes to avoid excessive concentrated flow - Place drain outlets in such a way as to avoid cascade effect.	o Construction contractor o Supervising consultant o Bureau of agriculture and rural development o Bureau of environmental protection and land administration.	*1,900,000 for grassing of road side slops and embankments.* *Other major physical construction works for mitigation will be estimated and included in the BOQ by the engineering design.*

			- Line runoff receiving surfaces or ditches with stone ripraps or concrete - Re- habilitate and re- plant disfigured and excavated land for quarry and borrow pit,		
			- Prohibit up slop cultivation at susceptible areas and - Prohibit animal grazing at road shoulders	o Woreda agriculture and rural development department o Farmer community	*Normal administrative cost*
		▪ Slop instability and erosion impacts, ▪ Landscape Alteration, Erosion and Instability at Material Extraction Sites: Quarry, Borrow, Sub base, Masonry, etc..	- Slop shapes and steepness shall be designed in terraced, stepped or edge rounding fashion at cut and fill sites based on the soil type - Select alternative route that avoids unstable areas as far as possible. - Reinstate all auxiliary and material extraction sites utilised offset and adjacent to the road - Provide adequate drainage line to intercept flows and to protect from entering slide susceptible areas and to reduce risk. - Provide retaining structures at road cuts and fill areas (dry masonry, gabion etc…) - Include energy dissipaters, grassing of embankments etc. at drainage outlets - Design should consider facility to avoid flood damages to farmlands at downside of drainage discharges.	o Design consultant	*Reinstate all auxiliary and material extraction sites utilised offset and adjacent to the road* *15,500,000* *Part of the design cost*
		▪ GHG Emission	- Enhancement of energy efficiency, - Preference to use renewable forms of energy, - Burn waste and/or garbage in designated areas and away from settlement, - Follow recommended WHO standard of emission levels control.	o Contractor	*Part of the design cost to minimise impact by work methodology*
		▪ Dust Pollution	- Educe dust from machinery work and movement and vehichle movements in settlement areas, - Application of water and other dust control mechanism in crushing operations, - Restricting traffic speeds, - Cover soil and dust forming materials during transportation in settlement areas, - Drivers instruction on dust reduction and speed limits,	o Contractor	*Part of the design cost to minimise impact by work methodology*

		▪ Non-hazardous Wastes	- Review of new waste sources during planning, siting, and design activities, including during equipment modifications and process alterations, - Establishment of priorities based on a risk analysis, - Waste management and provision of waste handling facilities at garages, camp sites and at working places, - Waste Prevention with alternative raw materials, good operating practices and minimizing hazardous waste, - Overfill Protection, - Recycling and Reuse, - Control Measures with avoid loss to the environment, proper storage, treatment and transport, and periodic inspection, - Collecting Miscellaneous Wastes, - Collection of data and information.	o Contractor	*Establishing waste disposal sites & waste management 450,000 birr*
		▪ Hazardous Wastes	- oil and grease in combination with water at machinery and vehicle washing sites must be treated, - Establishing hazardous materials management, - Inspect potential impacts and risks, - Hazard Assessment, - Release Prevention and Control Planning, - Works involving hazardous wastes and oils need to be carried out in a paved surface,	o Contractor	*Cleaning Hazardous Wastes 450,000 birr*
		▪ Tree cutting, Vegetation removal, Poaching by construction workers.	- Re Vegetation in place of important vegetation on road shoulders avoid location of material sites, camps & workshops in dense forest sites, Consider possible design options to avoid and/or minimize damage to the forest resources - Limit vegetation removal to only areas required to the effective land required for project works, in case of widening; - No realignment is made in the dense forested section. - Route selection for access to material sites, and detour road route should try to avoid the dense vegetation covered areas - Prohibit project workers from encroachment and poaching forest and wildlife areas,	o Contractor o Supervisor consultant o ERA o Woreda environmental protection & land administration Core process.	*Tree planting as replacement for damaged ones.* *2,100,000 birr*

			- Arrange awareness creation program for machine operators and site supervisors on work discipline to be followed while working in densely forested sites, so as to take care of the natural forests, not to damage or fell trees beyond what is essentially required for the carriage way width of the main road. - Prohibit forest fire setting and supervise fire risks by construction crew to minimize vegetation and wildlife damage and kills. - Re-vegetation of uncovered and graded grounds, excavated and abandoned material sites as soon as site work ends - Planting at least 15-seedlings for every tree cut as a replacement to damaged forest resource.		
		▪ Spread of Invasive Alien Species	- Planning and getting approval for introduction of new species, - Risk assessment to determine the potential for invasive behaviour,	o Contractor o Supervisor consultant o ERA o Woreda environmental protection & agricultural bureau.	*Part of the design cost to minimise impact by work methodology*
		▪ Pollution from Pesticides	- Restrict use any pesticides or pesticide products or formulations unless such use is in compliance with the EHSGs, - Restrict use any pesticide products that contain active ingredients, - Manufactured, formulated, packaged, labelled, handled, stored, disposed, and applied pesticides to be according to relevant international standards, - Prepare a Pest Management Plan (PMP) at time of high use.	o Construction contractor o Supervising consultant o Bureau of agriculture and rural development o Agriculture Bureau of the Woreda o	*Construction works for mitigation will be estimated and included in the BOQ by the engineering design*
		▪ Noise and Vibration	- Control and abatement of excessive noise, light or vibration in sensitive areas, - Exercise special care to direct all stationary floodlights, - Carry out noise generating activities during conventional working hours, - Equipment producing high levels of noise should be screened, - Sites for plants such as rock crusher far from the	o Contractor	*Part of the design cost to minimise impact by work methodology*

			settlement and noise sensitive areas, - Minimize the use of explosives and promote a systematic blasting schedule, - Following IFC Noise Level Guidelines, - Wearing of ear protection plugs when necessary.		
		▪ Energy Efficiency	- Identification, and regular measurement and reporting, - Energy balance, - Avoid any use of wood for cooking or other household demands, - Conversion & Efficiency Improvements with reduction of loses and conservation efficiency, - Regular comparison and monitoring of energy flows.	o Contractor	*Part of the design cost to minimise impact by work methodology*
		▪ Consumption of Raw Resources	- Identification, and regular measurement, - Reduce demand system efficiency for energy, - Water conservation, - Plan demands of raw material and efficient usage.	o Contractor	*Included in Engineering cost estimates*
		▪ Communicable Diseases	- Providing Medical Services; - Incorporate contractual clauses for the contractor to avail health facility / clinic and professionals at construction camps; - Provide consultant for the works of HIV/AIDS prevention works; - Establish clinic facility along with necessary resources; - Provide first aid attendants; - Providing surveillance and active screening and treatment of workers; - Testing and training health workers; - Undertaking health awareness and education initiatives; - Conducting immunization programs;	o Contractor o ERA o Woreda, Env'l Bureau	*COVID-19 Control 1,500,000 birr*
		▪ Water Borne Diseases	- Implementation of integrated vector control programs; - Identifying areas and activities that will pose risks; - Monitoring communities during high-risk seasons; - Distributing appropriate education materials; - Collaborating with public health officials and local health institutions. - Ensure sanitary improvements and elimination of	o Contractor o ERA o Woreda, Env'l Bureau	

			breeding habitats close to human settlements; - Elimination of unusable impounded water; - Increase in water velocity in natural and artificial channels;		
		▪ Increase in HIV/AIDs pandemic & STD diseases prevalence	- Awareness creation and counselling, - availing of condom & protective facilities	o Contractor's health expert o Woreda health centres o NGOs in the area	*HIV/AIDs alleviation program implementation; Birr 1,500,000*
		▪ Malaria Spread	- Reinstating ancillary sites and avoid artificial pond formation, - Distribution of mosquito Nets and other malaria controlling items, - Application of insect repellent, - Inform / aware local communities in areas exposed to malaria spread.	o Local administration o Contractor o Consultant	*Malaria prevention programmes Birr 2,200,000*
		▪ Flooding	- Provision of adequate drainage structure. - Provide energy dissipaters at the discharge outlets. - Provide adequately extended drainage line away from farmlands. - Awareness creation and capacity building for downstream farm community.	o Traffic police o Local Administration	
		▪ Drought	- Spreading abstractions and arranging alternative water supplies & efficiency in use. - Integrate with woreda level livestock and agricultural bureaus. - Provide water harvesting based on need and convenience. - Assist farmers and pastorals in small scale irrigation farming and water harvesting. - Promote regional economic diversification.	o Local administration o Contractor	

		▪ Accidents due to; - Increased construction traffic (vehicle, machinery and non-motorized traffic) - Due to road blockage for construction works in progress and - interference with existing roads and animals and wild life migratory routes	- `Flag men /safety personnel assigned to guide traffic flow at critical locations - Traffic signs are provided as required. - Adequate detour road shall be provided not to interfere with normal traffic flow. - Adequate side roads and shoulders for pedestrian and pack animals, - Speed control and traffic management measures put in place including bumps to be constructed at critical locations - Provide animal crossing corridor and/or maintain existing corridor. - Awareness creation on traffic safety and rules	o Contractor o supervision consultant	*Avail PPE first aid kit 3,200,000 birr*
			- Traffic rules and discipline should be observed by all workers. - The employer should ensure that all operators and drivers are fully qualified and are able to handle the responsibility they are assigned to	o Traffic police o Contractor	*Administrative cost*
		▪ Workers' health problem due to communicable diseases (Water born diseases, respiratory diseases etc)	- Provide water for workers from protected sources or public water supply - Ensure sanitary conditions, proper waste disposal and waste management in camps and at work places. - Rehabilitate excavated grounds at quarry sites and borrow pits to avoid mosquito breeding. - Provide standard clinic; (adequately staffed with skilled professionals; and equipped with necessary medicines and instruments) at main camps.	o Contractor	*Included in Engineering cost estimates*
		▪ Impairment of non-motorized transport ▪ Traffic congestion ▪ Damage to vehicles using un paved detour ways ▪ Accidents and delays	- Provide wider road shoulders and separate lane for pedestrian and non-motorized transport - Provide paved and well-constructed detour road during road construction. - Maintain and apply dust suppression measures to minimize dust pollution and vehicle accidents caused due to distant visibility problem.	o Supervising Consultant o Contractor	*Part of engineering cost estimate*

		▪ Community Safety	- Inclusion of buffer strips or other methods of physical separation; - Application of building codes to ensure structures; - hazard analysis; - Reducing inventories of hazardous materials; - Modifying process or storage; - Improving shut-down and secondary containment; - Reducing off-site impacts;	o Contractor	*Part of engineering cost estimate*
		▪ Emergency	- Contractor to prepare specific emergency response plan based on the ESIA and the CCH&SMP; - Informing the public and emergency response agencies; - Taking emergency response actions; - Reviewing and updating the emergency response plan to reflect changes and ensuring that the employees are informed of such changes; - Ensure the availability of first-aid services for all site personnel; - Assign an emergency contact person and avail contact information; - Assemble and clearly list the relevant emergency telephone contact numbers for staff and brief staff on the required procedures; - Provide education to personnel; - Register injuries, emergencies.	o Contractor	*Part of engineering cost estimate*
		▪ Security	- Providing immediate emergency instruction to personnel; and - Notifying proper personnel of a security incident. - Preparation of the site security plan. - Fencing & Gates. - Exterior Lighting. - Security Guards & Law Enforcement Support. - Incident Response.	o Local / woreda administration o The contractor	*Part of engineering cost estimate*

		▪ Induced developments and cultural influences; ▪ Illegal settlements at camp site and at road sides during construction. ▪ Impacts from Camps	- Regulate illegal settlements - Workers should be briefed on behavioural issues as relates to local cultural assets and attitudes and made aware of conducts and respects to be accorded to the community's social life - Locate camps away from sensitive sites like villages - Arrange contractual commitments to respect social factors for temporary employees.	o Local / woreda administration o The contractor o The local administration	*Local administrative cost*
		▪ Loss of houses ▪ Loss of crops, trees, ▪ Loss of land due to immigrants in to the area ▪ Loss / disruption of other social service infrastructures	- Compensation to the affected group should be effected according to regional as well as federal rules and regulations; - Resettlement of displaced people and relocation of properties and utilities should be completed well in advance of commencing the construction - Resettlement plan should be prepared in consultation and with full participation of the affected group. - Immigrants' land requirement should be administered by the local authorities	o A committee composing of ; - ERA ROW Agent, - Local administration - Affected group (PAPs) - Utility owners - Agriculture bureau - NGOs in the area - Community representatives	*As per RAP cost estimates*
		▪ Underserved Local Communities	- build local project support or ownership. - Carry out consultation to Underserved Local Communities. - Minimize cultural impacts with opportunities for culturally appropriate and sustainable development benefits.	o Local / woreda administration o The contractor o ERA	*As per RAP cost estimates*
		▪ GBV	- Awareness raising trainings on gender and GBV or SEA. - Develop GBV action plan. - Provide Gender sensitive camp facilities to project staff. - Collaborate with relevant stakeholders and NGOs.	o Local / woreda administration o The contractor o	*Included in Training Costs*
		▪ Labour Employment	- Introduce a worker code of conduct. - Programs to be organized for workers on their responsibilities and rights. - Workers need to be employed and managed following national regulations. - Employment opportunities to local communities.	o Contractor o ERA o Local administration	*Included in Training Costs*

		▪ Increase in Price of consumable items ▪ Employment opportunity ▪ Increase in house hold income	- Arrange and ensure supply of basic consumable items by encouraging entrepreneurs in the area. - Periodically avail basic items to workers at camps against payment of fair prices. - Local work force shall be encouraged to benefit from the employment opportunities during construction. - Encourage workers to use locally available products to assist local economy.	o Local administration o Contractor o ERA	*Administrative cost*
		▪ Community Access and Safety	- Temporary pedestrian / animal crossings; - Crossings synchronised with changes of construction sites; - Attempt to maintain the local peoples' need and existing routes / corridors; - Traffic need to be provided with clear signs; - Local community need to be advised on following provided crossings and traffic controls; - Provide safe sidewalk to community and animals; - Provide adequate access roads; - Provision of safe corridors; - Installation of barriers; - Installation and maintenance of speed control and traffic calming devices; - Installation and maintenance of all signs; - Adhere to recommended railway crossing standards of; 8m minimum clearance measured from top of rail to the soffit of the bridge; - comply with recommended standard and enough crossings to pedestrian and animals; - Welded wire mesh fence to be installed on both sides; - Aware community of not crossing side fences and strictly use provided crossings.	o Contractor o ERA o Local administration	*Part of engineering cost estimate*
		▪ Degradation of Sacred places; religious places, , monuments and burial places, ▪ Archaeological sites, ▪ Spoil Materials and	- Protect and avoid as far as possible such sites as churches, mosques, during construction - Locate culturally, & historically significant sites prior to construction - Preserve any archaeological findings encountered up on excavation.	o Regional / zonal culture and tourism bureau. o Contractor o Supervising consultant o The community o ERA	*Expected to be Part of the Detailed RAP Study*

		Waste Disposal	- Arrange orientation program and training of machine operators on work procedures, and discipline at physical and cultural heritage sites. They need also to be oriented on recognizing types and characteristic of such heritages and means to identify them while undertaking excavation operations. It is also essential that the operators trained on site management procedures to be followed, particularly if a PCR encountered is not movable - Liaison and make arrangements with the regional bureau of culture and tourism for the training and orientation of the workers and to cooperate by timely responding to reported findings. - Report to the relevant bureau up on finding of unregistered heritages as soon as possible, before making any change to its location and feature.		

3	**Operation Phase**	▪ Soil erosion and soil contamination	- Maintain storm drains and ditches regularly - Grass cover slops and graded grounds, and protect livestock grazing at road shoulders and embankments	o Regional rural roads authority o ERA district offices	*Regular administrative cost*
		▪ Water sources and wetland/marshland ecosystem preservation	- Waste management practices should improve, road side littering especially in towns and villages should be regulated	o Municipalities o ERA	
			- Minimized vehicular accidents through implementation of traffic and transport regulations – which will be a major cause of oil leakage.	o Traffic police	*Normal administrative cost*
		▪ Flora and fauna degradation	- Prohibit illegal hunting by enforcing rules and regulations. - Prohibit and regulate illegal timber cutting and charcoal trade in the area. - Supervise closely the protection and conservation of forest areas and wild life habitats. - Minimize forest fire risks by creating awareness among the road users and the surrounding community. - Post warning signals at critical location	o Woreda environment office o Local administrative organs, o farmers' cooperatives o Agricultural bureau o Forestry & wildlife desks	*Administration*
		▪ Impairment of non-motorized transport ▪ Availability of public transport ▪ transport cost	- Encourage local mode of transport to sustain, especially for transport of goods to market places and short distance service centres like flour mills, by maintaining separate lane. - Enforcing traffic safety guide lines and posting traffic signs as required - Assign adequate number of transport vehicles both private and public transport. - Transport fees should be in accordance to the improved road standards	o Local transport desk	*Normal administrative cost*
		▪ Traffic accidents	- Road shoulders have to be kept wide enough especially in towns and villages as per the design for use by the pedestrian. - Maintain traffic posts and traffic signals	o District road maintenance team of ERA	*Administrative cost*
			- Organize awareness creation forum on traffic regulations and safety principles both to the community, drivers and to the investors in transport industry of the area.	o Traffic police	*Normal Administrative cost.*

8.3. Environmental Monitoring Plan

8.3.1. General Considerations

The monitoring program for the present project will be undertaken both as compliance to set and proposed measures to mitigate adverse impacts and/or enhance positive ones. It also attempts to check the effects of project implementation. In this regard, the monitoring will try to meet the following objectives:

- To check on whether the proposed mitigation and benefit enhancement measures have actually been adopted, and are proving effective outcomes in practice
- To provide a means whereby any impacts which were subject to uncertainty at the time of preparation of the ESIA, or which were unforeseen, can be identified, and to provide a basis for formulating appropriate additional impact control measures.
- To provide information on the actual nature and extent of key impacts and the effectiveness of mitigation and benefit enhancement measures which, through a feedback mechanism, can improve the planning and execution of future, similar projects.

Compliance monitoring is usually given more emphasis in the case of road projects than is effects monitoring. This is because most impact controls take the form of measures incorporated in project designs and contract documents, and the extent to which recommendations on these matters, as set out in the ESIA, are complied with, plays a major part in determining the overall environmental performance of the project.

8.3.2. Monitoring Mechanisms

The monitoring activities will be made both internally and by external supervising institutions and/ or other stakeholders.

Internal Monitoring

The internal monitoring process begins early at the pre – construction stage and proceeds throughout different phases of the project as detailed later. The internal monitoring will be conducted mainly by the contractor on duty, the consultant supervising the work, ERA-ESMT and the regional and or woreda environmental protection offices as required.

The consultant and the contractor will carry out day to day monitoring activities, in line with the ESIA requirements. The Environmental, Monitoring and Safety Team of ERA will accomplish periodical monitoring by – monthly or quarterly as the need may be. The Resident Engineer and the environmental specialist will prepare monthly progress reports which also highlight environmental performances of the project work and submit it to ERA. The Environmental reports will be transmitted through ERA to the Regional and Federal CEFCC, who are the overall supervising environmental institutions.

External Monitoring

An overall supervision and monitoring of the environmental conditions and performances of the project will be made by the Environmental Protection Authorities both at federal and regional level. The monitoring reports submitted by ERA will be assessed and evaluated by CEFCC and comments and recommendations given as required, enabling or rectifying mistreatment and malpractices in the project implementation processes. CEFCC experts can require arrangements for site visits and supervision of the environmental conditions whenever it is felt necessary.

The project financing institutions like the, Ministry of Finance and Economic Cooperation (MOFEC), World Bank, European Union, and ADF may also need to check the project performances against their ESIA-Guidelines and have the mandates and capacity to do so as it deems necessary.

The community and NGOs active in the project area and other road users should also be allowed to give their opinions and comments on the project performances as regards to the consequential environmental and health risks being experienced due to the activities and also on the efficiency of remedial and/or preventive measures being taken by the implementers. The comments given should be considered by the contractor and also the supervising consultant should seek means to address the issues raised and respond to the comments.

8.3.3. Project Monitoring Phases

Pre-construction Phase Monitoring

Monitoring during the pre-construction phase of the project will be concerned with two aspects:

- Checking that the project designs and specifications incorporate appropriate measures to minimize negative impacts and to enhance beneficial impacts
- Check that mitigation measures have been included in BOQ as payable items
- Checking that the appropriate environmental protection clauses have been included in the contract documents to allow control of actions by the contractor, which are potentially damaging to the environment.

These activities have been carried out as part of the preparation of designs and tender documents for the project and the monitoring at the pre-construction phase has to confirm this issues.

Construction Phase Monitoring

Environmental monitoring during the construction phase will comprise two principal groups of activities:

- Review of the Contractor's plans, method statements, temporary works designs, and arrangements relating to obtaining necessary approvals from the Engineer, so as to ensure that environmental protection measures specified in the contract documents

are adopted, and that the Contractor's proposals provide an acceptable level of impact control.

- Systematic observation on a day-to-day basis of all site activities and the Contractor's offsite facilities including quarry and borrow areas, as a check that the contract requirements relating to environmental matters are in fact being complied with, and that no impacts foreseen and unforeseen are occurring.

These activities will be fully integrated with other construction supervision and monitoring activities carried out by the construction supervision consultant. Primary responsibility for ensuring that an adequate level of environmental monitoring is carried out will lie with the RE, as part of his duties connected with general site supervision. Actual monitoring on a day-to-day basis will be carried out by the site staff /environmentalist from the construction supervision consultant, under the direction of the RE.

The majority of monitoring will comprise visual observations, carried out at the same time as the engineering monitoring activities. Site inspections will take place with emphasis on early identification of any environmental problems and the initiation of suitable remedial action. Where remedial actions have been required on the part of the Contractor, further checks will need to be made to ensure that these are actually being implemented to the agreed schedule and in the required form. Each part of the site where construction is taking place needs to be formally inspected from an environmental viewpoint on a regular basis.

Post-construction Phase Monitoring

Post-construction phase monitoring will be concerned with identification of the need for routine and periodic maintenance to pavement, earthworks, drains and drainage structures, together with checking that the maintenance works are being carried out properly and are not resulting in environmental damage. This aspect will be the responsibility of ERA Maintenance Department, the regional rural roads Authority, the regional environmental protection departments.

8.3.4. Local Capacity for the Monitoring Activities

There are adequate legal and institutional frameworks as discussed under policy, legal and administrative framework chapter, to enable the monitoring and control of environmental damages and degradation. Proclamation No. 94/1994 Proclamation on Conservation, Development and Utilization of Forests, and other relevant policy and legal frame works are applicable to monitor illegal deeds on forest resources including illegal logging and poaching into sensitive habitats. Pollution control proclamation, water resources development proclamation, public health proclamations etc. Are all applicable instruments to enforce for compliance.

The monitoring activity and responsibility is shared among several stakeholders including organized institutions, NGOs and the community at large. There are organized and mandated institutions like; the woreda and zonal environmental protection and land administration offices; the natural resources development and conservation bureau; the farmers' associations, the community at large should contribute towards monitoring and administration of the forest resources, water and soil degradation.

However, most of those institutions lack skilled personnel and facilities to carry out the monitoring activities to the required standard. Hence, capacity building in terms of assigning skilled manpower, transportation facilities to patrol or visit the sites and incentives for he employees some of the constraints shall be dealt with. So capacitating those frontline institutions is essential. Awareness creation to the community, short term training for experts and motivation is also required to win the attention of all those stakeholders.

Table 8.3.4-1: Environmental Monitoring Indicators and Schedule

Pre-construction Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Displacement of people and loss of properties.	Proper implementation of compensation for PAPs	Complaints from PAPs	Major settlement sites; towns and villages along the road route	Once before the start of construction work	ESOSMD, SMT and RoW of ERA, Woreda representatives	*Transport cost and per-diem for 2-experts from ESOHSMD and ROW agent and one expert from Woreda land administration & environment desk. Birr 150,000*
Plan for Mitigation and Management	ESMP Document Preparation					*Birr 400,000*
Not including environmental clauses & mitigation measures in contract doc.	Include proposed mitigation measures in contract document and in BOQ as payable item.	Check inclusion of same in contract document.	ERA Head office	Once during contract doc. evaluation	Construction contract procurement Directorate, ESOSMD, SMT of ERA	*Part of the Branch's normal duty*
Water quality deterioration	Conservation of water quality by abstaining from dumping spoils, wastes and pollutants, into it, during construction and site clearance, at facility sites etc.	Water quality test parameters like TDS, PH, BOD, Turbidity and color, oil, grease, fuel products.	Samples collected from Rivers, stream crossings along the road and downstream side of road alignment, water sources close to camps and garage sites	Periodically (3-times); before project commences, during the construction and upon completion of the construction activity.	Supervising environmentalist from the consultant side, Regional water bureau, regional Environmental department,	*Birr 200,000*

Pre-construction Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Community Health Risks	Protect quality of water resources, Proper management of wastes, Promote disease prevention programs.	Health Records from Local Health Facilities Water quality test parameters like TDS, PH, BOD, Turbidity and color, oil, grease, fuel products.	Samples collected from Rivers, stream crossings along the road and downstream side of road alignment, water sources close to camps and garage sites Health Data Record	Periodically (3-times); before project commences, during the construction and upon completion of the construction activity.	Supervising environmentalist from the consultant side, Regional water bureau, regional Environmental department,	*Birr 200,000*
Loss of plots of land	Reduce area of land clearance and disturbance as far as possible. Use existing access roads for detour where feasible. Rehabilitate and reclaim abandoned quarry & borrow pit sites and, machinery compacted soils. Or properly construct and fence around pits for use as water harvesting structure/	Area of land affected in hectares	In the ROW and access roads, camps and material production sites	Two times per year for the construction period	Consultant, ESOSMD, SMT of ERA, the respective Woreda Environmental desk	*For daily allowance and transport service for ESOHSMD staffs and woreda representative Included in EMP Supervision cost*

Pre-construction Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Inappropriate Spoil soil disposal, waste from camp sites	Dispose spoil soil at defined location selected in consultation with each Woreda Administration	Unauthorized disposal sites and volume of material deposited to the extent of affecting the natural landscape and sanitary conditions	Site where unauthorized disposal is observed	Two times per year during the construction period	ESOSMD, SMT -ERA and woreda environment departments	*Monitoring of this activity can be covered with in the above item (loss of land monitoring) without additional cost.*
Trends of public health situation and HIV/AIDs prevalence rate in the project influence areas	Awareness creation among the workers and community in the surrounding areas about communicable diseases particularly on HIV/AIDs pandemic. Maintain sanitary conditions in the camps Provide First aid kits and basic treatment facilities at all work sites. Provide standard clinic; (adequately staffed with skilled professionals and equipped with necessary medicines and instruments) at main camps.	Records of health institutions in the project area, complaints of health problems received from the workers, any epidemic reported during the construction period in the area	Throughout the project area and facilities	Three time per year during the construction period	Supervising environmentalist, ESOSMD, SMT of ERA and woredas health centres & inspector.	*Monitoring of this activity can be conducted in parallel with the above stated activities without additional cost*

Pre-construction Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Malaria Spread	Awareness creation among the workers and community in the surrounding areas about Malaria prevention mechanisms. Maintain site condition to eliminate ponds favouring the breed mosquitoes. Provide mosquito nets and other protective equipments. Application of insect controlling chemicals repellents.	Records of health institutions in the project area, complaints of health problems received from the workers, any epidemic reported during the construction period in the area	Malaria Prone areas and Accommodation Facilities	Twice per year during the construction period	Supervising environmentalist, ESOSMD, SMT of ERA and woredas health centres & inspector.	*Included in EMP Supervision cost*
Soil erosion and gulley formation	Provide water ways at upstream of the road construction alignment, especially at and following the contours. Provide catch dams in steep sloped ditches, and sides protected with lined stone ripraps and stone pitching sides.	Area of land exposed to erosion effects	Following the road alignment, Seasonal flood plains, drainage channels following the road side, Discharge side of cross drains and culverts.	Two times per year of construction period	Consultant, ESOSMD, SMT of ERA, the respective woredas Environmental desk	*Monitoring of this activity can be covered with in the above item (loss of land monitoring) without additional cost*

Pre-construction Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
	Provide adequate flow dispersal structures like culverts and open ditches as the case may be to avoid or minimize concentrated flow. Construct plat form of stone ripraps (appropriate size) at the discharge side of culverts to minimize scouring effects and gulley formation.					
	Grassing and re-planting of embankments slope sides, and road sides. Replace trees with adequate number of seedlings and water until they can survive and grow to a height of at least 1-meter.					

Pre-construction Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Forest clearance, Loss of road side indigenous trees and plantations	Avoid cutting of indigenous trees along the road as far as possible. Any such tree found outside of the carriage way should be protected and let it to remain undisturbed. Workers should be instructed to this effect Avoid excessive clearance of vegetation covered areas. Register any indigenous tree fallen and re-place as soon as excavation is over onsite, replacement should be 15 seedling for every tree fallen.	Number of trees fallen total, indigenous trees, number of seedlings planted and number that survived and grew	Along the project road and at material production sites, camp sites.	Two times per year	Contractor Supervisor consultant ERA Woreda environmental protection & land administration Core process.	Monitoring of this activity can be covered with in the above item (loss of land monitoring) without additional cost

Construction Completion/De-Commissioning Phase						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Disfigured landscape and loss of aesthetics **Compacted soil surfaces.** **Stagnant water and excavated grounds at quarries and borrow pit sites** **Spoils of Demolished buildings and structures left on site**	Re-instate affected land areas and aesthetically significant landforms to their original conditions as far as possible. Back fill excavated and disturbed lands and compact until consolidated. Loosen compacted soil and vegetation cover the surfaces Plant grass and trees to cover the cleared surfaces and water until the plants grow to reasonable height. OR properly construct the pits for use as water ponds/ to suite the design standard of water conserving structure and fence the surrounding to keep away animal and children. Demolish camp site structures or make arrangements for future uses as the case may be when decided.	Land areas not rehabilitated to reasonable degree, Open ditches and excavated grounds, spoil soil deposits not properly spread and compacted, Stagnant water at road sides and material production site not covered by vegetation and trees of original species.	All project affected sites, ROW, quarry and borrow material site, campsites, detour road and access road used for the project.	One time during the commissioning and handing over of the construction works.	ESOSMD, SMT of ERA, The construction supervisor environmentalist, the contractor and the woredas representatives	*Included in EMP Supervision cost*

Operation Phase Monitoring						
Major Adverse Impacts	**Proposed Mitigation Measures**	**Monitoring Indicators**	**Location/Project Component**	**Frequency**	**Responsibility**	**Cost Estimate**
Silt up and blockages of drainage structures, overflow of runoff water and damages at discharge side of culverts,	Drainage line silt deposits should be removed as required and based on the level of deposits in the piping or trenches. Any material that cause obstructions should be cleared of the premises as observed during inspection. Upland erosion of the sandy soils is protected.	Number of blocked drainages and frequency of overflows of runoff water. Pot holes and eroded road surfaces, Gulley at the discharge side of culverts,	Along the road route and ROW.	all time per year	ERA, DRMC	Part of routine maintenance cost.
wearing out of road surfaces, pot holes formed,	Maintain the damaged part as soon as possible to avoid extended damages	Stagnant water forming at road surfaces and road sides etc	Along the road route and ROW.	all time per year	ERA, DRMC	Part of routine maintenance cost.
Loss of traffic signals	Replace damaged signals as required, and add more at additional sites found to be accident prone	Number of damaged posts and signals	Along the road route and ROW.	all time per year	ERA, DRMC	Part of routine maintenance cost.
Visibility problems due to shrubs and road side weeds	Remove side road weeds as it grows to not to obstruct sight visibility	Sight visibility problems due to obstructions	Along the road route and ROW.	all time per year	ERA, DRMC	Part of routine maintenance cost.
Die of grass and shrubs along the road side	Avoid Oil spills and use of herbicides at the road side	Drying and wilting of vegetative covers	Along the road route and ROW.	all time per year	ERA, DRMC	Part of routine maintenance cost.

8.4. Total Environmental Cost

The cost estimated under this section is not exhaustive and considers only part of the costs required for mitigation of environmental consequences related to both biological and physical environmental impacts mitigation measures. The total environmental cost (excluding costs of those measures that are part and parcel of the road design and routine/regular monitoring activities) is estimated as shown in the table below.

Table 8.4-1 Estimated Total Environmental Cost

Sec.	Activity Category	Mitigation and Management Measures	Measure	Amount	Total cost
A.	**Site Restoration & Artificial Landscaping**	Restoration of material sites (quarry/borrow) through landscaping by filling, grading and top soiling	Engineering		
		Restoration of compacted land due to detour access road by deep tilling with tractor tor & machinery & restoring	Engineering		
		Grassing, and planting with tree suitable species, and watering, as appropriate to rehabilitate disturbed areas (material sites, camp etc)	M^2	951,564	**900,000**
		Sub-Total			**900,000**
B.	**Environmental Mitigation Enhancement Measures**	install physical erosion prevention measures such as terraced graded embankments, check dams, etc	Engineering Cost		
		sediment basin/silt tarp construction, in drains/stream downstream of new access road opening or material sites	Engineering Cost		
		Treatment tank construction for residual chemicals	Engineering Cost		
		Water harvesting ponds d/s of diverted roadside ditche flow	Engineering		
		Construction of underpass to avoid interference with existing link roads, community & livestock route, and also wildlife crossing especially ASLNP area	Engineering Cost		
		Cleaning Hazardous Wastes	LS		**450,000**
		Establishing waste disposal sites & waste management	LS		**450,000**
		Tree planting & management all along the roadside in both direction with suitable local species & Replanting for lost vegetation in selected degraded sites in the road micro catchment area	No		**2,100,000**
		Grassing of steep embankment sides expressway embankments , exposed excavated area, and tree planting on selected section	M^2	951,564	**1,900,000**

		Compensation to affected household property services & infrastructures	RAP Cost		
		Restoration of material sites (quarry/borrow) through landscaping by filling, grading and top soiling	M^2		**15,500,000**
		Sub-Total			**20,400,000**
C.	**Public & environmental health**	Malaria prevention and treatment	Ls		**2,200,000**
		HIV/AIDS program implementation	Ls		**1,500,000**
		COVID-19	Ls		**1,500,000**
		Traffic Management	Engineering Cost		
		Avail PPE first aid kit	Ls		**3,200,000**
		Sub-Total			**8,400,000**
D.	**Environmental training & capacity building**	Purchase of air quality measurement, support suitable seedling & watering materials to nurseries	Ls		**650,000**
		Training to relevant sector offices (weredas environment, health, water resource, agriculture bureaus)	Ls		**750,000**
		Environmental awareness and education program to local community members	Ls		**500,000**
		Short term training to env. and sociologist	Ls		**350,000**
		Sub-Total			**2,250,000**
E.	**Environmental Monitoring & Management**	Establish Environmental Management Unit consiting Environmentalist & Sociologist for Environmental Monitoring & Supervision during the project construction phase	MM		**1,200,000**
		Water quality monitoring	No		**450,000**
		Internal Monitoring	Ls		**550,000**
		External Monitoring	Ls		**700,000**
		Benefit Monitoring including reduction in traffic congestion on existing asphalt road, reduction in rate of vehicular emission and also users satisfaction	Ls		**550,000**
		Sub-Total			**3,450,000**
Total					**35,400,000**
Contingency (10%)					3540000
Grand total					38,940,000

This part of the cost of environmental mitigation; monitoring and capacity building is estimated at Ethiopian Birr 38,940,000 [Thirty Eighth Million Nine Hundred Forty Thousand].

Mitigation measures considered under this cost include; bio-engineering mitigation measures for rehabilitation and landscaping of disturbed grounds and replacement of trees cut, relocation of archaeological findings and cemeteries, disease alleviation Program implementation, training of environmental specialists, supervision and monitoring costs.

Costs related to environmental enhancement measures that require major physical construction works will be estimated and included in the engineering design and tender documents, while relocation and compensation for properties are considered under the RAP costs.

8.5. Institutional Arrangements and Responsibilities

Sector development institutions are expected to have their environmental units to inspect and monitor their activities. Accordingly, ERA has established Environment, Social and Occupational Safety Management Directorate (ESOHSMD) under the Construction Projects Management Deputy Director General, while Right – Of – Way Management branch/Core process is structured under under each regional directorate.

The ESOHSMD is staffed with experienced experts and is capable of undertaking its responsibilities. Accordingly, the ESOHSMD oversees the mainstreaming of environmental and social issues into the road design and construction works.

The ROW Management Core process at each regional office effects the assessment of project affected persons, and properties; coordinates and facilitates land acquisition compensation payments.

ERA has delegated the day to day environmental compliance monitoring to the supervising consultants. Man Month inputs for environmental specialists are budgeted for each of the major road projects to undertake periodic environmental compliance monitoring and reporting of findings in every progress reports.

The contract for civil works also requires the contractor to establish environmental and safety unit under its organizational structure, conduct environmental and safety monitoring activities and to include performances in progress reports.

However, the regional road authority has not organized environmental unit of its own to date. The work load and environmental issues to be addressed in the rural road network development endeavours demands an environmental monitoring and inspection on a routinely bases after commissioning of the project. It is, therefore, recommended that such a unit be established under the regional rural roads authority.

The CEFCC offices both at federal is expected to review ESIA study documents and approve for disclosure, while both federal, regional and woreda level CEFCCs are expected to conduct periodic environmental compliance monitoring and audit of the project implementation process.

Now days, CEFCC structure has been decentralized to the regional and woreda level, and there is high possibility for closer follow ups and environmental compliance monitoring activities to be done. Some of the regional and woreda offices have already started practicing such project monitoring works.

For Physical and Cultural Resources (PCRs) issues; setting up of an arrangement with the concerned authorities for an appropriate and rapid response mechanism – including; artifact relocation or site management procedures to be followed, particularly if a PCR encountered is not movable would be essential. The regional and woreda level bureau of sports and culture will be helpful and should be involved and liaison with at all times.

The ESOHSMD of ERA will take the lead to organize a joint meeting following the contract award; with all of those stakeholders and make aware all to undertake their respective responsibilities on timely bases.

8.6. Communication and Reporting Requirements

8.6.1. Communication and Reporting on Design Studies

The primary objective of the environmental reporting is to get an early detection of critical environmental and social conditions and to provide information on the mitigation progress and results. The key environmental reports prepared at the design stage are the ESIA and RAP. These reports have been prepared following regulation and manuals of the client, ERA, and ESS framework of the World Bank.

CEFCC has delegated ESIA review and approval authority to sector ministries, accordingly to ERA for this project in particular, with establishing an Environmental and Social Unit, ESOSMD, with its delegated duties.

The ESIA carried out during the design period shall be communicated with concerned authorities and SHs. For this reason during completion of the design studies the findings of the ESIA shall be forwarded to CEFCC. The commission will undertake a verification of the study findings and send the reports to key stakeholders. Accordingly the findings of this desing study shall be communicated and shared with SHs and regional administrations, as the Ministry of Water and Energy, the Ministry of Transport, The World Bank regional administration and woreda offices.

8.6.2. Communications and Reporting during Construction Implementation

Implementation and performance of the ESMP in the different phase of the project development should be reported and documented. During the pre-construction phase, the tender document & project design should be reviewed & reported in conformation to incorporation of environmental & social consideration measures proposed in the ESIA study. During the project road construction period, the EMU of the environmental supervision consultant should prepare and a monthly ESMP implementation progress report to EMST based on their strict and daily follow up activities.

Communication shall be made via regular reporting from progress monitoring. A quarterly progress report shall be prepared by regular engineer's supervisions, by EMU team daily monitoring and monthly environmental supervision and be submitted to ERA. The quarterly ESMP implementation report should clearly present:

- Implementation status and progress,
- Summary on monitoring results,
- Taken, progressing or pending measures,
- Statistical record of non-compliance observed during the monitoring period,
- Compliance to social management measures, and
- Major environmental and social issues encountered during the ESMP implementation for subsequent measures.

ERA shall arrange a stakeholder meeting, following review of every quarterly progress report, and based on the reported status progress & issues encountered during the ESMP implementation, findings from ERA's ESOSMD periodic monitoring as well as the review of the monthly progress report.

The participants include contractor, supervision consultant, woreda's Land & Environment Protection Office, woreda administration and relevant sector offices like health & agriculture office. The meeting agenda will be to discuss on conduct of ESMP, result of monitoring, gaps and problems encountered etc.

8.7. Training Requirements

Capacity building for project implementing institutions environmental management and sustainable development issues, especially for the regional and district road and transport organizations and woreda environmental offices would assist for success full implementation of the ESIA objectives. Environmental inspectors of the project owner and that of the supervising consultant should be capacitated to fully undertake the required tasks and incorporate environmental issues in the overall project implementation. Regarding the Physical and Cultural Resources (PCRs), training for operators of excavation equipment in potential PCRs and artefact site, and for recognition thereof will be required. Lump sum training cost has been estimated and included under the mitigation and monitoring cost estimate section.

8.8. Need for Capacity Building and Trainings

Environmental Management and Monitoring activities to be undertaken will involve several stakeholders. The consultant, the contractor, the owner of the project (ERA), CEFCC offices at different levels (Woreda, regional and National), and the project financiers like the World Bank, ADB etc. may intermittently visit the site and check for environmental compliances.

All of these are expected to have capacities to check and guide the project implementation in compliance to the Standard ESIA and EMP requirements. The contractor and consultant are expected to have the required capacity and skill as per the requirements of the contract documents.

Capacity building for project implementing institutions on environmental management and sustainable development issues, especially for the regional and district road and transport organizations and woreda environmental and land administration offices would assist for success full implementation of the ESIA objectives. Environmental inspectors of the project owner and that of the supervising consultant should be capacitated to fully undertake the required tasks and incorporate environmental issues in the overall project implementation. Regarding the Physical and Cultural Resources (PCRs), training for operators of excavation equipment in potential PCRs and artefact site, and for recognition thereof will be required.

Capacity gaps observed with the client, and CEFCC offices have to be filled so as to enable accomplishments of their respective assignments. Capacity building is required both from personnel assignment, technical knowledge and provision of facilities like transport vehicle and office equipment. The woreda level Environmental Protection and land administration offices are newly established and lack both professional skills and material. It is, therefore, essential to capacitate the offices to fully handle the monitoring activities, especially during construction and operation phases of the project.

Lump sum training cost has been estimated and included under the mitigation and monitoring cost estimate section.

Chapter 9. Conclusion and Recommendations

9.1. Conclusion

In conclusion Meisso – Dire Dawa expressway Road is anticipated to provide additional and better road access along the central to eastern part of the nation. It is expected to have significant social and economic benefits in micro and macro levels. Being in the Addis _ Djibouti corridor, the expressway will support national import – export transaction. The project area, specially, the part further from the main trunk road in Sitti zone has lower road infrastructure to benefit from this project.

The project reducing the pressure on the existing Addis _ Djibouti trunk road will provide fast and efficient mobility along the corridor. The project facilitating connection between the woredas and regions of project zone, will grant enhanced economic interactions, better incomes, improved social services, job opportunities, etc...

The project with multiple beneficial implications, it also poses some environmental and social impacts. During the study three alternative routes were proposed for comparison and Alternative 1 and 2 were preferred over the third and Alternative 2 has been the best preference in terms of taking multi-disciplinary MCA analysis. Deputy

Different levels of the local administration were consulted in different period. And recently, community representatives from different age and occupation were consulted from all traversed kebeles, at woreda offices. Accordingly, all consultations basically aimed in providing relevant information on the proposed project and consult on potential impacts and mitigations needed.

Basically, the project omits from passing through central parts of main settlements. Yet, and significant farming activities are located in the beginning and end of project stretch, in Meisso – Oromia, Meisso – Somali and Erer near the end. Hence, major aspect of impact comes from land take from forest area and agricultural area.

Besides the land takes, other major impact of the project will be, the fact that as an expressway road, it will fence sides of the road to hinder ordinary human and animal / cattle movements across the road.

Other environmental impacts are anticipated with regard to water resources alteration, pollution and flooding, vegetation clearance, landscape alteration, air pollution, and waste disposals. The road construction will also pose some health and safety risks to the project staff and also the community. Socially, the project will influence the community from impacts on local economy, on vulnerable groups of people, on health facilities and instigating higher level of disease spread.

Mitigation measures of reducing impacts and ways for monitoring implementations were proposed which need to be followed effectively during construction.

9.2. Recommendations

In order to alleviate the possible adverse impacts resulting from implementing the Meisso – Dire Dawa expressway Road Project, the following measures are recommended to be implemented:

- The Client must create a conducive environment for the implementation of the Project (especially for the implementation of environmental and social mitigation measures) that all parties should also own the implementation of proposed mitigation measures;
- Accurate measurement of land acquired and property displaced and compensation of damaged / relocated properties as per the national Expropriation of Land Holdings laws. And compensations shall include all representatives from the PAPs and Woreda and shall be paid on time, and maximum effort is needed to the smoothen compensation payment procedures, so that they would not be major grievance sources to the project;
- Environmental management plan, and also different specific management plans were prepared in this ESIA, including GBV, community health, OHS and security. On the basis of these documents, the contractor shall prepare its management plan and action plans, which also need to be observed accordingly;
- The contractor and supervisor should closely work with the relevant local and Federal Authorities on matters that strictly require the participation or consultation of the latter.
- The contractor and the supervisor should abide by contractual obligations; and
- Community engagement and consultation shall continue, mainly in project construction stage, so that they would be aware about all project prospects, participate in mitigation works and also protect themselves from impacts of health and safety to the utmost.

Chapter 10. DISCLOSURE PLAN

The primary objective of the disclosure is to inform and continually update about the project and to engage seek and maintain active participation and support of PAPS, project-affected communities and their representatives throughout the various stages (appraisal, planning, implementation, follow up, monitoring and evaluation) of the project. Specific objectives include the following:

- To inform PAPs about and discuss the nature and scale of adverse and beneficial socio-economic impacts of the project on their livelihoods in a more transparent and direct manner and seek their active participation in the project cycle;
- To give PAPs and other members of affected communities a chance to have a say and express their views in the planning and implementation of the Project that affect them directly;
- To gather qualitative as well as quantitative information on viable income generation and livelihood schemes including assessment of needs, constraints and opportunities which PAPs could engage themselves in order to restore their income and livelihoods in a self-sustaining manner; and
- To discuss PAPs needs constraints and preferences in the identification and selection of potential sites for resettlement, rehabilitation and sustainable community development in the future.

On the basis of the above objectives, the stages of development of the Meisso – Dire Dawa Road Project need to be disclosed (with the target of reaching the stakeholders) at different levels through different media including: TV Broadcastings, Radio and National Newspapers issued in Amharic and English languages.

Chapter 11. KEY ISSUES TO BE INCLUDED IN BIDDING DOCUMENTS

This section presents a set of environment and related clauses suggested for inclusion or amendment in the respective Sub-Clauses of the General Conditions of Contract (GCC), and thus to be read in conjunction with same. However, they would not be taken in their entirety; that is, the Contract Engineer can use the whole or part of the proposed additions to the Sub-Clauses or paraphrase them to suit the context of the respective Sub-Clauses.

There are also issues suggested to be included in the Conditions of Particular Application (CPA) with their usage similar to the possibilities proposed (above) for the GCC.

General Conditions of Contract

Protection of the Environment

Add the following sub-paragraphs to Sub-Clause 4.18 as follows:

Notwithstanding the Contractor's obligation under Sub-Clause 4.18 of the General Conditions of Contract, the Contractor shall carry out, without limitation, the following measures with a view to reducing or eliminating adverse environmental effects by the site Works:

(i) All quarries and borrow pits shall be filled and landscaped, as far as practical, to their original condition after extraction of construction material.

(ii) Soil erosion due to the surface runoff or water from culverts or other drainage structures should be avoided by putting in place proper erosion control measures.

(iii) Long traffic diversion roads shall be avoided (as may be stipulated in the Specifications) so as to minimise the effect of dust on the surrounding environment. In any case, all diversions shall be kept damp to reduce dust.

(iv) Haulage routes shall be kept as short as possible, and watered as necessary.

(v) Spillage of oil, fuel, and lubricants shall be avoided. If spilt, they shall be collected immediately and disposed of in such a way as not to adversely affect the natural environment.

(vi) Rock-blasting near settlement areas shall be properly co-ordinated with the relevant officers of the Employer's government in an attempt to minimize levels of noise pollution and community interference.

The formulation and enforcement of an adequate health and safety program shall be the obligation of the Contractor with respect to all the works under this Contract, regardless of whether performed by the Contractor or his sub-contractors. The Contractor shall, within 14 days after commencement of the Works, meet the Engineer to present and discuss his plan for

the establishment of such health and safety measures as may be necessary to provide against accidents, unsafe acts, and so forth. Within 28 days after commencement of the Works, the Contractor shall submit a written safety program to the Engineer covering the overall works and based on the laws and regulations of Ethiopia. In addition, he shall prepare special health and safety programs for blasting and handling of explosives as may be stipulated in the Specifications.

Rates of Wages and Conditions of Labor

The Contractor shall pay rates of wages and observe conditions of labour not less favourable than those established for the trade or industry where the work is carried out. In the absence of any rates of wages or conditions of labour so established, the Contractor shall pay rates of wages and observe conditions of labour which are not less favourable than the general level of wages and conditions observed by other employers whose general circumstances in the trade or industry in which the Contractor is engaged are similar.

Facilities for Staff and Labour

Save insofar as the Contract otherwise provides, the Contractor shall provide and maintain such accommodation and amenities as he may consider necessary for all his staff and labour, employed for the purposes of or in connection with the Contract, including all fencing, water supply (both for drinking and other purposes), electricity supply, sanitation, cookhouses, fire prevention and fire-fighting equipment, air conditioning, cookers, refrigerators, furniture and other requirements in connection with such accommodation or amenities. On completion of the Contract, unless otherwise agreed with the Employer, the temporary camps/housing provided by the Contractor shall be removed and the site reinstated to its original condition, all to the approval of the Engineer.

Health and Safety

Due precautions shall be taken by the Contractor and at his own cost, to ensure the safety of his staff and labour and, in collaboration with and to the requirements of the local health authorities, to ensure that medical staff, first aid equipment and stores, sick bay and suitable ambulance service are available at the camps, housing and on the Site at all times throughout the period of the Contract and that suitable arrangements are made for the prevention of epidemics and for all necessary welfare and hygiene requirements.

The Contractor shall report to the Engineer details of any accident as soon as possible after its occurrence. In the case of any fatality or serious accident, the Contractor shall, in addition, notify the Engineer immediately by the quickest available means. The Contractor shall also notify the relevant authority whenever such report is required by the law of the country of the employer.

Disorderly Conduct

The Contractor shall at all the time take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his staff and labour and take all reasonable precautions for the preservation of peace and protection of persons and property in the neighbourhood of the Works against the same.

Foreign Personnel

The Contractor shall be responsible for the return to the place where they were recruited or to their domicile of all such persons as he recruited and employed for the purposes of or in connection with the Contract, and shall maintain such persons as are to be so returned in a suitable manner until they shall have left the site or, in the case of persons who are not nationals of and have been recruited outside Ethiopia shall have left Ethiopia or the site, as appropriate.

If the Contractor shall fail to observe this condition, the Employer may maintain and return as soon as possible the said persons and recover the cost thereof from the Contractor.

Supply of Foodstuffs

The Contractor shall arrange/facilitate for the provision of a sufficient supply of suitable food at reasonable prices for all his staff and labour, or his Sub-contractors, for the purposes of or in connection with the Contract.

Supply of Water

The Contractor shall, so far as is reasonably practicable, having regard to local conditions, provide on the Site an adequate supply of drinking and other water for the use of the Engineer's Representative and his staff, the Contractor's staff and labour.

Measures against Insect and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect all staff and labour employed on the Site from insect nuisance, rats, and other pests and reduce the dangers to health and the general nuisance caused by the same. The Contractor shall provide his staff and labour with suitable prophylactics for the prevention of malaria, and take steps to prevent the formation of stagnant pools of water. He shall comply with all the regulations of the local health authorities in these respects and shall in particular arrange to spray thoroughly with approved insecticide all buildings erected on the Site. Such treatment shall be carried out at least once a year or as instructed by the Engineer. The Contractor shall warn his staff and labour of the dangers of other water-borne diseases like bilharzias and wild animals.

Alcoholic Liquor or Drugs

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter, or otherwise dispose of any alcoholic liquor or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Sub-contractors, agents, staff or labour.

Arms and Ammunition

The Contractor shall not give, barter, or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

Festivals and Religious Customs

The Contractor shall in all dealings with his staff and labour have due regard to all recognised festivals, days of rest and religious and other customs.

Funeral Arrangements

The Contractor shall make any necessary arrangements for the transport, to any place as required for burial, of any of his expatriate employees or members of their families who may die in Ethiopia. The Contractor shall also be responsible, to the extent required by the local regulations, for making any arrangements with regard to burial of any of his local employees who may die while engaged upon the Works.

Employment Records of Workers

The Contractor shall keep proper wages books, in the language stipulated in the Appendix to Bid, showing the time worked and wages paid to all employees in and about the execution of the Works, together with such other records as are required by any Statute, Ordinance, Law, Regulation or Bye-Law in force in the Country of the Employer governing the employment of labour. He shall be bound, whenever required, to produce such wages books and other records for the inspection of any persons authorised by the Engineer.

Royalties

Add the following sentence at the end of Sub-Clause 7.8

“The Contractor shall also be liable for all payments or compensation, if any, levied in connection with the dumping of part or all of any such material. Royalties in respect of the extraction of material from borrow pits and quarries for use in connection with the Works shall be paid by the Employer”

Conditions of Particular Application

The issues contained in this section are those requiring special attention by the design consultant, the contractor and the supervision engineer. Some of them are repetitions of the proposed mitigation measures (for proper emphasis) and some are additional issues to be considered by the design consultant as part of the TD so that their implementation would be guaranteed; because if they are included in the TD, it would be convenient to monitor and enforce their implementation.

Trade Unions

The Contractor shall recognise the freedom of his employees to be members of trade unions.

Observance by Sub-Contractors

The Contractor shall ensure that all sub-contractors engaged upon the Works observe all the requirements of the Contract.

Camp Establishment and Demolishing

The Contractor shall establish all camps, with the approval of the Engineer and consultation of the Client, at appropriate site taking into consideration, not only the permanent works but also the peculiar environmental and social situation of the area.

In abandoning the camps, the Contractor, at no cost to the Client, shall remove the entire superstructure as well as the foundations of all buildings.

- The contractor shall select location of campsites in collaboration with local authorities, RE and with ESMT of ERA, and camps shall only be established at places/locations approved by ERA ESMT and the RE in collaboration with local Officials,
- Locate campsites in less productive areas away from streams and rivers (at least 500 m),
- The RE and the contractors shall take photograph of the camp site campsites before the construction of any structure in order to be to compare the level of environmental degradation before and after the establishment of the camp site and to plan rehabilitation work.
- Establish construction campsite with appropriate and standard sanitation facilities including an imperviously lined septic tanks to reduce possible pollution impact on ground and surface water resources,
- Dispose all the wastes from the camp properly in a designated and authorised places,
- The contractor shall take all necessary measures and precautions to avoid any nuisance or disturbance to inhabitants arising from the execution of works.

If the campsites are not going to be used or going to be demolished, the contractor shall reinstate (the reinstatement activities shall include stockpiling the top soil during camp construction, removing all concretes/slabs and all scrap metals from the workshops, loosening the compacted soils, and spreading of the top soils) to its original state.

Air Pollution

The Contractor shall inspect and service all the transport and the construction machinery, to the satisfaction of the Engineer, so that their emissions shall not pollute the air.

- Parts of the Crusher Plant from where dust would rise shall be covered.
- The Contractor shall prevent generation of air pollutants by watering during crushing and screening of aggregates,
- The Contractor shall locate construction plants such as stone crushing plants away from the settlement areas, hospitals and schools.
- The Contractor shall avoid burning of materials such as tires, plastic, rubber products or other materials that creates heavy smock or nuisance odour.
- The Contractor shall avoid disposing of any volatile chemicals to the air,
- The Contractor shall cover any vehicle with an open load carrying area used for transporting potentially dust producing materials should have properly fitted side and tail boards. Materials having the potential to produce dust should not be loaded to a level higher than the side and tail boards and should be covered with a clean tarpaulin in good condition.
- The RE shall supervise and monitor the contractor's compliance of the contractors with the above conditions.

Disruption of Services

The contractor shall be liable for any damage to services resulting from his or his subcontractors' actions. Any damage caused to services by the contractor or subcontractors should be made good without delay at the contractor's cost.

Accidental Discovery of Archaeological Remains

Work shall be halted and relevant authorities shall be notified, principally by the contractor immediately in the event of accidental discovery of archaeological remains or any other artefacts of national or international interest.

Soil and Water Pollution

The contractor shall dispose all sanitary and other wastes, at all camps and sites, safely in such a way as will not result in any form of soil or water pollution or hazard to human or animal health.

The contractor shall take all reasonable precautions to prevent spillage and leakage of materials with the potential to pollute soil and water resources. The measures shall be implemented in an effective way throughout the life of the base camp.

The contractor shall be responsible, at his own cost, for cleaning up any pollution caused by his activities, to the satisfaction of the Engineer, and the payment of full compensation to those affected by the pollutants.

Erosion and Gully Control

The contractor shall provide adequate cross sectional area to drainage structures to allow sufficient passage for the discharge and also shall minimise the effect of discharge from structures to the downstream side in the form of gully formation. Thus, the contractor shall introduce energy dissipaters such as ripraps and scour checks, for safe disposal of the discharge, along the course on the downstream side.

Occupational Health and Traffic Safety

The contractor shall make every effort to minimise road safety hazards and inconvenience to other road users, resulting from the passage of his or his subcontractors' haulage vehicles, and shall impose and enforce compliance with speed limits.

- All detours shall be constructed to the specified standard stipulated in contract document and shall be watered as per the contact specifications to suppress the dust that is a cause of many accidents to mainly road users.
- The contractor shall provide workers especially working on hazardous sites like quarry and crusher sites with protection materials like masks, goggles, gloves, etc.
- The contractor shall prepare a detailed safety management plan approved by the Engineer,
- The contractor shall provide diversions with suitable and reflecting road signs; provide barricades and delineators and flagmen to guide the traffic. For regulation of traffic, the flagmen shall be equipped with red an d green flags,
- The contractor shall use clear, labelled properly and meaningful traffic signs and speed limits, especially at road crossing of the people and conjunction of animals
- The contractor shall provide traffic awareness especially for the local road users
- The contractor shall prepare “Traffic Management Plan” for the entire or sections of the road project, that should be approval by the RE and ERA ESMT for review and comment.

General Health

The contractor shall ensure the availability of first-aid service to the workers

- The contractor shall undertake, through his dedicated staff or a sub-contractor for this activity, prevention and control of the spread of STIs, especially the HIV/AIDS pandemic, in the workplaces of the contract.
- the contractor or construction activities shall be aware that the road traverse through malaria endemic areas and be prepared to avoid possible health risk through environmental health and hygiene management of camp sites and availing clinic, chemically treated mosquito nets and medicines for the work force;
- The contractor shall not induce malaria outbreak by creating temporary & permanent water holding areas which favour mosquito breeding,
- The contractor shall restore borrow pits and quarry areas to avoid breeding sites for mosquito,
- The contractor shall provide clinics with all necessary medications in major construction camps, and First-Aid Kits at all working sites.

- Explosives and chemicals should be stored under proper security at a safe distance from the road and any inhabited premises,
- Give warning each time of his intention to blast and should station personnel on the roads and elsewhere with flags, horns and whistles and prevent persons , animals and traffic entering danger zone,
- The contractor shall provide safe water supply & appropriate waste disposal facilities including the provision of sanitary latrines in the construction camp,
- The contractor shall provide health education mainly focusing on the HIV control and prevention, void discrimination in work places due to HIV/AIDS and provide counselling service. This activity shall be executed as a sub contract by local NGOs and relevant institution or NGOs. The contractor shall provide free counselling and distribute condoms & leaflets to workforce and vulnerable group of nearby communities,
- The contractor shall provide education to personnel of the contractor about safety procedures and emergency response plans associated with their task.

Use of Child Labour

The contractor shall abide to the Ethiopian and international laws that limit the minimum age for labour. That is, he shall not recruit children for the type of labour not suitable for their age.

Spoil Disposal

The contractor shall dispose of all unnecessary and spoil material at the appropriate sites, approved by the Engineer. That is, spoil materials should:

- be disposed on land not required for any activity by the local people for agriculture, grazing, or any other public services;
- not be disposed on areas of aesthetic value; and
- not in any case be disposed as side-tipping especially on the valley side of road sections

Preparation of Site ESMP

The contractor shall prepare, for approval by the Engineer and final acceptance by the client, a detailed Site Environmental Plan (SEP) related, but not limited to, interventions:

- For the base camp, prior to its construction, which also covers other work sites, the SEP must make specific and adequate provision for the disposal of sanitary and other wastes in such a way that it will not result in any form of pollution or hazard to human or animal health.
- For stockpiling of topsoil from borrow pit areas and redistribute over the entire surface after reinstating the sites when no more needed.
- For reinstating quarry sites to a shape close to their original contour and approved by the Engineer
- For protecting the water resource against pollution
- For protecting the flora and fauna against deforestation and pouching respectively
- For not affecting protected areas along the route corridor
- For handling RoW issues; and
- Other issues or problems that would be encountered on site
- Information provided in the SEPs should include, but not be limited to the following:

- a site plan showing the location and proposed extent of the borrow pit, quarry sites, access road and any other facilities which would be installed
- details of all landholdings, vegetation and land use
- measures which will be taken to minimise erosion caused by access road construction and drainage system operation
- measures which will be taken to reinstate the site
- measures should be taken to reinstate all sites and make the borrow pits and quarry site safe on completion of exploitation, and to rehabilitate any agricultural land which has been affected by detours access roads construction and operation
- The Engineer should satisfy himself, prior to approval of the SEPs that all reasonable precautions have been or will be taken into account to minimise adverse environmental impacts.
- In the case of interventions for camps, quarry sites, borrow pits, crusher sites, etc., the sites shall be photographed prior to exploitation so that monitoring of reinstatement would be effective.

Impact from Quarry sites, Borrow Areas and Detours

The contractor shall select quarry and borrow sites that are far from settlement and environmentally sensitive areas after approval by RE, ERA ESMT and local authorities.

- The contractor shall not select quarry and borrow sites near and at river bed,
- The contractor shall not establish quarries and borrow pits in forested areas,
- The contractor shall reinstate all quarries and borrow sites and access roads after the completion of the road construction works, any material sites shall not be left open unless otherwise approved by ERA ESMT and RE upon request from locals to have the sites open permanently. The reinstatement works shall include the following activities;
- The contractor shall take photographs of the proposed borrow areas, quarry sites and detour roads before the commencement of the works;
- The contractor shall take lists of all the tree species found in the proposed quarry sites, borrow areas and detour roads and the exact number of trees to be affected in the presence of Environmentalist from the Supervision Team and a Forester from the Local Forestry department
- The contractor shall preserve top soils for later use to refill borrow sites and quarry areas; and do not mix top soil with subsoil.
- Borrows and quarries shall be reinstated (which include dumping unnecessary materials and excess cuts, landscaping/levelling/shaping, spreading the top soil uniformly over the surface, constructing spillways if in case the sites are deep enough to hold water and putting a barrier all around the sites to prevent accidents on animals and human beings) after completion of the works
- provide proper drainage to avoid storage of water in quarry and borrow sites to reduce malarial out break through reduction of mosquito breeding sites

Access roads to these sites shall be reinstated (execute the following activities including: preservation of the top soils and stockpiling the top soils, removing the applied selected/foreign materials, loosening the compacted soils and spreading the top soil) to productive state when construction is completed.

Clause for Compensatory Tree Planting

The contractor shall compensate for the loss of mature trees by planting at least 5 seedlings for every tree removed during road widening, detours and borrow area clearing and manages their growth until they reach a height of 1 metre before handing them over to the client.

The contractor shall confine clearing of vegetation to what is absolutely necessary. All trees and shrubs which are not required to be cleared or removed for construction purposes should be protected from any damage that may be caused by the contractor's construction operations and equipment,

Clause for Grassing of Embankments, Cut Sections and Disturbed Ground

The contractor shall grass all embankments and cut slopes susceptible to erosion with appropriate grass species and shall ensure the survival of the grasses before handing over to the client.

Impact on Fauna

The contractor shall forbid his workforces from deliberately killing wild animals, hunting wild animals for food or sport purposes, involving in any trade activities of dead or alive wild animals or parts.

The contractor shall create awareness among his drivers to give priority for road crossing animals and abstain from running after them or chasing the animals.

The contractor shall aware his drivers to put off light and give priority for road crossing nocturnal animals during the night time.

Compensation for Injury

The Contractor shall in accordance with the Laws of Ethiopia, and any other Regulations in force from time to time in Ethiopia, pay compensation for loss or damage suffered in consequence of any accident or injury or disease resulting from his/her work to any workman or other person in the employment of the Contractor or any Sub-Contractor.

Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carry out such regulations, orders and requirements as would be made by the Government or the local medical or sanitary authorities, for the purpose of dealing with and overcoming the same.

Passage and Control of Traffic

The Contractor's attention is drawn to Specifications covering the Passage and Control of Traffic, and in particular, to the requirement for the submission of a Program for Passing of

Traffic, to be included in the Health and Safety Plan, as required following the award of the Contract.

Reinstatement and Compensation for Damage to Persons or Property

The Contractor shall reinstate all properties, whether public or private, which are damaged as a consequence of the construction and maintenance of the works, to a condition as specified and at least equal to that prevailing before his first entry on them.

If in the opinion of the Engineer the Contractor shall have failed to take reasonable and prompt action to discharge his obligations in the matter of reinstatement, the Engineer shall inform the Contractor in writing of his opinion, in which circumstances the Employer reserves the right to employ others to do the necessary work of reinstatement and to deduct the cost thereof from any money due or which shall become due to the Contractor.

Clause for Preservation and Protection of Cultural Heritages

Any cultural and archaeological resources encountering should be reported and/or preservation measures should be taken by consulting with concerned authorities and implemented as necessary.

- Protect and avoid as far as possible such sites as churches, mosques, cemeteries, during construction
- Locate culturally & historically significant sites prior to construction
- Preserve any archaeological findings encountered up on excavation.
- Arrange orientation program and training of machine operators on work procedures, and discipline at physical and cultural heritage sites. They need also to be oriented on recognizing types and characteristic of such heritages and means to identify them while undertaking excavation operations.
- Liaison and make arrangements with the regional bureau of culture and tourism for the training and orientation of the workers and to cooperate by timely responding to reported findings.
- Report to the relevant bureau up on finding of unregistered heritages as soon as possible, before making any change to its location and feature.

References

1. African Community Access Partnership (AfCAP) (2017) Regional Climate Risk Screening for Climate Adaptation of Rural Road Networks. Addis Ababa, Ethiopia.
2. CEFCC. (2000) ESIA Guideline Document. Addis Ababa, Ethiopia.
3. CEFCC. (2003) Procedural ESIA Guideline. Addis Ababa, Ethiopia.
4. ERA, (2004) Draft Road Safety Audit Manual. Addis Ababa, Ethiopia.
5. ERA. Environmental and Social Management Manual, 2008 Addis Ababa, Ethiopia.
6. ERA. HIV/AIDS Policy, 2004 Addis Ababa, Ethiopia.
7. ERA. Resettlement/Rehabilitation Policy Framework,2002 Addis Ababa, Ethiopia.
8. FDRE, A Proclamation for the Establishment of Environmental Protection Organs (Proclamation No. 295/2002). Addis Ababa, Ethiopia.
9. FDRE. A Proclamation to Provide for the Definition of Powers and Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia. Proclamation No. 691/2010. Addis Ababa, Ethiopia.
10. FDRE. Environmental Impact Assessment Proclamation (Proclamation No. 299/2002). Addis Ababa, Ethiopia.
11. FDRE. Environmental Pollution Control Proclamation (Proclamation No. 300/2002). Addis Ababa, Ethiopia.
12. FDRE. Proclamation for the Establishment of ERA, Proclamation No. 80/1997. Addis Ababa, Ethiopia.
13. FDRE. Proclamation on Rural Land Administration and Land Use (Proclamation No. 456/2005). Addis Ababa, Ethiopia.
14. FDRE. Proclamation to Provide for the Expropriation of Land Holdings for Public Purposes and Payment of Compensation (Proclamation No. 1161/2019). Addis Ababa, Ethiopia.
15. FDRE. Solid Waste Management Proclamation. (Proclamation No. 513/2007). Addis Ababa, Ethiopia.
16. FDRE. The Conservation Strategy of Ethiopia, 1996. Addis Ababa, Ethiopia.
17. FDRE. The Constitution of Federal Democratic Republic of Ethiopia, 1995. Addis Ababa, Ethiopia.
18. FDRE. The Environmental Policy of Ethiopia, 1997. Addis Ababa, Ethiopia.
19. Glasson, J. et al. (1999). Introduction to Environmental Impact Assessment, 2nd ed. SPON Press. London.
20. International Finance Corporation (IFC). (2007) Environmental, Health, and Safety Guidelines, World Bank Group. Washington, DC.
21. International Finance Corporation (IFC). (2007) General EHS Guidelines: Community Health and Safety, World Bank Group. Washington, DC.
22. International Finance Corporation (IFC). (2007) General EHS Guidelines: Occupational Health and Safety, World Bank Group. Washington, DC.
23. International Finance Corporation (IFC). (2007) Toll Roads, World Bank Group. Washington, DC.
24. Masters, G. M. (2003). Introduction to Environmental Engineering and Science. Prentice-Hall of India Private Limited. Eastern Economy Edition. New Delhi-110 001. New Delhi, India.
25. Mengesha Tefera, Tadlwos Chernet and Worklneh Haro. (Compilers). (1996). Explanation of the Geological Map of Ethiopia. 2nd ed. Ethiopian Institute of Geological Surveys. Addis Ababa, Ethiopia.
26. Ministry of Foreign Affairs. (2018) Climate Change Profile: Ethiopia April. Addis Ababa, Ethiopia.
27. MoLSA. (2007). The Occupational Safety & Health Directive. Addis Ababa, Ethiopia..
28. United Nations. (2018) The Djibouti City – Addis Ababa Transit and Transport Corridor: Turning Diagnostics into Action.
29. World Bank. (2017) Environmental and Social Safeguard Framework. International Bank for Reconstruction and Development/The World Bank. Washington, DC.

ANNEXES

Annex A . *Checklist for Environmental Scoping*

Annex B . *Temporal Scope & Distribution of Impacts*

Annex C . *Photo Collage of Project Area*

Annex D . SHs and Community Consultations

Annex E . *SHs and Community Consultations*

Annex E – (2) . *Minutes of Primary Consultations with Zonal and Woreda Administrations*

- DETAILS WILL NOT BE DISCLOSED TO OBSERVE PRIVACY OF PARTICIPANTS -

Annex E – (3) . *Minutes of Second ESIA Consultations with SHs*

- DETAILS WILL NOT BE DISCLOSED TO OBSERVE PRIVACY OF PARTICIPANTS -

Annex E – (4) . *Minutes of Community Level ESIA Consultations*

- DETAILS WILL NOT BE DISCLOSED TO OBSERVE PRIVACY OF PARTICIPANTS -

Annex E – (5) . *Key Participants during SHs Consultations*

- WILL NOT BE DISCLOSED TO OBSERVE PRIVACY OF PARTICIPANTS -

Annex F . *Ancillary Sites Management Plan*

- TO BE PREPARED -

Annex G . *Community Health and Safety Risk Management Plan*

- WILL BE DISCLOSED AS STANDALONE DOCUMENT -

Annex H . *GBV Risk Assessment & Management Plan*

- WILL BE DISCLOSED AS STANDALONE DOCUMENT -

Annex I . *Occupational Health & Safety Risk Management Plan*

Annex J . *Resource Efficiency and Pollution Prevention Management Plan*

- TO BE PREPARED -

Annex K . *Security Risk Management Plan*

- WILL NOT BE DISCLOSED DUE TO SAFETY CONCERNS; A SUMMARY WILL BE INCLUDED IN THE MAIN TEXT -

Annex L . *Company's ESIA Competency Certificate*

(Net Consult P.L.C.)

Annex A - Checklist for Environmental Scoping

Check list for Environmental Scoping					
No.	**Potential Impact Areas**	**Impact Type**			**Evaluation Basis**
		No impact	**Adverse Impact**	**Beneficial Impact**	
I	**Physical Environment**				
	1.1 Soil and Bedrock				
	1.1.1 Soil Erosion		X		
	1.1.2 Stability of slopes		X		
	1.1.3 Soil Contamination by Spills of Hazardous Material		X		
	1.1.4 Material Use		X		
	1.1.5 Ground subsidence	X			
	1.2 Water Resources and Quality				
	1.2.1 Change in Surface Water Hydrology		X		
	1.2.2 Change in Ground Water Hydrology		X		
	1.2.3 Sedimentation/ Siltation		X		
	1.2.4 Water Harvesting		X	X	
	1.2.5 Highway Water Pollution		X		
	1.3 Air Quality				
	1.3.1 Air Pollution due to Dust Particle		X	X	
	1.3.2 Air Pollution due to Traffic		X		
II	**Natural Environment**				
	2.1 Biological and Ecological Changes				
	2.1.1 Impact on Vegetation		X		
	2.1.2 Impact on Important Flora and Fauna		X		
	2.1.3 Degradation of Ecosystem		X		
	2.1.4 Wildlife Reserve with Bio –diversity	X			
	2.1.5 Impairment of Fisheries Ecology	X			
	2.1.6 Encroachment in to Precious Ecology	X			

III	**Human and Social Environment**				
	3.1 Social Issues				
	3.1.1 Social Acceptability			X	
	3.1.2 Resettlement/ Displacement	X			
	3.1.3 Demographic Changes		X	X	
	3.1.4 Changes in Way of Life		X	X	
	3.1.5 Impact on Women		X	X	
	3.1.6 Impact on Indigenous people	X			
	3.1.7 Induced Development		X	X	
	3.1.8 Security Issues		X		
	3.2 Economic Issues				
	3.2.1 Loss of Agricultural Land		X		
	3.2.2 Loss of Property		X		
	3.2.3 Employment Opportunities			X	
	3.3 Effect on public and private services		X	X	
	3.4 Health and sanitary issues		X	X	
	3.5 Traffic safety		X	X	
	3.6 Cultural religious and historical areas		X	X	
	3.7 Damage to Aesthetic sites	X			
	3.8 Impact on local and national economy			X	
	3.9 GBV			X	
	3.10 Underserved Communities			X	

Annex B - Checklist for Temporal and Spatial Scope Identification

No.	Valued Environmental Components	Project Phases/ Type of Impacts			
		No Impact	Positive Impact	Negative Impacts	
				Significant	Insignificant
Pre-Construction Phase					
1.	Impact on Vegetation and Fauna	X			
2.	Water Resources and Water Quality	X			
3.	Soil Erosion and Gulley Formation	X			
4.	Landscape and Land Slide	X			
5.	Air Quality	X			
6.	Health Issues	X			
7.	Induced Development or Economic Issues	X			
8.	Socio- Cultural Issues	X			
9.	Gender Issues	X			
10.	Tourism and Investment	X			
11.	OHS	X			
Construction Phase					
1.	Mobility (and accessibility) & Reduced Traffic Generated Gaseous Emission		X		
2.	Employment opportunities		X		
3.	Contribution to macro economy		X		
4.	Social Services (schools, health centres, etc.)		X	X	
5.	Impact on Gender and Vulnerable Groups		X	X	
6.	Improved Road Safety		X		
7.	Vegetation (Deforestation)			X	
8.	Fauna (Fragmentation, killing and migration of wildlife)			X	
9.	Water Resource & Water quality (pollution and turbidity, change in course, etc.)			X	
10.	Landscape Intrusion				X
11.	Soil and geology (erosion, contamination, slope stability, etc.)			X	
12.	Air quality (Pollution)			X	
13.	Noise and Vibration				X
14.	Community Health			X	
15.	OHS			X	
16.	Cultural			X	
17.	Underserved Communities			X	
18.	Security			X	
Operation Phase					
1.	Water resources and water quality			X	
2.	Soil erosion and land resources			X	
3.	air quality			X	X
4.	Economic issues		X		
5.	Health issues		X		X
6.	Socio- cultural issues		X		X

7.	Impact on Local Underserved Communities			X	
8.	GBV		X	X	
9.	Induced development		X		
10.	Tourism and investment		X		
11.	Security				X

Annex C – List of Cross Drainage Structures

No	Station	Name	Location (UTM)		Type Of Structure	No Of Cell	Dimension Of Structure		
			X	Y			Height (M)	Width (M)	Diameter (M)
1	66+700	C50	687377.4	1018854.2	Bridge	1	2.5	11	
2	66+060	C51	687936.2	1019152.6	BC/SC	1	1.5	1.5	
3	67+500	C52	689600	1019841	Bridge	1	3	13	
4	69+330	C53	691036	1020932	Bridge	1	3	13	
5	69+800	C54	691396	1021267	Bridge	1	3	12	
6	70+960	C55	692123	1022152	Bridge	1	2.5	9	
7	73+050	C56	693731	1023489	Bridge	1	2.5	10	
8	73+680	C57	694213	1023837	Bridge	1	2.5	8	
9	74+400	C58	694884	1024091	Bridge	1	4	20	
10	75+730	C59	696132	1024564	Bridge	1	3.5	15	
11	76+340	C60	696683	1024847	BC/SC	1	2.5	4	
12	77+580	C61	697764	1025429	BC/SC	1	2	3	
13	79+750	C62	698818	1026033	Bridge	2	4	15	
14	80+750	C63	700404	1027185	Bridge	1	4	20	
15	81+450	C64	700962	1027602	Bridge	1	3.5	20	
16	82+640	C65	701842	1028399	BC/SC	1	2	4	
17	83+290	C66	702272	1028884	BC/SC	1	2	5	
18	86+575	C67	704474	1031318	Bridge	2	4	20	
19	88+770	C68	705924	1032968	Bridge	1	3.5	15	
20	90+970	C69	707298	1034705	Bridge	2	4	20	
21	92+520	C70	708378	1035767	BC/SC	1	2	2.5	
22	93+975	C71	709549	1036617	Bridge	1	4	20	
23	96+300	C72	711538	1037847	Bridge	3	5	20	
24	98+290	C73	712969	1039175	BC/SC	1	2.5	4.5	
25	100+440	C74	714387	1040789	Bridge	1	3.5	11	
26	103+300	C75	716162	1042992	Bridge	1	3.5	14	
27	104+380	C76	717062	1043645	Bridge	1	3.5	17	
28	105+050	C77	717537	1044118	Bridge	2	4	20	
29	105+780	C78	717941	1044647	BC/SC	1	2	4	
30	106+185	C79	718150	1045062	BC/SC	1	3	9	
31	106+965	C80	718435	1045727	BC/SC	1	3	9	

32	108+280	C81	718862	1047002	BC/SC	1	1.5	2	
33	110+100	C82	720015	1048315	Bridge	2	3.5	20	
34	111+340	C83	721021	1049042	Bridge	1	3.5	13	
35	111+740	C84	721346	1049276	BC/SC	1	2	2.5	
36	112+710	C85	722133	1049845	BC/SC	1	2	2	
37	113+330	C86	722639	1050209	Bridge	1	2.5	12	
38	113+700	C87	722958	1050409	BC/SC	1	2	5	
39	115+920	C88	724876	1051513	Bridge	3	6	20	
40	116+680	C89	725541	1051871	BC/SC	1	2	4	
41	117+840	C90	726563	1052426	BC/SC	1	2	3.5	
42	119+125	C91	727670	1053073	BC/SC	1	2	3.5	
43	119+5810	C92	728037	1053289	BC/SC	1	2	2	
44	121+840	C93	730049	1054374	Bridge	2	3.5	15	
45	122+160	C94	730347	1054503	BC/SC	1	2	4	
46	122+635	C95	730778	1054690	Bridge	1	3.5	18	
47	122+990	C96	731102	1054830	PC	1	2	2	
48	124+240	C97	732275	1055232	BC/SC	1	2	3	
49	124+890	C98	732916	1055380	BC/SC	1	2	4.5	
50	125+640	C99	733654	1055511	Bridge	1	3.5	12	
51	126+650	C100	734655	1055669	Bridge	1	2.5	9	
52	127+290	C101	735283	1055773	Bridge	1	3	12	
53	128+090	C102	736258	1055987	Bridge	1	3.5	15	
54	129+090	C103	737041	1056144	Bridge	1	2.5	11	
55	131+300	C104	739181	1056724	BC/SC	1	2	3	
56	132+530	C105	740388	1056908	BC/SC	1	2.5	4	
57	133+550	C106	741338	1056803	BC/SC	1	2	3.5	
58	134+300	C107	742022	1056575	Bridge	1	2.5	11	
59	135+000	C108	742675	1056271	Bridge	3	5	20	
60	136+200	C109	743704	1055650	Bridge	1	4	15	
61	140+190	C110	746566	1052956	Bridge	1	3	12	
62	141+820	C111	748069	1052350	Bridge	1	4	20	
63	142+850	C112	749051	1052095	Bridge	2	4.5	20	
64	144+710	C113	750885	1052095	Bridge	2	3.5	20	
65	148+510	C114	754294	1053750	Bridge	2	4	15	
66	150+900	C115	756339	1054990	Bridge	1	2.5	8	
67	151+900	C116	757193	1055598	Bridge	3	7.5	20	
68	156+200	C117	760421	1058329	Bridge	3	6	20	
69	158+120	C118	761920	1059476	Bridge	3	7.5	20	

70	158+975	C119	762744	1059665	Bridge	1	3	12	
71	160+380	C120	764116	1059957	Bridge	1	3	9	
72	161+540	C121	765245	1060278	BC/SC	1	1.5	3.5	
73	162+970	C122	766434	1060842	Bridge	1	3	10	
74	164+870	C123	768325	1061509	Bridge	2	4	20	
75	165+445	C124	768872	1061680	BC/SC	1	1.5	3	
76	166+890	C125	770277	1062019	Bridge	1	2.5	11	
77	167+485	C126	770856	1062158	Bridge	2	3.5	15	
78	168+680	C127	772017	1062439	Bridge	2	5	20	
79	169+400	C128	772731	1062579	Bridge	1	4	11	
80	171+475	C129	774790	1062587	BC/SC	1	4	4	
81	172+090	C130	775401	1062566	Bridge	2	5	20	
82	172+490	C131	775808	1062553	BC/SC	1	4	4	
83	173+809	C132	777243	1062185	Bridge	1	4	12	
84	177+030	C133	780280	1061875	Bridge	1	4	11	
85	177+630	C134	780738	1062027	Bridge	2	4	15	
86	177+750	C135	780895	1062075	BC/SC	1	4	5	
87	178+500	C136	781623	1062349	BC/SC	1	4	4	
88	180+170	C137	783089	1063144	Bridge	1	4	18	
89	180+800	C138	783651	1063431	BC/SC	1	4	4.5	
90	182+430	C139	785174	1063982	Bridge	2	4	15	
91	183+020	C140	785741	1064147	BC/SC	1	4	4	
92	184+320	C141	786990	1064511	Bridge	1	4	10	
93	185+250	C142	787890	1064774	Bridge	1	4	13	
94	186+400	C143	788890	1064966	BC/SC	1	4	5	
95	187+700	C144	789168	1065440	BC/SC	1	4	2.5	
96	187+150	C145	789623	1065569	Bridge	1	4	10	
97	188+700	C146	791151	1065622	Bridge	3	6	20	
98	189+600	C147	792023	1065461	Bridge	1	4	20	
99	190+900	C148	793308	1065274	BC/SC	1	4	2	
100	191+050	C149	799007	1065461	BC/SC	1	4	4.5	
101	191+925	C150	794523	1065318	Bridge	2	5	20	
102	193+050	C151	795641	1065471	Bridge	2	4	15	
103	195+380	C152	797948	1065768	BC/SC	1	4	6	
104	195+555	C153	798123	1065760	Bridge	1	4	12	
105	197+050	C154	799617	1065686	BC/SC	1	4	3	
106	198+110	C155	800675	1065634	Bridge	3	5.5	20	
107	198+885	C156	801447	1065595	BC/SC	1	4	2.5	

108	199+050	C157	801611	1065601	BC/SC	1	4	3	
109	199+620	C158	802254	1065627	Bridge	2	4	15	
110	199+850	C159	802373	1065631	Bridge	1	4	13	
111	200+830	C160	803387	1065685	BC/SC	1	4	3	
112	201+360	C161	803917	1065754	Bridge	1	4	9	
113	201+790	C162	804344	1065809	BC/SC	1	4	5	
114	202+305	C163	804851	1065875	BC/SC	1	4	3	
115	202+780	C164	805320	1065936	BC/SC	1	4	2	
116	203+210	C165	805747	1065992	BC/SC	1	4	4	
117	204+470	C166	807018	1066299	Bridge	2	3.5	15	
118	205+510	C167	808030	1066288	Bridge	1	3	12	
119	206+500	C168	809010	1066416	Bridge	1	2.5	10	

Annex D - Project Photo Collage

Topography along the Road Corridor

Rolling Terrain Just after Meisso

Flat / Rolling Terrain with Accacia Woodland in Afdem Woreda

Gully Formations Afdem Woreda

Rivers along the Road

Meisso River, KM 74+000

Mulu River, KM 81+000

River, KM 95+100

River, KM 116+800

River, KM 151+900

Consultations of Stakeholders during EIA Study

Primary Consultations

Primary Consultation at Meisso Woreda, W. Hararge, Oromia

Primary Consultation at Mullu, Meisso, Sitty, Somali

Primary Consultation at Afdem, Afdem, Sitty, Somali

Primary Consultation at Bike, Bike, Sitty, Somali

Primary Consultation at Erer, Erer, Sitty, Somali

Secondary Consultations

Secondary Consultation, Meisso Woreda, W. Hararge, Oromia

Secondary Consultation, Mullu, Meisso, Sitty, Somali

Secondary Consultation, Bike, Bike, Sitty, Somali

Secondary Consultation, Erer, Erer, Sitty, Somali

Secondary Consultation,Sitty Zone, Somali

Community Consultations

Community Consultations at Meisso Woreda - Oromia

Consultations at W. Hararge - Oromia

Community Consultations at Meisso Woreda - Somali	Community Consultations at Afdem Woreda - Somali
	
Community Consultations at Bike Woreda - Somali	**Community Consultations at Erer Woreda - Somali**
	
Community Consultations at Melka Jebdu Kebele – Dire Dawa	**Consultations at Somali Regional State**

Land Uses along the Road Corridor

Accacia Woodland near Mullu

Some Grazing Lands and Cattle Production Towards Mullu

Farming Near Mullu

Cattle Production in Meisso, Sitty, Somali

Acacia Woodland in Meisso, Sitty, Somali

Drinking Water Well for Cattles

Light Acacia Cover and Some Bare Lands towards Erer

1. Introduction

The environmental and social impact assessment (ESIA) team has been conducting consultations, discussions and surveys with all concerned stakeholders within the influence area Miesso- Bike - Dire Dawa Expressway road project since June 2, 2020, when the first reconnaissance survey started. The second consultation process was carried out from October 27- November 3, 2019, and November 9-13, 2019.The third consultation was carried out from December 14-20, 2019, and the fourth was from December 28- January 5, 2021. The fifth one which is taken as part of the consultation and discussion with project affected persons and also taking census of household characteristics, properties, assets, natural resources, utilities etc.., of those persons within the influence area of 142 km length and width of 90 meters (1278 hectares of land).

Detail purposes of each consultations and discussions with all concerned stakeholders at different times and results obtained from each of the consultations are presented below in each of the sections.

2. Result Consultations at Different Stages

2.1. First Consultation and Reconnaissance Survey

Outline of the Consultation

Indicated above, the first consultations and discussions made with all concerned stakeholders during reconnaissance survey made from June 2-6, 2020 were aimed:-

- to introduce and inform about the envisaged Mieso- Bike- Dire Dawa Expressway road project to be constructed;
- to collect opinion particularly from Woreda key stakeholders on the Expressway road project and get their consent; and
- to explore the situation of each of the Zones, Woredas and Kebeles that could be traversed by the envisaged Expressway from Miesso – Bike- Dire Dawa, and collected baseline data and information;

To meet the above stated objectives of public consultation, the ESIA team travelled from June 2 to 6, 2019 to all the Woredas that were expected to be traversed by the envisaged Expressway that include, Miesso in West Hararge Zone of Oromia; Mayesso, Afdem, Gota-Bike and Erer in Siti Zone of Somali National Regional States and Melka Jabdu (01Kebele) of Dire Dawa Administration. Table shown below indicates consultations and discussions made with different stakeholders during the first field reconnaissance survey.

Table 2.1-1: Consultations and Discussions made with local Stakeholders (Zones, Woredas and Town Administration)

No.	Consultation (made at)	Zone and Region	Remarks
1.	Meisso Woreda	West Harerge Zone, Oromia National Regional State	*Informal / Minutes Not Recorded*
			Formal / Minutes Recorded
2.	Meisso Woreda	Siti Zone of Somali National Régional State	*Formal / Minutes recorded*
3.	Afdem Woreda of Somali National Regional State		*Formal / Minutes Recorded*
4.	Bike City Woreda of Somali National Regional State		*Formal / Minutes Recorded*
5.	Erer Woreda of Somali National Regional State		*Informal / Minutes Not Recorded*
6.	Siti / Shinile Zone		*Informal / Minutes Not Recorded*
	Dire Dawa City Administration	Dire Dawa City Administration	*Informal / Minutes Not Recorded*

Source: Consultations made during Reconnaissance Survey, June, 2020.

Based on the information and data collected from the above Woredas, the following nary preliminary data/information regarding each of the Kebeles would be traversed by the Expressway are identified and recorded as shown below on table 2.1-2.

Table 2.1-2: National Regional States, Zones, Woredas and Kebeles Traversed by Mieso-Dire Dawa Expressway

S/N	Regional State	Zone	Woreda	Kebele
1	Oromia	West Hararge	Miesso	Chacholu
				Fayo
				Gurbo
2	Somali	Sitti	Mayesso	Somadaye
				Kurfa Sowa
				Muluwan
				Mulutu
				Kolmaye
				Arma Dobe
				Huluka Dobe
				Arkaye
3			Afdem	Dhalladu
				Derila
				Afdem Town
4			Gota-Bikei	Gota
				Bike

				Bokoli
				Holabor
				Khara Biyo
				Biyo Kululu
7				Megal Ada
				Erer (01)
				Erer (02)
			Erer	Erer (03)
				Gode
				Gara Sule
				Hurso
8	Dire Dawa City Administration			Melka Jabdu (01Kebel)
Total				42

Source: Primary Consultation Data, October and November 2020.

Output of the first Consultations and Discussions

The opinion of the key stakeholders who have participated in consultations and discussions during the reconnaissance survey of Miesso - Bike- Dire Dawa Expressway was very much similar, and all of them appreciated and accepted the Concept Design, Feasibility Study and Preparation of different documents towards the implementation of the Expressway. So, on their behalf, they have promised to contribute, inform all other stakeholders concerned and ready to perform all what are required from them.

The participants of the consultations and discussions also clearly stated that the envisaged Expressway influence area is neglected one, and so many studies concerning building road from Miesso to Dire Dawa have made, promises were given and not yet put into practice. Due to this fact they have expressed their opinion that they still have doubt about the study. As they have expressed, this is because many studies were carried out and promises were made but never realized.As observed during the reconnaissance survey, the road that exists between Miesso-Bike-Dire Dawa near Melka Jabdu is partly an earth and gravel road with low standard.

The other major issues raised during consultations and discussions in all the Woredas were that, from their past experience during rail way construction those households whose properties such as residence houses, grazing areas, crop farmland, horticulture farmland etc.., affected were not paid appropriate compensation based on the Constitution of the Federal Democratic Republic of Ethiopia (FDRE) and subsequent Proclamations and Regulations provided for Expropriation of Land for Public Purpose, Payment of Compensation and Resettlement.

The key stakeholders with home consultations and discussions were made during the reconnaissance survey indicated from their own experiences on compensation payment and rehabilitation programs implemented in projects such as Addis Ababa – Djibouti Railway and High Electric Power Tension Transmission Line extended form Awash to Djibouti. In this regard, the major issues and areas of problems are related to lack of appropriate taking of inventories of

those properties/assets that would be affected, lack of appropriate valuation for those properties would be affected and lack of appropriately paying the estimated compensation.

The overall responses made during consultations and discussions made with stakeholders to overcome the above raised issues and problems were:

- to take inventories of properties/asset would be affected by a task force whose members will include professionals and qualified persons to be established;
- to make adequate estimation of valuations of properties/assets based on Proclamation No.1161/2019, a Proclamation to determine Expropriation of Landholdings for Public Purpose, Payment of Compensation and Resettlement and Council of Ministers Regulation No.472/2020;
- Similar National Regional State Proclamations and Regulations proclaimed as appropriate; and
- To make effective and efficient compensation payment and implement resettlement action plan (RAP) prepared to ensure the wellbeing of those who would be affected.

The list of key stakeholders participated in consultations and discussions made during the reconnaissance survey in all the Woredas of the Expressway road project influence area are attached on the last part of the report.

Pictures of First Consultation during Reconnaissance Survey

Consultation at Meisso Woreda - Oromia

Consultation at Meisso Woreda - Somali

Consultation at Afdem Woreda - Somali

Consultation at Bike Woreda - Somali

Consultation at Erer Woreda - Somali

2.2. Woreda Level Consultation with Government Stakeholders

The second consultations and discussions were made with Woreda level government stakeholders within the influence area of the Expressway from form October 27- November 3, 2019, and November 9-13, 2019.

The purpose of Woredal level consultations and discussions with government stakeholders, particularly, those sector offices such as Woeda Administration, Environment, Forest and Climate Change, Agriculture and Natural Resources, Livestock and Pastoral Community Development, Land Administration, Road and Transport, Communication and Public Relations, Water Supply and Sewerage Women, Youth and Children, Education, Health etc...,were:-

- to inform them about Adama- Awash- Mieso – Bike- Dire Dawa Expressway road project with emphasis on Awash (Brigade) (Mille Junction- Miesso – Bike-Dire Dawa which is 207km long and get feedback on the positive and negative impact of the Expressway;

- to get their consent and feedback on mitigation measures to be taken to minimize social risks and negative impacts that could encounter the project affected households and their families;
- to collect socioeconomic baseline data from each of the Woredas within the influence area of the Expressway;
- to brief them that estimation and compensation payment for moveable and immovable properties and assets would be affected due to the Expressway are made based Proclamation No.1161/2019 and Council of Ministers Regulation No.472/2020, and consultation and discussion on such issues;

Detail discussions and consultations on the above agendas were made in all the Woredas of Miesso, Mayesso / Mulu), Afdem, Gota-Bike and Erer found within influence area of the Expressway fromform October 27- November 3, 2019, and November 9-13, 2019 with the above indicated heads/representatives sector offices. In summary, a total of 35Woreda level government stakeholders have participated in the consultations and discussions as shown in the table below.

Table 2.2-1: Number of Woreda Level Government Stakeholders participated in Consultations and Discussions made at each Woreda

Woreda	Number of Participants			Remarks
	Total	Male	Female	
Miesso (Oromia)	14	12	2	*Consultation and Discussion made minutes recorded and attached in Annex*
Mayesso (Somali)	8	6	2	*Consultation and Discussion made minutes recorded and attached in Annex*
Bike	8	8	0	*Consultation and Discussion made minutes recorded and attached in Annex*
Erer	5	5	0	*Consultation and Discussion made minutes recorded and attached in Annex*
Total	35	31	4	

Source: Compiled from field level Consultations and Discussions, October-November 2020.

Results of Consultations and discussions

As it was reflected during consultations and discussions made with concerned stakeholders at each of the Woreda of the expressway influence area, the government representatives welcomed and appreciated the idea of constructing the Expressway from Adama - Awash (Birgade) Mille Junction – Miesso- Bike and Dire Dawa. They have also expressed their opinion that they ready to coordinate, facilitate and provide all support required from the local governments within their jurisdiction that include Woreda and Kebeles.

Each of the sector government stakeholders participated in the consultations and discussions expressed their views and showed their interest that they are willing to provide all supports required from them, fulfil their duties and responsibilities as required from them.

However, the Woreda government stakeholders from the experiences they had in implementation of projects such as the new Addis Ababa –Djibouti Railway; High Electric Power Tension Transmission Line extended form Awash to Djibouti and the like, they have raised several issues and questions that particularly related to the Rail Way construction, reported and also made the following recommendations.

- Adequate number of over pass and under pass for crossing livestock were not built during the rail way line construction; and therefore, number of under pass and over pass should be constructed at appropriated location within the consent of concerned stakeholders;
- when under pass and over pass structures for the passage of livestock like Camel and large group of cattle on the Railway Line the required height and width were not kept, and with the expressway to be built, required height and width of the structures should be considered;
- under pass and over pass structures built by the Railway project are very fare from each; and this should not be repeated; and
- when the Expressway is constructed the currently existing livestock and human beings foot paths have to be maintained and under passes and over passes to be constructed should take into consideration livestock movement and crossing the Expressway for grazing areas and water;
- inventories of properties and assets that are found within the width of 90meters by length of 142km (1278hectares) of the Expressway that include grazing areas, farmland, forestland, areas under residences, ritual places, cultural heritage areas, burial places and other institutions should be taken based on which mitigation measures would be taken for all the would be affected properties and assets;
- valuation and estimation for compensation payment has to be implemented according to Proclamation 1161/2019 and Council of Ministers Regulation No 472/2020;
- The stakeholders with whom consultation made were also reported that the Railway line that stretched from Addis Ababa to Djibouti traversing their respective woreda is not benefiting them because the railway line does not pass through towns and no adequate Railway Stations form where to get transport services ;
- requests were made by the stakeholders that, the Expressway road project should be connected to the towns with Link Roads and also to pass nearby towns;
- Creation of employment opportunities for the local staff and particularly for youth during the different phases of construction of the Expressway is requested to be realized;
- Issues related to livelihoods restoration particularly, material and technical support to be made for those households would be affected due to loss of their residence houses, vulnerable groups/ people with special needs like women headed households, household headed children, and persons with disabilities were raised; and
- on their part, the stakeholders confirmed that they are ready to support and willing to standby with those who will be engaged construction of the expressway;.

In addition to consultations and discussions made with Woreda stakeholders within the influence area of the Expressway, similar consultations and discussions were made with Somali National Regional State concerned sector office, Siti Zone Administration of Somali and West Hararghe Zone of Oromia.

Detailed records ofminutes taken when consultations and discussions were made at all the influence areas of the Woredas of the Expressway, National Regional State of Somali with concerned sector offices; Siti and West Hararghe Zones of Somali and Oromia are attached on annex of the ESIA.

Below are shown some pictures taken during consultations and discussions made at different levels.

Pictures of Woreda Level Consultation with Government Stakeholders

Consultation at MeissoWoreda - Oromia

Consultation at GumbiBordedeWoreda - Oromia

Consultation at Meisso Woreda - Somali

Consultation at Bike Woreda - Somali

Consultation at ErerWoreda - Somali

Consultation at Sitti Zone - Somali

2.3. Kebele Level Consultation and Discussion with Community Representative Stakeholders

Kebele is the lowest administrative unit through which development intentions and services are provided to the population living within its jurisdiction. All the different economic and social development programs/projects implemented are supported by technical staff assigned at Woreda level and that include staff such as agronomist, animal health assistant, extension agent, plant protection agent, health extension workers, teachers, health professionals etc.., assigned at Kebele level.

The primary stakeholders of a Kebele are its entire population, and particularly based on the rural setting of Ethiopia, the Kebele Chief Administrator, a Kebele Manager, , and technical staff assigned at Kebele level.

In the case of introducing and orienting the Kebele community at large about Adama-Awash (Birgade) Mille Junction-Miesso – Bike- Dire Dawa Expressway feasibility study and getting feedback information on the positive and negative aspect of the Expressway, primary stakeholders that include, the Kebele Chief Administrator, the Manager, Religious Leader, knowledgeable Elder, Women and Youth representatives' are paramount.

Taking this into consideration, pre- informed and pre-arranged consultations and discussions were carried out with community representatives' that include Kebele Chief Administrator, Manager, a Religious Leader, an Elder, Women and Youth representatives from each of the 30Kebeles from Miesso-Bike-Dire Dawa(near MelkaJebdu) that would be traversed by the Expressway from December 14 – 20, 2020.The total participants of Kebele/ representatives in pre-informed and pre-arranged consultations and discussions made were about 226. The details are presented in the table below.

Table 2.3-1: Number of Represented Participants from their Respective Kebeles in Consultations and Discussions made at each Woreda Level

Woreda	Total Kebele	Participants		
		Total	Male	Female
Gora - Bike	6	35	33	2
Erer	7	44	32	12
Dire Dawa	1	16	13	3
Afdem (Somai)	4	24	19	5
Mayesso (Somai)	6	35	31	4
Miesso (Oromia)	6	39	32	7
Total	30	193	160	33

Source: Compiled from Consultations and Discussion made, December, 2020

Purpose of Kebele/Community Consultation and Discussion

The purpose of Kebele/Community Consultation and Discussion with their representatives' in all the influence Woredas of the Expressway were to:-

- Inform the commencement of Meiso – Dire Dawa Expressway feasibility study and preparation of required documents for the startup of the project;
- Get feedback and know the concerns and views of the communities on the positive and negative expectations of the Expressway project;
- Collect data/information to enrich the ESIA study;
- Identify types of supports expected from community Kebeles and the population at large;
- Identify major challenges that could encounter community members and particularly project affected persons.

Results of community representatives Consultations and Discussions

Community representatives participated in consultations and discussions reflected that they are happy, appreciated and welcomed construction of Miesso-Bike-Dire Dawa Expressway. However, they reflected that they anticipated the following negative aspect when the railway line was constructed and indicated that they do not need these negative aspect to be reacted, and these are:-

- Made requests to have as many as possible over passes and under passes crossings within reasonable distances both for livestock and human population traveling/moving from North to South and from South to North of the Expressway;
- To take into consideration the existing social and economic conditions of Pastoralists, Agro-Pastoralists, and Mixed Farming living within the influence area and provide adequate support for improvement of their livelihoods;
- to take precautions not to repeat the same mistakes made, such as construction of inadequate over passes and under passes;inappropriate compensation payment made for those whose properties were affected by railway line constructed;

Regarding positive impacts, the following were indicated:--

- Fencing of the Expressway on right and left sides, protects people and livestock from risks of accidents;
- Construction of the Expressway would open up employment opportunities to youth and Kebele Community at large;
- Reduce travel time both in going and coming back home from Dire Dawa, Miesso and other towns nearby;
- Shortens transporting of goods and materials time from and to Ports such Djibouti and others;
- If closely working with the communities is enhanced, the possibility of reducing negative social risks and impacts enhanced;
- Recommended for frequent consultations and discussions between the project office and community representatives for smooth implementation of the Expressway;
- Promised that land replacement for affected residence area could be given easily, particularly within the pastoral community areas ;

Overall, the consultations and discussions made with community/Kebele representatives' indicated that they are willing to mobilize the entire community/Kebele population for the implementation of the Expressway road project, disseminate about the expressway envisaged to be constructed, and to participate in any activities required from them.

Regarding the minutes taken and recorded, the details are found on attached annexes on the ESIA. Pictures taken during consultations and discussions made with Kebele/Community representatives are shown below.

Pictures of Kebele Level Community Consultations

Community Consultations at MeissoWoreda - Oromia

Consultations at W. Hararge - Oromia

Community Consultations at MeissoWoreda - Somali

Community Consultations at AfdemWoreda - Somali

Community Consultations at Bike Woreda - Somali

Community Consultations at ErerWoreda - Somali

Community Consultations at MelkaJebduKebele– Dire Dawa

Consultations at Somali Regional State

2.4. Additional Consultation and Discussion with Government Stakeholders at Different Levels

For collection of addition information on challenges in community health and safety, challenges in energy, waste and pollution management, Risk on Gender biased violence and labours working conditions, and security risk assessment, consultations and discussions were from December 29, 2020 to 5th of January, 2021.The consultations and discussions were made at all the influence Woredas of the Expressway; Siti Zone of Somali, West Hararghe Zone of Oromia and Somali National Regional State. The specific sectors consulted include, Women, Children and Youth Affairs, health, Agriculture and Natural Resources, Regional Police Commission, Judiciary and Security Agency.

3. Consultation and Discussion with Project Affected Households

Miesso – Bike –Dire Dawa Expressway with 142 km length is envisaged to be constructed would expropriate a total area of 1278 hectares of land right of way. Data collected using Satellite Imagery indicated that the envisaged Expressway would affect residence houses, farmland, grazing areas, forest, horticultural crops etc.., the data collected using Satellite Imagery does not indicate quantities, types, conditions of the properties/assets would be affected. It could not also indicate, ownership title, characteristics of the population would be affected within the influence area of 1278 hectares.

To bridge that gap that currently exists, particularly in quantification of the properties would be affected and also data required for preparation of Land Acquisition, Restrictions on Land Use and Involuntary Resettlement, three, Net Consult P.L.C surveyors have taken census of population that include households characteristics, properties, assets, natural resources, utilities, graveyards, etc.., would be affected due to the Expressway road project. The surveyors have also conducted consultations and discussions with individual property/ asset owners and groups of community members withinthe ROW of the Expressway envisaged to be constructed. The surveyors made consultations and discussion with household members and community groups when they took inventories of would be affected properties and assets on issues of valuation for their properties, compensation payments and related matters.

Regarding the overall consultations and discussions, it is a process and required to be continued throughout the expressway implementation with project affected persons (PAPs), government stakeholders and the community at large, because the expressway will have influence on all of them. List of key stakeholders participated in Consultation made during reconnaissance survey is attached below. The other detail lists of participants in different consultations and discussions made with government stakeholders and community representatives at different levels attached on other Annexes that contained in minutes taken and recorded.

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA

ETHIOPIAN ROADS AUTHORITY

Consultancy Services of the Review of Feasibility Study and Environmental Impact Assessment (EIS), Detailed Engineering Design, Preparation of Resettlement Action Plan (RAP) and Tender Document Preparation for

Meisso – Dire Dawa Expressway

[*Final*] Occupational Health & Safety Plan

- Annex I -

February 2021

Aarvee Associates Architects Engineers & Consultants Pvt. Ltd. In JV with Net Consult P.L.C.

Executive summary

This occupational health and safety plan is prepared forMeisso – Dirre Dawa Expressway Project. It is prepared according to the Ethiopian labor law and World Bank ESSs as well as other international experiences. The plan is organized in such a way that every activity performed by the Project Road will give priority to avoid hazards in the first place. If avoiding hazards is not possible, personal protective equipment and First Aid will be organized for risk full activities. This OHS plan takes specific sites, detailed activities, machineries involved, the anticipated potential hazards, classification of the hazard, and the essential precautions the Project Road will implement or follow to prevent the hazards.

According to the requirements of Meisso – Dirre Dawa Express Road Project, it is mandatory for all individuals to undergo medical checkups before getting their employment letter or sign contract agreement. Moreover, all employed personnel are required to attend the OHS induction training and get certification before they are deployed to actual project activities. The induction training includes the Safety Policy, General OHS awareness, Basic First Aid, Basic Fire Prevention, Contact Information, Rights and Responsibilities, Working Alone Procedure, Incident Reporting and Investigation, Personal Hygiene, Personal Protective Equipment and Emergency Preparedness. Furthermore, the project shall develop a separate operational health and safety guideline document and posters to be used as required and available at critical points for easy reference and raising the awareness of its employees.

The implementation of OHS is the responsibility of all workers, in general, and the respective departments and the EHS department, in particular. Failure to follow safety precautions may lead to disqualification for the worker and punishment for the department and the sub–contractor.

In this project the implementation of all recommended safety precaution for each site activity is monitored by all the department heads, safety officer and joint workplace and occupational safety committee and ERA Environment social and occupational Safety team. Last but not least, safety is always reflected as a priority to Meisso – Dirre Dawa Expressway Project.

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Acronyms

ACM	Asbestos Containing Material(s)
CPR	Cardio – Pulmonary Resuscitation
dB	decibels
EHS	Environment, Health and Safety
EMS	Emergency Medical Services
ERA	Ethiopian Roads Authority
ESOS	Environmental, Social and Occupational Safety
HIV/AIDS	Human-Immune deficiency Virus Acquired Immune Deficiency Syndrome
JSA	Job Safety Analysis
LOC	Local Organizing Committee
OHS	Occupational Health and Safety
PPE	Personal Protective Equipment
RA	Risk Assessment
RoW	Right of Way
WMS	Work Method Statement

Part I

General Background

1. Project Background

The Meisso – Dirre Dawa Expressway Project that covers 77 km is located in the eastern part of the country. It starts from near Meisso town (a town about 303 km east of Addis Ababa) and passing through Meisso-somale, Afdem, Bike, Erer districts and Dirre Dawa city administration. The road will connect two regional administrative and one city administration namely, Oromia, Somali and Dire Dawa city administration respectively.

Meisso – Dirre Dawa Expressway Project involves opening new road that has removal of natural vegetation in the RoW, cut and fill opening of borrow and, quarry material extraction by blasting and jackhammer. Apart from these earthwork activities, the road construction involves precast yard, asphalt plant, bitumen stockpile area, campsite construction and management activities.

Moreover, it requires rock quarrying either by blasting or using jackhammer requires a number of heavy machineries and skilled personnel. With all due care, the construction industry is prone to accident that emanate from negligence, ignorance or lack of proper orientation. This Occupational, Health and Safety (OHS) plan is prepared to avoid, eliminate or minimize the risk of hazards on people, resources and animals during the construction of Meisso – Dirre Dawa Express Road Project which is about77km in length.

2. General Aspects of Occupational Health and Safety

Occupational health and safety induction training is a vital component of any company's health and safety management system. It is the process of introducing new, inexperienced, relocated and returning employees to a safe and healthy workplace. This Occupational health and safety plan has been designed and developed to work systematically and manage occupational health and safety at the events surrounding and associated with Meisso – Dirre Dawa Expressway Project. It provides a systematic approach to comply with the duties and obligations found under the Occupational and Workplace Safety Labor proclamation, Regulations and Codes of Practice.

Safety training provides employees with necessary safety information about their job and tasks, informs them of specific details about workplace hazards and provides an opportunity to learn about the company and their colleagues, ask questions and to clarify new or confusing information. All employees of Meisso – Dirre Dawa Expressway Project are obliged to attend mandatory safety induction training before engaging to their routine activities.

Apart from the safety induction orientation, the project contractor shall recruit and provide special First Aid training to all project drivers, guards, and foremen. These trainees are responsible to handle any emergency at all circumstances in their vicinity and beyond. Furthermore, the project shall establish its emergency management clinic in the main camp, sign agreement with hospitals along the proposed express road to handle cases beyond the capacity of the clinic, mobilize project ambulance, and equip active worksites with First Aid Kits.

2.1. Safety Policy

Ethiopian Roads Authority considered that People are the most important asset hence, their health and safety is greatest responsibility of the authority. Therefore, it is ERA's policy to provide a safe, accident-free, and healthy work environment for everyone. However, excellent safe and healthy conditions do not occur by chance. They are the result of diligent work and careful attention to all ERA's policies by everyone. Occupational Health and Safety Policy is based on a belief that the well-being of people employed at work, or people affected by road work, is a major priority and must be considered during all work performed on behalf of ERA.

The objectives of this Safety Policy are to:

- achieve accident free workplace by complying with all relevant health and safety;
- make health and safety an integral part of every managerial and supervisory position;
- ensure health and safety is considered in all planning and work activities;
- provide periodic training on occupational safety to ensure that employees work in the safest manner;
- identify and control all potential hazards in the workplace through hazard identification and risk analysis;
- ensure all potential accident/incidents are controlled and prevented; and
- provide effective injury management and rehabilitation for all employees

Thus, to achieve the objective of the safety police or the success of ERA health and safety management is dependent on:

1. Pro-active planning of all work activities with due consideration given to implementing OHS controls that are suitable to each given situation, including emergencies;
2. Understanding the total work process and associated OHS risks;
3. Ensuring the work team is totally committed to achieving the objectives;
4. Ensuring that open and honest communication exists between management and all employees; and

5. Internal and Third Party compliance auditing and monitoring, to prove that we *"Walk the Talk"*

The responsibility for safety shall be adopted as an integral part of everyday work, therefore it is vital that every employee shares in the commitment to eliminate unsafe acts and conditions by thinking safely and acting safely at all times.

2.2. Objectives

The objective of this occupational health and safety plan for Meisso – Dirre Dawa Express Road Project is to foster a safe and healthy work environment. It helps to protect co-workers, employers, customers, and many others who might be affected by the workplace environment.

Thus, the objective includes conducting safety and health inspections to find and eliminate unsafe working conditions or practices, to control health hazards, and to comply with local, state, and federal codes and investigating promptly and thoroughly occupational accidents to determine the cause and how to prevent a reoccurrence. In general, it helps to avoid, reduce, or minimize the detrimental effects of the road construction activities on the health and wellbeing of workforces and enhance their safety through occupational health and workplace safety plan.

2.3. Scope

The scope of the OHS plan for Meisso – Dirre Dawa Express Road Projects primarily concerned with creating sufficient awareness on the role and responsibility of each workforce on safe working conditions, the possible occupational health and safety risks, monitoring individuals for the onset of disease and ill-health arising from exposure to hazards.

Furthermore, it focuses on occupational hygiene primarily concerned with examining and controlling individual exposure to dangerous substances that can cause ill-health and ergonomics which is a field concerned with ensuring that the work process is designed to be aligned to the individual and thereby reducing the likelihood of human error.

2.4. Essential Legal Provisions

Labor standards play crucial role in protecting the interest of workers both at the national and international level. As workers are by far weaker parties in labor relationship, setting a minimum threshold, beyond which acting is prohibited, has been considered by governments as an important means to protect workers. The need to ensure workers' safety, freedom and dignity,

and the quest for the promotion of peace and economic efficiency calls for protective labor standards. The standards are set at the international level and incorporated in different instruments including the ILO Conventions. In the context of Ethiopia, they are found in the Federal Democratic Republic of Ethiopia Constitution and the Labor Proclamation (No. 1156/2019).

This proclamation is acted to ensure worker-employer relations are governed by basic principles of rights and obligations with a view to enabling workers and employers to secure durable industrial peace; sustainable productivity and competitiveness through cooperative engagement towards the all-round development of our country. Thus, the Ethiopian Labor Proclamation has a provision requires the employer to have an obligation to safeguard workers from accidents and injuries. The proclamation also requires that the employer provide regular health services including during worker injury and sickness.

2.5. Ethiopian Roads Authority's Commitments

Ethiopian Roads Authority is committed to implement this occupational health and safety plan in its fullness. In order to implement the plan successfully, the Authority will mobilize adroit personnel and consultant that will follow the day – to – day site conditions with regard to occupational health and safety. Moreover, the Authority will enforce the contractor of the proposed express road toprovide the necessary personal protective equipment for the workforce as per the JSA.

2.6. Organizational Arrangement, Role and Responsibilities

A successful corporate safety program should include a clear statement of policy by the client or owner, expressly showing management support for meeting safety objectives and the involvement of different stakeholders in the management system.

Ethiopian Road Authority

Ethiopian roads authority through its Environment, social, occupational and safety (ESOS) directorate shall put safety and health on the top of the agenda along with financial considerations.

To ensure that all contracts are completed on time, on budget and safely, ERA shall:

- ensure that environment, occupational health, and safety issues are well addressed in the contract agreement;
- recruit and assign capable and experienced supervision consultant
- Have allowed sufficient time and resources for implementing the contractor's safety program

- Ensure that environment, occupational health, and safetyare not compromised through monitoring
- Ensure that environment, health and safety system of the contactor is in place through supervision during the mobilization period
- Monitor practical implementation of the occupational health and safety plan for the project

Construction Supervision Consultant (CSC)

The main responsibilities of the CSC will be:

- assign competent senior environmental and social specialists for supervision of the project
- review the contractor's environmental, occupational health and safety plan, implementation work plans, method of implementation, their approval, and making sure that these and other environmental, occupational health and safety requirements that are included in the contract document and fully complied accordingly.
- responsible for a day-to-day observation of all site activities and occurrence of any unforeseen environment, health and safety issues.
- If unforeseen adverse impacts are observed, the CSC will recommend appropriate actions to be taken for the contractor or other implementing body to overcome or mitigate the problems in time;
- if necessary the CSC will seek the advice from ERA's environmental, social, and occupational and safety directorate necessary actions.
- Prepare progress report for the ERA monthly,
- Conduct environment, occupational health and safety audit quarterly.

Contractors

- Plan emergency routes and exits, traffic routes, danger areas, loading bays, ramps, etc.
- Ensure provision of safe work equipment, with due care to their suitability, selection, safety features, safe use, training and information, inspection and maintenance.
- Provide safe working slope for excavators.
- Design and anchor fork-lift trucks and dump trucks to prevent roll-over or overturn
- Provide suitable safety signs and warning notices
- Provide personal protective equipment, e.g. reflective clothing that should be fit, comfortable and well maintained.
- Keep the workplace free from hazards

- ☞ Provide suitable communication and information –to let employees know how to protect themselves against hazards
- ☞ Conduct regular jobsite safety inspections
- ☞ Employ trained first aid personnel on site and/or put in place an emergency response system.

Project Manager

Besides his/her engineering responsibilities the project manager is responsible to:

- ➢ Oversee all project OHS issues;
- ➢ give the monthly work action plan to the all departments and EHS coordinator;
- ➢ hands over requests from respective departments and work sites OHS induction training requests and pass it to OHS department for execution of the trainings;
- ➢ collect and approve the monthly JSA or work action plan concerning occupational health and safety for proper implementation;
- ➢ involved in the supervision of the implementation of the OHS work action plan;
- ➢ provide inputs for the improvement the OHS service;
- ➢ make sure all the necessary materials including vehicle are available for EHS service;
- ➢ involve in accidents investigation and reporting;

Construction Department

- ➢ instruct the OHS department to prepare monthly OHS action plan;
- ➢ establish project safety committee and request the OHS department to conduct training for the safety committee;
- ➢ provide all the necessary support for the OHS department for the proper excursion of the monthly OHS plan;
- ➢ involved in the supervision of the implementation of the OHS work action plan;
- ➢ provide inputs for the improvement the EHS service;
- ➢ make sure all the necessary materials including vehicle are available for EHS service;
- ➢ involve in accidents investigation and reporting;

EHS Department Coordinator's Responsibility

- ➢ get monthly work action plan from Engineering department;
- ➢ conduct OHS induction trainings as per the request from respective departments and work sites obtained from the engineering and administrative departments;
- ➢ certify trainees of OHS upon completion of basic induction training;

- conduct JSA and organize and coordinate EHS work action plan with respective departments or work site personnel;
- identify safety training needs, organize, conduct safety training courses;
- conduct pre–engagement safety orientation and onsite job safety trainings;
- carryout regular inspections, surveys, and audits together with Supervisors and Managers;
- conduct accidents and incidents analysis for take corrective and preventative actions;
- responsible for the legal compliance of the project in matters related to EHS;
- address safety and environmental non-compliance and will make proposal for improvements;

Site Occupational health &Safety Officer's Responsibility

The Site occupational health and Safety Officer is responsible to:

- implementing the organization's Occupational Health and Safety Policy;
- using the principals of hazard controls (Best to Worst guide in the H&S System) in all design and construction activities to minimize the risk to all personnel in the workplace;
- participating in the planning and risk assessment stages of site activities;
- stimulating a high level of safety awareness at all times to avoid risks and supervise PPE;
- identifying and conduct safety training needs and participate in accident investigations;
- ensuring safe equipment and plant is provided and maintained;
- insisting on correct and safe work practices at all times;
- assisting in the identification and preparation of safe work procedures;
- participating in safety meetings and safety programs;
- monitoring daily and weekly compliance with safe work methods (controls);
- Prepare monthly action plan with the coordinator and site personnel on EHS issues;
- Offer emergency management and preparedness training and manage emergencies
- Transport and keep in place safety signs to required sites;
- Address safety non-compliance and propose for improvements;
- Prepare and submit monthly report to the OHS;

Employee's Responsibility

- Attend the mandatory OHS induction orientation training;
- Receive competence certificate from the OHS department before employment;
- Always follow safety instructions and wear the PPE provided by the project contractor;
- Keep once own personal hygiene and neat living and working areas;

- Handle with due care all instruments and tools entrusted to him for work;
- inform immediately the employer any act which endangers himself or his fellow workers or which prejudice the interests of the undertakings;
- observe the provisions of this Proclamation, collective agreement, work rules and directives issued in accordance with the law;
- refrain from any kind of gender based violence and report to the management when such misbehaviors are noted;
- Your safety is your personal responsibility therefore always follow the correct procedures and never take shortcuts;
- Take responsibility and clean up if you made a mess and clean and organize your workspace, in addition, ensure a clear and easy route to emergency exits and equipment;
- Be alert and awake on the job.

Moreover, the following diagram shows organizational arrangement and responsibilities to practically implement occupational health and safety plan

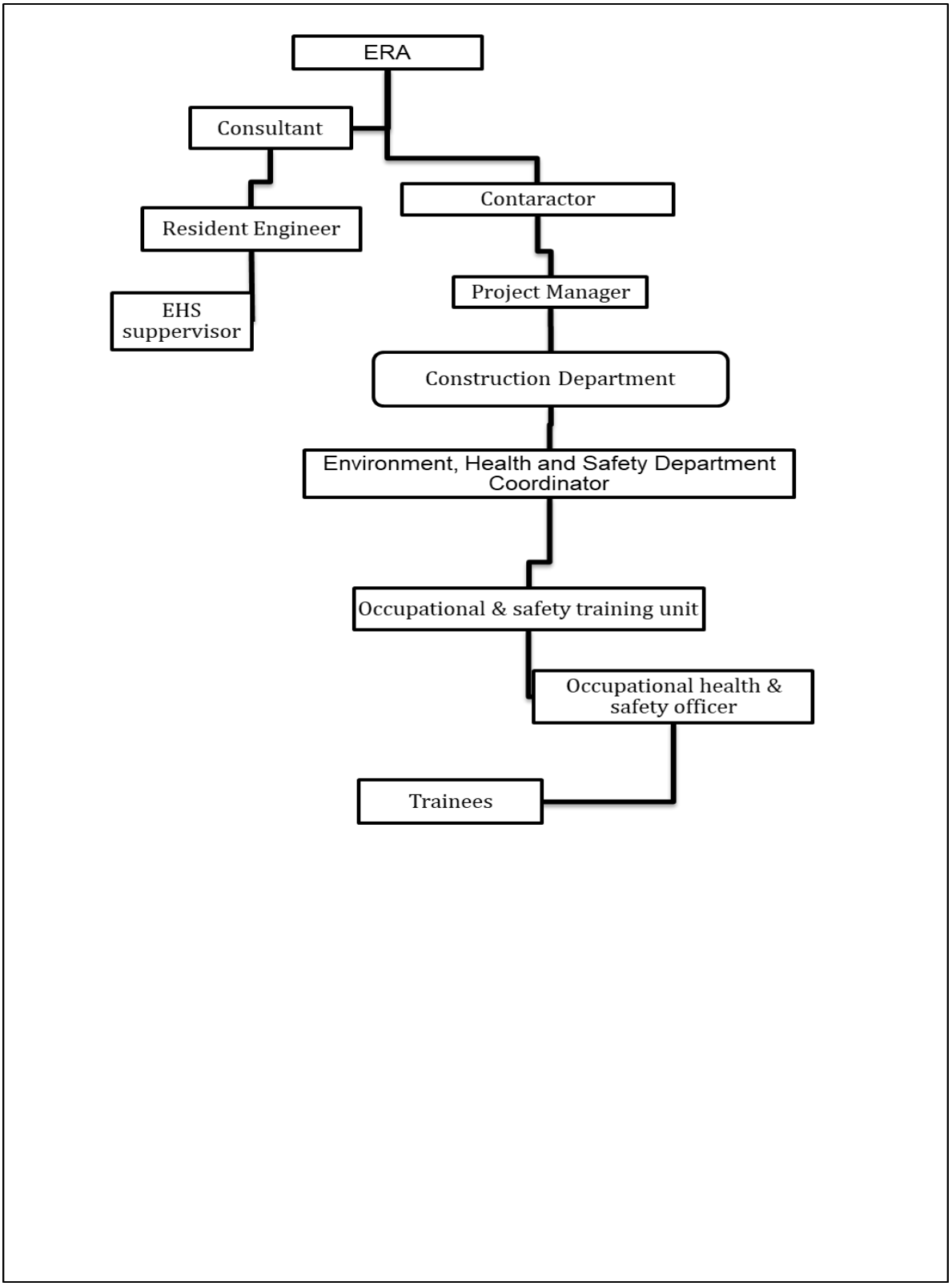


Figure 1: Organizational heretic stricture for the implementation of OHS.

2.7. Occupational Health and Safety Operational Procedures

- OHS department establishes Joint Occupational Health and Safety and Traffic Safety Committee. The engineering department head, administrator and company managers of sub–contractors form the joint committee;
- Members of the committee will receive advanced training in handling Occupational Health and Safety and Traffic safety operations along with their daily routine;
- All employees will receive training on safety and get certificate by safety officer to work on site. No employee is allowed to work without safety clearance certificate;
- Members of the joint committee will make sure that all employees fulfill the safety precautions required by all work operation sites;
- Every month the EHS department will prepare a monthly Occupational Health and Safety action plan in collaboration with the engineering department. The plan includes JSA and emergency management along with responsible parties for the successful execution on the action plan;
- Members of the joint committee are entitled to get a copy of job safety analysis (JSA) report before the commencement of the activities under their supervision;
- Members of the joint committee will be in charge of site situation during emergency;

2.8. Restrictions in Workplaces

Meisso–Dirre Dawa Express Road Project construction takes the national and international safety standards into considerations. Thus, the following acts are strictly outlawed, restricted during all working hours, and have precarious consequences:

- Use of drugs, addict chemicals and alcoholism;
- Horseplay during working hours;
- Holding any kind of firearms such as pistol, gun, knives, spears, etc. unless legally authorized personnel;
- Harassing women, children and other vulnerable groups;
- Showing an act of disrespect to the local norms and cultures;
- Drinking alcohol at workplaces and coming to work drunk;

Notice such acts and similar occasions must be reported immediately to the project manager and the project consulting engineer. The reports will be investigated promptly and comparable actions will be taken apart from the legal procedures.

2.9. The three rights of workers

The workers have three important rights:

1. The right to know about hazards in their workplace and to get information, supervision and instruction to protect their health and safety on the job;

2. The right to participate in identifying and solving workplace health and safety problems either through a health and safety representative or a worker member of a joint health and safety committee;

3. The right to refuse work that they believe is dangerous to their health and safety or that of any other worker in the workplace.

2.9.1. The Right to Know

Workers have the right to know about any potential hazards to which they may be exposed in the workplace. The primary way that workers can become aware of hazards in the workplace is to be informed and instructed on how to protect their health and safety, including health and safety related to the use of machinery, equipment, working conditions, processes and hazardous substances. ERA will enable the workers' right to know in various ways, such as making sure they get:

- ☞ Information about the hazards in the work they are doing;
- ☞ Training to do the work in a healthy and safe way; and
- ☞ Competent supervision to stay healthy and safe.

2.9.2. The Right to Participate

ERA believes that Workers have the right to be part of the process of identifying and resolving workplace health and safety concerns. This right is expressed through direct worker participation in health and safety in the workplace and/or through worker membership on joint health and safety committees or through worker health and safety representatives. ERA encourages employee participation in the EHS committee.

2.9.3. The Right to Refuse

Workers have the right to refuse work that they believe is dangerous to either their own health and safety or that of another worker in the workplace. Workers may refuse work if they believe their health and safety is endangered by any equipment they are to use or by the physical conditions of the workplace. In certain circumstances, members of a joint health and safety

committee who are "certified" in collaboration with supervising consultant have the right to stop work that is dangerous to any worker and report to ERA within 48houres.

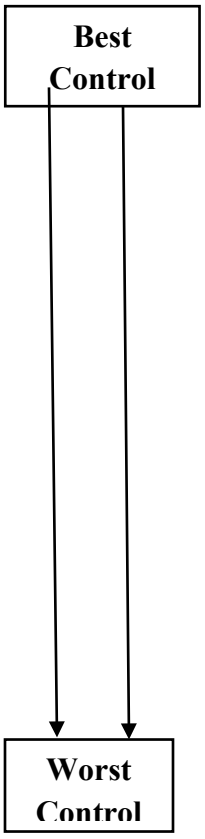
2.10. Job Safety Analysis (JSA)

JSA is the process of identifying potential hazards; assessing their risk and recording how to eliminate isolate or minimizes the risk to worker safety (controls). Where potential hazards are identified as Significant (Class A or Class B); JSA shall be completed using the step–by–step guide. The JSA will demonstrate the major events, understanding of the risks (particularly Class A and B risks) involved in the work and typical controls used. The JSA form F02–01 provides a record to demonstrate compliance to legal requirements.

Evaluation of the JSA

The JSA will be evaluated on how well ***Significant*** (Class A and Class B) hazards have been identified for the work activity to be undertaken and whether the suggested controls, wherever possible, eliminate the potential hazard, isolate it or minimize the risk of injury.

Controls should be as high as practical in the "Best to Worst" guide shown below:



1. **Eliminate the hazard completely**
   E.g. remove items from the area/select different area for employees to utilize.
2. **Isolate people from the hazard**
   E.g. guards on entry points
   E.g. use effective barriers and edge protection.
   E.g. enclose noisy machinery.
3. **Minimize by:**

A. Use an engineered control

e.g. Use a machine to lift heavy objects.

E.g. use barrier controls to assist patron movement

B. Change work practices

E.g. training in lifting techniques.

E.g. training in dealing with patrons

C. Provide Personal Protective Equipment (PPE) in all cases, this must be seen as the last line of defense in the effective control of workplace hazards and the least preferred option.

E.g. High visibility jackets in car-park areas

Job Safety Analysis Step by Step

Does the JSA provide?

1. A description of the work activity or task to be undertaken.
2. The date the JSA was developed.
3. The name and signature of the person who developed the JSA.
4. The project name/ number and the name of the Principal service provider/contractor
5. The job steps involved in doing the work.
6. Potential hazards associated with the work and its job steps which are Class A and B risks.
7. The controls that will be put in place to eliminate isolate or minimize the potential hazards identified.
8. Controls as high as practicable on the "Best to Worst" control guide.
9. The name of the person(s) responsible for ensuring that the control(s) is in place.

Class A (High Risk)	**1. Does the hazard have the potential to kill, or permanently disable you? (Serious Harm)**
Class B (medium Risk)	**2. Does the hazard have the potential to cause a serious injury, or illness, which will temporarily disable you or result in a Lost Time Injury (LTI)? (Serious Harm)**
Class C (Lower Risk)	**3. Does the hazard have the potential to cause a minor injury, which would not disable you, but may result in first aid treatment?**

2.11. Hazard Reporting

Procedures

All employees are encouraged to report hazards immediately. The supervisor on site shall investigate all reported hazards and document corrective actions. Corrective actions will be signed off when completed. The procedure and responsibilities for reporting hazards are outlined on the following flowchart. The supervisor shall complete a Hazard Report Form where hazards cannot be corrected immediately.

The OHS department shall issue a Hazard Report Form to all supervisory personnel and safety committee representatives. Forms for use by employees shall be placed in the appropriate

reserve area shed and camp clinic. These are to monitored and reviewed regularly and as a minimum weekly.

Assessment

When a hazard is identified in the workplace, a Risk Class will be assigned immediately using the categories outlined in the Hazard Identification and Risk Assessment. The Risk Class (A, B or C) will determine the appropriate level of response required to protect the health and safety of workers, i.e. immediate 24 - 48 hours, within 7 days, within 7-14 days and so on.

Corrective Actions

The Hazard Report shall be signed by the inspection team leader and presented to the contractor supervisor if he/ she is not part of the team.

The above mentioned supervisor shall sign off the report when satisfied that all items on the report have been satisfactorily actioned. Copies of the signed reports shall be recorded in this manual.

2.12. Accident Investigation and Reporting

The Safety and Security Coordinator will investigate all serious harm accidents within 24-hours. Investigation will be recorded on Accident Investigation form or its equivalent.

Accidents shall be recorded by (Name and Position)……

Accidents shall be investigated by Safety and Security Coordinator

Accidents resulting in serious harm shall be reported to client by the contractor.

(Name and Position)……

All injuries are recorded using Form F12 – 01 and all accidents will be investigated using Form

3. Detail OHS Implementation Plan

Table 1: Detailed OHS implementation plan

No	OHS Activities	Implementation period	Responsibility	Monitoring Indicator
1	Prepare OHS plan	Mobilization period	EHS department in collaboration with projectmanager, construction department and other departments	Draft and final manual
2	Submit draft OHS Manual for comment	Mobilization period		
3	Collect comment and submit final manual	Mobilization period		
4	Establish safety committee	Mobilization period		Number of name of safety committee
5	Conduct the first safety committee meeting	Mobilization period		Meeting minute
6	Conduct training for safety committee	Mobilization period		Signature list of trainees
7	Recruiting trainees for training	Mobilization period		
8	Conduct health fitness investigation	Every recruitment period		
9	Conduct Basic safety induction	Every quarter		
10	Sign for completion of training	Every quarter		
11	Provide certificate of completion	Every quarter		
12	Sign PPE use obedience form	Every quarter		
13	Provide the required PPE as per the JSA	Throughout project life		
14	Recruit trainees for Fire safety from all departments	Mobilization period		
15	Conduct the training	Mobilization period		

15	Recruit trainees for First Aid from all departments	Every quarter		
16	Conduct the training	Every quarter		
17	Compile and submit general report	Every quarter		Report

Part II

Activities, Hazards, Safety Precautions, and Required Personal Protective Equipment

4. Activities, Hazards, Safety Precautions, and PPEs

This section provides site-specific project activities, the potential hazards, hazard category, the safety precautions, and PPEs to avoid hazards. The various sites included in this section are; campsite, construction plants, borrows pit and quarry sites, workshop and laboratory and earth work.

4.1. Camp Site Construction and Operation

This section provides the activities, potential hazards, classification of the hazards, hazard amelioration, the necessary PPE, Fire extinguisher requirements and First Aid measures for camp site construction and operation. The construction and operation of the camp site involves site clearance, excavation, site leveling and compacting material on the site. Excavation of trenches for foundation works, concrete works, super–structure and roof works, installation of sanitary pipeline and electrical system, welding, drilling and screwing, clean water supply pipeline works, erection of reservoir, construction of parking lot, furnishing offices, kitchen and living rooms, erecting fire extinguishers, constructing wastewater treatment tanks and soak away pit, gardening and camp site beautification, solid and liquid waste management activities, and clinic operation waste management. These activities are accomplished using dozers, loaders, excavators, graders, dump trucks, rollers, ladders, water truck, mixer, and portable electrical devices.

4.1.1. Potential Hazards

The construction and operation of campsite activities involves a number of activities that might cause physical, chemical and biological hazards. The physical hazards include trap, entangle / collapse hazard, eye hazard from solid particles, materials, blazing and welding operations, head hazards from falling objects, overhead loads and sharp projections, foot hazards from penetration of sharp objects, electrical hazards, objects cutting hazards, fumes and burning hazards, noise and vibration hazards and fire hazard. The chemical hazards include absorption Hazards on body parts, ingestion hazards, and inhalation hazards. The biological hazards include clinical waste, wastewater and solid waste hazards. Sections 4.1.1.1 up to 4.1.1.3 summarize the category, classification, safety precautions and the PPE required to avoid each hazard. Details on the physical, biological and chemical hazards and the mandatory safety precautions are given in Annex A.

4.1.1.1. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the campsite construction and operation using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides the details on how hazards classification is determined using the two variables risk classification matrix.

Table 2: kind and classification of hazards

Category	Kind of hazard		Classification of hazard
Physical	Trap, Entangle, / Collapse Hazard		A
	Fall Hazards (person falling from heights)		B
	Eye Hazard from solid particles, materials, blazing and welding operations		A
	Head Hazards from falling objects, overhead loads and sharp projections		A
	Foot Hazards from penetration of sharp objects		C
	Electrical Hazards	At higher voltage levels At medium voltage levels At lower voltage levels	A B C
	Cutting Hazards	Injury on major organs Minor injury	A C
	Fumes and burning Hazards Noise and Vibration Hazards Fire Hazard		A B A
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards		A A A
Biological	Clinical waste hazards		A

	Wastewater hazards	A
	Solid waste hazards	B
	STI including HIV/AIDS	A

4.1.1.2. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate them. This section provides the safety precautions necessary to follow to eliminate the hazards. The table below summarizes the details on the safety precautions to follow for each identified hazard.

Table 3: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances, • Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost, • Avoid horseplay in working zones, • Never use a cell phone when working around heavy machineries, • Provide adequate and well-anchored stop blocks
	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or

		down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails, • Move ladder than trying to reach to far sides, • Never climb onto a ladder from the side, and • Never switch from ladder to another in the air
Category	**Kind of hazard**	**Safety Precautions**
Physical	Eye Hazard from solid particles, materials, blazing and welding operations	• Use machine guards or splash shields, • Frequent check on equipment prior to use, • Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and • Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.
	Head Hazards from falling objects, overhead loads and sharp projections	• Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places • Manage and supervise visitors, • Put barricades, danger signals and reflective tapes, and • Provide safety nets around areas prone to involve falling of objects
	Foot Hazards from penetration of sharp objects	• Good housekeeping, • Knocking-down or removed sharp objects immediately, and • Put barricades, danger signals and reflective tapes,
	Noise & Vibration Hazards	• Check exhaust outlets are fitted with silencers or mufflers, • Do not keep machinery running unnecessarily, • Keep compressor motor covers closed when they are running, • Check concrete breaker mufflers are securely fitted. • Check that machinery panels are secured and do not rattle. • Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy

		machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible, • Don't expose workers to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection, • Use acoustic insulating materials and isolation of the noise source where feasible.
Category	**Kind of hazard**	**Safety Precautions**
Physical	Electrical Hazards	• Let electrical works to the competent electricians, • Regularly check and maintain electrical equipment in accordance with the manufacturers' printed instructions, • Do not tie power cables in knots which can cause short circuits, • Lining electrical devices with warning signs and establish "No Approach" zones around or under high voltage power lines • Check all electrical cords, cables, and hand power tools for frayed or exposed cords and follow manufacturer recommendations for maximum permitted operating voltage, • Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits, • Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas, • Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled, • Completely break the circuit when working with high voltage,
	Fire Hazard	• Aware of every individual on site the fire risk and let them know the precautions to prevent a fire and the action to be taken if fire does break out. • If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of

		fumes are being emitted in a closed space and leave immediately • Cylinders should be kept outside the building, • When moving cylinders use trolleys and never lift by the valve assemblies, • When cylinders aren't in use, valves and regulators must be protected by appropriate caps, • Always check for damaged/leaking valve before start working • Insulate all electrical wires
Category	**Kind of hazard**	**Safety Precautions**
Chemical	Absorption, ingestion and inhalation Hazards	• Keep containers of chemicals in a separate and secure store. • Make sure there is a label on the container–if there is no label, do not use it. • Read the label and make sure you understand what it says, & follow the instructions. • When opening containers, hold a rag over the cap or lid as some volatile liquids tend to spurt up when this is released; transfer the contents of containers in the open air. • Avoid breathing in any fumes from chemicals. • Provide good ventilation, or work in the open air. • Leave the work area immediately if you feel dizzy or unwell. • Eye protection should be worn when chemicals are being moved / transferred on site. • Wash before you eat and do not eat or smoke at your workstation. • For chemical splashed on skin, rinsed immediately with plenty of clean running water. • Eyes should be flushed out thoroughly with water and should receive immediate medical attention. • If you are burned by a chemical or feel unwell after using a chemical, seek medical attention without delay. • If there is a spillage of chemicals on the ground or floor, report

		the matter at once
Biological	Clinical waste hazards	• Train clinical personnel for proper collection and transportation of clinical wastes • Incinerate waste only when workers are away taking wind direction into consideration and report all incidents • Provide proper collection and incineration system
	Wastewater hazards	Provide for proper wastewater collection and treatment
	Solid waste hazards	• Train about sorting at source and provide suitable materials for the different categories of solid wastes, • Provide for proper solid water treatment
	STI including HIV/AIDS	• Create sufficient and targeted awareness to the workforces periodically, • Provide sufficient access to VCT, condom, peer trainings and psychosocial support, • Work jointly with local health institutions to intensify their effort against the pandemic,

4.1.1.3. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 4: kind and PPE requirements for minimizing hazards

Category	**Kind of hazard**	**PPE**
Physical	Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, materials, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects, overhead loads and sharp projections	Helmets
	Foot Hazards from penetration of sharp objects	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material).
	Fire Hazard	Equip all working and living areas with fire extinguishers and train all workers in firefighting techniques and procedures
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards	Glove, safety clothes, safety shoes, and nose masks
Biological	Clinical waste hazards Wastewater hazards	Glove, safety clothes, safety shoes, and nose masks

	Solid waste hazards	

4.2. Quarry Site Establishment and Crusher Plant Operation

This section provides the activities, potential hazards, hazards classification, hazard prevention, PPE and First Aid measures that must be followed during quarry site establishment and crushed plant operations. Quarry site establishment and crusher plant operations involves site clearance (removal of vegetation and top soil) and site preparation for unloading of machineries, rock breaking by jack hammer, rock drilling, packing of explosives, blasting, stockpiling of rock for crushing, crushing rock, stockpiling crushed aggregate, loading and transporting of crushed aggregate, rehabilitation of site and routine maintenance of machineries. These operations involves the utilization of rock drillers, compressor, jack hammer, dozer, loaders, excavators, dump trucks, portable electrical maintenance devices such as welders, grinders and screw drivers, crane, and crusher plants.

4.2.1. Potential Hazard

Quarry site establishment and crusher plant operations involve a number of activities that might cause physical and chemical hazards. The physical hazards include accident related with blasting operation such as flying rocks, ground vibration; trap, entangle / collapse hazard, eye hazard from solid particles, head hazards from falling objects, overhead loads and sharp projections; foot hazards from penetration of sharp objects, noise and fire hazard. The chemical hazards include absorption, ingestion, and inhalation hazards. The following three sections 4.2.1.1 to 4.2.1.3 gives the details on the category of the hazards, the safety precautions and personal protective equipment required. Detail procedure and safety precautions for explosive storage and transportation are given in Annex D.

4.2.1.1. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the Quarry site establishment and crusher plant operations using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides the details on how hazards classification is determined using the two variables risk classification matrix.

Table 5: kind and classification of hazards

Category	Kind of hazard		Classification of hazard
Physical	Flying rocks from blasting and rock breaking operations		A
	Trap, Entangle, / Collapse Hazard		A
	Fall Hazards (person falling from heights		B
	Eye Hazard from solid particles, materials, blazing and welding operations		A
	Head Hazards from falling objects, overhead loads and sharp projections		A
	Foot Hazards from penetration of sharp objects		C
	Electrical Hazards	At higher voltage levels	A
		At medium voltage levels	B
		At lower voltage levels	C
	Cutting Hazards	Injury on major organs	A
		Minor injury	C
	Fumes and burning Hazards		A
	Noise and Vibration Hazards		B
	Fire Hazard		A
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards		A
Biological	Clinical waste hazards		A
	Wastewater hazards		A
	Solid waste hazards		B

4.2.1.2. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate the hazards. This section provides the safety precautions necessary to follow to eliminate the hazards. The table below summarizes the details on the safety precautions to follow for each identified hazard.

Table 6: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Flying rocks	• Sweep the blast area to free it from lose rock prior to drilling, • Post adequate number of guards at safe distances, • Evacuate all people and animals from the area, • Any worker within the perimeter have safe cover and warned, • Locate good blaster commanding field to view the blast area so the shot can be aborted at the last minute if necessary. • Warning signs, prearranged blasting times, or warning sirens, in themselves, are seldom adequate for blast guarding, • Make sure that the burden is proper and enough collar distance is used, • In multiple-row shots, long delays between later rows, on the order of 10 milliseconds/foot of burden, may reduce fly rock. • Prepare and execute a proper blasting plan and good blast design,
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances, • Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost • Avoid horseplay in working zones,

		• Never use a cell phone when working around heavy machineries, • Provide adequate and well-anchored stop blocks
	Eye Hazard from solid particles, materials, blazing and welding operations	Use machine guards or splash shields, Frequent check on equipment prior to use, Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.

Category	Kind of hazard	Safety Precautions
Physical	Electrical Hazards	• Let electrical works to the competent electricians, • Regularly check and maintain electrical equipment in accordance with the manufacturers' printed instructions, • Do not tie power cables in knots which can cause short circuits, • Lining electrical devices with warning signs and establish "No Approach" zones around or under high voltage power lines • Check all electrical cords, cables, and hand power tools for frayed or exposed cords and follow manufacturer recommendations for maximum permitted operating voltage, • Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits, • Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas, • Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled, • Completely break the circuit when working with high voltage, and • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.
	Fire Hazard	• Aware of every individual on site the fire risk and let them know the precautions to prevent fire & the action to be taken if fire does break out. • If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of fumes are being emitted in a closed space and leave immediately • Cylinders should be kept outside the building, • When moving cylinders use trolleys, skids or mats and never lift by the valve assemblies, • When cylinders aren't in use, valves and regulators must be protected by appropriate caps, • Always check for damaged/leaking valve before start working

		• Insulate all electrical wires
Category	**Kind of hazard**	**Safety Precautions**
Physical	Head Hazards from falling objects, overhead loads & sharp projections	Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places Manage and supervise visitors, Put barricades, danger signals and reflective tapes, and Provide safety nets around areas prone to involve falling of objects
	Foot Hazards from penetration of sharp objects	Good housekeeping, Knocking-down or removed sharp objects immediately, and Put barricades, danger signals and reflective tapes,
	Noise and Vibration Hazards	Check exhaust outlets are fitted with silencers or mufflers, Do not keep machinery running unnecessarily, Keep compressor motor covers closed when they are running, Check concrete breaker mufflers are securely fitted. Check that machinery panels are secured and do not rattle. Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible, Don't expose workers to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection, Use acoustic insulating materials and isolation of the noise source where feasible.

	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails, • Move ladder than trying to reach to far sides, • Avoid side climbing and switch from ladder to another in the air
Category	**Kind of hazard**	**Safety Precautions**
Physical	Ground vibration	• Properly design blast operation will give lower vibrations • Reduce the charge weight of explosives per delay • Blasting during typically quiet periods should be avoided, if possible • The public's perception of ground vibrations can be reduced by blasting during periods of high local activity such as the noon hour or shortly after school has been dismissed
Biological	Clinical waste hazards	• Train clinical personnel for proper collection and transportation of clinical wastes • Provide proper collection and incineration system • Incinerate waste only when workers are away taking wind direction into consideration and report all incidents
	Wastewater hazards	• Provide for proper wastewater collection and treatment
	Solid waste hazards	• Train about sorting at source and provide suitable materials for the different categories of solid wastes, • Provide for proper solid water treatment
Chemical	Absorption, ingestion and inhalation Hazards	• Keep containers of chemicals in a separate and secure store. • Make sure there is a label on the container–if there is no label, do not use the contents.

		• Read the label and make sure you understand what it says, then follow the instructions. • When opening containers, hold a rag over the cap or lid as some volatile liquids tend to spurt up when this is released; transfer the contents of containers in the open air. • Avoid breathing in any fumes from chemicals • Provide good ventilation, or work in the open air. • Leave the work area immediately if you feel dizzy or unwell. • Eye protection should be worn when chemicals are being moved or transferred on site. • Wash before you eat and do not eat or smoke at your workstation. • For chemical splashed on skin, rinsed immediately with plenty of clean running water. • Eyes must be flushed out thoroughly with water &must receive immediate medical attention. • If you are burned by a chemical or feel unwell after using a chemical, seek medical attention without delay. • If there is a spillage of chemicals, report the matter at once

4.2.1.3. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 7: kind and PPE requirements for minimizing hazards

Category	**Kind of hazard**	**PPE**
Physical	Fly rock from blasting operations	Helmets, reflective vests, and gloves and goggles
	Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects,	Helmets
	Foot Hazards from penetration	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Dust, Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material). Use nose masks
	Fire Hazard	Equip all working and living areas with fire extinguishers train all workers in firefighting techniques and procedures
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards	Glove, safety clothes, safety shoes, and nose masks
Biological	Clinical waste hazards Wastewater hazards Solid waste hazards	Glove, safety clothes, safety shoes, and nose masks

4.3. Asphalt Plant Erection and Operation

Asphalt plant is one of the most important components of road construction project. The erection and operation of asphalt plant involves site clearance, unloading of the asphalt plant and other machineries, excavation of trenches for foundation works, concrete works, installation of the asphalt plant, electrical system installation, welding, drilling and screwing, unloading of bitumen and dumping of aggregate, melting of the bitumen and mixing with aggregate, loading and transporting the asphalt–aggregate hot mix, erecting fire extinguishers, and waste management operations. These activities are accomplished using loaders, excavators, graders, dump trucks, rollers, ladders, crane, water truck, mixer, and portable electrical devices such as welding, grinding, and screwing machines.

4.3.1. Potential Hazard

The process of asphalt plant erection and operation involves a number of activities that might cause physical and chemical hazards. The physical hazards include trap, entangle / collapse hazard, eye hazard from solid particles, materials, blazing and welding operations, head hazards from falling objects, overhead loads and sharp projections, foot hazards from penetration of sharp objects, electrical hazards, objects cutting hazards, fumes and burning hazards, noise and vibration hazards and fire hazard. The chemical hazards include absorption hazards on body parts, ingestion hazards, and inhalation hazards.

4.3.1.1. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the asphalt plant erection and operation using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides the details on how hazards classification is determined using the two variables risk classification matrix.

Table 8: kind and classification of hazards

Category	Kind of hazard	Classification of hazard
Physical	Trap, Entangle, / Collapse Hazard	A
	Fall Hazards (person falling from heights	B
	Eye Hazard from solid particles, materials, blazing and	A

	welding operations		
	Head Hazards from falling objects, overhead loads and sharp projections		A
	Foot Hazards from penetration of sharp objects		C
	Electrical Hazards	At higher voltage levels At medium voltage levels At lower voltage levels	A B C
	Cutting Hazards	Injury on major organs Minor injury	A C
	Fumes and burning Hazards Noise and Vibration Hazards Fire Hazard		A B A
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards		A A A

4.3.1.2. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate the hazards. This section provides the safety precautions necessary to follow to eliminate the hazards associated with asphalt plant erection and operation. Table 8 below summarizes the details on the safety precautions to follow for each identified hazard.

Table 9: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances,

		• Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost, • Avoid horseplay in working zones, • Never use a cell phone when working around heavy machineries, and Provide adequate and well-anchored stop blocks
	Eye Hazard from solid particles, materials, blazing and welding operations	• Use machine guards or splash shields, • Frequent check on equipment prior to use, • Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and • Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.
	Head Hazards from falling objects, overhead loads and sharp projections	• Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places • Manage and supervise visitors, • Put barricades, danger signals and reflective tapes, and • Provide safety nets around areas prone to involve falling of objects
Physical	Electrical Hazards	• Let electrical works to the competent electricians, • Regularly check and maintain electrical equipment in accordance with the manufacturers' printed instructions, • Do not tie power cables in knots which can cause short circuits, • Lining electrical devices with warning signs and establish "No Approach" zones around or under high voltage power lines • Check all electrical cords, cables, & hand power tools for frayed or exposed cords & follow manufacturer recommendations for permitted operating voltage, • Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits, • Protecting power cords and extension cords against damage from

		traffic by shielding or suspending above traffic areas, • Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled, • Completely break the circuit when working with high voltage, and • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.
	Fire Hazard	• Aware of every individual on site the fire risk and let them know the precautions to prevent a fire and the action to be taken if fire does break out. • If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of fumes are being emitted in a closed space and leave immediately • Cylinders should be kept outside the building, • Use trolleys for moving cylinders, skids or mats and never lift by the valve assemblies, • When cylinders aren't in use, valves and regulators must be protected by appropriate caps, • Always check for damaged/leaking valve before start working
Physical	Foot Hazards from penetration of sharp objects	• Good housekeeping, • Knocking-down or removed sharp objects immediately, and • Put barricades, danger signals and reflective tapes,
	Noise and Vibration Hazards	• Check exhaust outlets are fitted with silencers or mufflers, • Do not keep machinery running unnecessarily, • Keep compressor motor covers closed when they are running, • Check concrete breaker mufflers are securely fitted. • Check that machinery panels are secured and do not rattle. • Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible,

		• Don't expose workers to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection, • Use acoustic insulating materials and isolation of the noise source where feasible.
	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails, • Move ladder than trying to reach to far sides, • Avoid side climbing and switch from ladder to another in the air
Chemical	Absorption, ingestion and inhalation Hazards	• Keep containers of chemicals in a separate and secure store. • Make sure there is a label on the container–if there is no label, do not use the contents. • Read the label and make sure you understand what it says, then follow the instructions. • When opening containers, hold a rag over the cap or lid as some volatile liquids tend to spurt up when this is released; transfer the contents of containers in the open air. • Avoid breathing in any fumes from chemicals • Provide good ventilation, or work in the open air. • Leave the work area immediately if you feel dizzy or unwell. • Eye protection should be worn when chemicals are being moved or transferred on site. • Wash before you eat and do not eat or smoke at your workstation. • If the skin is splashed with a chemical, it should be rinsed immediately with plenty of clean running water. • Eyes should be flushed out thoroughly with water and should

		receive immediate medical attention. • If you are burned by a chemical or feel unwell after using a chemical, seek medical attention without delay. • If there is a spillage of chemicals, report the matter at once

4.3.1.3. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 10: kind and PPE requirements for minimizing hazards

Category	**Kind of hazard**	**PPE**
Physical	Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects,	Helmets
	Foot Hazards from penetration	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Dust, Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material). Use nose masks
	Fire Hazard	Equip all working and living areas with fire extinguishers train all workers in firefighting techniques and procedures

Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards	Glove, safety clothes, safety shoes, and nose masks

4.4. Workshop Construction and Operation

Workshop plays essential role in road construction project by providing routine and onsite maintenance to machineries, vehicles and other useful technical services. The construction and operation of workshop involves site clearance, unloading of workshop the equipment and other machineries, excavation of trenches for foundation works, concrete works, electrical system installation, workshop operations using welding, cutting, drilling and screwing machines, changing of used engine and hydraulic oil, charging and changing of car and machinery batteries, fixing tyers, and waste management operations. These activities are accomplished using loaders, excavators, graders, dump trucks, rollers, ladders, crane, water truck, mixer, and portable electrical devices such as welding, grinding, and screwing machines.

4.4.1. Potential Hazard

The process of workshop construction and operation involves a number of activities that might cause physical and chemical hazards. The activities and instruments used in the workshop pause very serious physical hazards, if left unchecked and used without proper safety precautionary measures. In this section details on these hazards and their classification along with the important safety precaution is displayed. All personnel involved in these activities are strongly advised to follow the recommendations for each identified hazard to avoid potential hazard during the construction and operation phases of the workshop.

4.4.1.1. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the workshop construction and operation using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides the details on how hazards classification is determined using the two variables risk classification matrix.

Table 11: kind and classification of hazards

Category	Kind of hazard		Classification of hazard
Physical	Trap, Entangle, / Collapse Hazard		A
	Fall Hazards (person falling from heights		B
	Eye Hazard from solid particles, materials, blazing and welding operations		A
	Head Hazards from falling objects, overhead loads and sharp projections		A
	Foot Hazards from penetration of sharp objects		C
	Electrical Hazards	At higher voltage levels At medium voltage levels At lower voltage levels	A B C
	Cutting Hazards	Injury on major organs Minor injury	A C
	Fumes and burning Hazards Noise and Vibration Hazards Fire Hazard		A B A
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards		A

4.4.1.2. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate the hazards. This section provides the safety precautions necessary to follow to eliminate the hazards associated with asphalt plant erection and operation. The table below summarizes the details on the safety precautions to follow for each identified hazard.

Table 12: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances, • Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost, • Avoid horseplay in working zones, • Never use a cell phone when working around heavy machineries, and Provide adequate and well-anchored stop blocks
	Eye Hazard from solid particles, materials, blazing and welding operations	• Use machine guards or splash shields, • Frequent check on equipment prior to use, • Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and • Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.
	Head Hazards from falling objects,	• Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places

	overhead loads and sharp projections	• Manage and supervise visitors, • Put barricades, danger signals and reflective tapes, and • Provide safety nets around areas prone to involve falling of objects
Category	**Kind of hazard**	**Safety Precautions**
Physical	Electrical Hazards	• Let electrical works to the competent electricians, • Regularly check and maintain electrical equipment in accordance with the manufacturers' printed instructions, • Do not tie power cables in knots which can cause short circuits, • Lining electrical devices with warning signs and establish "No Approach" zones around or under high voltage power lines • Check all electrical cords, cables, and hand power tools for frayed or exposed cords and follow manufacturer recommendations for maximum permitted operating voltage, • Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits, • Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas, • Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled, • Completely break the circuit when working with high voltage, and • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.
	Fire Hazard	• Aware of every individual on site the fire risk and let them know the precautions to prevent a fire and the action to be taken if fire does break out. • If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of fumes are being emitted in a closed space and leave

		immediately • Use trolleys for moving cylinders, skids/mats & never lift by valve assemblies, • When cylinders aren't in use, valves and regulators must be protected by appropriate caps, • Always check for damaged/leaking valve before start working • Cylinders should be kept outside the building
Category	**Kind of hazard**	**Safety Precautions**
Physical	Foot Hazards from penetration of sharp objects	• Good housekeeping, • Knocking-down or removed sharp objects immediately, and • Put barricades, danger signals and reflective tapes,
	Noise and Vibration Hazards	• Check exhaust outlets are fitted with silencers or mufflers, • Do not keep machinery running unnecessarily, • Keep compressor motor covers closed when they are running, • Check concrete breaker mufflers are securely fitted. • Check that machinery panels are secured and do not rattle. • Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible, • Don't expose workers to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection, • Use acoustic insulating materials and isolation of the noise source where feasible.

	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails, • Move ladder than trying to reach to far sides, • Avoid side climbing and switch from ladder to another in the air
Category	**Kind of hazard**	**Safety Precautions**
Chemical	Absorption, ingestion and inhalation Hazards	• Keep containers of chemicals in a separate and secure store. • Make sure there is a label on the container–if there is no label, do not use the contents. • Read the label and make sure you understand what it says, then follow the instructions. • When opening containers, hold a rag over the cap or lid as some volatile liquids tend to spurt up when this is released; transfer the contents of containers in the open air. • Avoid breathing in any fumes from chemicals • Provide good ventilation, or work in the open air. • Leave the work area immediately if you feel dizzy or unwell. • Eye protection should be worn when chemicals are being moved or transferred on site. • Wash before you eat and do not eat or smoke at your workstation. • If the skin is splashed with a chemical, it should be rinsed immediately with plenty of clean running water. • Eyes should be flushed out thoroughly with water and should receive immediate medical attention.

		• If you are burned by a chemical or feel unwell after using a chemical, seek medical attention without delay. • If there is a spillage of chemicals, report the matter at once

4.4.1.3. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 13: kind and PPE requirements for minimizing hazards

Category	**Kind of hazard**	**PPE**
Physical	Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects,	Helmets
	Foot Hazards from penetration	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Dust, Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material). Use nose masks
	Fire Hazard	Equip all working and living areas with fire extinguishers train all workers in firefighting techniques and procedures

Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards	Glove, safety clothes, safety shoes, and nose masks

4.5. Laboratory Construction and Operation

In road project constructions, laboratories play the essential role in providing quality tests reports on time and space. The construction of laboratory and erection of laboratory facilities involved site clearance, excavation of trenches for foundation works, concrete works, unloading and installation of the laboratory facilities, electrical system installation, erecting fire extinguishers, conducting routine laboratory tests by collecting test samples from material extraction and construction sites, and waste management operations. These construction activities of laboratory are accomplished using loaders, excavators, graders, dump trucks, rollers, ladders, crane, water truck, mixer, and portable electrical devices such as welding, grinding, and screwing machines. On the other hand, the laboratory facilities are used to collect and run the required routine laboratory tests and associated housekeeping. One of the equipment used for this purpose is the nuclear density moisture gauge for measuring the level of required compaction.

4.5.1. Potential Hazard

The construction and operation of laboratory involves a number of activities that might cause physical, chemical, and nuclear hazards. The physical hazards include trap, entangle or collapse hazard, fall hazard, eye hazard, electrical hazard, hazards related to welding/cutting and brazing, noise and gas fume related hazards, machinery, crane and vehicle hazards and fire hazards. There chemical hazards are related to ingestion, absorption and inhalation related to chemicals. The nuclear hazard is associated with the operation, transportation and storage of nuclear gage. For each identified physical hazard an appropriate prevention measures are proposed below.

4.5.1.1. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the laboratory construction and operation using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex

B provides the details on how hazards classification is determined using the two variables risk classification matrix.

Table 14: kind and classification of hazards

Category	Kind of hazard		Classification of hazard
Physical	Trap, Entangle, / Collapse Hazard		A
	Fall Hazards (person falling from heights		B
	Eye Hazard from solid particles, materials, blazing and welding operations		A
	Head Hazards from falling objects, overhead loads and sharp projections		A
	Foot Hazards from penetration of sharp objects		C
	Electrical Hazards	At higher voltage levels At medium voltage levels At lower voltage levels	A B C
	Cutting Hazards	Injury on major organs Minor injury	A C
	Fumes and burning Hazards Noise and Vibration Hazards Fire Hazard		A B A
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards		A
Nuclear	Radiation of radioactive substances related hazards		A

4.5.1.2. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate the hazards. This section provides the safety precautions necessary to follow to eliminate the hazards associated with asphalt plant erection and operation. The table below summarizes the details on the safety precautions to follow for each identified hazard.

Table 15: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances, • Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost, • Avoid horseplay in working zones, • Never use a cell phone when working around heavy machineries, and Provide adequate and well-anchored stop blocks
	Eye Hazard from solid particles, materials, blazing and welding operations	• Use machine guards or splash shields, • Frequent check on equipment prior to use, • Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and • Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.

	Head Hazards from falling objects, overhead loads and sharp projections	• Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places • Manage and supervise visitors, • Put barricades, danger signals and reflective tapes, and • Provide safety nets around areas prone to involve falling of objects
Category	**Kind of hazard**	**Safety Precautions**
Physical	Electrical Hazards	• Let electrical works to the competent electricians, • Regularly check and maintain electrical equipment in accordance with the manufacturers' printed instructions, • Do not tie power cables in knots which can cause short circuits, • Lining electrical devices with warning signs and establish "No Approach" zones around or under high voltage power lines • Check all electrical cords, cables, and hand power tools for frayed or exposed cords and follow manufacturer recommendations for maximum permitted operating voltage, • Double insulating / grounding all electrical equipment used in environments that are, or may become, wet; using equipment with ground fault interrupter (GFI) protected circuits, • Protecting power cords and extension cords against damage from traffic by shielding or suspending above traffic areas, • Appropriate labeling of service rooms housing high voltage equipment ('electrical hazard') and where entry is controlled,

		• Completely break the circuit when working with high voltage, and • Conduct detailed identification and marking of all buried electrical wiring prior to any excavation work.
	Fire Hazard	• Aware of every individual on site the fire risk and let them know the precautions to prevent a fire and the action to be taken if fire does break out. • If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of fumes are being emitted in a closed space and leave immediately • Cylinders should be kept outside the building, • When moving cylinders use trolleys, skids/mats & never lift by valve, • When cylinders aren't in use, valves and regulators must be protected by appropriate caps, • Always check for damaged/leaking valve before start working
Category	**Kind of hazard**	**Safety Precautions**
Physical	Foot Hazards from penetration of sharp objects	• Good housekeeping, • Knocking-down or removed sharp objects immediately, and • Put barricades, danger signals and reflective tapes,
	Noise and Vibration Hazards	• Check exhaust outlets are fitted with silencers or mufflers, • Do not keep machinery running unnecessarily, • Keep compressor motor covers closed when they are running, • Check concrete breaker mufflers are securely fitted. • Check that machinery panels are secured and do not rattle.

		• Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible, • Don't expose workers to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection, • Use acoustic insulating materials and isolation of the noise source where feasible.
	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails, • Move ladder than trying to reach to far sides, • Avoid side climbing and switch from ladder to another in the air
Category	**Kind of hazard**	**Safety Precautions**
Chemical	Absorption, ingestion and inhalation Hazards	• Keep containers of chemicals in a separate and secure store. • Make sure there is a label on the container–if there is no label, do not use the contents. • Read the label and make sure you understand what it says,

		then follow the instructions. • When opening containers, hold a rag over the cap or lid as some volatile liquids tend to spurt up when this is released; transfer the contents of containers in the open air. • Avoid breathing in any fumes from chemicals • Provide good ventilation, or work in the open air. • Leave the work area immediately if you feel dizzy or unwell. • Eye protection should be worn when chemicals are being moved or transferred on site. • Wash before you eat and do not eat or smoke at your workstation. • If the skin is splashed with a chemical, it should be rinsed immediately with plenty of clean running water. • Eyes should be flushed out thoroughly with water and should receive immediate medical attention. • If you are burned by a chemical or feel unwell after using a chemical, seek medical attention without delay. • If there is a spillage of chemicals, report the matter at once

4.5.1.3. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 16: kind and PPE requirements for minimizing hazards

Category	Kind of hazard	PPE
Physical	Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects,	Helmets
	Foot Hazards from penetration	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Dust, Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material). Use nose masks
	Fire Hazard	Equip all working and living areas with fire extinguishers train all workers in firefighting techniques and procedures
Chemical	Absorption Hazards on body parts Ingestion Hazards Inhalation Hazards	Glove, safety clothes, safety shoes, and nose masks

4.5.1.4. General Safety Precautions for Workshop and Laboratory Personnel

Along with the aforementioned safety precautions the following general safety precautions are mandatory to implement while working in workshops. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Keep all tools in good condition with regular maintenance;
- Use the right tool for the job;
- Examine tool for damage before use and operate according to the manufacturer's instructions;
- Provide and use the proper protective equipment;

- Never carry a tool by the cord or hose;
- Never yank the cord or the hose to disconnect it from the receptacle;
- Keep cords and hoses away from heat, oil, and sharp edges;
- Disconnect tools when not in use, before servicing, and when changing accessories such as blades, bits and cutters;
- All observers should be kept at a safe distance away from the work area;
- Secure work with clamps or a vise, freeing both hands to operate the tool;
- Avoid accidental starting. The worker should not hold a finger on the switch button while carrying a plugged-in tool;
- Tools should be maintained with care and sharp and clean for the best performance. Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance;
- The proper apparel should be worn. Loose clothing, ties, or jewelry can become caught in moving parts; and
- Portable electric tools that are damaged shall be removed from use and tagged "Do Not Use."

4.6. Construction Works

4.6.1. Earth Works

Earth works includes sub–base and base course. These activities present several forms of dangers to the work forces and road users. In this project, the construction activities proceeds while the existing road is used by travelers all forms of hazards might come to pass. Thus, all precautionary measures are exercised to avoid or minimize such hazards. The aforementioned construction activities involves site clearance and preparation by removing existing fences, houses, utilities etc. from RoW, construction of diversion road on the side of the existing road; excavate the exiting road to the required level, transport and dispose the undesirable spoil material, excavate, load and transport back–filling materials from borrow areas, form sub–base and base course layers, and water showering all layers construction activities and compaction of each layer to the required levels, and testing for the required level of compaction. These activities involve the utilization of water trucks, rollers, dozers, graders, loaders, excavators, dump trucks, mixers, and vibrators for compaction, and Nuclear Density Moisture Gauge.

4.6.1.1. Potential Hazards

The earth work involves a number of activities that might cause physical and chemical hazards. The physical hazards include traffic accidents, accidents during demolishing of structures and removal of utilities, trap, entangle or collapse hazard, fall hazard, eye hazard, noise and dust pollution related hazards, machinery and vehicle operation hazards and fire hazards and radioactive hazard from nuclear density moisture gauge. For each identified physical hazard an appropriate prevention measures are proposed under each sub–section.

4.6.1.2. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the earthworks using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides details on hazards classification is determined using the two variables risk classification matrix. Moreover, all personnel working on Nuclear Density Moisture gauge must carefully read Annex F.

Table 17: kind and classification of hazards

Category	Kind of hazard		Classification of hazard
Physical	Trap, Entangle, / Collapse Hazard		A
	Fall Hazards (person falling from heights		B
	Eye Hazard from solid particles, materials, blazing and welding operations		A
	Head Hazards from falling objects, overhead loads and sharp projections		A
	Foot Hazards from penetration of sharp objects		C
	Electrical Hazards	At higher voltage levels At medium voltage levels At lower voltage levels	A B C
	Cutting Hazards	Injury on major organs Minor injury	A C

	Fumes and burning Hazards	A
	Noise and Vibration Hazards	B
	Fire Hazard	A

4.6.1.3. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate the hazards. This section provides the safety precautions necessary to follow to eliminate the hazards associated with asphalt plant erection and operation. The table below summarizes the details on the safety precautions to follow for each identified hazard.

Table 18: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances, • Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost, • Avoid horseplay in working zones, • Never use a cell phone when working around heavy machineries, and Provide adequate and well-anchored stop blocks
	Eye Hazard from solid particles, materials, blazing and welding	• Use machine guards or splash shields, • Frequent check on equipment prior to use, • Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and • Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.

	operations	
	Head Hazards from falling objects, overhead loads and sharp projections	• Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places • Manage and supervise visitors, • Put barricades, danger signals and reflective tapes, and • Provide safety nets around areas prone to involve falling of objects
Category	**Kind of hazard**	**Safety Precautions**
Physical	Traffic accidents	• Hire well qualified and experienced drivers and operators • Provide mandatory safety orientation concerning safe ways of driving and their responsibilities (such as not driving after drinking, driving only the permitted hours per day, don't allow passengers to accompany, always using safety belts, etc.) • Provide traffic safety orientation trainings to students in schools and local people around public gathering places such as markets and religious areas, • Always suppress dust around road construction activity sites, • Put proper warning traffic signs 100 m in front of construction sites from entrance and exist sides, • Whenever the need arises deploy trained traffic safety operators (flag persons) to smoothen traffic flow around construction sites, • Complete the construction activities in the planned period to avoid further congestion that could cause accidents, • Put reflective tapes around work areas and don't allow strangers to cross into the work areas,
	Fire Hazard	• Aware of every individual on site the fire risk and let them know the precautions to prevent a fire and the action to be taken if fire does break out. • If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of fumes are being emitted in a closed space and leave immediately

		• Cylinders should be kept outside the building, • When moving cylinders use trolleys, skids or mats and never lift by the valve assemblies, • When cylinders aren't in use, valves and regulators must be protected by appropriate caps, • Always check for damaged/leaking valve before start working • Insulate all electrical wires
Category	**Kind of hazard**	**Safety Precautions**
Physical	Foot Hazards from penetration of sharp objects	• Good housekeeping, • Knocking-down or removed sharp objects immediately, and • Put barricades, danger signals and reflective tapes,
	Noise and Vibration Hazards	• Check exhaust outlets are fitted with silencers or mufflers, • Do not keep machinery running unnecessarily, • Keep compressor motor covers closed when they are running, • Check concrete breaker mufflers are securely fitted. • Check that machinery panels are secured and do not rattle. • Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible, • Don't expose workers to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection, • Use acoustic insulating materials and isolation of the noise source where feasible.

	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails, • Move ladder than trying to reach to far sides, • Avoid side climbing and switch from ladder to another in the air

4.6.1.4. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 19: kind and PPE requirements for minimizing hazards

Category	Kind of hazard	PPE
Physical	Traffic accidents Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects,	Helmets
	Foot Hazards from penetration	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Dust, Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material).

		Use nose masks
	Fire Hazard	Equip all working and living areas with fire extinguishers train all workers in firefighting techniques and procedures

4.6.2. Culverts, Bridges, Drainage and Retaining Walls Construction

The construction of culverts, bridges drainage structures and retaining walls involves a number of activities such as establishing of diversion roads, excavation works, compaction, laying foundation, masonry works, and concrete works. Physical and chemical hazards are the most dominant potential hazards involved in these construction activities.

4.6.3. Potential Hazards

The construction of culverts, bridges, drainage structures and retaining walls involves a number of activities that might cause physical and chemical hazards. The physical hazards include traffic accidents, trap, entangle or collapse hazard, fall hazard, eye hazard, machinery and vehicle operation hazards and fire hazards. For each identified physical hazard an appropriate prevention measures are proposed under each sub–section.

4.6.3.1. Type and Category of the Potential Hazards

In the operation of OHS service, it is necessary to give emphasis to the risks that are known to have serious consequences. This section provides the classification of the hazards identified for the structures construction using the two variable risk classification matrixes. The table below summarizes the classification of the various hazards identified and analyzed. Annex B provides the details on how hazards classification is determined using the two variables risk classification matrix.

Table 20: kind and classification of hazards

Category	Kind of hazard		Classification of hazard
Physical	Traffic accidents Trap, Entangle, / Collapse Hazard		A
	Fall Hazards (person falling from heights		B
	Eye Hazard		A
	Head Hazards		A
	Foot Hazards from penetration of sharp objects		C
	Cutting Hazards	Injury on major organs Minor injury	A C

4.6.3.2. Hazard Type, Category and Safety Precautions

The major purpose of identifying and categorizing hazards is to follow certain precautionary majors to eliminate the hazards. This section provides the safety precautions necessary to follow to eliminate the hazards associated with asphalt plant erection and operation. The table below summarizes the details on the safety precautions to follow for each identified hazard.

Table 21: kind and safety precautions to reduce hazards

Category	Kind of hazard	Safety Precautions
Physical	Trap, Entangle, / Collapse Hazard	• Provide training for workers, • Provide sufficient barricades, warning signs, and reflective tapes, • Provide high visibility safety wear, • Provide turn-around and layout internal traffic control patterns, • Ensure adjustable side mirrors function, • Prohibit equipment from backing up long distances, • Designate back-up person or spotter for each operation, • Stop work when visual contact has been lost, • Avoid horseplay in working zones,

		• Never use a cell phone when working around heavy machineries, and Provide adequate and well-anchored stop blocks
	Eye Hazard from solid particles, materials, blazing and welding operations	• Use machine guards or splash shields, • Frequent check on equipment prior to use, • Locate operations with eye hazards away from places expected to be occupied or transited by workers or visitors, and • Provide extra area guarding or proximity restricting where machine or work fragments could present a hazard.
	Head Hazards from falling objects, overhead loads and sharp projections	• Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places • Manage and supervise visitors, • Put barricades, danger signals and reflective tapes, and • Provide safety nets around areas prone to involve falling of objects

Category	Kind of hazard	Safety Precautions
Physical	Traffic accidents	• Hire well qualified and experienced drivers and operators • Provide mandatory safety orientation concerning safe ways of driving and their responsibilities (such as not driving after drinking, driving only the permitted hours per day, don't allow passengers to accompany, always using safety belts, etc.) • Provide traffic safety orientation trainings to students in schools and local people around public gathering places such as markets and religious areas, • Always suppress dust around road construction activity sites, • Put proper warning traffic signs 100 m in front of construction sites from entrance and exist sides, • Whenever the need arises deploy trained traffic safety operators (flag persons) to smoothen traffic flow around construction sites, • Complete the construction activities in the planned period to avoid further congestion that could cause accidents, • Put reflective tapes around work areas and don't allow strangers to cross into the work areas,
	Foot Hazards from penetration	• Good housekeeping, removing sharp objects immediately, and put barricades, danger signals and reflective tapes,
	Fall Hazards (person falling from heights)	• Train height workers on proper use of ladders and scaffolds, • Inspect the ladder for any defects, cracks or broken parts, • Clean shoes and ensure steps have enough skid resistance, • Install guardrails and toe boards at the edge fall hazard areas, • Use safety belt and lanyard travel limiting devices, • Always face the ladder and use both hands for going up or down, • Don't climb ladder with objects; use a rope to raise objects; • Always keep your body within the ladder rails,

		• Move ladder than trying to reach to far sides, • Avoid side climbing and switch from ladder to another in the air

4.6.3.3. Hazard Type, Category and Personal Protective Equipment

In occupational health and safety procedures the most important focus of the service is to eliminate hazards. In certain situations hazards are not possible to be eliminated completely. In such situations it is critical to minimize the hazards using personal protective equipment. The table below displays the personal protective equipment required to minimize the hazards for each identified and classified hazard. For details on the use and purposes of personal protective equipment please refer to Annex C.

Table 22: kind and PPE requirements for minimizing hazards

Category	Kind of hazard	PPE
Physical	Traffic accidents Trap, Entangle, / Collapse Hazard	Reflective vests
	Fall Hazards (person falling from heights	Safety harness and safety belt, safety foot wear, helmets, and reflective vests
	Eye Hazard from solid particles, blazing and welding operations	Eye protection devices, such as safety glasses, goggles, and/or a full face shield.
	Head Hazards from falling objects,	Helmets
	Foot Hazards from penetration	Provide protective footwear.
	Electrical Hazards	Use insulated gloves
	Dust, Noise and Vibration Hazards	Ear muffle, and wear anti–vibration gloves (made using a layer of visco-elastic material). Use nose masks

Part III

Basic Induction OHS Orientation Training

5. Introduction

This basic induction OHS orientation training is organized under the "*first impressions are forever*" theme to create basic awareness that last forever while employees work in this project. Too many times companies rush through orientation not realizing employees have different comfort levels with their new job, bring different experiences to the job and have different learning needs. New employees starting with any company will have expectations about the workplace culture and the emphasis on the safety orientation training they receive will be reflected in their work performance.

All contractor staff must receive the following minimum basic induction OHS training, before the commencement of construction, maintenance and/or rehabilitation activities. All the departments and construction sites arrange for the basic OHS training for the employees working in their department. Employees can work in their respective department or work sites only after they get the mandatory certificate of completion of OHS training. It is the responsibility of the respective departments or work sites to ensure all workers have this OHS training certificate. Moreover, the respective departments conduct the JSA in collaboration with OHS department and communicate with their respective workers. The basic induction OHS training courses shall include Safety Policy, General OHS Awareness, contact information, rights and responsibilities, working alone, incident reporting and investigation, personal hygiene, personal protective equipment, and emergency preparedness. For detail contents refer Annex I.

5.1. The Benefits of Basic Induction OHS Training

The benefits of providing new employees with a comprehensive orientation are numerous:

- Employees become aware of the health and safety hazards on the job, controls for these hazards and how they can affect their safety and the safety of others.
- Helps reduce the risk of injuries and accidents and increase efficiency of the new employee
- Meets legislative requirements (demonstrates due diligence).
- Helps balance the company's need for productivity with the employee's need for security.
- Contributes to building a retention culture within the organization, thereby reducing turnover.
- Demonstrates the company's moral obligation to protect the employee from harm.

5.2. Who Needs an OHS Induction Training Session?

All new employees who meet any of the following definitions need OHS induction training. New employees are defined as any person who is:

- New to the place of employment;
- Returning to a place of employment where the hazards in that place of employment have changed during the employee's absence or where the absence from the place of employment is greater than six months;
- Affected by a change in the hazards of a place of employment;
- Relocated to a new place of employment if the hazards in that workplace are different from the hazards in the employee's previous workplace;

5.3. Documentation

All orientation training records of new employees should be kept on hand at the employer's place of employment until project completion date. Orientation documents should be filed in the employee's personnel file along with all their training records.

6. Emergency Preparedness and Response

Emergencies that could result in an accident or incident causing injuries, illnesses, or environmental impacts, or that could cause health and safety risks or environmental impacts, need to be considered in the EHS Management System of Meisso- Dire Dawa expressway project. Ethiopian Roads Authority establishes and maintains operational controls to identify the potential for and responses to accidents, incidents, and emergency situations, and to prevent and mitigate the likely associated injury, illness, and adverse environmental impacts through control and monitoring of the project contractor. Furthermore, ERA regularly reviews contractor's emergency preparedness and response plans and operational controls. In addition, a timely review will be undertaken after accidents, incidents, or emergency situations.

6.1. Emergency Personnel Names and Telephone Numbers

No	Name	Telephone
1	Contractor site manager	
2	Contractor representative	
3	First aider	
4	Project manager	
5	Project administrator	
6	Contractor's ambulance service	
7	Contractor's clinic service	
8	Hospital	
9	Police station	
10	Nearest fire brigade	

6.2. Emergency Procedures

The successful management and implementation of emergency procedures has related costs. Our company is in-charge of all the costs related during emergencies. Furthermore, we have insurances for all workers and assets the company has on site.

Medical Emergencies

The following steps will be followed during medical emergencies

1. Do not move victim unless absolutely necessary.
2. Call medical emergency phone number:
    - First Aider
    - Ambulance
    - Fire Department
    - Others(Project Manager and Representative)
3. Provide the following information:

- Nature of medical emergency
- Location of the emergency (address, building, room number)
- Your name and phone number from which you are calling.

4. If personnel trained in First Aid are not available, as a minimum, attempt to provide the following assistance:
    - Stop the bleeding with firm pressure on the wounds (*Note*: avoid contact with blood or other bodily fluids).
    - Clear the air passages using the *Heimlich* maneuver CPR in case of choking.
5. In case of rendering assistance to personnel exposed to hazardous materials, consult the Material Safety Data Sheet (MSDS) and wear the appropriate personal protective equipment. Attempt first aid ONLY if trained and qualified.

Fire Emergencies

When fire is discovered, follow the next steps:

1. Notify the site personnel about the fire emergency by the following means
    - Voice communication
    - Phone paging
2. Notify the *Dire Dawa* fire brigade (or if necessary the *Addis Ababa* fire brigade)
3. Fight the fire ONLY if:
    - The fire brigade has been notified.
    - The fire is small and is not spreading to other areas.
    - Escaping the area is possible by backing up to the nearest exit.
    - The fire extinguisher is in working condition and personnel are trained to use it.
4. Upon being notified about the fire emergency, occupants must:
    - Leave the building using the designated escape routes.
    - Assemble in the designated area.
    - Remain outside until the competent authority announces that it is safe to re-enter.

The Project/Site Manager must:

- Disconnect utilities and equipment unless doing so jeopardizes his/her safety.
- Coordinate an orderly evacuation of personnel.
- Perform an accurate head count of personnel reported to the designated area.

- Determine a rescue method to locate missing personnel.
- Provide the fire department personnel with the necessary information about the facility.
- Assist all physically challenged employees in emergency evacuation.

Chemical Spill Emergencies

When a *large chemical spill* has occurred, the following steps apply

1. Immediately notify the *Project/Site Manager*.
2. Contain the spill with available equipment (e.g., pads, booms, etc.).
3. Secure the area and alert other site personnel.
4. Do not attempt to clean the spill unless trained to do so.
5. Attend to injured personnel and call the medical emergency number, if required.
6. Call trained personnel to perform a chemical spill cleanup.
7. Evacuate building as necessary

When a small chemical spill has occurred, the following steps apply:

1. Notify the *Project/Site Manager*.
2. If toxic fumes are present, secure the area (with caution tapes or barriers).
3. Deal with the spill in accordance with the instructions described in the chemical safety manual.
4. Small spills must be handled in a safe manner, while wearing the proper PPE.

Severe Weather Emergencies

Rainfall (Storm)

1. Stop work immediately.
2. Find an indoor shelter.
3. Stay calm and await instructions from the *Project/Site Manager*.

Runoff/Flood

1. Stop work immediately.
2. Avoid walking through the runoff.
3. Stay calm and await instructions from the *Project/Site Manager*.

Emergency Evacuation Routes

In case of emergency, evacuate through the following locations:

- **Main evacuation route**: The main entrance gate for the camp.
- **Secondary evacuation route**: None.

Once evacuation of the site is complete congregate at the assembly points.

Responsibilities of workforce during emergency evacuation:

- Inform colleagues who are still working.
- Promptly leave / evacuate the site using the nearest emergency exit route.
- Gather and report to the officer in charge at the Evacuation Area. Ensure that your name is called during a headcount.
- When evacuating building, DO NOT:
  - Return to the office / room to take things
  - Overtake or push other evacuees
  - Be playful, joke around or make light of the evacuation
- If there are workers who are sick, hurt or disabled assist them to evacuate the building.
- Workforces may re-enter the building in an orderly fashion only AFTER the building is declared safe.

Laboratory Evacuation

- Remain calm--DO NOT rush the following procedures:
- Close laboratory as usually done after class or at day's end.
- If tests are in progress, turn any heat or flames OFF and discontinue any other operations.
- Close all doors, but DO NOT lock.
- Leave building by nearest exit.
- Stay at least 100 m away from building.
- Do not return to building until notified to do so by the police.

6.3. EHS Best Practices

Incident rate is usually calculated by multiplying the number of total recordable injuries by 200,000 and dividing by the hours worked. Severity rate is usually calculated by multiplying the number of lost-time workdays by 200,000 and dividing by the hours worked. ERA will strive to

reduce these rates to the lowest possible level and will strive to continuously improve to achieve world-class performance by ensuring strict adherence to the following strategies:

- EHS is line management-driven;
- Annual target reduction for EHS;
- Performance accountability (covered in annual performance review);
- High visibility for EHS (site inspection and job observations);
- Compliance auditing (planned inspections);
- Practical risk assessment;
- Team communication and consultation (EHS meetings, OHSC meetings);
- Training and awareness (all employees);
- Recognition for individual and team EHS performance;
- Document and data control;
- Emergency preparedness and response;
- Audits and Quality assurance; and
- Management reviews.

Table 23 equation for the calculation of incident and severity rates.

$Ir=\frac{Ti*200000}{hw}$, whereas ''*Ir*'' stands for incident rate ''*Ti*'' stands for total recordable injuries ''*hw*'' stands for hours worked
$Sr=\frac{Lt*200000}{hw}$, whereas ''Sr'' stands for Severity rate ''*Lt*'' stands for lost- time workdays ''hw'' stands for hours worked

7. Performance Measurement and Monitoring

It is important to identify key parameters to measure and communicate performance internally and externally, including compliance with relevant legal and other requirements, incident trends and progress toward objectives and targets. The ultimate indicators of the effectiveness of the

EHS Management Plan are indicated in the Table 24below.

Table 24 Ultimate Indicators of the Effectiveness of the EHS Management Plan

Indicator (as defined by OHSA)	ERA's Performance Target
Recordable incident rate	Less than 2
Lost-time injury rate	Less than 1

ERA recognizes that there is no single reliable measure of health and safety performance. What is required is a "basket" of measures or a "balanced scorecard" that provides information on a range of health and safety activities. Leading indicators, or positive performance measures (PPM), provide information on how the system operates in practice, identifies areas where remedial action is required, provides a basis for continuous improvement, and provides a mechanism for feedback and consequential motivation (see Table 25). Monitoring these leading indicators (PPM) will ensure the effectiveness of the EHS Management Plan and that ERA's targets and objectives are met.

Table 25 Positive Performance Measure for Safety

Objective	Indicator	Measure/Monitor	Results	Improvement
All activities to be subject to hazard analysis & risk assessment	Risk Assessment	% Risk assessment complete % Control measures implemented	Track reported % monthly by Contractor	Review progress at monthly senior management meetings, & target areas for improvement
Written work procedures in place for critical activities	Work procedures	% Written procedures complete	Track reported % monthly by Contractor	Review progress at monthly senior management meetings, & target areas for improvement
Provision of safe workplace	Work place inspection target for each frontline supervisor across the whole site on a monthly basis each with a specific area Workplace& visibility	% Scheduled inspections completed by name and work area; % Actions arising completed by name & work area % Visibility/inspection tours	Track reported % monthly by Supervision consultant	Review progress at monthly senior management meetings, & target areas for improvement

	tour by ERA's ESOS team once per month	completed.		
Employees working safely	Performance based observations	% Employees working safely %Personnel protective equipment (PPE)compliance	Track reported % monthly by Supervision consultant	Review progress at monthly senior management meetings, & target areas for improvement
Incident reporting and implementation of remediation measures	Timeliness of Reporting Incident investigation effectiveness Log of corrective actions	% Incidents reported within 24-48 hours % Near-miss incidents %Incident investigation complete on time % Corrective actions implemented	Track reported % monthly by Contractor	Review progress at monthly senior management meetings, & target areas for improvement
Safe &competent employees	Performance assessment including training needs identification &Training records	% Performance assessments complete % Scheduled training Complete contractor	Track reported % monthly by contractor	Review progress at monthly senior management meetings, & target areas for improvement

8. Accidents, Incidents, Non-conformances &Corrective & Preventive Action

Root or basic cause analysis is important for evaluating and investigating accidents, incidents and non-conformance and for establishing objectives and targets for a successful corrective action program. Through this process, the actions taken to address non-conformance can result in permanent and positive changes in the EHS Management System and continuous improvement. It is important that employees with health, safety, and environmental responsibility be part of this process to assist in identifying actual and potential health and safety risks, and adverse environmental impacts.

Ethiopian Roads Authority (ERA) has written operational controls for handling and investigating potential accidents, incidents, and non-conformance that include:

- ☞ Tracking and recording details of accidents, incidents, and non-conformance;
- ☞ Root or basic cause analysis;
- ☞ Mitigating any health and safety risks and adverse environmental impacts that arise from accidents, incidents, or other non-conformance, including corrective and preventive action;

- Where mitigation is necessary, conducting a health and safety risk assessment and significance evaluation of the environmental aspects of the proposed corrective and preventive action(s) to determine appropriateness and effectiveness; and
- Implementing, recording, and communicating changes arising from the corrective and preventive action, e.g., changes in operational controls.

9. Records and Records Management

Ethiopian Roads Authority (ERA) maintains and preserves internal and external records that are critical to design and performance of the EHS Management System of Meisso-Dire Dawa expressway project. These records include:

- Employee training records;
- Inspection reports;
- Management of change checklists and outcomes;
- Consultation reports;
- Accident, incident, and non-conformance reports;
- follow-up corrective and preventive action reports;
- Medical test reports (medical test reports and health surveillance reports might be considered confidential);
- Health surveillance reports;
- Cases of occupational disease and compensation claims;
- Audits and quality assurances;
- Management reviews;
- Environmental aspect evaluations;
- Hazard identification, risk assessment and risk control records; and
- Contractor as well as construction supervision consultant reports.

10. Auditing, Review, and Update

Ethiopian Roads Authority (ERA will conducts internal and cooperate with interested parties to conduct external audits to determine the degree of implementation and to verify performance of and implementation of occupational health and safety plan for Meiesso –Dire Dawa express road project of the contractor EHS Management System. Management and labour representatives may undertake audits. The results of audit(s) and management review(s) form the basis for the annual written statement of assurance by management on effectiveness of the EHS Management System. Annually, ERA's Environment, social occupational and safety directorate in collaboration with regional project management will submit to the contractor

through project manager a written statement of assurance or feedback as to effectiveness or none compliance of the EHS Management System.

Additionally, the supervising consultant will conduct quarterly compliance as well as performance audit for the environment, health and safety of the proposed express road project and submit quarterly audit report to the ERA.

Finally, supervision consultant and ERA's ESOS team will follow practicability of the occupational health and safety plan of the contractor, and order the contractor to update the OHS plan on time.

11. Management Review

ERA's project team leader, consultant's RE and environmental inspector, project manager of the contractor reviews the EHS Management System to determine its continued suitability, adequacy, and effectiveness. Outcomes of a management review include recommendations to revise contactor's OHS plan, to revise established objectives and targets, and to specify corrective actions for individual management with target dates for completion.

Finally, the management review minute of meeting will be reported to ERA.

12. Annexes

12.1. Annex A: Physical, Biological and Chemical Hazards and Safety Precautions

Physical Hazards

The physical hazards include trap, entangle or collapse hazard, fall hazard, eye hazard, electrical hazard, hazards related to welding/cutting and brazing, noise and vibration hazards, machinery, crane and vehicle hazards, hazards flying rock and fire hazards.

A. Trap, Entangle, or Collapse Hazard

Injury or death can occur from being trapped, entangled, or struck by machinery; unobvious movement during operations; unexpected collapse of the unsupported sides of a trench; workers falling into the excavation trenches; and vehicles driven into or too close to the edge of an excavation, particularly while reversing, causing the sides to collapse.

Safety Precautions to Prevent and Ameliorate Trap/Entangle/Collapse Hazards

The Project Road implements the following safety precautions to avoid and ameliorate trap, entangle, or struck. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

For workers who must be on foot in a work zone:

- Provide sufficient barricades, adequate warning signs or signals where person on foot must work / travel through or near heavy equipment operations or congested travel areas;
- Provide turn-around and lay out internal traffic control patterns to eliminate congestion;
- Provide high visibility safety wear of proper classification to all workers in the activity zone;
- Ensure worksite machineries and vehicles have working adjustable side mirrors and train workers on proper use and maintenance of side mirrors;
- Prohibit equipment operators from backing up long distances and work to minimize the distance trucks need to back-up to access the work zone;
- Each operator should have a designated back-up person or spotter to signal when it is safe for operators to back equipment into work areas and to make sure everyone keeps clear of the moving equipment;
- Provide training for workers, including spotters, on safe operating practices to prevent back-up related injuries and fatalities;
- Provide training for ground crews on recognizing blind spots for different types of equipment's and educate workers on the concept of teamwork in safety; and

- Establish a policy and educate workers about hazards related to cell phone distraction while driving or operating equipment in a work zone;

Workers must do the following to protect themselves:

- Be aware where heavy machinery is operating and stay in clear view of operation zone;
- Know where blind spots exist for different types of equipment's;
- Never use a cell phone when working around heavy machineries;
- Instruct all drivers and operators of vehicles to stop work when visual contact has been lost and do not resume until it is re-established;
- Perform preventive maintenance checks and services to inspect for equipment defects concerning safety, report problems and follow safe operating practices;
- Eliminate the need for equipment backups whenever it is practical to do so;
- Avoid horseplay in working zones; and report near misses promptly so they can be investigated and corrective action taken immediately.

Employer will do the following precautionary measures to eliminate trap, entangle or struck hazards in all working zones:

- Designing and installing equipment, where feasible, to enable routine service, such as lubrication, without removal of the guarding devices or mechanisms;
- Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out) machinery with exposed or guarded moving parts, or in which energy can be stored (e.g. compressed air, electrical components) during servicing or maintenance;
- Adequate and well-anchored stop blocks will be provided on the surface to prevent vehicles being driven into the excavation while tipping;
- Provide sufficient reflective tape around excavation and other construction activities areas;
- Designing machines to eliminate trap hazards and ensuring that extremities are kept out of harm's way under normal operating conditions. Where a machine or equipment has an exposed moving part or exposed pinch point that may endanger the safety of any worker, the machine or equipment should be equipped with, and protected by, a guard or other device that prevents access to the moving part or pinch point; and
- Arrange and enforce for mandatory safety induction orientation trainings

B. Fall Hazards

Fall hazards might arise from falling into excavated trenches, working on ladders and scaffolds, falling from top of equipment, falling from edge of roof or falling through openings in a roof. This might happen as a result of failure to secure ladder or place at the proper angle; reaching too far along side of ladder, rather than repositioning the ladder; creating extra height for the ladder by standing it on top of objects; climbing with one hand while carrying objects in the other; using metal ladders around electrical hazards; and using ladders that are damaged. These are the types of situations which are inherently dangerous, and need to have fall protection, not just fall prevention applied to them. By following the rules set out for ladder and scaffolds safety, the risk of fall from a ladder will be greatly avoided or reduced.

Safety Precautions to Prevent or Ameliorate Harms from Fall Hazards

The Project Road implements the following measures to greatly reduce the risk of fall hazards. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- make sure there are no overhead power lines with which the ladder might make contact;
- Inspect the ladder for any defects, cracks or broken parts before using;
- Clean shoes and ensure steps have enough skid resistance on them;
- Always face the ladder and use both hands whether going up or down;
- Use a rope to raise any objects; do not climb with them;
- Always keep your body within the ladder rails, and never reach to the side to put your body beyond the rails, move the ladder instead;
- Never climb onto a ladder from the side or switch from on ladder to another in the air;
- Never slide down a ladder;
- Never use a ladder which is too short, and never stand it on something such as a box, bricks or an oil drum to gain extra height;
- Installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area;
- Proper use of ladders and scaffolds by trained employees;
- Use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard area, or fall protection devices such as full body harnesses used in conjunction with shock absorbing lanyards or self-retracting inertial fall arrest devices attached to fixed anchor point or horizontal life-lines;
- Appropriate training in use, serviceability, and integrity of the necessary PPE;

- Whenever a person is performing a difficult task, it is important to have somebody hold the bottom of the ladder, or be at the base of equipment being stood upon. This not only provides a person who might be able to help break the persons fall, but it also can help the person get the tasks done, by handing whatever tools they need, and keeping more room for them to safely work.
- In the case of openings, the alternative is to provide a substantial cover which will bear your weight, and which is not easily moved. It must be boldly and clearly marked as to its purpose. If there is an up-stand at the edge of the roof of sufficient strength, conventional scaffold tubes to support guard-rails and toe boards can be attached to this.
    - Remember that trestle scaffolds, whether the trestles are fixed or folding in type, should be used only for light work of comparatively short duration. Folding trestles should be used only for scaffolds of one tier in height, and the working platform should be at least 430 mm (two scaffold boards) wide. One-third of the height of the trestles should be above the working platform. Fixed trestles should not be used for scaffolds of more than two tiers in height, and where the working platform is more than 2 m high guard-rails and toe boards should be provided. Trestle scaffolds are not suitable for work situations where a person is liable to fall a distance of more than 4.5 m from the platform.

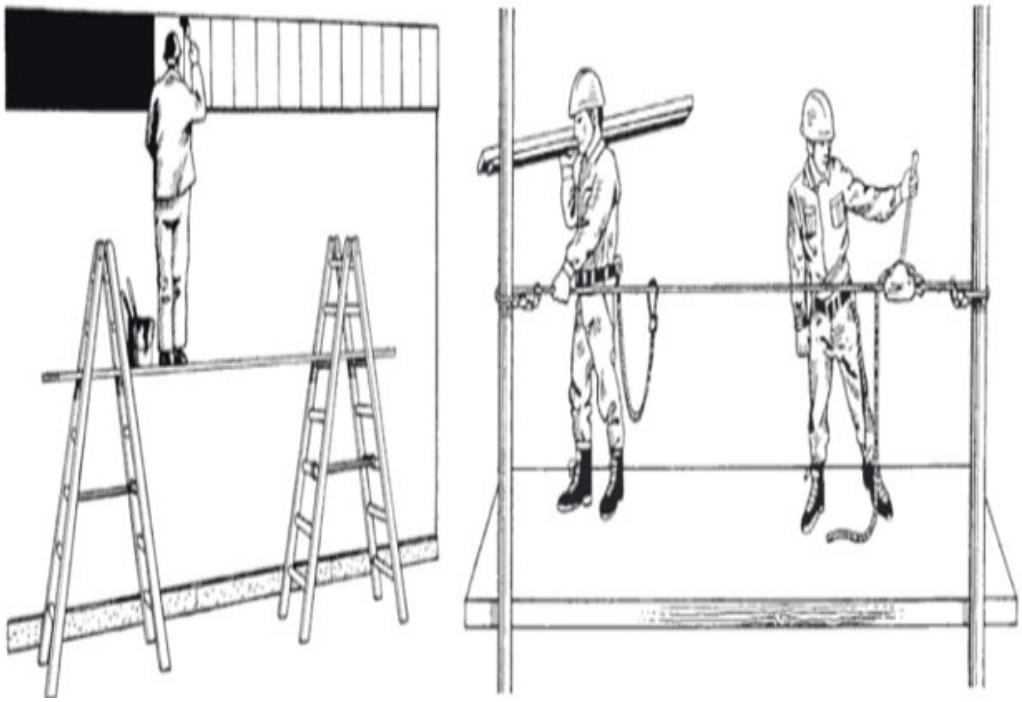


Figure 2: A trestle scaffold suitable only for light work such as cleaning or painting and use of safety belt and harnesses

C. Eye Hazard

A wide variety of construction operations, such as solid particles, liquid chemical spray or others may strike a worker in the eyes causing an eye injury or permanent blindness.

Safety Precautions to Avoid and Ameliorate Eye Hazards

The project implements the following measures to reduce the risk of eye hazards. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Use of machine guards or splash shields and/or face and eye protection devices, such as safety glasses with side shields, goggles, and/or a full face shield. Specific Safe Operating Procedures (SOPs) may be required for use of sanding and grinding tools and/or when working around liquid chemicals. Frequent checks of equipment prior to use to ensure mechanical integrity;
- Moving areas where the discharge of solid fragments, liquid, or gaseous emissions can reasonably be predicted (e.g. discharge of sparks from a metal cutting station, pressure relief valve discharge) away from places expected to be occupied or transited by workers or visitors. Where machine or work fragments could present a hazard to transient workers or passers-by, extra area guarding or proximity restricting systems should be implemented, or PPE required for transients and visitors;
- Provisions should be made for persons who have to wear prescription glasses either through the use over-glasses or prescription hardened glasses.

D. Head Hazards

Falling objects, overhead loads and sharp projections are to be found everywhere on construction sites. A small object falling from a height can cause serious injuries or even death if it strikes an unprotected head.

Safety Precautions to Avoid or Ameliorate Head Hazards

The Project Road implements the following measures to greatly reduce the risk of head hazards. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Clearly mark *hard–hat* areas with safety signs at the entrances and other suitable places,
- Manage and supervise visitors,
- Provide safety nets around areas prone to involve falling of objects places,

E. Foot Hazards

Foot injuries fall into two broad types: those due to penetration of the sole by nails and those due to crushing by falling materials.

Safety Precautions to Avoid or Ameliorate Foot Hazards

The Project Road implements the following measures to greatly reduce the risk of foot hazards. These safety precautions also apply for all other activities that might cause similar hazard:

- Good housekeeping, knock-down/removed nails immediately, and provide safety footwear.

F. Electrical Hazards

Electrical hazards are different from other types of hazard found in construction work because the human senses provide no advance warning, whereas an approaching vehicle may be heard, the prospect of a fall may be seen, or escaping gas may often be smelt. The great majority of electrical accidents result in electric shock and burns. Fire and explosion from sparks in flammable atmospheres and radiation from electric arc welding are also possible causes of injury.

Before operating a portable tool, check it to ensure that:

- there is no damage to the portable leads and plugs;
- there is a correct fuse;
- the tool is set at the right speed for the job; and
- leads and cables are kept out of the way of other workers and are not in contact with water

When finish using tool, make sure that the moving part is fully stopped before you put it down.

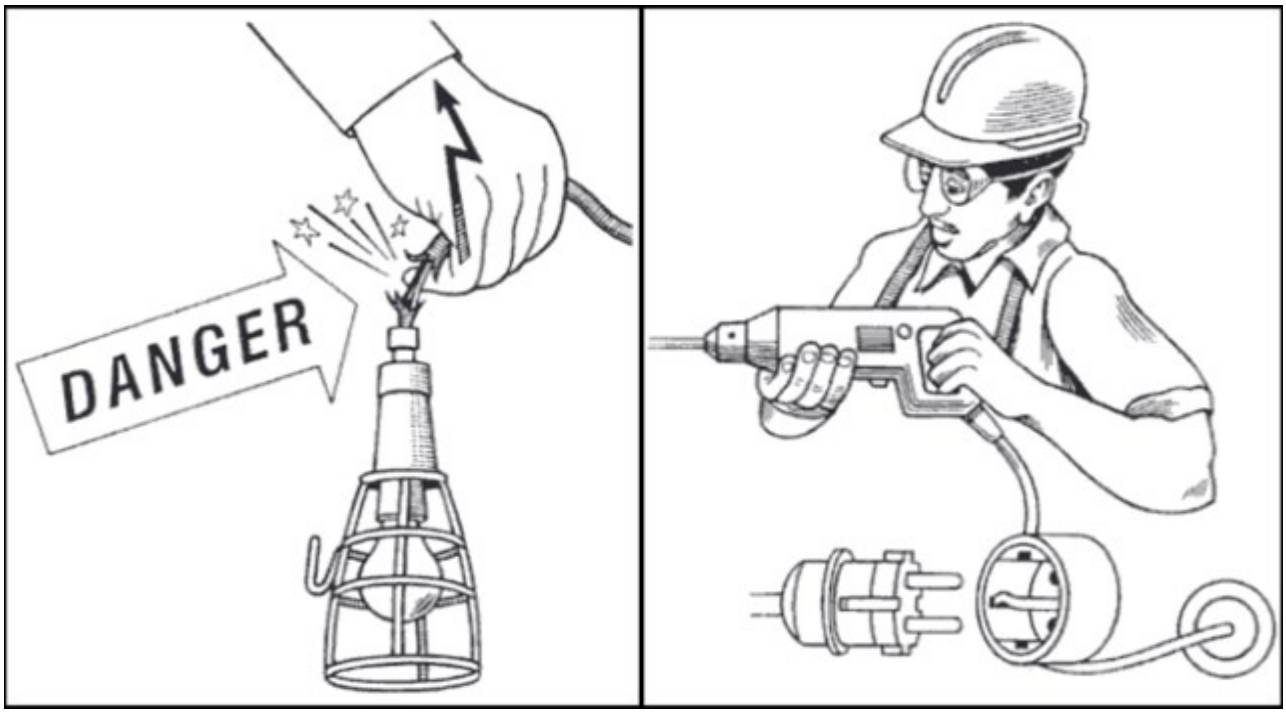


Figure 3: Electrical installations–pay special attention to the condition of temporary or portable electrical equipment and its cables

G. Fly Rock Hazards

Fly rock is the most hazardous and a leading cause of onsite fatalities and equipment damage from blasting operations. Occasionally, fly rock will leave the mine site and cause serious injury and damage to persons and property beyond the mine limits. Excessive fly rock is most often caused by an improperly designed or improperly loaded blast.

Safety Precautions to Avoid or Ameliorate Harms from Fly Rock

The Project Road implements the following safety precautions to avoid or reduce the risk of fly rock. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Sweep the blast area to free it from lose rock prior to drilling,
- Prepare and execute a proper blasting plan and good blast design,
- Make sure that the burden is proper and that enough collar distance is used,
- Post adequate number of guards at safe distances. Any people within this perimeter will have safe cover and will be adequately warned. Remember that warning signs, prearranged blasting times, or warning sirens, in themselves, are seldom adequate for blast guarding. It is particularly good if the blaster has a commanding field of view of the blast area so the shot can be aborted at the last minute if necessary.

- One-fourth inch-size material makes better stemming than fines, particularly where there is water in the boreholes. In some cases, it may be necessary to lengthen the stemming zone above the main charge and use a small deck charge to reduce fly rock and still assure that the cap rock is broken. In multiple-row shots, long delays between later rows, on the order of 10 milliseconds per foot of burden, may reduce fly rock.

H. Hazards related to Welding / Cutting/ Brazing and Fumes

Welding creates an extremely bright and intense light that may seriously injure a worker's eyesight. In extreme cases, blindness may result. Additionally, welding may produce noxious fumes to which prolonged exposure can cause serious chronic diseases. Danger from welding is not only to the welder doing the job but also to those working nearby. The risks include eye damage, skin injuries, burns and the inhalation of toxic gases.

Safety Precautions to Avoid or Ameliorate Welding/Cutting/Blazing and Fume Hazards

The Project Road implements the following safety precautions to avoid or minimize the risk of Welding / Hot Work hazards. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- The welder and anyone assisting should wear proper and suitable protective goggles or use a full-face mask or shield to protect the eyes and face from invisible ultraviolet and infrared rays given off by the welding arc. Additional methods may include the use of welding barrier screens around the specific work station with sturdy opaque or translucent materials (a solid piece of light metal, canvas, or plywood designed to block welding light from others). Devices to extract and remove noxious fumes at the source may also be required.
- Goggles must also be worn when carrying out weld chipping to protect the eyes from flying pieces of slag.
- The welder should wear protective gloves long enough to protect wrists and forearms against heat, sparks, molten metal and radiation. Leather is a good insulator.
- The welder should wear high-top boots to prevent sparks from entering footwear.
- Special hot work and fire prevention precautions and Standard Operating Procedures (SOPs) should be implemented if welding or hot cutting is undertaken outside established welding work stations, including 'Hot Work Permits, stand-by fire extinguishers, stand-by fire watch, and maintaining the fire watch for up to one hour after welding or hot cutting has terminated. Special procedures are required for hot work on tanks or vessels that have contained flammable materials.

- The work piece should be well earthed, and all equipment should be earthed and insulated.
- Precautions should be taken against starting fires from sparks from the work area: burning particles are capable of starting a fire 20 m away.

For oxy–acetylene welding:

- Store the cylinders separately, avoid leakage and keep them away from any source of heat and direct sunlight. If not stored outdoors, the store must be well ventilated. The cylinders in use should be retained upright in a rack or trolley and not left free-standing. Flashback arresters should be fitted to the cylinder regulators and non-return valves fitted in the hose connectors at the torch end.
- The gas hoses should be in good condition and easily distinguished. They should be protected against heat, sharp objects and dirt, especially oil and grease. These substances can, even in small amounts, cause an explosive ignition in the event of a leak in the oxygen hose. All joints, especially on the cylinders, should be kept tight. If an acetylene cylinder becomes accidentally heated, shut off the valves, raise the alarm, clear the area of personnel, and apply water (if possible, totally immerse).
- When transporting gas cylinders, valve protective caps must be in place and cylinders must be secured to dolly.
- Cylinders must be stored upright and secured to the cart or wall.
- Wear gloves and goggles for eye protection.

Fumes: Welding in a confined space, the use of some types of welding rod, or welding on certain painted metals may cause an accumulation of toxic gases and fumes. If local ventilation cannot be arranged, the welder should be provided with respiratory protection and a supply of fresh air. Welding carried out on metals covered with alloys of lead, cadmium, mercury or zinc may lead to a build-up of dangerous fumes requiring exhaust ventilation. Fumes may also be produced from paint and plastic on the surface being welded, and they should first be cleaned off.

I. Noise and Vibration Hazards

Excessive exposure to loud noise can cause permanent damage to your hearing. Noise at work can cause stress, making it difficult to sleep. Very high levels of noise caused, for example, by using cartridge tools can cause instantaneous hearing damage. Noise also makes it difficult to hear sounds that you need to hear such as work signals and warning shouts.

Safety Precautions to Avoid or Ameliorate Noise and Vibration Hazards

The Project Road implements the following safety precautions to minimize the risk of noise and vibration hazards. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Check that exhaust outlets are fitted with silencers or mufflers, and do not keep machinery running unnecessarily.
- Keep compressor motor covers closed when they are running.
- Check that concrete breaker mufflers and similar devices are securely fitted.
- Check that machinery panels are secured and do not rattle.
- Ensure that sound-insulating screens are provided to reduce noise from stationary plant and that where practicable noisy machinery is sited behind earth mounds or brick stacks to isolate or screen it as far as possible.

For workers working at or near a noisy machine:

- Don't expose them to a noise level greater than 85 dB (A) for a duration of more than 8 hours per day without hearing protection.
- The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85 dB (A). Hearing protective devices provided should be capable of reducing sound levels at the ear to at least 85 dB (A);
- Although hearing protection is preferred for any period of noise exposure in excess of 85 dB (A), an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB (A) increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent;
- Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible;
- Periodic medical hearing checks should be performed on workers exposed to high noise levels; and insert ear plugs with clean hands;
- Keep your hearing protection clean and in a safe place when you are not using it;
- Look out for damage: if the earmuffs no longer fit properly or the seals have become hard or damaged, ask for a replacement.

Vibrations

Many noisy machines or hand-operated tools also transmit vibrations to the body–pneumatic rock drills or concrete breakers are common examples. In this way they can injure muscles and joints, and affect blood circulation causing what is known as ‘‘white finger disease”.

- Exposure to hand-arm vibration from equipment such as hand and power tools, or whole-body vibrations from surfaces on which the worker stands or sits, should be controlled through choice of equipment, and installation of vibration dampening pads or devices;
- If there is no choice to substitute these machines, wear anti–vibration gloves (made using a layer of visco-elastic material), which help to cushion the vibration and limit the duration of exposure.

Along with using anti-vibration tools and gloves, workers can reduce the risk of hand-arm vibration syndrome (HAVS) by following work practices:

- Employ a minimum handgrip consistent with safe operation of the tool or process.
- Wear sufficient clothing, including gloves, to keep warm.
- Avoid continuous exposure by taking rest periods.
- Rest the tool on the work piece whenever practical and refrain from using faulty tools.
- Maintain properly sharpened cutting tools.
- Consult a doctor at the first sign of vibration disease and ask about the possibility of changing to a job with less exposure.

J. Machinery, Crane and Vehicle Operation Hazards

All mechanical motions are potentially hazardous. Motion hazards, such as rotating devices, cutting or shearing blades, in-running nip points, reciprocating parts, linear moving belts and pulleys, meshing gears, and uncontrolled movement of failing parts, are examples of motion and peculiar to any one machine or job operation. Personnel working within areas where they are exposed to machinery or equipment hazards must be aware of the potential accidents. Moreover, vehicular operations are known to be the underlying cause of site traffic accidents include bad driving techniques which include reversing blind; carelessness or ignorance of special hazards, e.g. work near overhead power lines or excavations; carrying unauthorized passengers; poor maintenance of vehicles; overloading or bad loading; site congestion; poor traffic layout; and lack of proper roadways combined with uneven ground and debris.

Safety Precautions to Avoid or Ameliorate Harm from Machineries Operation Hazards

The Project Road implements the following measures to greatly reduce the risk related with machineries and vehicular operation accidents. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Hire properly trained and experienced vehicle drivers and machine operators;
- Level and mark route in such a such a way that potential hazards such as overhead power lines and steeply sloping ground are avoided;
- Where possible a one-way system should be used;
- Clearly display speed limits and safety signals around activity areas;
- If routes have to approach overhead structures or overhead power lines, contact with them can be avoided by erecting warning barriers of the goalpost type (figure 2). The crossbar should be of rigid material, preferably timber, and painted in two contrasting warning colors.
- All personnel within areas where machines are operated must wear eye protection or face shields.
- Machine operators or their helpers will not wear loose fitting clothing, neckties, rings, bracelets, or other apparel that may become entangled in moving machinery.
- Hairnets or caps will be worn to keep long hair away from moving machinery
- Gloves will not be worn where there is a chance of them being caught in machinery.
- Earplugs or muffs will be used when required for worker protection.
- The Office of Health and Safety should be contacted to assist supervisors in determining personnel protective equipment needs.

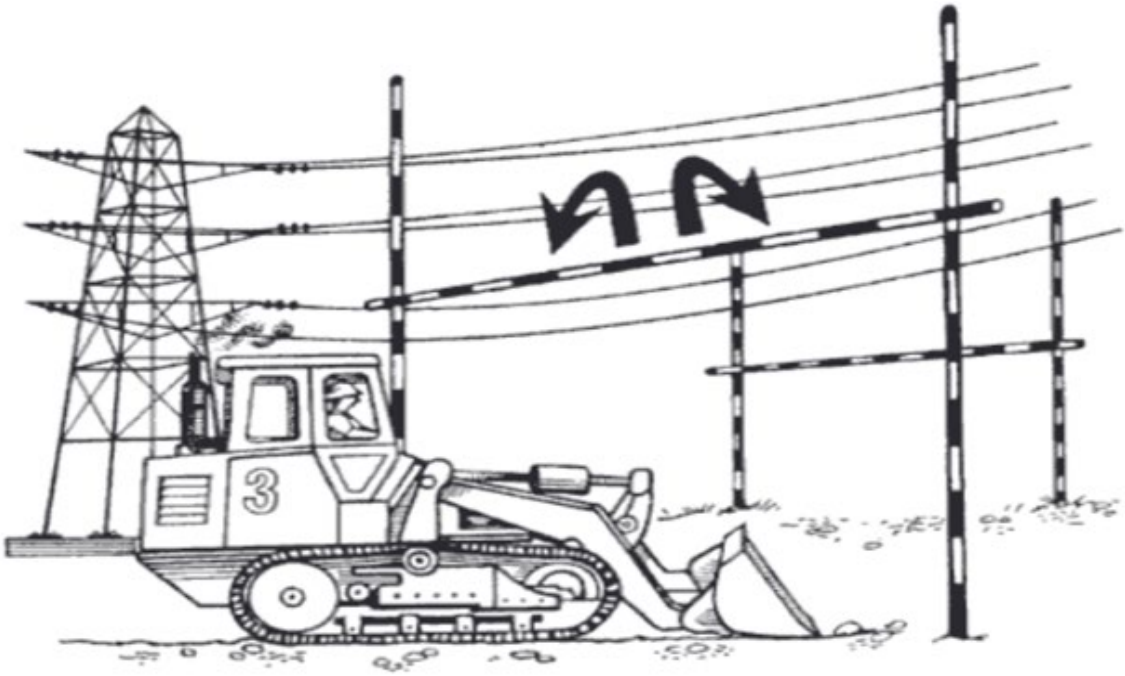


Figure 4: Goalposts to compel drivers to lower crane and excavator jibs, and avoid contact with overhead power lines

- In the case of power lines, there should be a barrier on both sides of the line and set at least 6 m horizontal distance away;
- Workers are frequently struck by vehicles travelling backwards when the driver's rear view is obscured. Enlist the help of another worker before you reverse and keep him/her in view at all times. If no one is available, walk round to the rear of the vehicle yourself to see that all is clear and give a sound signal before starting to reverse;
- An unattended vehicle should have the engine switched off, and unless the vehicle is on a marked incline the gear should be left in neutral and the handbrake on, on sloping ground the wheels should also be chocked.
- Tipping bodies should be lowered when the machine is unattended, but if it is occasionally necessary to leave them in the raised position they should be blocked to prevent their fall.
- Foot injuries to drivers and their assistants during loading and unloading are common, and you should wear safety boots or shoes.

Maintenance of vehicles falls into three categories:

- a daily check by the driver of water, oil, fuel, lights, inflation of tyres and brakes
- a weekly check by a fitter;
- periodic servicing to the manufacturers' requirements

A written record of maintenance and repairs should be kept on site.

Crane Operation Safety Precautions

- Equipment shall be operated by a qualified operator. *Exception*: Maintenance and test personnel and inspectors, when in the performance of their duties, shall be allowed access only after permission has been granted by the operator;
- The operator, when operating the equipment, shall maintain full attention on the task being performed (e.g., no use of headsets, music, cell phones);
- The operator shall ensure that hand signals used during the lift are understood and followed by all involved;
- No load in excess of the rated capacity shall be lifted;
- Before leaving the crane or carrier unattended, the operator shall land any load, place the controls or master switch in the off position and open the main line device of the specific crane or carrier;
- The main line disconnect shall not be closed until the operator has made sure that no one is on or adjacent to the crane or carrier;
- If the crane or carrier has been locked out or tagged out, the operator shall not remove the lock or tag, unless the lock or tag has been placed there by the operator. To remove someone else's lock or tag refers to the Lockout/Tag-out program;

Loading and Unloading

- Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads that cannot be centered.
- Only loads within the rated capacity of the truck shall be handled.
- The long or high (including multiple-tiered) loads that may affect capacity shall be adjusted.
- Trucks equipped with attachments shall be operated as partially loaded trucks when not handling a load.
- A load engaging means shall be placed under the load as far as possible; the mast shall be carefully tilted backward to stabilize the load.

- Extreme care shall be used when tilting the load forward or backward, particularly when high tiering. Tilting forward with load engaging means elevated shall be prohibited except to pick up a load. An elevated load shall not be tilted forward except when the load is in a deposit position over a rack or stack. When stacking or tiering, only enough backward tilt to stabilize the load shall be used.

K. Traffic Accidents

Traffic accident is the most dangerous cause of injury and death in the actual road construction and operation activities. In this road upgrading project, several factors could cause traffic accidents both on the workforce and the local road users (vehicular and on foot travelers). Traffic accidents fall under high risk Class "A" hazard.

Safety Precautions to Avoid or Ameliorate Harms from Traffic Accidents

The Project Road implements the following safety precautions to alleviate the factors contributing to vehicular accidents. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Hire well qualified and experienced drivers and operators and provide mandatory safety orientation concerning safe ways of driving and their responsibilities (such as not driving after drinking, driving only the permitted hours per day, don't allow passengers to accompany, always using safety belts, etc.)
- Provide traffic safety orientation trainings to students in schools and local people around public gathering places such as markets and religious areas,
- Always suppress dust around road construction activity sites,
- Put proper warning traffic signs 100 m in front of construction sites from entrance and exist sides,
- Whenever the need arises deploy trained traffic safety operators (flag persons) to smoothen traffic flow around construction sites,
- Complete the construction activities in the planned period to avoid further congestion that could cause accidents,
- Put reflective tapes around work areas and don't allow strangers to cross into the work areas,

L. Accidents from Demolish

The Project Road involves demolishing of existing structures such as houses, fences, remove utilities, and cut trees and so on. This activity could cause harm to the workforce and other local people. The principal causes of accidents during demolition are:

- the choice of an incorrect method of demolition;
- an unsafe place of work;
- the unintentional collapse of the structures being demolished, or of an adjoining structure, because of lack of temporary support

Safety Precautions to Avoid or Ameliorate Harms from Demolish of Structures

The Project Road will put the following safety precautions in place to alleviate the harms that could arise from demolish activities. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Allow owners of houses to easily and safely remove their fences and trees,
- For structures the project will assign a trained supervisor to supervise the process of demolish by disconnecting all services from the structure. Failure to do this adequately can result in electric shock and explosions. Arrangements will be made to keep the public as far away as possible from the site,
- Communicate with service providers and the client concerning utility networks so that those underground will be easily located and removed,

M. Fire Hazard

Fires on construction sites arise from the misuse of compressed gases and highly flammable liquids, from the ignition of waste material such as cellular plastic materials, and from the failure to recognize that adhesives and some floor and wall coatings are highly flammable. Liquefied Petroleum Gases (LPG) that is widely used on construction camp sites for cooking purposes is a frequent cause of accidents. A leakage of liquid from a cylinder immediately vaporizes and, because it is heavier than air, flows along the ground and collects in drains, excavations and other low-lying places. As it takes only 2 % of the vapor in air to form a flammable mixture, if leakage occurs in a confined space there is a high risk of explosion. Whenever LPG is used indoors, there must be good ventilation.

Safety Precautions to Avoid or Ameliorate Harms from Fire Hazards

The project implements the following safety precautions to avoid the risk of fire hazards. These safety precautions also apply for all other activities and sites that might cause similar hazard:

- Aware of every individual on site the fire risk and let them know the precautions to prevent a fire and the action to be taken if fire does break out.
- If fire breaks out, get someone to call the fire brigade. Do not continue trying to fight the blaze yourself if large quantities of fumes are being emitted in a closed space. Get out as fast as possible.

Everyone on site should be trained to:

- know of two unobstructed ways off the site if there is a fire or other emergency;
- know how to raise the alarm;
- know where firefighting appliances are kept;
- be able to use the firefighting appliances; and be able to select the correct type of portable fire extinguisher for specific types of fire,

LPG stores should conform to the following standards:

- There should be no excavations, drains or basements nearby,
- There should be a dry powder fire extinguisher at the store,
- Where LPG cylinders are stored on site, it should be in an open-air compound at ground level surrounded by a fence at least 2 m high; there should be sufficient shelter to prevent cylinders being exposed to extremes of temperature,
- The compound floor should be paved or compacted level, and kept clear of flammable material, weeds or rubbish,
- Cylinders must be kept 1.5 m from the compound fence and 3 m from the site boundary,
- Cylinders should never be stored below ground level or closer than 3 m to cylinders containing oxygen or materials which are toxic or corrosive, e.g. ammonia or chlorine,
- There should be notice stating “LPG–Highly flammable” and prohibiting smoking,
- Cylinders, full or empty, should be stored upright with the valve uppermost, and
- The valves of empty cylinders should be kept closed, for if they are left open, air will diffuse into the cylinder and may form an explosive mixture.

Handling of LPG

When handling LPG cylinders, take account of the following points:

- A damaged or leaking valve can have serious consequences.
- When cylinders aren’t in use, valves and regulators must be protected by appropriate caps.
- When moving cylinders use trolleys, skids or mats and never lift by the valve assemblies.
- Before using a cylinder, ensure all joints are gas tight by using soapy water and a brush.
- If a leak is detected, move the cylinder as soon as possible to an open space and inform your supervisor at once.
- Cylinders used for heating huts should be kept outside the building.
- If, when lighting a burner, the match or taper goes out before the burner ignites, turn off the burner valve before lighting another match or taper.

Chemical Hazards

A great many chemical substances are used in construction–there is hardly a site without them. They are found in adhesives, cleaning agents and stonework, decorative/protective treatments for metals, floor treatments, fungicides, cements, grease, paints, battery acids, engine and hydraulic oils, and solvents. The sources of chemical hazards during camp site construction and operation emanate from cement for construction, diesel, grease, engine and hydraulic oil, and battery acids used for vehicular and machineries operations. A chemical can cause injury in various ways depending upon whether it is solid or liquid, or in the form of airborne dust, vapor, fumes or gas. The routes into your body are by:

- Inhalation: Some toxic gases and vapors cause irritation in the nose and throat and so give warning of their presence; others do not, and penetrate to the lungs or blood stream.
- Ingestion: This is possible when you handle chemicals such as lead-based paints and then eat or smoke without first washing your hands, when toxic vapors contaminate cups, plates or eating utensils, or when you eat meals at the work site;
- Absorption through the skin. Some solvents can be absorbed through the skin into the blood stream and may travel to internal organs such as the brain and liver.

Safety Precautions to Avoid or Ameliorate Harms from Chemical Hazard

The Project implements the following measures to reduce the risk of chemical hazards. These safety precautions also apply for all other activities and sites that might cause similar hazard:

Accidents and ill health from the use of chemicals can be prevented if a worker knows what chemicals he/she is using and the risks they pose, and follow the established safe practice in handling them. Generally, there is an order of priority in the measures for dealing with hazardous chemical substances:

- Substitute the chemical with a harmless or less hazardous one;
- Enclose the process using the chemical, or provide other engineering controls such as exhaust ventilation; this is often difficult in construction processes; and
- Use personal protective equipment (PPE);

If the use of hazardous chemicals cannot be avoided, the Project Road implements the following basic safety measures you can adopt to protect yourself from danger:

- Check that you are wearing the correct PPE before you handle chemicals (the chemical safety data sheet should say whether you need gloves, eye protection, protective clothing, rubber boots or respirators) and that the equipment is in good order.
- Keep containers of chemicals in a separate and secure store.

- Because two containers look the same, do not assume that they contain the same material.
- Make sure there is a label on the container–if there is no label, and then do not use the contents.
- Read the label and make sure you understand what it says, then follow the instructions.
- If the information is not sufficient to tell you how to handle the chemical safely, ask your supervisor for the chemical safety data sheet and do not use the chemical until you have seen it; if you do not understand it, ask questions until you do.
- When opening containers, hold a rag over the cap or lid as some volatile liquids tend to spurt up when this is released; transfer the contents of containers in the open air.
- Avoid breathing in any fumes from chemicals. Provide good ventilation, or work in the open air. Leave the work area immediately if you feel dizzy or unwell.
- If you are using large quantities of solvents, wear impermeable clothing. Remove any clothing wetted by solvents and leave it to dry in a well-ventilated place.
- Eye protection should be worn when chemicals are being moved or transferred on site.
- When mixing or pouring chemicals using temporary containers, make sure they are suitable and correctly labeled. Never use food or drink containers.
- Wash before you eat and do not eat or smoke at your workstation.
- If the skin is splashed with a chemical, it should be rinsed immediately with plenty of clean running water. Eyes should be flushed out thoroughly with water and should receive immediate medical attention.
- If you are burned by a chemical or feel unwell after using a chemical, seek medical attention without delay.
- If there is a spillage of chemicals on the ground or floor, report the matter at once so that the right action can be taken, such as soaking it up with dry sand.

Cement

Cement mixes are a well-known cause of skin disease. Both irritant and allergic contact dermatitis can result from proximity to wet cement. Prolonged exposure to wet cement (for example, if you kneel or stand in it) may cause cement burns or ulceration of the skin. The following precautions should be taken:

- Avoid breathing in cement dust, as well dust created by the surface treatment of hardened concrete which may contain high silica content, by wearing suitable respiratory protective equipment.

- Protect the skin from contact by wearing long-sleeved clothing and full-length trousers, with rubber boots and gloves when required.
- Protect the eyes; if any cement gets into the eyes, rinse them immediately with plenty of warm water.
- Immediately wash off any dust or freshly mixed cement that gets on to the skin.
- Clean off your clothing and boots after work.

Lead

Inorganic lead is found in many construction products, e.g. electricity cables, pipes, gutters and old lead sheet roofs. Organic lead is added to motor fuels, and storage tanks will be heavily contaminated. There is a risk to health from inhaling dust or fumes created by burning or cutting materials containing lead, including painted surfaces, by welding, by grinding or cutting, and by spray painting of leaded paints. Lead can be absorbed when swallowed, usually when food is contaminated, and adequate washing facilities should be provided. Organic lead compounds are readily absorbed through the skin. Excessive lead absorption causes constipation, abdominal pain, anemia, weak muscles and kidney damage. It can also affect the brain, causing impaired intellect, strange behavior, fits and coma.

Recommended precautionary measures for people working with lead in any form:

- Wash your hands regularly, and always before eating; you are at higher risk if you smoke with lead on your hands.
- Use the protective clothing and respiratory protective equipment which should be provided whenever lead levels exceed national control limits.
- Wear work clothing on the job and store your “street” clothing where it cannot be contaminated by your work clothing.

Used Hydraulic and Engine Oil

- Collect liquids in leak-proof containers;
- Transfer into main collecting drums in a place separated from human encroachments;
- Handover the drum to METEC when the drum is full and a number of them are accumulated;

Fueling Safety

- Fuel tanks shall not be filled while the engine is running. Spillage shall be avoided.
- Spillage of oil or fuel shall be carefully washed away or completely evaporated and the fuel tank cap replaced before restarting engine.
- No truck shall be operated with a leak in the fuel system until the leak has been corrected.

- Open flames shall not be used for checking electrolyte level in storage batteries or gasoline level in fuel tanks.

Safety Measures

1. Stop the exposure *immediately* by separating the victim and the source.
2. If the victim is unconscious, check to see if the victim is breathing. If not, give artificial respiration. If highly toxic material is present in the victim's mouth or respiratory path, use chest compression, not mouth-to-mouth.
3. Decontaminate the victim immediately by washing off any skin residues of chemical, and remove any contaminated clothing. Speed is absolutely essential in this step.
4. Obtain professional help.

In all cases due consideration must be given to the protection of yourself and other personnel in the vicinity of the incident. This is critical in the case of a large chemical spill.

Speed is essential in performing **first aid** for poisoning. **If you are alone with the victim**, you must give first attention to the victim, especially in re-starting breathing, separating the victim from the chemical source, and decontaminating the victim's skin. **If another person is with you and the victim**, one of you should perform first aid; the other should seek professional help as described above.

Recognizing the signs and symptoms of poisoning quickly and following appropriate procedures may help save a person's life, but first aid should never be considered a substitute for professional medical treatment. First aid is only to help the patient get well enough so proper medical treatment may be provided.

After the victim has been fully cared for and professional help has been sought, these additional steps should be taken. As with the first aid procedures, due consideration must be given to your safety and those around you.

1. Bring the **label** to the physician or poison control center. You should also save the container and any remaining should an official request to see it.
2. Eliminate the source of the contamination to prevent or reduce the risk that others may be exposed to the chemical. In the case of a significant spill, this will have to be done by professionals trained to respond to these kinds of emergencies.
3. Decontaminate any clothing or equipment as needed. Never put on clothing previously contaminated with chemical, and always wash contaminated clothing by itself with detergent and water.

Specific Instructions

The label should be consulted for specific first aid instructions. Below are some of the more common instructions one might expect to see on the label.

Poison in Eyes

Hold eyelids open; wash eyes immediately with a gentle stream of clean running water. Use large amounts of water. Delay of only a few seconds can greatly increase the extent of injury. Continue washing for 15 minutes or more. Do not use chemicals or drugs in the wash water. They may increase the extent of injury.

Inhaled Poisons

If victim is in an enclosed space, do not attempt a rescue without proper respiratory equipment. Get the patient to fresh air immediately. Loosen all tight clothing. Apply artificial respiration if breathing has stopped or is irregular. Call for emergency help.

Prevent chilling (wrap patient in blanket but don't overheat). Keep patient as quiet as possible.

If patient is convulsing, watch his or her breathing and protect the patient from falling and striking his or her head on the floor or wall. Keep the patient's chin up so air passage will remain free for breathing.

Swallowed Poisons

Call for emergency help immediately. If vomiting is to be induced, place the blunt end of a spoon (not the handle), or your finger, at the back of the patient’s throat; or use an emetic of two tablespoons of salt in a glass of warm water.

When retching and vomiting begin, place patient face down with head lowered, thus preventing vomits from entering the lungs and causing further damage. Do not let patient lie on back.

Never induce vomiting unless directed by the label or a medical professional to do so. Do not induce vomiting if:

- Patient is unconscious or experiencing convulsions.
- Patient has swallowed petroleum **products** (kerosene, gasoline, lighter fluid, etc.).
- Patient has swallowed a **corrosive poison** (strong acid or alkaline products).

Chemical Splash/Burns of Skin

Remove contaminated clothing. Wash with large quantities of running water. Immediately cover with loosely applied clean cloth (any kind will do). Avoid use of ointments, greases, powders, and other drugs. Treat shock by keeping patient flat, warm, and reassured until the arrival of a doctor.

Biological Hazards

The biological camp site hazards emanate mostly during the camp site operation phase. This includes clinic health service wastes and wastewater from sanitary pipeline network.

Safety Precautions to Avoid or Ameliorate Harms from Biological Hazards

The Project Road implements the following measures to greatly avoid or reduce the risk of biological hazards. These safety precautions also equally apply for all other activities and sites that might cause similar hazard:

- Waste minimization;
- Conduct sorting at source for solid clinic wastes;
- Segregate waste water from toilets seats and household and bath room washing. Reuse the household wastewater for gardening after treatment;
- Materials contaminated with hazardous biological agents will be collected in the appropriate containers and disposed at incinerators;
- Design work processes and controls, and use adequate equipment and materials to reduce the release of dangerous substances;
- Apply collective protection measures at the source of the risk, such as ventilation and appropriate organizational measures; and
- Apply individual protection measures including personal protective equipment where exposure cannot be prevented by other means.

Control and Prevention of Spread of HIV/AIDS

- Conduct KAP survey and come up with description of the situation of HIV/AIDS among the local community and the workforce
- Prepare action plan for intervention
- Conduct project sensitization
- Liaison with local health institutions and all other stakeholders
- Conduct awareness raising sessions
- Avail IEC materials for the workforce and local community
- Distribute condom
- Avail condom for free
- Encourage workforce to involve in VCT and PICT
- Prepare and submit monthly and quarter reports

12.2. Annex B: Classification of Hazard

Hazards are classified as Class A, B or C using two variable risk assessment matrixes. In this approach the following steps are followed:

Step 1: Consider the consequence of exposure to the hazard

Using the table below, determine as realistically as possible the consequence resulting from exposure to the hazard. As an example, fueling is a common activity and occurs at most Main Roads project sites. A minor spill of diesel fuel during fueling operations that impacts the ground may result in a moderate, short-term effect to the natural environment. Based on the table below, this would result in consequence of "II".

Table 7: Two variable risk matrix – definition of consequences

Security level	Consequences	Types
	Health and Safety	Natural Environment
V	Multiple fatalities, or significant irreversible effects to >50 persons.	Very serious, long-term environment impairment of ecosystem functions.
IV	Single fatality and/or severe irreversible disability (>30%) to one or more persons.	Very serious, long-term environment impairment of ecosystem functions.
III	Moderate irreversible disability or impairment (<30%) to one or more persons.	Serious medium term environment effects.
II	Objective but reversible disability requiring hospitalization.	Moderate, short-term effects but not affecting ecosystem functions.
I	No medical treatment required.	Minor effects on biological of physical environment.

Step 2: Consider the likelihood of the exposure to the hazard occurring.

Using the table below, determine the likelihood of exposure to the hazard resulting in the consequence determined in Step 1. Consider how frequently the activity is conducted in determining the likelihood. The example of the minor spill of diesel fuel is a likely occurrence, and therefore, the definition of likelihood would result in a level "B".

Table 8: Two variable risk matrix – definition of likelihood

Level	Descriptor	Description	Indicative Frequency
A	Almost certain	The event will occur on an annual basis.	Once in a year
B	Likely	The event has occurred several times in your career.	Once every 3 years.
C	Possible	The event might occur once in your career.	Once every 10 years.
D	Unlikely	The event does occur somewhere from time to time.	Once every 30 years.
E	Rare	Heard of something like the occurring elsewhere.	Once every 100 years.

Step 3: Using the Two Variable Risk Matrix table below, determine the Risk Rating from the consequence and likelihood descriptors.

To use the Two Variable Risk Matrix:

1. Identify the consequence descriptor that best describes the consequences of the exposure to the hazard in Step 1.
2. Identify the likelihood descriptor in Step 2 that best describes the likelihood of exposure to the hazard resulting in the consequence determined in Step 1.
3. The risk rating is provided in the box where the Likelihood row and Consequence column meet.

In the case of the minor diesel fuel example, the intersection of the consequence (II) and the likelihood descriptor (B) results in a “Medium Risk” rating.

Table 9: Two variable risk matrix

Two Variable Risk Matrix					
Consequences Label					
Likelihood tag	**I**	**II**	**III**	**IV**	**V**
A	Medium	High	High	Very High	Very High
B	Medium	Medium	High	High	Very High
C	Low	Medium	High	High	High
D	Low	Low	Medium	Medium	High
E	Low	Low	Medium	Medium	High

12.3. Annex C: Personal Protective Equipment PPE

Why do you need PPE?

Although hazards are meticulously identified and preventive actions are stated in the aforementioned sections, the working conditions in the Project Road are in most cases push for the use of some personal protective equipment (PPE), such as a helmet, hearing and eye protection, boots and gloves to protect workers. However, there are disadvantages in using PPE:

- Wearing some forms of PPE may involve discomfort to the user and slow down the work.
- Extra supervision is called for to see that PPE is worn.
- PPE costs money.

Some PPE such as safety helmets and footwear should be used on all construction sites. The need for other PPE will depend on the sort of work you do. Remember, too, that proper work clothes will provide protection for the skin.

Head protection

Falling objects, overhead loads and sharp projections are to be found everywhere on construction sites. A small object falling from a height can cause serious injuries or even death if it strikes an unprotected head.

Safety helmets protect the head effectively against most of these hazards, and you should wear a helmet whenever you are on site and particularly when you are in an area where overhead work is going on. These areas, known as "*hard-hat areas*", should be clearly marked with safety signs at entrances and other suitable places. The same rule applies to managers, supervisors and visitors. Only safety helmets which have been tested to national or international standards should be used. A chin-strap on the helmet prevents it from failing off and should be used when appropriate.

Foot protection

Foot injuries fall into two broad types: those due to penetration of the sole by nails which have not been knocked down or removed, and those due to crushing by falling materials, which can be minimized by wearing protective footwear. The type of safety shoes or boots to be used will depend on the nature of the work (e.g. the presence of ground water on construction sites), but all safety footwear should have an impenetrable sole and uppers with a steel toe-cap.

Hand and skin protection

Hands are extremely vulnerable to accidental injury, and in construction more injuries are caused to hands and wrists than to any other part of the body. Open wounds, abrasions, fractures, dislocations, strains, amputations and burns occur. They are largely preventable by better manual handling techniques and equipment, and by wearing suitable hand protection such as protective gloves and gauntlets.

Among the common hazardous tasks where hand protection should be provided are:

- operations involving contact with rough, sharp or jagged surfaces;
- contact with or splashes from hot, corrosive or toxic substances such as bitumen and resins;
- working with vibratory machines such as pneumatic drills where some cushioning of the vibrations is desirable;
- electrical work in humid and cold weather

Eye protection

In the Project Road many eye injuries occur as a result of flying material, dust or radiation when the following jobs are being carried out:

- breaking, cutting, drilling, dressing or laying of stone, and concrete works with hand or power tools;
- chipping and dressing painted or corroded surfaces;
- cutting off or cutting out cold rivets and bolts;
- dry grinding of surfaces with power grinders;
- welding and cutting of metals

Some of these hazards can be removed permanently by proper machine guarding, exhaust ventilation or work design. For many hazards, for example, stone cutting or dressing, personal eye protection (goggles, safety glasses or shields) is the only practical solution. Sometimes workers are aware of the danger they run and the consequences if their eyes are damaged, but do not wear eye protection. This is because the type chosen interferes with vision or is uncomfortable to wear, or is not immediately at hand when needed.

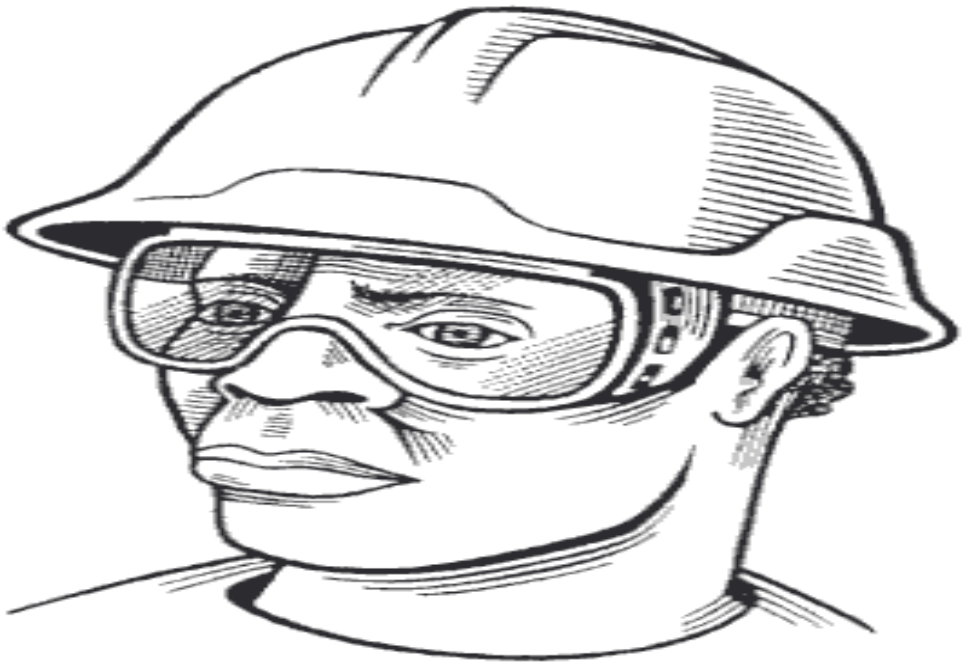


Figure 5: Eye protection must be suitable, comfortable and available to encourage workers to wear it

Hearing Protection

In areas or in working conditions where an employee is exposed to excessive noise (over 55 dBA) or where an employee is exposed to continuous, intermittent or impact noise, a hearing conservation procedure must be developed and implemented. It must include: monitoring and measuring noise levels, mandatory use of proper and adequate hearing protection, and postings where noise levels exceed 55 dBA.

Respiratory Protection

In workplaces where employees may be exposed to airborne contaminants that cannot be controlled by ventilation, employers must provide employees with adequate respiratory equipment and establish a code of practice for the selection, care, use, maintenance and fitting of the equipment. In addition, precautions, including mandatory use of respiratory protection, must be taken to protect employees working in conditions that may cause respiratory diseases, pneumoconiosis, inhalation fevers or respiratory irritation.

Skin Protection

Employees are required to wear or use protective equipment to protect from any hazard that may harm skin. The Regulation is not specific to work conditions or types of work; it outlines that employees are obligated to use gloves, boots, body coverings, eye protection, barrier cream or any other equipment to protect them from hazards that may injure the skin. Types of work where any employee may need to consider this section may be health care or personal care workers, kitchen workers, working with chemicals, working with hot objects or around flames, or in industries such as agriculture, food processing or baking, forestry, construction, embalming, fishing, or auto repair, where exposures to conditions may cause skin irritation or occupational dermatitis.

12.4. Annex D: Explosive Storage and Transportation

The GoE regulates explosive importation and storage including proper recordkeeping to protect the public from misuse. The Project Road will build separate explosive warehouse from the surrounding buildings. Separation distance requirements between ammonium nitrate and blasting agent storage facilities are less than for high explosives. However, the distance requirements for separation of blasting agents and ammonium nitrate from occupied structures and rights-of-way are the same as those for high explosives. Detonators may not be stored with other explosive materials.

The Project Road explosive warehouse will remain locked except when explosives are being deposited or withdrawn. Only authorized personnel will deposit or withdraw explosives. The number of authorized persons will be kept to a minimum for both safety and security purposes. Explosive stocks will be piled nearly to facilitate safe handling, and the oldest explosives should be used first to assure freshness. This is important for all explosive materials to prevent fuel segregation or evaporation. The Project Road will avoid prolonged storage of explosives along with maintaining good housekeeping standards both inside and outside the warehouse. To minimize the fire hazard, vegetation outside the warehouse, except live trees over 3 m high, should be cleared for a distance of at least 9 m and rubbish should be cleared for at least 20 m. Smoking or flames are not permitted in or within 50 m of an outdoor storage magazine. Magazines should be clearly marked. Primed explosives must never be stored in magazines.

The project will transport explosives using approved vehicle that is in good repair and especially outfitted for the job. The project will avoid the practice of using the most conveniently available vehicle for explosive transportation. The interior of the explosives compartment must be constructed of non-sparking material. If detonators are to be hauled on the same vehicle as explosives, they must be properly separated. The operator of the explosives vehicle is a well trained in both driving and explosives handling. Before moving out with the explosives load, the driver will make sure that the explosives cannot fall from the vehicle because frictional impact will readily initiate explosives.

At the jobsite, the explosives will be stored in a safe location, away from traffic and encroachments from anything. The blast area will be delineated with cones or cordoned off, and. unauthorized persons will not be permitted within, 'this area.' Explosives should not be stored where they can be hit by falling rock or working equipment. Explosives should be under constant surveillance whenever they are not in a warehouse.

Blasting Operation

The Project Road follows standard blasting procedures before, during and after the blasting operations. For this project the procedure is handled by specially trained blasting experts. Thus, the project will use:

- Explosive team headed by licensed blasting expert confirmed by The Federal Democratic Republic of Ethiopia National Intelligence and Security Service Main Department.
- Explosives are requested by the project site manager and approved by project general manager in consultation with blasting team leader.
- Explosives are issued from store to be transported to blasting site under the supervision of blasting team leader and local government representatives.
- Prior to blasting, guard boundary line and alarming will be executed 30 minutes beforehand, all the entrances of the access roads within 300 m of the blasting areas, alarming and safety man shall be provided to check the surrounding area, after confirming safety conditions are ready, blasting can be done.
- Make sure that all workforces around the blasting activity use the required PPE.
- After blasting, blasting expert and his team enters the excavation area and check safety conditions. Any existing problems or defects such as dead holes will be treated properly.
- Prior to loading the rock, excavator will clear away loose rocks. If necessary, some support measures could be taken to ensure the stability of rock slope and adjoining rock.

Blasting Procedure at Quarry Site

1. **Drilling:** Hand pneumatic drill, hydraulic rig will drill holes in excavated rocks. Drilling shall be conducted strictly as per the blasting design. Holes will be kept vertically and horizontally in a uniform layout. The depth of drilling hole shall be at the same level with that of hole bottom so as to achieve relatively surface.
2. **Charging (Explosive):** Explosives shall be used in the quantities and manners recommend by the manufacturers, and also according to blasting quantities and site condition.
3. **Blasting:** After charging explosive in holes, it must execute the stated sequence of blasting, i.e. preparation – Alarming – Blasting – Turn off Alarming, etc. In order to ensure blasting safety, millisecond detonating system will be adopted in blasting operation.
4. **Safety Checking:** Prior to starting blasting, alarm must be raised to remind passing people and nearby resident of blasting. In addition, some persons will be arranged to check the surrounding area. After confirming safety conditions are ready, blasting can be done.

12.5. Annex G: Basic First Aid

Safe practices at work, home, and play can prevent many injuries, illnesses, and deaths. However, once injury or sudden illness has occurred, effective first aid can make the difference between a rapid or prolonged recovery, a temporary or permanent disability, and even life or death. According to this manual first aid is defined as “emergency care provided for injury or sudden illness before professional emergency medical treatment becomes available.”

A first aid provider is someone trained in the delivery of initial emergency procedures, using limited equipment to perform a primary assessment and intervention until Emergency Medical Services (EMS) personnel arrive. The essential responsibilities of a first aid provider are:

- Recognizing a medical emergency,
- Making the decision to help,
- Identifying hazards and ensuring personal safety,
- Activating the EMS system, and
- Providing supportive, basic first aid care.

The goal of this training is to help you gain the knowledge, skills, and confidence necessary to manage a medical emergency until more advanced help is available. Employers are responsible to establish, maintain and visibly post all information regarding adequate first aid supplies, providers, equipment and facilities in the event of a workplace injury.

Essential First Aid Procedures

Recognizing an Emergency

A general impression is a quick sense of what has occurred, or is occurring, when you first observe an emergency scene. This impression can help guide you in your approach. If injured, how was the person injured? Injuries occur from physical force against the body. The manner in which that force creates an injury is called the Mechanism of Injury. Mechanisms that transfer significant force are best assumed to result in serious injury until proven otherwise.

Does the person appear to be unresponsive? A person who is not moving and appears to have collapsed can be in a life-threatening condition known as sudden cardiac arrest. Your immediate assessment and care can be his or her only chance for survival.

Deciding to Help

The most critical decision you will make is whether to get involved when a medical emergency has occurred. It is normal to feel hesitant because you are unsure of your ability to help. You might hesitate because you feel like you are alone in helping. You are only the first link in a progressive chain of emergency care. Your involvement lasts only until relieved by another first aid provider or responding EMS providers—in most cases, a very short period of time.

You might hesitate for fear of making things worse. Your basic first aid training provides you with sound knowledge and skills designed only to help – and not harm –those in need. You might also hesitate because you think you don't have a lot of medical knowledge. Extensive medical knowledge is not necessary. First aid skills are based on common sense and simple, effective procedures that can be easily learned and safely applied. Finally, you might hesitate because others have already stopped to help. It never hurts to see if additional assistance is needed. Other bystanders may not have any first aid training or may be hesitant to provide care.

Primary Assessment — Unresponsive Person

The primary assessment helps you assess for immediate life-threatening problems, activate the EMS system, and rapidly provide priority care. It is the same for all ages and is performed quickly. Before anything else, pause and assess the scene for hazards. If the situation is dangerous to you, do not approach. If the situation is not dangerous do the following:

A. Access Patient

- Pause and assess scene. *Scene is safe!*
- Tap or squeeze shoulder. Ask loudly, "Are you okay?" Use his name if you know it.For an infant, tap the foot. *No response!*
- Have someone alert EMS and get an AED. If you are alone with an unresponsive adult, immediately alert EMS yourself.
- When alone with an unresponsive child or infant, provide about two minutes of CPR before leaving to call for EMS and get an AED yourself.
- Look quickly at face and chest for normal breathing. Occasional gasps are NOT considered normal. *Normal breathing present!*
- Normal breathing is effortless, quiet, and regular. If normal breathing is found, place the person on his or her side in the recovery position. Weak, irregular gasping, snorting, or gurgling sounds can occur early in cardiac arrest. These actions provide no usable oxygen. This is not normal breathing. If someone is not breathing, or only gasping, perform CPR.

B. Prepare

- Extend arm nearest to you up alongside head.
- Bring far arm across chest and place back of hand against cheek.
- Grasp far leg just above knee and pull it up so foot is flat on ground.

C. Roll

- Grasp shoulder and hip and roll patient toward you. Roll in a single motion, keeping head, shoulders, and torso from twisting.
- Roll far enough for face to be angled forward.
- Position elbow and knee to help stabilize head and body.

D. Suspected Injury

- If person has been seriously injured, do not move unless fluids are collecting in airway, or you are alone and need to leave to get help.
- During roll, make sure head ends up resting on extended arm and head, neck, and torso are inline.

Unresponsive and Breathing — Recovery Position

Even if a person is breathing normally, a lack of responsiveness is still considered to be a life-threatening condition that requires immediate care. There are a variety of things that can result in unresponsiveness, including medical conditions such as stroke or seizures, or external factors, such as alcohol or drug overdose. Regardless of the cause, the greatest treatment concern is the ability of the person to maintain a clear and open airway. If an unresponsive person has been seriously injured, do not move the person unless fluids are collecting in the mouth and airway, or you are alone and need to leave to get help. Frequently assess the breathing of anyone placed in a recovery position. The condition can quickly become worse and require additional care.

Soft-Tissue Injuries

Blood vessels are present throughout the body. Bleeding occurs when tissues are damaged. Heavy bleeding is likely if a major blood vessel is damaged. Bleeding reduces the oxygen-carrying capacity of blood. Heavy or uncontrolled bleeding can quickly become life threatening. Arterial bleeding is bright red and will often spurt from a wound. It can be difficult to control due to the pressure created by the heart's contractions. If the blood is dark red and flowing steadily, it is likely coming from a damaged vein. Bleeding from a vein can be heavy. Regardless of the source, all heavy bleeding must be controlled as soon as possible. Clot-forming fibers naturally collect at a wound site to create a patch to stop bleeding. Severe bleeding can overwhelm this process and prevent clotting from occurring.

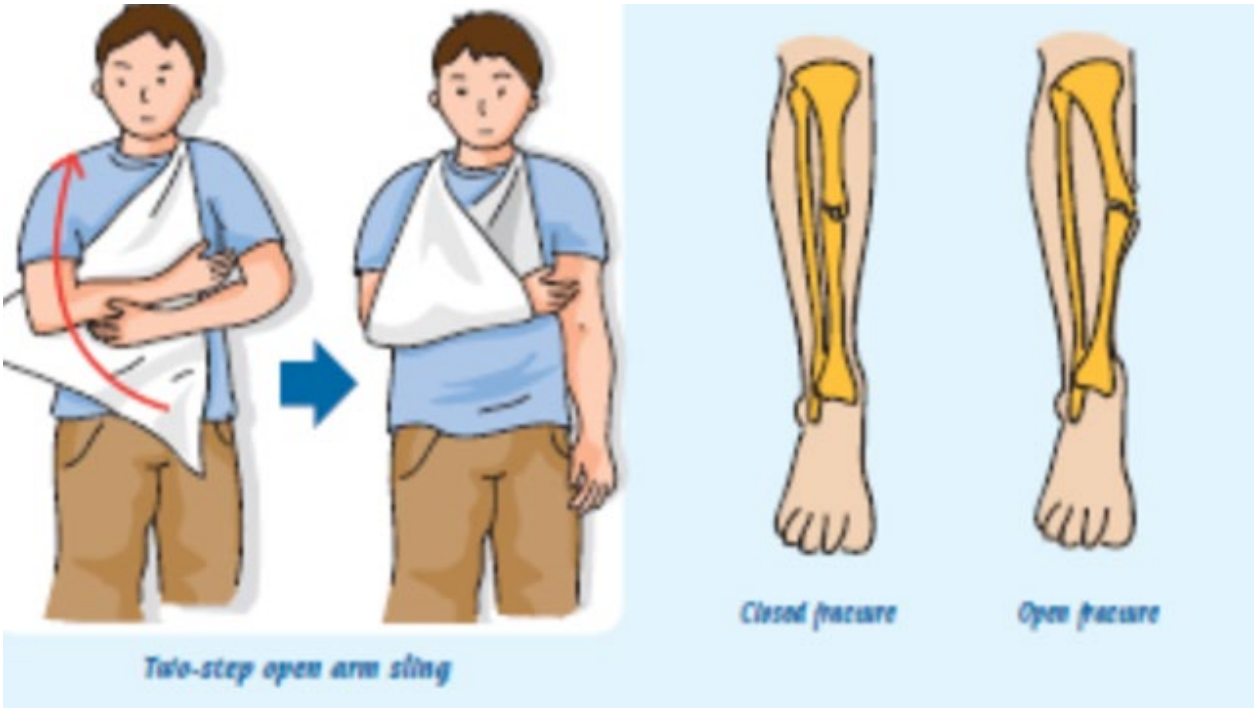
First Aid during Fall/Fracture Hazards

Fractures: A fracture is a crack in the bone, and the skin over the fracture may be intact or torn.

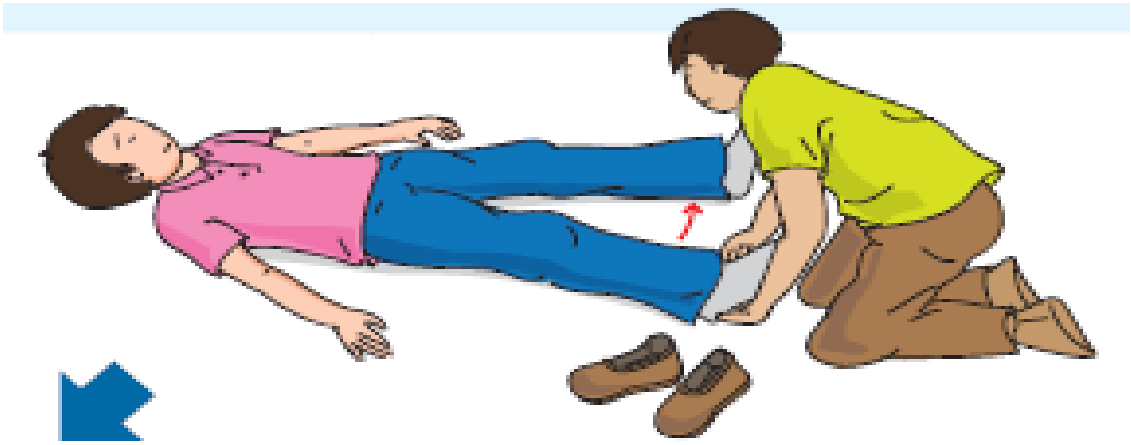
To Treat Fractures:

1. Calm the casualty down.
2. Treat bleeding wounds, if any. For open fractures, stop bleeding and cover exposed bone ends.
3. Rest, support and immobilize injured part in a position most comfortable for the casualty.

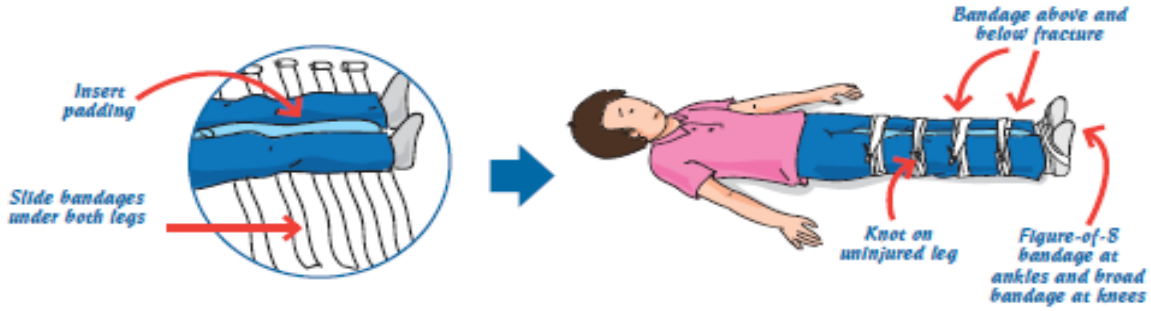
3a) If the casualty has a dislocated shoulder, fractured upper arm, forearm or wrist, apply the open arm sling as shown.



3b) if the casualty has a fracture in the leg, straighten the injured leg and bring the uninjured leg (which acts as a splint) to the injured leg.



Slide the bandages under both legs as shown, and insert padding between the knees and ankles.



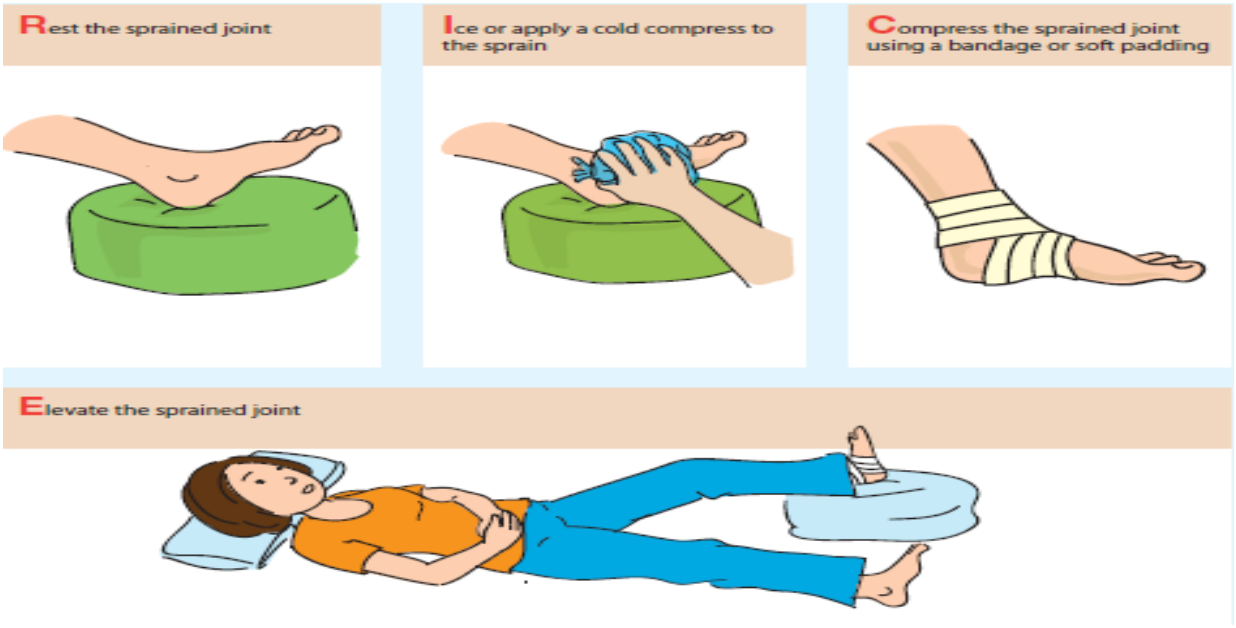
Bandage the legs together as shown and knot on the side of the uninjured leg.

4. Check the casualty's circulation every 10 minutes.
5. Seek medical attention and ambulance from the main camp.

Sprains

Sprains occur at joints and involve ligaments, the most common being sprained ankles. A strain, however, is an injury to the muscles and tendons especially when they are stretched.

Treat Sprains (and Strains) using R.I.C.E.



First Aid during Eye Hazards

- Rinse eye with saline solution or tap water if saline is not available.
- Do not try to remove object.
- Do not allow the victim to rub or apply pressure to the injured eye.
- Cover the eye lightly with a gauze pad or clean cloth
- Seek medical attention.

First Aid during Head Hazards

- Calm the casualty down. Treat bleeding wounds, if any.
- For open fractures, stop the bleeding and cover exposed bone ends.
- Rest, support and immobilize injured part in a position most comfortable for the casualty.
- Seek medical attention.

First Aid during Burn Injuries

Minor Burns:

- Expose the burn and cool burns with cold water and continue until pain lessens.
- After cooling, cover with a dry, sterile bandage or clean dressing.
- Protect from friction/pressure and don't pop blisters or apply any ointment or other substance.

Major Burns:

- Assess/Alert/Attend to any life threatening problems
- Call emergency of Activate EMS

- If caused by a liquid chemical, flush with large amounts of water right away.

Inhaled Poisonous Fume

- If victim is in an enclosed space, do not attempt a rescue without proper respiratory equipment. Get the patient to fresh air immediately. Loosen all tight clothing. Apply artificial respiration if breathing has stopped or is irregular. Call for emergency help.
- Prevent chilling (wrap patient in blanket but don't overheat). Keep patient as quiet as possible.
- If patient is convulsing, watch his or her breathing and protect the patient from falling and striking his or her head on the floor or wall. Keep the patient's chin up so air passage will remain free for breathing.

Bleeding Injuries

1. Put on protective gloves or place a barrier between you and the casualty's blood.
2. Check if there are any foreign objects (e.g. glass fragments) in the wound.
3. If there are no foreign objects in the wound: a. Place a sterile gauze pad over it. b. Apply firm direct pressure on the wound using your palm or fingers. c. Secure it with a bandage. d. Elevate the injured arm or leg above the heart level

If there are any foreign objects (e.g. glass fragments) in the wound, do not press on the object. Avoid applying direct pressure on the object by building up padding around it before bandaging.

Apply Direct Pressure

- Quickly expose and inspect wound.
- Using a clean, absorbent pad, apply direct pressure with flats of fingers directly on point of bleeding.
- If a pad is not available, apply direct pressure with just your gloved hand.

Apply Pressure Bandage

- Wrap a roller gauze or elastic bandage around limb and over injury to provide continuous pressure to wound.
- Include enough pressure to control bleeding.
- Avoid wrapping so tight that skin beyond bandage becomes cool to touch, bluish, or numb.

Make sure a finger can be slipped under bandage once applied.

If Bleeding Continues

- If blood soaks through the pad, apply another pad, leaving the initial pad in place.
- Apply more pressure with the palm of your hand.
- When direct pressure is not effective at controlling bleeding from a limb, apply a tourniquet only as a last resort.

Activate EMS immediately for any heavy bleeding. Bleeding exposes you, the provider, to potentially infectious body fluids. Always use protective barriers, such as disposable gloves, to protect both you and the injured person. Continuous firm and direct pressure applied to a wound is the best method for controlling external bleeding.

When barriers are not available, an injured person can provide self-care or a provider can use improvised barriers, such as a plastic bag.

First Aid during Burning from Fire Hazard

Minor Burns:

- Expose the burn and cool burns with cold water and continue until pain lessens.
- After cooling, cover with a dry, sterile bandage or clean dressing.
- Protect from friction/pressure and don't pop blisters or apply any ointment or other substance.

Major Burns:

- Assess/Alert/Attend to any life threatening problems
- Call emergency of Activate EMS
- If caused by a liquid chemical, flush with large amounts of water right away.

General Instructions

It is important to obtain additional information:

- Has the patient been working with a chemical?
- Did contamination occur?
- Precisely which product was used?
- How much was ingested?
- How long ago?

Managing Shocks

Shock develops when not enough blood flows to the vital organs of the body. Victims with shock may stop responding. Common causes of shock are:

- Severe bleeding
- Nervous system injuries
- Heart attack or other heart problem
- Severe burns
- Severe allergic reaction
- Dehydration

Signs and Symptoms:

- Dizziness, faint or weak feeling
- Rapid, shallow breathing
- Anxiety, restlessness, agitation, or confusion
- Cool and clammy to the touch
- Pale or grayish skin
- Thirst
- Nausea or vomiting

First Aid:

- Help person lie on their back.
- Keep victim lying flat with feet slightly elevated if possible.
- Cover person to keep him/her warm, but prevent overheating.
- Ensure an open airway for victim and adequate breathing.
- Monitor victim and administer CPR if necessary.

Bites and Stings First Aid

General Signs and Symptoms associated with bites and stings:

- Redness
- Swelling
- Pain
- Itching
- Nausea
- Problems breathing

General First Aid for bites and stings:

- Remove jewelry and constrictive clothing
- Wash the area with soap and clean water
- Cover the area with an adhesive bandage or gauze wrap
- Apply ice if needed to reduce pain and swelling

Nosebleeds and First Aid

Most nosebleeds are not serious and can be handled by a first aid responder. Most will stop on their own or with simple first aid actions. In some cases nosebleeds can indicate a more serious condition which may require ongoing medical attention.

If the nose bleed is related to an injury, the victim should be assisted in finding medical assistance urgently.

Some people may be taking medications that make them more prone to bleeding. These people should also seek care urgently.

Nosebleeds and First Aid

Signs and symptoms to monitor:

- Bleeding in the back of the throat, causing the victim to vomit blood
- Bleeding from one or both nostrils

First Aid Interventions:

- **Sit upright and lean forward.** By remaining upright, you reduce blood pressure in the veins of your nose. This discourages further bleeding. Sitting forward will help you avoid swallowing blood, which can irritate your stomach. Have the victim spit out blood that collects in the back of the throat or mouth.
- **Pinch the nose firmly.** Use your thumb and index finger to pinch your nostrils shut. Breathe through your mouth. Continue to pinch for 5 to 10 minutes. Pinching sends pressure to the bleeding point on the nasal septum and often stops the flow of blood.
- **To prevent re-bleeding,** don't pick or blow your nose and don't bend down for several hours after the bleeding episode. During this time remember to keep your head higher than the level of your heart.

Diabetes and Diabetic Emergencies

Diabetes is a chronic condition that causes an imbalance of blood sugar and insulin. Emergencies can occur if someone's blood sugar becomes very high or very low. Several factors can contribute to hypoglycemia in people with diabetes, including taking too much insulin or other diabetes medications, skipping a meal, or exercising more or at a higher intensity than usual.

Hypoglycemia (Low Blood Sugar)

Signs and Symptoms:

- Shakiness
- Dizziness
- Sweating
- Hunger
- Irritability or moodiness
- Anxiety or nervousness
- Headache, vision problems
- Drowsiness
- Seizures

First Aid Interventions:

- Five to six pieces of hard candy
- Four ounces of fruit juice or regular — not diet — soda
- One tablespoon of sugar, jelly or honey
- Three glucose tablets (available without a prescription at most pharmacies)

**Use the above interventions only if victim is alert – if not alert or appears confused, call emergency.

Heat Exhaustion and Heat Stroke

Causes of heat exhaustion include exposure to high temperatures, particularly when combined with high humidity, and strenuous physical activity. Without prompt treatment, heat exhaustion can lead to heatstroke, a life-threatening condition. Fortunately, heat exhaustion is preventable.

Heatstroke occurs if your body temperature continues to rise. At this point, emergency treatment is needed. In a period of hours, untreated heatstroke can cause damage to your brain, heart, kidneys and muscles. These injuries get worse the longer treatment is delayed, increasing your risk of very serious complications.

Heat Exhaustion First Aid

Signs and Symptoms:

- Cool, moist skin with goose bumps when in the heat
- Heavy sweating
- Faintness
- Dizziness
- Fatigue
- Weak, rapid pulse
- Low blood pressure upon standing
- Muscle cramps
- Nausea and Headache

First Aid Interventions:

- Stop all activity and rest.
- Move to a cooler place.
- Drink cool water or sports drinks.
- Contact your doctor if your signs or symptoms worsen or if they don't improve within one hour. Seek immediate medical attention if your body temperature reaches 104°F (40°C) or higher.

First Aid for Poisoning

It is essential that poisoning incidents be recognized immediately, because prompt treatment may mean the difference between life and death.

An effort should be made to obtain evidence from containers or spray equipment; the labels on containers should be read and retained. If poisoning is suspected, first aid must be given

immediately and medical advice and help must be sought at the earliest opportunity. If possible, the patient should be taken to the nearest medical facility

Signs and symptoms of poisoning

Poisonings are usually acute and result from extensive skin contact or ingestion. Signs and symptoms vary with the type of chemical and can sometimes be confused with those of other illnesses.

Indications of poisoning

General: extreme weakness and fatigue.

Skin: irritation, burning sensation, excessive sweating, staining.

Eyes: itching, burning sensation, watering, difficult or blurred vision, narrowed or widened pupils.

Digestive system: burning sensation in mouth and throat, excessive salivation, nausea, vomiting, abdominal pain.

Nervous system: headaches, dizziness, confusion, restlessness, muscle twitching, staggering gait, slurred speech, fits, unconsciousness.

Respiratory system: Cough chest pain and tightness, difficulty with breathing, wheezing.

General Instructions

It is important to obtain additional information:

- Has the patient been working with a chemical?
- Did contamination occur?
- Precisely which product was used?
- How much was ingested?
- How long ago?

5. Stop the exposure *immediately* by separating the victim and the source.
6. If the victim is unconscious, check to see if the victim is breathing. If not, give artificial respiration. If highly toxic material is present in the victim's mouth or respiratory path, use chest compression, not mouth-to-mouth.
7. Decontaminate the victim immediately by washing off any skin residues of chemical, and remove any contaminated clothing. Speed is absolutely essential in this step.
8. Obtain professional help.

In all cases due consideration must be given to the protection of yourself and other personnel in the vicinity of the incident. This is critical in the case of a large chemical spill.

Speed is essential in performing **first aid** for poisoning. **If you are alone with the victim**, you must give first attention to the victim, especially in re-starting breathing, separating the victim from the chemical source, and decontaminating the victim's skin. **If another person is with you and the victim**, one of you should perform first aid; the other should seek professional help as described above.

Recognizing the signs and symptoms of poisoning quickly and following appropriate procedures may help save a person's life, but first aid should never be considered a substitute for professional medical treatment. First aid is only to help the patient get well enough so proper medical treatment may be provided.

After the victim has been fully cared for and professional help has been sought, these additional steps should be taken. As with the first aid procedures, due consideration must be given to your safety and those around you.

4. Bring the **label** to the physician or poison control center. You should also save the container and any remaining should an official request to see it.
5. Eliminate the source of the contamination to prevent or reduce the risk that others may be exposed to the chemical. In the case of a significant spill, this will have to be done by professionals trained to respond to these kinds of emergencies.
6. Decontaminate any clothing or equipment as needed. Never put on clothing previously contaminated with chemical, and always wash contaminated clothing by itself with detergent and water.

Specific Instructions

The label should be consulted for specific first aid instructions. Below are some of the more common instructions one might expect to see on the label.

Poison in Eyes

Hold eyelids open; wash eyes immediately with a gentle stream of clean running water. Use large amounts of water. Delay of only a few seconds can greatly increase the extent of injury. Continue washing for 15 minutes or more. Do not use chemicals or drugs in the wash water. They may increase the extent of injury.

Inhaled Poisons

If victim is in an enclosed space, do not attempt a rescue without proper respiratory equipment. Get the patient to fresh air immediately. Loosen all tight clothing. Apply artificial respiration if breathing has stopped or is irregular. Call for emergency help.

Prevent chilling (wrap patient in blanket but don't overheat). Keep patient as quiet as possible.

If patient is convulsing, watch his or her breathing and protect the patient from falling and striking his or her head on the floor or wall. Keep the patient's chin up so air passage will remain free for breathing.

Swallowed Poisons

Call for emergency help immediately. If vomiting is to be induced, place the blunt end of a spoon (not the handle), or your finger, at the back of the patient's throat; or use an emetic of two tablespoons of salt in a glass of warm water.

When retching and vomiting begin, place patient face down with head lowered, thus preventing vomits from entering the lungs and causing further damage. Do not let patient lie on back.

Never induce vomiting unless directed by the label or a medical professional to do so. Do not induce vomiting if:

- Patient is unconscious or experiencing convulsions.
- Patient has swallowed petroleum **products** (kerosene, gasoline, lighter fluid, etc.).
- Patient has swallowed a **corrosive poison** (strong acid or alkaline products).

Chemical Burns of Skin

Remove contaminated clothing. Wash with large quantities of running water. Immediately cover with loosely applied clean cloth (any kind will do). Avoid use of ointments, greases, powders, and other drugs. Treat shock by keeping patient flat, warm, and reassured until the arrival of a doctor.

Vomiting

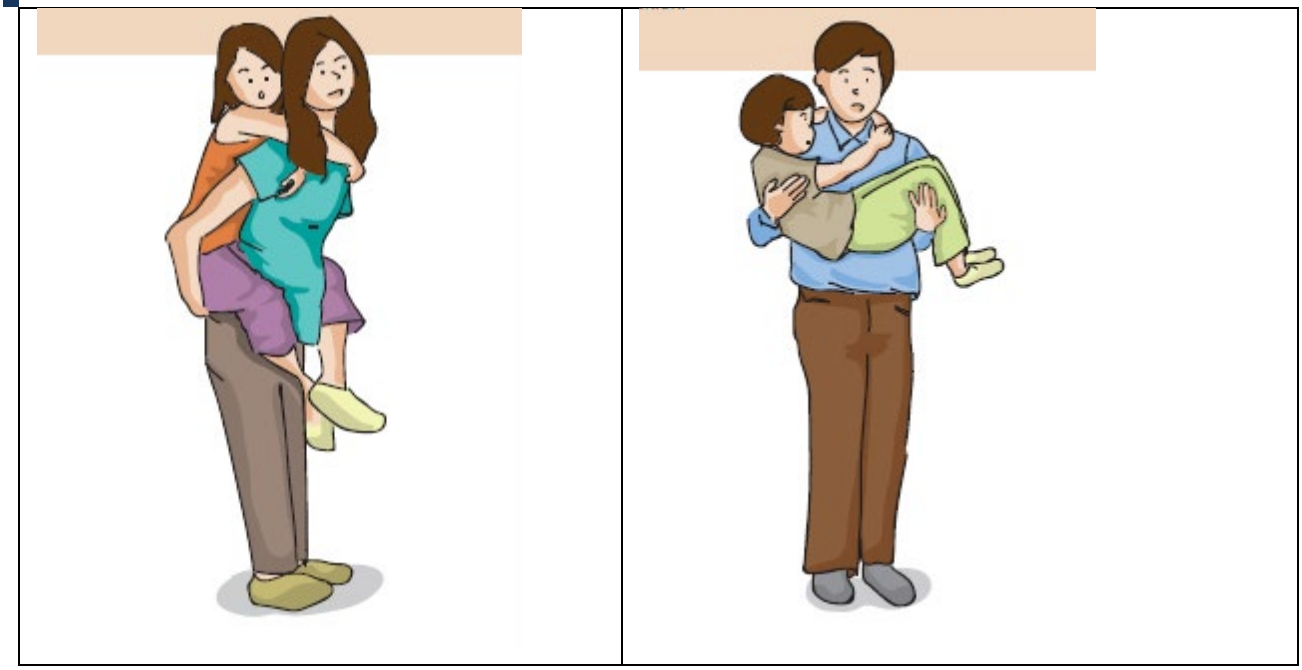
Do not induce vomiting unless the patient has swallowed chemical that is known to be highly toxic, and medical help is not expected soon. Never induce vomiting if the patient has swallowed oil spray or products diluted in diesel or kerosene, because of the possibility of inhalation of the vomited material, which would be more dangerous than the intestinal poisoning. The product label should indicate whether the chemical is highly toxic (skull-and-crossbones signs). Vomiting should be induced only if the patient is conscious. If necessary, sit or stand the person up and tickle the back of the throat with a finger. Whether vomiting occurs or not, give the patient a drink comprising three table spoonful of activated charcoal in half a glass of water. Repeat until medical help arrives.

Casualty Evacuation

When stretchers are not available or cannot be improvised, you may need to transport casualties by methods such as those listed below. You are recommended to undergo our Community Emergency Preparedness Program for a better understanding on these casualty

evacuation methods. You may risk injuring yourself and your practice partner if you attempt the following on your own.

Human Crutch Used when the casualty is conscious and able to walk with some assistance. Hold him firmly around the waist and use your shoulders to support his arm while allowing his body weight to rest on you.	**Fireman's Lift** Used for lightweight casualties. Stoop low, bend the casualty over your shoulders and lift him up. Secure the casualty's leg with your arm as shown for more stability.
	
Piggyback Used when the casualty is lightweight, conscious and able to hold on to you.	**Cradle** Used when the casualty is a child or a lightweight adult. Slip your arms beneath her shoulder blades and knees to ensure that casualty will be in the most comfortable position.



12.6. Annex G: Tips for Fire Extinguisher Use

- Test that the extinguisher works before you approach the fire;
- Protect yourself at all times;
- Take care. Speed is essential but it is more important to be cautious;
- Keep your back to the exit at all times and stand 2 to 2.4 m away from the fire;
- Follow the 4-step **P-A-S-S** procedure:
    1. **P**ull the pin (release the lock latch or press the punch lever).
    2. **A**im the nozzle at the base of the fire.
    3. **S**queeze or press the trigger.
    4. **S**weep the extinguisher from side to side.

If the fire doesn't go out or the extinguisher appears to be getting empty, leave the place at once Back out with the lever squeezed and the nozzle pointed at your feet. This will help protect you until you are out of the area.

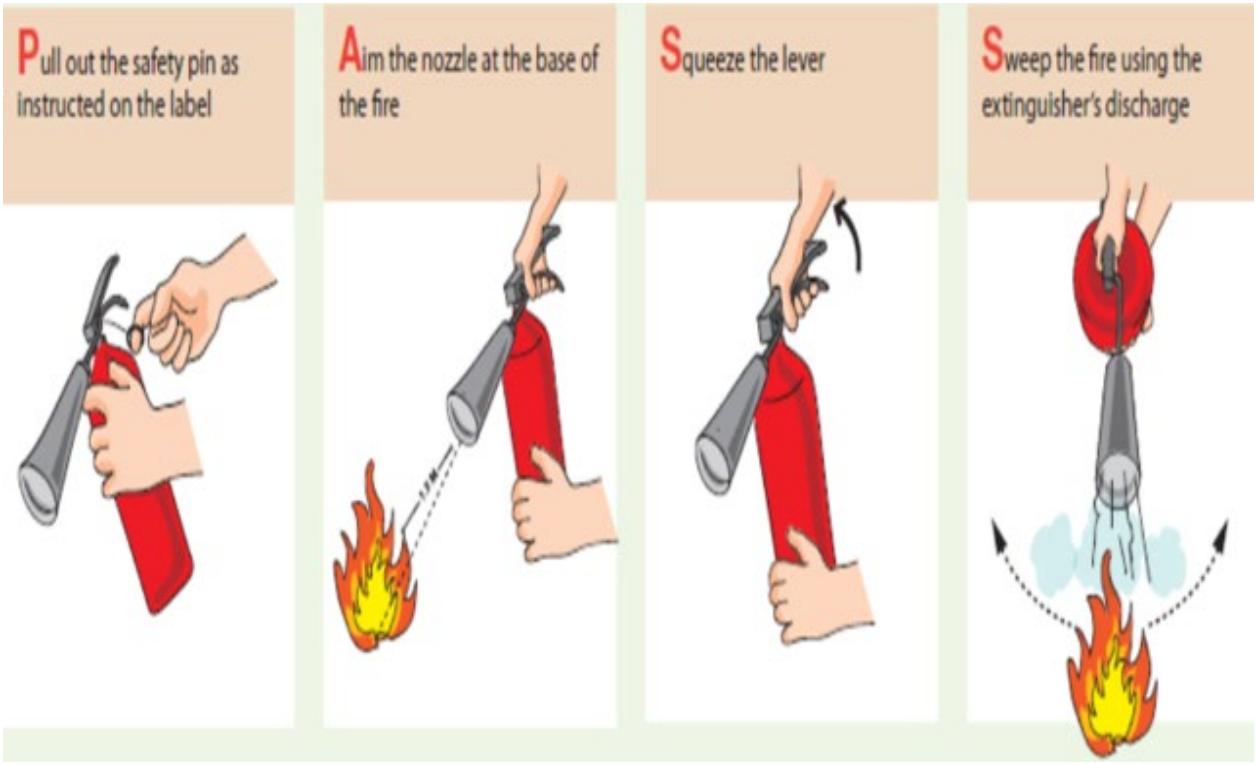


Figure 6: Firefighting with PASS procedure

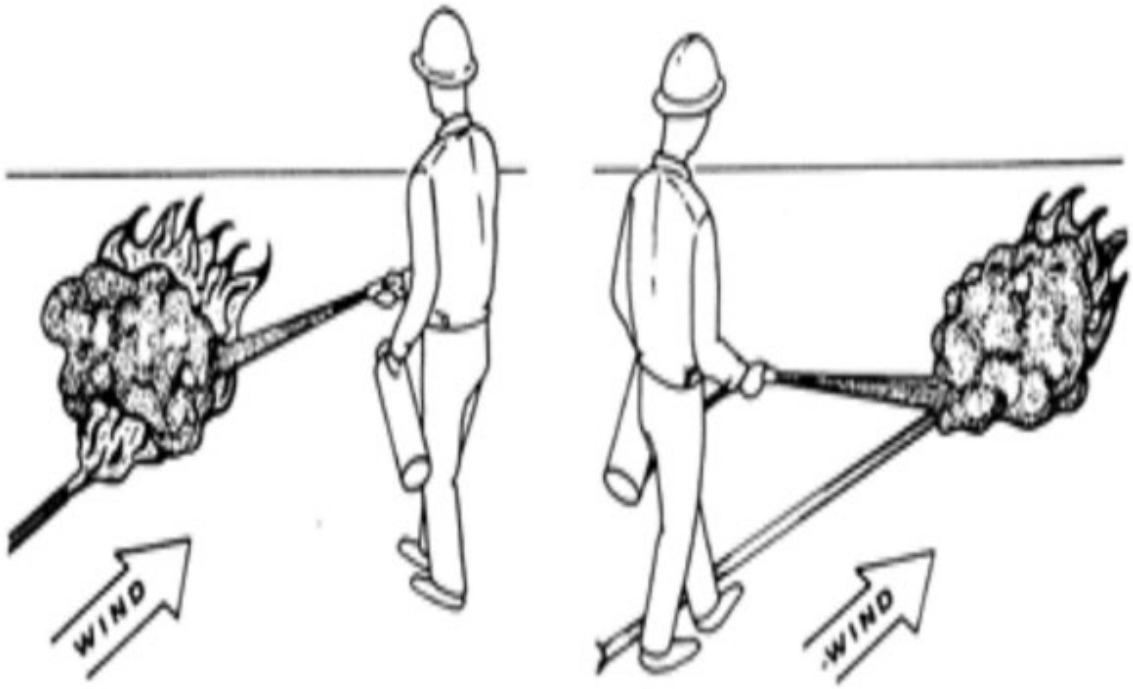


Figure 7: (Left) Wrong way (Right) Right way to apply a fire extinguisher to fight fire

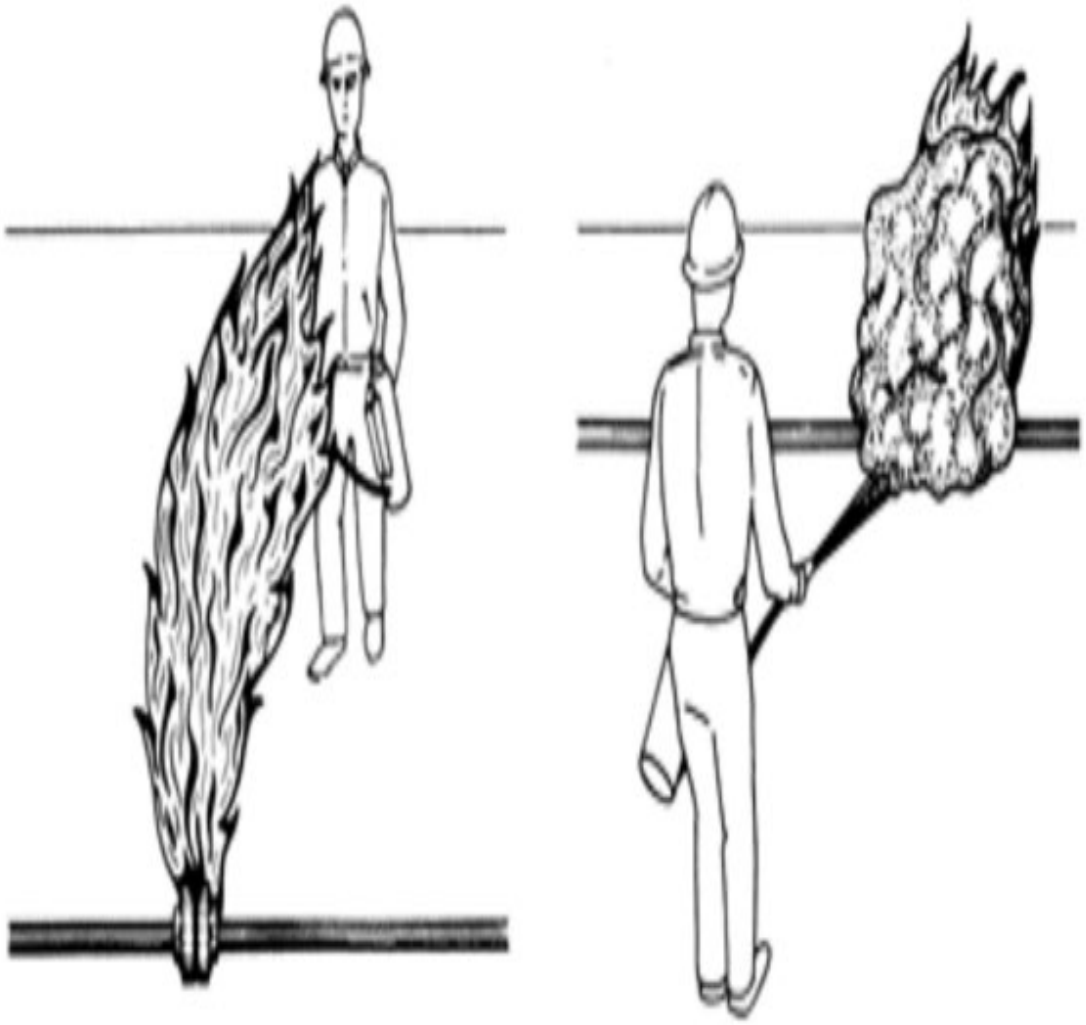


Figure 8: Always approach the fire from upwind. Right Way and Wrong Way to Handle Small LP-Gas Fires

Accident Investigation Report **Form 001**

NOTE: A separate form should be completed for each person injured.

This investigation is aimed at identifying causes, not attributing blame.

All investigating personnel should be trained in investigation techniques.

Reference No. _____ Injury ☐ Damage ☐ Near Miss ☐

1. Site: _____

2. Personal Details

Surname First Name

Other Initials

Date of Birth ☐☐☐☐☐☐☐☐ Gender ☐

Day Month Year M/F Preferred Language Contact No.

3. Occupation/Job Title and Details

When begun this ☐☐☐☐☐☐☐☐

Description of occupation or job title Occupation/job Day Month Year

Main tasks performed

Training provided:
☐ Induction.
☐ Trade/task specific.
☐ Both of the above
☐ None of the above

4. Time and Date of Damage / Accident / Near Miss Received ☐☐☐☐☐☐☐☐☐☐☐☐ **Time and Date Report** ☐☐☐☐☐☐☐☐☐☐

Am/pm

Day Month Year am/pm Day Month Year

5. Accident Results

☐ Fatal ☐ Hospital inpatient ☐ Doctor only

☐ First aid only ☐ Property damage ☐ Nil (injury/damage)

Nature of injury, disease or damage:

_____

Location of injury, disease or damage:

_____

_____

_____

_____

6. Outcome (Questions to be answered, as information becomes available)

Rehabilitation

☐ Not Required

☐ Required

Date of Resumption

Short-term alternate duties ☐☐☐☐ ☐☐☐☐

Long -term alternate duties ☐☐ ☐☐ ☐☐☐☐

Normal duties ☐☐ ☐☐ ☐☐☐☐

Day Month Year

☐☐☐☐ Total number of days lost.

☐ OSH Department of Labor report completed and sent

☐ Organization investigation undertaken

7. Description of Incident (include any particular chemical, product, process equipment involved)

What was the worker doing at the time? _____

_____

Name/s of witnesses	Signature of worker	Date:

Mechanism of injury

How exactly was the injury, disease or damage sustained?

What happened? (Undesired event)

Reconstruct the sequence of events that led to the undesired event.

1.	4.
2.	5.
3.	6.

List contributing factors

Investigating

Person:

Name Position Signature

Date investigation conducted:

Day Month Year

**** Attach detailed investigation report for all Serious Harm Injuries

9. Corrective Action Undertaken: _____

_____

_____

Estimated Cost of Incident:	Estimated Cost of Correction:

10. Project Manager's Comments: (manager, employer or Contractor to sign and date)

_____

_____

Signature:	Date:

11. Safety Engineers Comments: (sign and date)

_____

_____

Signature:	Date:

JOB SAFETY ANALYSIS — Form 002

Organization Name: _____ Dept/ Construction Site: _____

Work Activity/Task: _____ Principal Employees: _____

Date: _____

Prepared by: _____

NOTE: Sign off to be provided at Safety and Training

Signature:

Item	Job Step (Break the job down into steps)	Potential Hazard (What can harm you)	Controls (What are you going to do to make the job as safe as possible)	Responsible Person

Reviewed by: _____ _____ _____

Principal Employees/volunteers Representative | Position | Signature | Date

HAZARD IDENTIFICATION RECORD (LOG)

Form 003

Log Sheet Number: _____Work Place: _____ Completed by: _____

Hazard Report No. and Date	Hazard Location/ Description (what are the hazards and who might be harmed?)	Risk Assessment Hazard Class and Likelihood (A-B-C)	Control Measures and Corrective Action required	Person Responsible for Implementing Control Measures	Completion Date	
					Projected	Actual

Page No._____

Form 004

Training Attendance Register				
Training Name: _____ Training Location: _____ Date: _____				
Name of Participant(s)	Job Position	Training Type	Hours Attended	Signature
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Training Provider		Names of Trainers		Length of Course (Hours)
		1		
		2		

PERSONAL PROTECTIVE EQUIPMENT ISSUE RECORD			**Form 005**
Dept/Work Site: _____	**Occupation: _____**	**Date: _____**	
PPE Items	**PPE condition**	**Name of Recipient**	**Signature of Recipient** I have received the listed PPE with appropriate instruction/ training in its correct use.

VEHICLE INSPECTION REPORT (On arrival)	**Form 006**
Location: _____	**Date: _____**
Owner: _____	**Registration No: _____**
Make: _____	**Model: _____**

The following items are *minimum* requirements:

Current Registration?	Yes	No
Current WOF?	Yes	No
Certificate of Fitness (rentals)	Yes	No
Tyres inflated evenly (visual)?	Yes	No
No visible damage?	Yes	No
Spare tyre within (inflated)	Yes	No

	Action to be Undertaken/ Comments Tick if Correct
No current Registration	Check with supplier – do not use unless issued
No current WOF	a/a
No Certificate of Fitness	a/a
Flat tyre	Check before use
Visible damage	Report to supplier - discretionary use if not critical of effecting WOF
No spare tyre/flat	Report to supplier or re-inflate

Annex H: Weekly Site Safety Audit Checklist

No	ITEMS TO INSPECT	Y/N/NA	COMMENTS
1	**Plant and Equipment Asphalt and Crusher Plants**		
1.1	Plant in sound condition?		
1.2	Workplace is clean and orderly		
1.3	Daily pre-start checks completed?		
1.4	Safety items/faults recorded in pre-start checklist?		
1.5	Lights, signals, beepers working?		
1.6	Fire extinguishers fitted/charged?		
1.7	Seat belts installed/worn?		
1.8	Speed limits posted/observed?		
1.9	Driver/operator ticketed/licensed?		
1.10	Warning signs/stickers in place?		
1.11	PPE worn for type of plant?		
1.12	Worker and Other separation acceptable?		
1.13	High visibility clothing worn?		
1.14	Spotters being used during plant operations?		
1.15	Safe operations being observed by all?		
	Heavy Duty Equipment's /Machineries		
1.16	Machineries in sound condition?		
1.17	Workplace is clean and orderly		
1.18	Daily pre-start checks completed?		
1.19	Safety items/faults recorded in pre-start checklist?		
1.20	Lights, signals, beepers working?		
1.21	Fire extinguishers fitted/charged?		
1.22	Seat belts installed/worn?		
1.23	Speed limits posted/observed?		
1.24	Driver/operator ticketed/licensed?		
1.25	Warning signs/stickers in place?		
1.26	PPE worn for type of plant?		
1.27	Worker and Other separation acceptable?		

1.28	High visibility clothing worn?		
1.29	Safe operations being observed by all?		
2	**Motor Vehicles**		
2.1	Daily pre-start checks completed?		
2.2	4wd roll-over bar fitted?		
2.3	Brakes, warning lights operating?		
2.4	Glass in clean condition?		
2.5	Fire extinguishers/fitted/charged?		
2.6	Seat belts installed/worn?		
2.7	Reverse beeper operating?		
2.8	Qualified operators for on-site plant and equipment appointed?		
2.9	Operators are provided with refresher training?		
2.10	First aid kitted fitted/supplied and stocked?		
3	**Flammable Gases and Liquids**		
3.1	Containers/drums clearly marked with contents?		
3.2	Safety Data Sheets is available /current?		
3.3	Correct separation of cylinders?		
3.4	Storage area well ventilated?		
3.5	Cylinders stored out of sun/heat?		
3.6	Gas cylinders vertical, secured/chained?		
3.7	Fire extinguishers available /charged?		
3.8	No smoking and hazard signs in place and visible?		
3.9	Cylinder caps in available and use?		
3.10	Bunds/drip trays available and in place?		
3.11	All inspection/color coded tags used and legible?		
3.12	Empty/Full cylinders segregated, stored and secured?		
4	**Welding and Cutting**		
4.1	All hoses fitted with 2 Flash Back arrestors (Cylinder/Torch end)?		
4.2	Electrical leads protected?		
4.3	Screen in place when welding is being carried out?		
4.4	Gas bottles on trolley and restrained?		
4.5	Fire extinguisher in place at work point?		

4.6	All equipment inspected/tags current?		
4.7	Cylinder caps in use and secured in place?		
4.8	Specific PPE available and being used?		
4.9	Signage in positioned and placed to notify workers and others?		
4.10	Flammable material separated as required by the permit?		
5	**Materials Handling, Storage**		
5.1	Material stored, secured and/or stacked safely?		
5.2	Mechanical aids for lifting available and used?		
5.3	Materials weather protected (Sun, Rain, and Storm etc.)?		
5.4	Signage is in place to notify workers and others?		
5.5	No temporary or permanent water holding areas to favor mosquito breeding?		
5.6	Spotters available to manage traffic and worker movement and control?		
5.7	Adequate space for vehicles to manoeuver around/through compound?		
6	**Work at Height**		
6.1	Fall protection (barricades, railings) in place to prevent falls?		
6.2	Access to working at height is adequate and safe?		
6.3	Exclusion zones are in place and effective for the area?		
6.4	Ladders used are inspected/tagged?		
6.5	Are ladders used for access only?		
6.6	Are harness available and required/worn and used correctly?		
6.7	Are ladders stored/maintained/protected correctly?		
7	**Scaffold**		
7.1	Is scaffolding erected where needed for the work activities?		
7.2	Are access to platforms in place, secure and safe?		
7.3	Safety harness available, worn and used during erection of scaffolding?		
7.4	Warning signage in place, visible to all workers and others?		
7.5	Is the Scaffolding adequate for the job/activities being carried out?		
7.6	The scaffolding complies with design drawings (Temporary Works)?		

8	**Excavations and Trenching**		
8.1	Daily checks completed by competent person and recorded?		
8.2	Checks for underground services performed prior to excavation?		
8.3	Underground services located prior to excavation (hand digging, HydroVac)?		
8.4	Are sufficient and adequate barricaded in place to prevent falls into excavations?		
8.5	Is the excavation >1.5 meters deep shored, battered benched?		
8.6	Is the excavated materialaway from the cut face (1 meter)?		
8.7	Is the excavation/trench width adequate for working activities?		
8.8	Is the excavation/trench Benching/Battering/Shoring adequate?		
9	**Formwork/Concrete Work**		
9.1	Are design drawings available for the temporary works and sign-off obtained?		
9.2	Is the temporary works erected in accordance with design drawings?		
9.3	Is the temporary works inspected prior to and during pour?		
9.4	Is the Formwork in good order and safe condition?		
9.5	Penetrations covered and cover secured/fixed with words – 'hole below'?		
9.6	All Vertical bars are covered and protected with anti-implement devices		
9.7	All waste concrete controlled and disposed of correctly?		
10	**Traffic Management (Pedestrian and Vehicle)**		
10.1	Traffic Management Plan(s) approved by the Engineer?		
10.2	Traffic control & signs checked every day for compliance with the plan?		
10.3	Road traffic rules/signs being obeyed by workers and others?		
10.4	Barriers and signage adequate for the work activities?		
10.5	Are proactive measures in place to prevent pedestrians and vehicles entering active working areas?		
10.6	Parking rules are obeyed by workers and others?		
10.7	Speed limits obeyed by workers and others?		

10.8	Dust suppression systems being operated and adequate for the whole operation?		
10.9	Driving habits being observed comply with on-site requirements?		
10.10	Haul roads sign posted, marked, maintained and have adequate edge bund for usage?		
10.11	Traffic awareness workshops held – Schools, churches, community meetings etc.?		
10.12	TMP distributed to all workers, drivers, operators working on-site?		
10.13	Are quarter safety awareness and enhancement meetings held and attended by everyone?		
10.14	Maximum traffic diversions for work activities – 5 Km rural – 1 Km urban?		
10.15	Minimum lane width for traffic movement – single 3.5m – two-way 7.5m		
10.16	Roads maintained in a safe and trafficable condition at all times?		
10.17	Has the contractor prepared a response plan for deteriorating road conditions/environment?		
11	**Housekeeping**		
11.1	Specific waste bins available and in segregated way place/used emptied/lids?		
11.2	All work areas are tidy and with safe access to all locations?		
11.3	On-site sewage/septic tanks are controlled and not allowed to overflowing?		
11.4	Walkways and passages demarcated/tidy/safe and maintained?		
11.5	Signage legible, clean, visible and appropriate?		
11.6	Waste containers for cigarette butts provided and used?		
11.7	Lighting adequate provided within facilities and to work locations?		
11.8	Security site fencing installed around hazards/compound?		
11.9	Appropriate signs to inform visitors about work conditions		
12	**Fire Prevention**		
12.1	Adequate number of Fire extinguishers available and in place?		
12.2	All extinguishers have clear and ready access to uplift?		

12.3	All extinguishers inspection tags up to date?		
12.4	Appropriate signage in place to inform those in the area?		
12.5	Correct Firefighting procedure displayed?		
12.6	Emergency contact Numbers' displayed (fire, ambulance, police)?		
12.7	No smoking enforcement/signs displayed?		
12.8	Extinguishers suitable type/size for environment?		
12.9	Company vehicles fitted with fire extinguishers?		
12.10	Emergency response plan displayed and understood by all in the area?		
13	**Noise**		
13.1	Has a noise assessment been conducted to identify if any excessive levels exist?		
13.2	Is the correct PPE available, been issued, worn and maintained by the workers and others?		
13.3	Is the correct signage erected to inform workers and others as required?		
13.4	Is a medical assessment conducted with each worker exposed to high noise levels?		
14	**Explosives and Power tools**		
14.1	Has a Blasting Management Plan been prepared and approved by the Engineer?		
14.2	Site location/plan approved by the Engineer?		
14.3	Storage facility designed and approved for the explosives?		
14.4	Transportation of explosives is in compliance with legislative controls and procedures?		
14.5	Controls during blasting operations are in-place and effective?		
14.6	Blasting operations under the control of a qualified and certified Blaster?		
14.7	All precautions are in-place to ensure no harm to individuals during blasting operations?		
14.8	Police control traffic movement within 400 m of the blasting operations?		

14.9	All signs are in place to warn others of the blasting operations?		
14.10	Are Operators trained and hold the correct certification?		
14.11	Are warning signs visible and in place to warn workers and others?		
14.12	Is the correct PPE available, been issued, worn and maintained by the workers using the tool and other in close proximity?		
14.13	Is the tool placed in a secure container?		
14.14	Weather condition have been assessed (Lighting Storms etc.)?		
15	**Offices and Living Areas**		
15. 1	Workplace is clean and orderly.		
15.2	Floor surfaces are kept dry and free of slip hazards.		
15.3	Illumination is adequate in all common areas and workstations.		
15.4	Emergency evacuation plans are posted at eye level.		
15.5	Electrical cords & plugs are in good condition with proper grounding.		
15.6	Office equipment are clean and working properly		
15.7	Adequate ventilation is provided		
15.8	Emergency exit signs are properly displayed.		
15.9	Fire extinguishers are visible and accessible.		
15.10	Fire extinguishers are serviced annually.		
15.11	Are entrances & exits to & from work areas free from obstructions?		
16	**Workshop**		
16.1	Are there clear indications when equipment is switched on?		
16.2	Are there procedures to report faulty equipment?		
16.3	Are equipment guards in place?		
16.4	All workers are wearing PPE as per their JSA		
16.5	All workers in designated areas wear safety footwear		
16.6	All engine oils are properly handled		
16.7	Are there any potentially hazardous areas that warnings are appropriate?		
16.8	Is the size of the sign appropriate to the environment, lighting and viewing distance?		
17	**Power Tools**		
17.1	Tools, cords in good condition?		

17.2	Correct tools used for the job?		
17.3	Guards on tools in place?		
17.4	Tools/leads/cords tagged/correct color and recorded?		
17.5	Terminal boxes with covers?		
17.6	Switch boards locked, access, phone number for access?		
17.7	Electrical leads protected from damage?		
17.8	PPE available and worn?		
18	**Compressed Air**		
18.1	Compressor fitted with silenced unit?		
18.2	Fire Extinguisher available?		
18.3	All valves operational and correct?		
18.4	Inspection – Tags on machine/tools with details recorded?		
18.5	Whip checks/chains on hoses fitted?		
18.6	Drip tray provided under diesel engine fill point?		
18.7	Specific PPE for Workers using air tools (AVG/Hearing Protection/etc.)?		
18.8	Manifolds tested and identified effective?		
18.9	Exhaust fumes from compressor away from working area/location?		
19	**Cranage and Rigging**		
19.1	Operator, dog man, rigger, Trained/certified?		
19.2	Log book/maintenance records?		
19.3	Daily pre-start checks completed?		
19.4	Any oil or diesel leaks?		
19.5	Load charts/certificates available?		
19.6	All Rigging gear tagged/color code?		
19.7	Rigging gear/slings good condition?		
19.8	Rigging gear/slings stored correctly?		
19.9	Fire extinguishers fitted/charged?		
19.10	2 tag lines available?		
19.11	Hooks, clasps, shackles good working order and condition?		
19.12	Outriggers used, stabilizedpads and correct set-up?		
19.13	PPE available and worn?		

ቁጥር : ሀ/ኮ/4743/11

ቀን : 19/11/2011

የብቃት ማረጋገጫ የምስክር ወረቀት

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Environment, Forest & Climate Change Commission

Ref No : ሀ/ኮ/4743/11

Date : 27/7/2019

CERTIFICATE OF COMPETENCE

COMMISSION OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, BY VIRTUE OF THE POWER VESTED TO IT BY ENVIRONMENTAL COMPETENCE ISSUING DIRECTIVE NO **03/2017,** HAS ISSUED THIS CERTIFICATE OF COMPETENCE TO **NET CONSULT PLC** AS CONSULTANCY IN **ENVIRONMENTAL IMPACT ASSESSMENT AS ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT CONSULTING FIRM IN** CATEGORY OF **LEVEL 1.** LIST OF EXPERTS ARE ANNEXED WITH THIS CERTIFICATE.

WITH REGARDS

Shiferaw Nageeh
Environmental & Social Impact Assessment & Environmental Licensing Director General

Environment, Forest & Climate Change Commission

የብቃት ማረጋገጫ ምስክር ወረቀት

CERTIFICATE OF COMPETENCE

ዕድሣት (Renewal)

ቀን ፡ 09/05/2014 ዓ.ም
Date: 17/01/2022 G.C

ያዘጋጀው ስምና ፊርማ
Name & Signature

አየለ ምንዳዬ
Ayele Mindaye

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Checked by
ጎንፋ አራርሳ
Gonfa Ararsa
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Environmental Licensing Director

የተሰጠበት (delivered)
ቀን ፡ 10/05/2011 ዓ.ም
Date: 18/01/2018G.C

በኢትዮጵያ ፌዴራላዊ ዲሞክራሲያዊ ሪፑብሊክ
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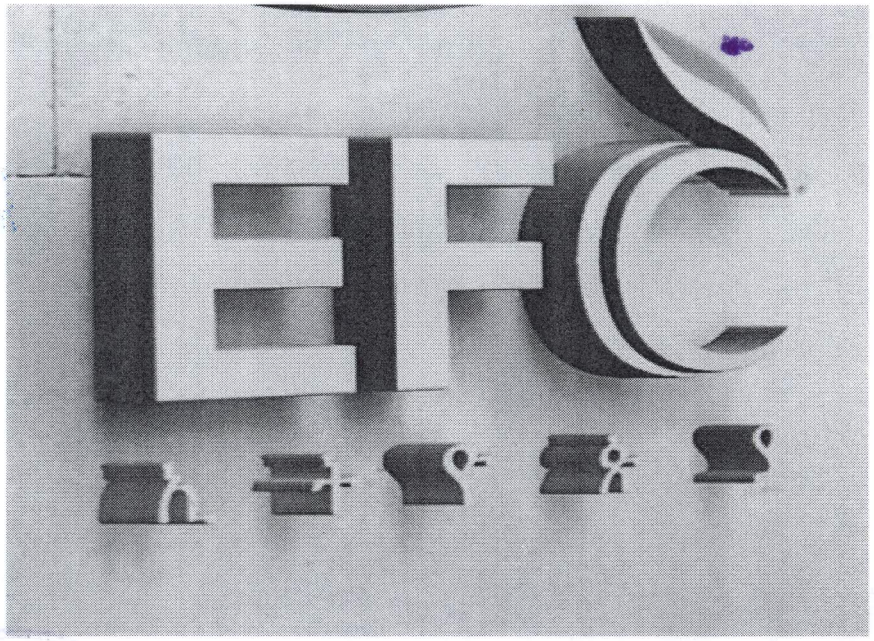

FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA
COMMISSION OF ENVIRONMENT, FOREST AND CLIMATE CHANGE