

ESIA REPORT

FOR THE PROPOSED BULBULLA IAIP AND SHASHEMENE RTC

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

CENTRAL EASTERN OROMIA REGION, ETHIOPIA

Oromia Region IPDC

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GLOSSARY

ACHA	Aluto Controlled Hunting Area
ACPZ	Agro Commodity Procurement Zones
AfDB	African Development Bank
AGP	Agricultural Growth Program
AQIA	Air Quality Impact Assessment
ASLNP	Abijata Shalla Lakes National Park
ASNP	Abijata-Shala National Park
ASTM	American Society for Testing Materials
AVC	Aluto Volcano Centre
BDL	below the detection limit
CAPEX	Capital Expenditure
CO	Carbon Monoxide
CO₂	Carbon dioxide
CSA	Central Statistical Agency of Ethiopia
EEP	Ethiopian Electric Power
EHS	Environmental, Health and Safety
EIA	Ethiopian Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
ELSR	Elevated Level Storage Reservoirs
ERA	Ethiopian Roads Authority
ESMP	Environmental And Social Management Plans
ETWRDEC	Engineer Tequam Water Resources Development and Environment Consultancy
EWCA	Ethiopian Wildlife Conservation Authority

FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GHG	Green House Gases
GLSR	Ground Level Storage Reservoirs
GPS	Global Positioning System
GTP	Growth and Transformation Plans
GTP II	National Growth and Transformation Plan II
ha	Hectares
IAIP	Integrated Agro Industrial Parks
IBA	Important Bird Area
IDS	Industrial Development Strategy
IFC	International Finance Corporation
ILO	International Labour Organisation
IPCC	Intergovernmental Panel on Climate Change
IPDC	Industrial Parks Development Corporations
ISRIC	International Soil Reference and Information Centre
ISS	Integrated Safeguards System
ITCZ	Inter Tropical Convergence Zone
IUCN	International Union for Conservation of Nature
IUSS	International Union of Soil Sciences
MACE	Mahindra Consulting Engineers
MAP	Mean Annual Precipitation
MEFCC	Ministry of Environment, Forest and Climate Change
MoA	Ministry Of Agriculture and Natural Resources

Mol	Ministry Of Industry
MSW	Municipal Solid Waste
Na–HCO₃	Sodium Bicarbonate
NCSA	National Capacity Self-Assessment
NMP	Noise Management Plan
NMT	Non-Motorised Transport
NNE	North-Northeast
NO₂	Nitrogen Dioxide
NO_x	Oxides Of Nitrogen
PA	Protected Areas
PAP	Project Affected People
PM₁₀ and PM_{2.5}	Particulate Matter
OPEX	Operational Expenditure
OS	Operating Safeguards
RAP	Resettlement Action Plan
RTC	Rural Transformation Centres
TDS	Total Dissolved Solids
ToR	Terms of Reference
SABS	South African Bureau of Standards
SANS	South African National Standards
SME	Small and Micro Enterprises
SO₂	Sulphur Dioxide
STP	Sewage Treatment Plant
SSE	South-southeast
SSW	South-southwest

UN	United Nations
UNHCR	United Nations High Commissioner for Refugees
UNIDO	The United Nations Industrial Development Organisation
UNOPS	United Nations Office for Project Services
US	United States
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UTM	Universal Transverse Mercator
WASH	National Water Supply, Sanitation and Hygiene
WBG	World Bank Group
WFB	Wonji Fault Belt
WMS	Welfare Monitoring Survey
WRB	World Reference Base Classification System
WSP	WSP Environment and Energy, Africa.

1 INTRODUCTION

1.1 BACKGROUND TO THE PROJECT

Ethiopia is located in the Horn of Africa and it is bordered by Eritrea to the north and northeast, Djibouti and Somalia to the east and southeast, Sudan and South Sudan to the west, and Kenya to the south. It is the second most populous country in Africa (after Nigeria which has a population of approximately 186 million people, 2016 estimates); with a population of over 100 million people across a total area of 1.1 million. The country is divided into nine National Regional States and two city administrations. Each state is drawn along ethno-linguistic lines and is endowed with a degree of self-rule. Each state is headed by a state president which is elected by the state council. These states are further divided into 103 Zones (sub-regions), 800 Woredas (districts), and 15,000 Kebeles (the lowest administrative units). Each Regional State (including Oromia) has its own regional government.

Ethiopia has a federal system of government which was established in the early 1990s, in accordance with the Charter of the Transitional Government adopted in 1991. The national constitution supports a pluralist political system and is headed by Dr Mulatu Teshome, President of the Federal Democratic Republic of Ethiopia (FDRE).

Agriculture is a key driver of Ethiopia's long-term growth and food security, contributing 46% of the country's Gross Domestic Product (GDP) and accounts for 90% of export value with approximately 83% of the population being dependent on agriculture for their livelihoods. Due to investments by the FDRE and its development partners, the agriculture sector has seen consistent growth of over 8 to 10% per annum over the past decade. The FDRE is committed to supporting the development of the sector through designing, introducing and implementing relevant policies, strategies, and programs such as the Growth and Transformation Plans (GTP) and Agricultural Growth Program (AGP). In spite of consistent growth in the agricultural sector in recent years, it has been identified that the sector is not yet performing to its optimum in terms of productivity, wealth creation, foreign exchange generation and food security.

The average land holdings in Ethiopia are noted to be between 0.2 and 0.5 hectares (ha), with the majority of these not being integrated into the commercial value chain for agricultural produce. Although food-processing industries are present in Ethiopia, they are currently restricted in their production by the availability of raw materials. The restriction on raw material input is related mainly to access, but also to the quality of the produce which results in inefficient handling chains, post-harvest losses and higher prices. Investment and development of the agro-industrial sector will in turn improve the economy by converting the agro-export from primary, unprocessed products to processed products, which will underpin economic growth for this sector and Ethiopia as a whole. The primary limitation to this proposed agro-industrial growth is the severe lack of infrastructure. The development of agro-industries presents Ethiopia with an opportunity to accelerate economic development and achieve its industrial development goals.

The FDRE committed to a five-year undertaking, as part of the first Growth and Transformation Plan (GTP I) to build the foundation to launch the Country from a predominantly agrarian economy into industrialisation. Among the sectors to which the second Growth and Transformation Plan (GTP II) gives emphasis is manufacturing and industrialisation to provide the basis for economic structural change; and a central element in this strategy for transforming the industry sector is development and expansion of industrial parks and villages around the country.

The development of Integrated Agro Industrial Parks (IAIPs) and accompanying Rural Transformation Centres (RTCs) forms part of the government-run Industrial Parks Development Corporations (IPDC) strategy to make Ethiopia's agricultural sector globally competitive. The concept is driven by a holistic approach to develop integrated Agro Commodity Procurement Zones (ACPZs) and IAIPs with state-of-the-art infrastructure with backward and forward linkages based on the Inclusive and Sustainable Industrial Development model. A total of 17 ACPZs have been identified (**Figure 1-1**).

The United Nations Industrial Development Organisation (UNIDO) in coordination with the FDRE, as represented by Ministry of Industry (Mol) and the Ministry of Agriculture and Natural Resources are

working in partnership to establish an appropriate platform for agro-industrial development, in the form of IAIPs, with the aim of transforming the agriculture sector. The concept of IAIPs is to integrate various value chain components via the cluster approach. Associated RTCs are to act as collection points for fresh farm feed and agricultural produce to be transported to the IAIPs where the processing, management, and distributing (including export) activities are to take place.

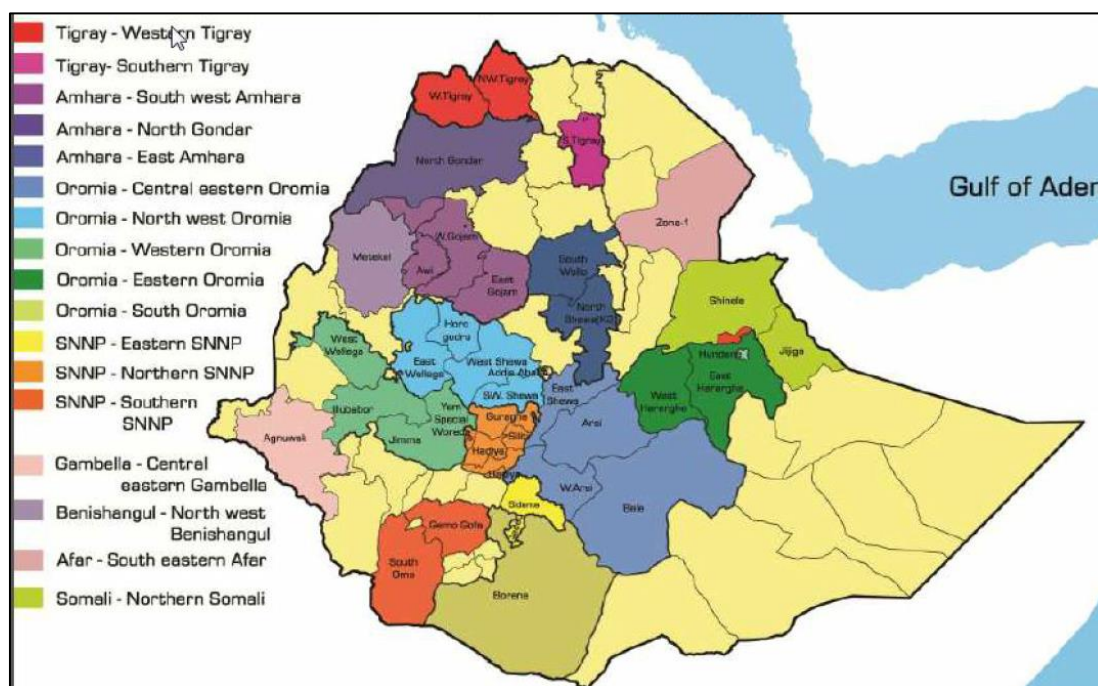


Figure 1-1: Potential Agro Commodities Processing Zones (Source: MACE)

Of the 17 ACPZs four have been selected for the establishment of pilot IAIP and RTC facilities (**Figure 1-2**). The four IAIPs and accompanying RTCs are to be established strategically across the country as a pilot phase. Based on the success of the four initial developments UNIDO and the FDRE will establish additional IAIPs and RTCs around the country. The United Nations Office for Project Services (UNOPS), on behalf of UNIDO and the FDRE, is facilitating the process to obtain the required environmental permissions for the proposed developments.

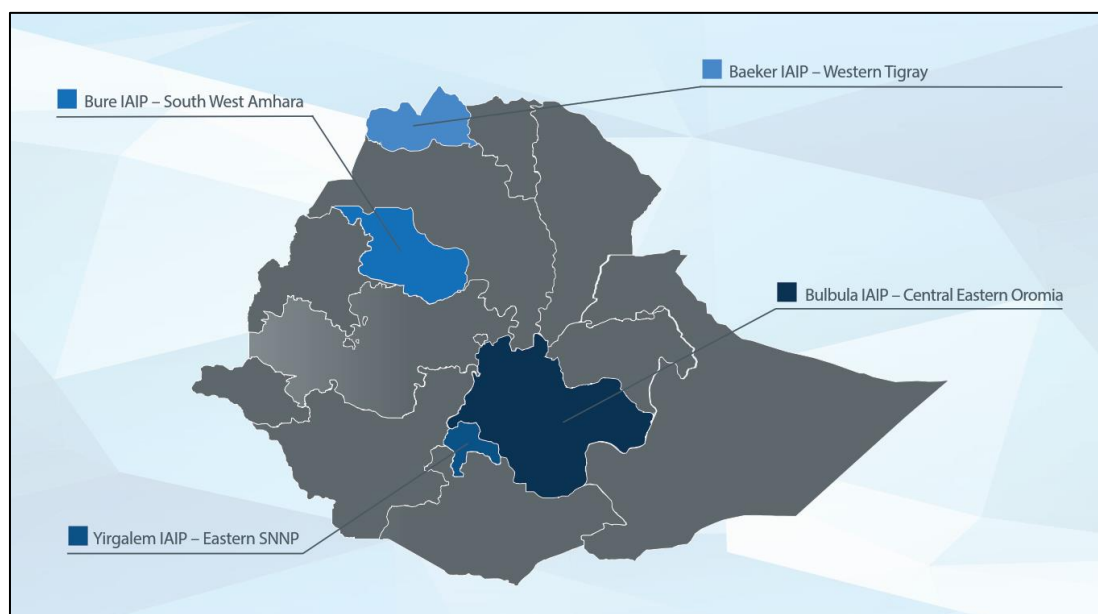


Figure 1-2: The four ACPZs selected for pilot facilities (Source: MACE)

This report relates to Central Eastern Oromia ACPZ facilities as identified in **Table 1-1**.

Table 1-1: ACPZs selected and associated piloting facilities.

Region	IAIP	RTC
Oromia (Central Eastern)	Bulbulla	Shashemene

The proposed Bulbulla IAIP site is located within the Oromia Region, which is one of the nine regional state members of the FDRE established by the 1995 constitution provisions. Administratively, Oromia is divided into 20 administrative zones and 261 Woredas. Important cities and towns in the Oromia region include: Adama, Ambo, Asella, Bishoftu, Chiro, Dembidolo, Fiche, Gimbi, Robe, Goba, Dello Buna, Jimma, Metu, Negele Boran, Moyale, Nekemte, Shashamane, Haramaaya and Waliso.

The IAIP site falls under the jurisdiction of Bulbulla Town within the East Shewa administrative zone which is located in the Central Eastern Oromia Region, connecting the western regions to the eastern ones. This zone is bordered on the south by the West Arsi Zone, on the southwest by the SNNP Region, on the west by South west Shewa and Oromia Special Zone Surrounding Finfinne, on the northwest by North Shewa, on the north by the Amhara Region, on the northeast by the Afar Region, and on the southeast by Arsi. The main towns and cities in East Shewa include: Bishoftu (Debre Zeit), Metehara, and Ziway and 12 Woredas: Ada'a, Adama Zuria, Adami Tullu and Jido Kombolcha, Bora, Boset, Dugda, Fentale, Gimbichu, Liben, Lome, Ziway Town.

The location of the Bulbulla IAIP and Shashemene RTC sites are indicated in **Figure 1-3**.

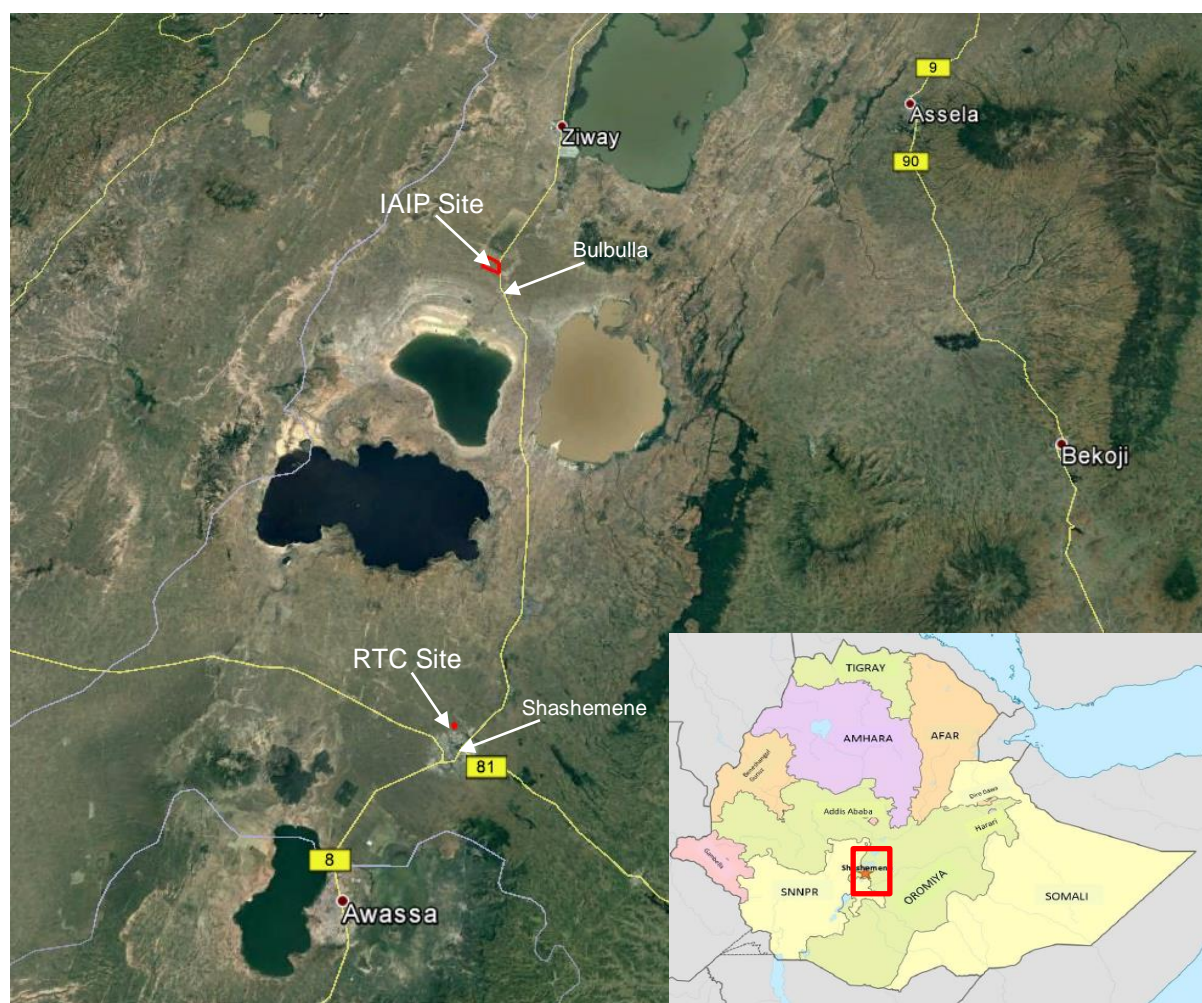


Figure 1-3: Layout showing the administrative map of the Regions and location of the IAIP and RTC sites in Central Eastern Oromia.

Under the Ethiopian Environmental Impact Assessment (EIA) Proclamation (No. 299/2002), the proposed Project requires an EIA and authorisation by the Ministry of Environment, Forest and Climate Change (MEFCC) before any construction activities may commence. Due to the potential for international project financing the Environmental and Social Impact Assessment (ESIA) will be undertaken in line with the Ethiopian Environmental Legislation as well as the African Development Bank (AfDB) Integrated Safeguards System (ISS).

The Ethiopian based environmental consultancy, Engineer Tequam Water Resources Development and Environment Consultancy (ETWRDEC), in collaboration with WSP, Environment & Energy, Africa, have been appointed to undertake the required Environmental and Social Impact Assessment (ESIA) for the proposed Bulbulla IAIP and associated Shashemene RTC within the Central Eastern Oromia Region (the Project) in order to obtain environmental certification.

An ESIA is conducted in order to identify and assess the likely environmental and social impacts of a proposed project, to determine their magnitude and significance, and to define management or mitigation measures designed to avoid and minimise where possible, or if not, to offset or compensate for adverse impacts and risks.

The development of the Oromia IAIP and the RTC will require ancillary infrastructure such as access roads, power lines, water pipelines and communication infrastructure in order to successfully implement the project. Ideally ancillary infrastructures would be captured as part of the development project and assessed within this ESIA. However, at this stage of the proposed Project, the routing of all linear infrastructure, including access roads, power lines, water pipelines and communication infrastructure to the sites have not yet been finalised. Therefore, this ancillary infrastructure will need to be considered under separate environmental and social studies by the third parties establishing this infrastructure.

1.2 LAND TENURE AND LAND USE

In Ethiopia all land belongs to the State; whilst land can be leased to private individuals, they cannot own it. The Constitution provides for equal access, use, transfer and administration over land. It grants access to agricultural land for rural residents, and allows all inhabitants to utilise the land for farming. Farmers and pastoralists could be granted lifetime 'holding rights' giving them rights to farm the land except for its sale and mortgage.

Based on the data presented below in **Table 1-2**, only 28% of the region's land is cultivated while the remaining 72% stand uncultivated and covered by bush, shrubs, forests, etc.

Table 1-2: Regional data - Land Use and Land Cover type

No.	Land Use and Land Cover type	Spatial Coverage in	
		km ²	%
1	Intensively Cultivated Land	46,980	12.93
2	Moderately Cultivated Land	42,401	11.67
3	State Farm	2,252	0.62
4	Perennial Crop Cultivated Land	11,408	3.14
5	Afro-Alpine Heath Vegetation	1,271	0.35
6	Dense and Mixed High Forests	29,579	8.14
7	Dense and Open Riparian Woodland	11,517	3.17
8	Bush Land	38,513	10.60
9	Shrub Land	45,744	12.59
10	Open, Bushed, Shrubby and Wooded Grassland	123,063	33.87
11	Swamp and Marshes	1,126	0.31

No.	Land Use and Land Cover type	Spatial Coverage in	
		km ²	%
12	Salt Flats, Exposed Rock and Sand	6,866	1.89
13	Water Body	2,652	0.73
14	Urban or Built-Up land	7	0.002
15	Total	363,375	100

Source: Ministry of Agriculture and Rural Development

1.3 PURPOSE OF THIS REPORT (ESIA REPORT)

The fundamental objective of an ESIA is to ensure that the proposed development is environmentally sound and socially acceptable, and hence contributes to the development of environmental and social functions of local communities. It is also expected to provide a means whereby the overall environmental performance and social benefits of the project can be enhanced. This ESIA has been prepared to fulfil the requirements of the African Development Bank and the Ethiopian Environmental Impact Assessment Proclamation (299/2002) (the 'EIA Regulations').

The objective of the ESIA phase is to undertake an assessment of those potential impacts likely to result in significant effects, identified through the scoping phase. The Scoping Phase was conducted in November 2017 and determined the Terms of Reference for the ESIA. The ESIA:

- Meets the requirements of the Ethiopian EIA regulations;
- Meets the requirements of the AfDB Operating safeguards;
- Provides input into the Project Engineering Team to ensure that the design minimises environmental and socioeconomic impacts and maximises sustainability opportunities wherever possible;
- Identifies cross-cutting issues and coordinate mitigation measures across topics to be incorporated in an Environmental and Social Management Plan (ESMP); and
- Incorporates stakeholders through the ESIA process in accordance with the AfDB stakeholder engagement requirements.
- In line with the AfDB requirements a Relocation Action Plan (RAP) has been developed and issued as a separate document associated with the ESIA report.

1.4 STRUCTURE OF THIS REPORT

The structure of this report is as presented in **Table 1-3** below.

Table 1-3: Structure of the ESIA Report

Chapter	Contents	AfDB Requirements
Chapter 1 – Introduction	Presents a brief background to the proposed Project, the ESIA process and the purpose and structure of the report.	Identify the project and the key role players.
Chapter 2 – Project Description	Provides a basic description of the Project area and the proposed Project components.	Define the project and identify potential sources of impacts. Describe features, locations and activities of project. Identify interactions between project and resources.

Chapter	Contents	AfDB Requirements
		Convey what is being proposed. (2015)
Chapter 3 – Need and Desirability	Describes the need and desirability and motivates the rationale for the proposed Project.	
Chapter 4 – Project Alternatives	Details the level of information provided regarding Project alternatives that have been considered thus far.	Identify and compare alternatives. Balance economic, technical, environmental and social factors. Look at merits and disadvantages of each alternative. (2015)
Chapter 5 – Policy, Legal and Administrative Framework	Provides an outline of the legislative, policy and administrative requirements, as well as international best practise applicable to the proposed Project.	The assessment complies with the relevant legislation and standards applicable in the local jurisdiction and the Bank. Takes into account national and regional standards. The Bank assesses the institution's requirements, which needs to be equivalent to the AfDB's requirements. (OS1; 2013)
Chapter 6 – The ESIA Methodology	Provides a brief overview of the ESIA process to be followed for the proposed Project.	Conducted to the principles of proportionality and adaptive management. The level of assessment and management must be proportional to the level of risk associated with the project. This assessment leads to the development of an ESMP. (OS1; 2013) Apply an 'interactions matrix' to identify possible interactions between project components and resources/receptors. (2015)
Chapter 7 – Stakeholder Engagement	Provides a brief overview of the stakeholder engagement process required.	Capture perspective of vulnerable individuals or groups. Stakeholder engagement activities carried out throughout the ESIA process. Demonstrate links between stakeholder feedback and ESIA element.

Chapter	Contents	AfDB Requirements
		Confirm and verify stakeholder engagement activities. (2015)
Chapter 8 – Baseline of the Receiving Environment	<p>Provides a summary of the site investigations undertaken and findings thereof. This has addressed the following technical topics:</p> <ul style="list-style-type: none"> – Climate; – Topography and Geomorphology; – Geology; – Soils; – Surface Water (Hydrology); – Groundwater (Hydrogeology); – Wetlands; – Air Quality; – Noise; – Transport / Access; – Waste Management; – Visual; – Biodiversity; and – Socio-economic. 	<p>Assess potential impacts on: geology, soils, surface and groundwater resources, air resources and climate, noise and vibration, ecosystems, socioeconomic and cultural. (OS1, 2013)</p> <p>Ensure flows, water ecological functions and the integrity of river systems and wetlands are maintained.</p> <p>Assess potential risks and impacts on biological diversity and ecosystem services.</p> <p>Categorise habitats into Natural Habitats, Modified Habitats and Critical Habitats.</p> <p>Identify invasive alien species and take precautions to avoid the introduction or spreading of the species.</p> <p>Detailed evaluation of climate change risks and adaptation measures (Category 1) or review climate change risks and adaptation measures (Category 2); assess climate change vulnerability. (2013)</p> <p>Comply with national regulations in legally protected areas and internationally recognised areas. (OS3, 2013)</p>
Chapter 9 - Identification of Potential Impacts	Description and assessment of physical, natural and socio-economic environment environmental and social impacts that have been identified.	<p>Identify potential interactions between the project and the physical, biological, cultural or human environment.</p> <p>Identify risks associated with cumulative impacts.</p> <p>Determine characteristics and magnitude of impacts. (2015)</p>
Chapter 10 – Cumulative Impacts	Description and assessment of cumulative impacts that have been identified.	<p>Determine the size of the area around the project that should be assessed and how to practically assess complex interactions.</p> <p>Consider the degree to which the project will contribute to possible cumulative impacts. (2015).</p>

Chapter	Contents	AfDB Requirements
Chapter 11 – Environmental and Social Management Plan	Presents the action plan for the management of impacts throughout the construction and operation of the proposed project.	<p>Identify measures to avoid, minimise and mitigate.</p> <p>Follow a mitigation hierarchy which is in line with any relevant Bank Requirements. The hierarchy is as follows:</p> <ul style="list-style-type: none"> - Avoid at Source or Reduce at Source - Abate on Site - Abate at Receptor - Repair on Remedy - Compensate - Offset (2015) <p>Compensation and offsetting is a last resort (OS1; 2013). Define basic management and monitoring measures to ensure impacts remain in conformance with predictions and mitigation measures effectively address impacts. Define roles and responsibilities, measures for information disclosure, grievance redress mechanism and process for confined consultation. (GN1.4)</p>
Chapter 12 – Conclusions	Concludes the ESIA Report.	

1.5 DETAILS OF THE ESIA PROJECT TEAM

The MEFCC requires that an ESIA study of this type utilises a multidisciplinary team composed of a team of experts to undertake ESIA study. A list of the members of the Project team for the ESIA is provided in **Table 1-4**. As far as possible specialist studies were undertaken by ETWRDEC which is a Level 1 local Ethiopian Consultancy firm licensed with the MEFCC. Full certificates of competency for each specialist as well and the MEFCC certificate for ETWRDEC are provided (see **Appendix A**). International ESIA experience and supplementary specialist expertise was provided by WSP Environment and Energy, Africa.

Table 1-4: ESIA Project Team

Technical Area	Expert	Level of Competency	Reference No.
Policy, Law and Institutional Analyst	Mr. Imru Tamrat Yigezu	Consultant	11/1-1/2774
Sociologist	Mr. Girma Demisie Tefera	Senior Consultant	11/1-1/6592
Environmental Health	Mr. Abiyot Yismaw Gete	Consultant	11/1-1/6887
Land Use	Mr. Wosen Gultie Gebrekidan	Senior Consultant	11/1-1/6793

Technical Area	Expert	Level of Competency	Reference No.
Biodiversity	Mr. Kahsae Ghebretensae Asgedom	Senior Consultant	11/1-1/1422/10
Water Resource Management	Mr. Getachew Abrha Tesfamariam	Senior Consultant	11/1-1/1609/10
Environmental Engineer	Mr. Tequam Tesfamariam	Senior Consultant	11/1-1/6560
Waste Management	Mr. Addisu Gebremedhin Atshiba	Senior Consultant	11/1-1/6457

Each of the above experts are licensed with the MEFC. A copy of each of the above experts Certificate of Competency issued by the MEFC is attached in **Appendix A**.

1.6 DETAILS OF THE APPLICANT AND ENVIRONMENTAL ASSESSMENT PRACTITIONER

Any comments on the ESIA Report should be provided to the applicant, as well as the environmental assessment practitioner, as per the details provided in **Table 1-5** and **Table 1-6** respectively.

Table 1-5: Detail of the Applicant

Item	Detail
Name of Applicant	Oromia Region IPDC
Responsible Person	Mohammed Hassen
Telephone	0966783649
E-mail	mohassen55@gmail.com

Table 1-6: Detail of the Environmental Assessment Practitioner

Item	Detail
Name of Firm	Engineer Tequam Water Resource Development and Environment Consultancy
Certificate of Competence	Environmental Impact Assessment Studies as a Consulting Firm in Level 1 Reference Number: 11/1.1/6883 Date: 27/4/2017
Responsible Person	Mr. Tequam Tesfamariam
Postal Address	P O Box 23849 Addis Ababa Ethiopia
Telephone	+251 911675791
E-mail	tequam1955@yahoo.com

1.7 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations have been made/identified during the assessment process and in the compilation of this ESIA Report:

- The information provided by all parties is assumed to be accurate;
- The competent authority would not require additional specialist input, as per the proposals made in this report, in order to make a decision regarding the application.

2 PROJECT DESCRIPTION

This Chapter provides a description of the proposed Project, which entails the Bulbulla IAIP and Shashemene RTC facilities, and associated phases.

2.1 BULBULLA IAIP

2.1.1 LOCATION

The proposed Bulbulla IAIP falls under the jurisdiction of Bulbulla Town within the East Shewa administrative zone in the Central Eastern Oromia Region (**Figure 2-1**). The site abuts the federal highway No. 7 connecting Addis Ababa and Awassa which are approximately 180 km north and 85 km south of the site respectively. As the proposed site is located approximately 4 km north of Bulbulla town, and approximately 20 km south of Ziway Town, it allows the proposed development to make use of the existing social infrastructure in terms of banking, financial, recreational and logistics support. The site is geographically located between 856019.4476 N to 858304.6467 N, and 458642.0520 E to 460744.7941 E.

The proposed Bulbulla IAIP is 263.007 hectares (ha) in extent. The IAIP is anticipated to be a pilot facility with the intended extent of development to ultimately reach a total 1,000 ha. The extension of the IAIP area will be based on the success of the project. This report only pertains to the assessment of the 263 ha pilot development. Future expansion of the IAIP will require separate environmental and social assessments to be undertaken.

The growing area to be serviced by the IAIP is approximately 334,971 ha with the main farming activities in the area consisting of wheat, barley, haricot bean, fava bean, tomato, potato as well as dairy, fish, poultry, honey and meat production. The predominant land uses on the site include farming (pastoral and crops) and residential activities with dwellings distributed across the site.

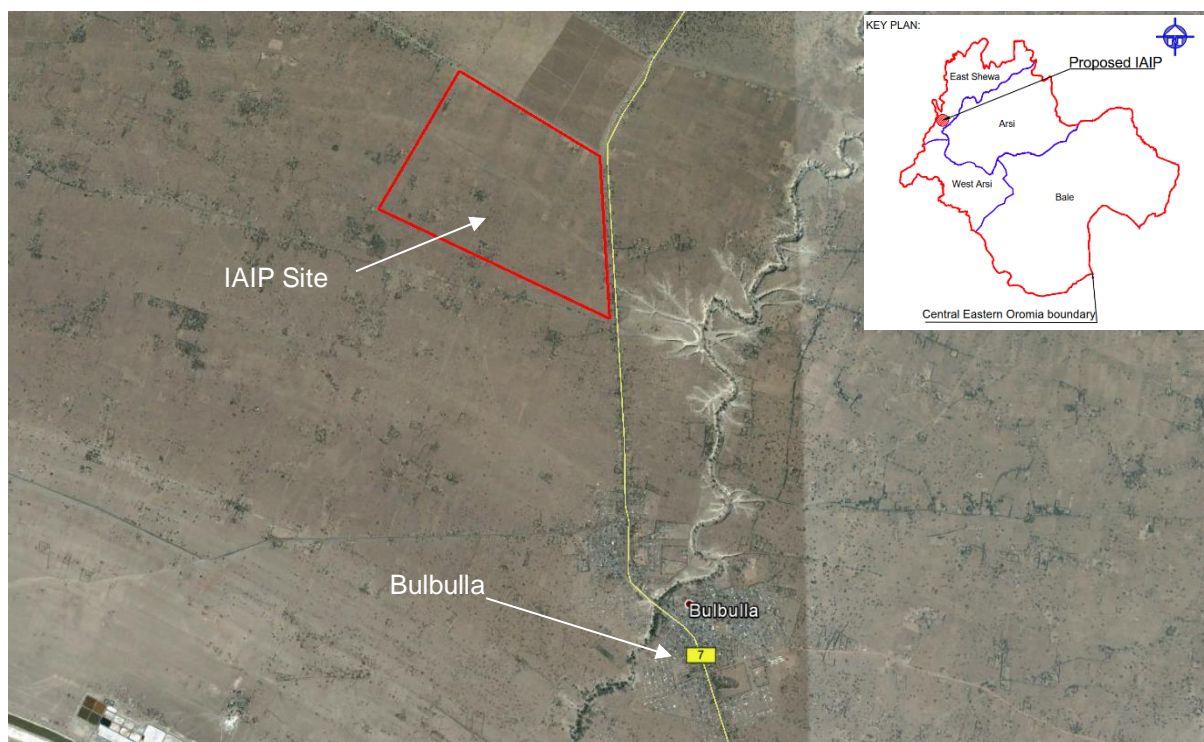


Figure 2-1: Bulbulla IAIP, Central Eastern Oromia Region

The coordinates of the Bulbulla IAIP area are provided in **Table 2-1**. **Figure 2-2** shows the layout of the IAIP boundary.

Table 2-1: Coordinates of the Bulbulla IAIP area

Point	Easting (m)	Northing (m)
1	460654.52	857504.97
2	460744.79	856019.45
3	458642.05	857026.08
4	459364.01	858304.65

Note: Coordinates are given in geographic format, zone 37, hemisphere N of the Adindan, Ethiopia datum (Ellipsoid: Clarke 1880)

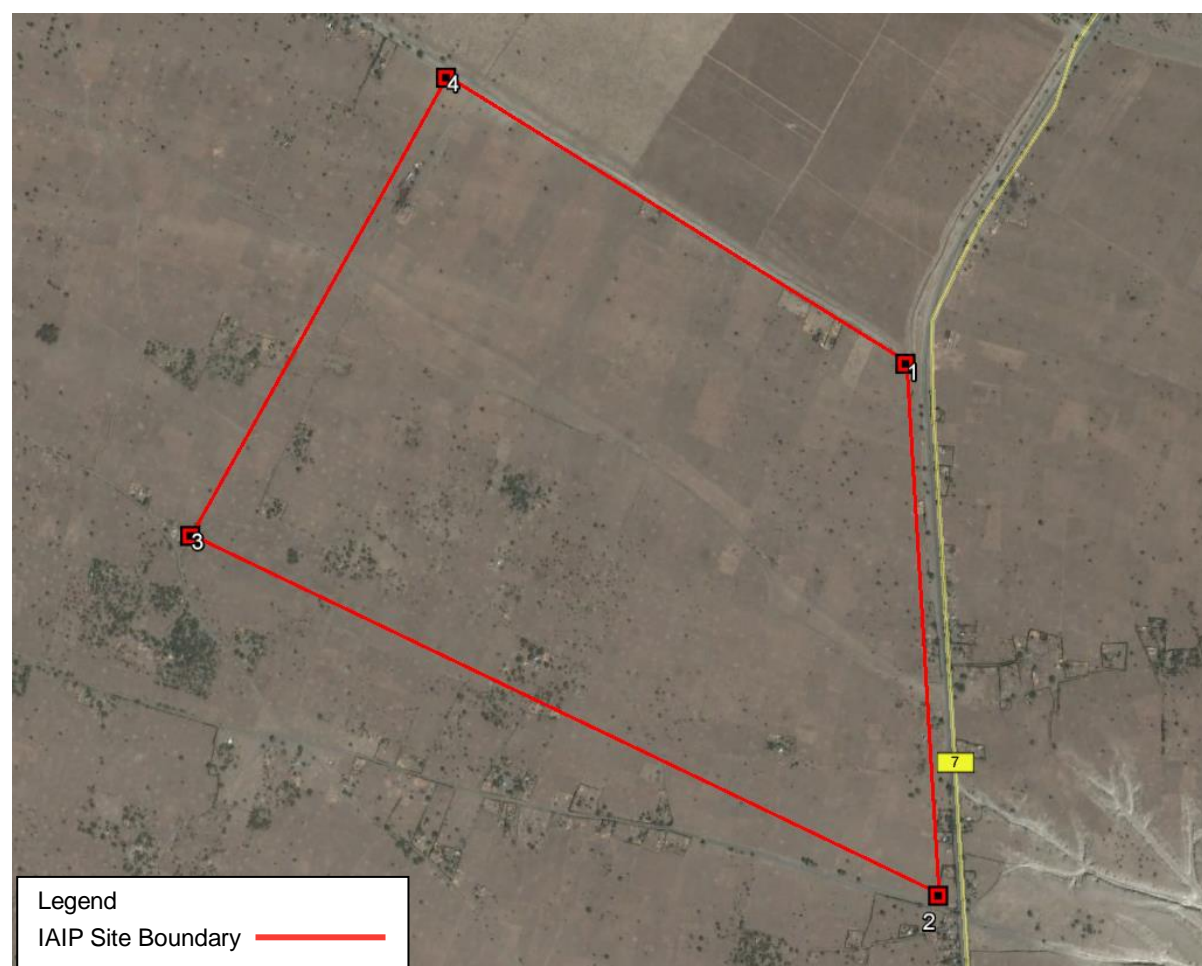


Figure 2-2: Layout showing the boundary of the IAIP area.

2.1.2 SURROUNDING AREA

The area surrounding the IAIP site consists of households, settlements and associated support infrastructure such as roads and electrical power lines as well as agricultural land including land for crop production and open grassland for grazing. The area includes mixed vegetation as well as the Bulbulla River, located approximately 1 km east of the proposed site. **Table 2-2** provides a rough breakdown of the various land use patterns identified within a 5 km radius of the IAIP site, as indicated in **Figure 2-3**.

Table 2-2: Land use pattern in the adjoining area – 5 km radius

Land use classification	Area in hectares	%
Water body	56.00	0.71%
Agriculture	5123.76	65.27%
Mixed vegetation	2401.10	30.59%
Settlements	216.15	2.75%
Barren land	31.09	0.40%
Roads	21.90	0.28%
Total	7850.00	100.00%

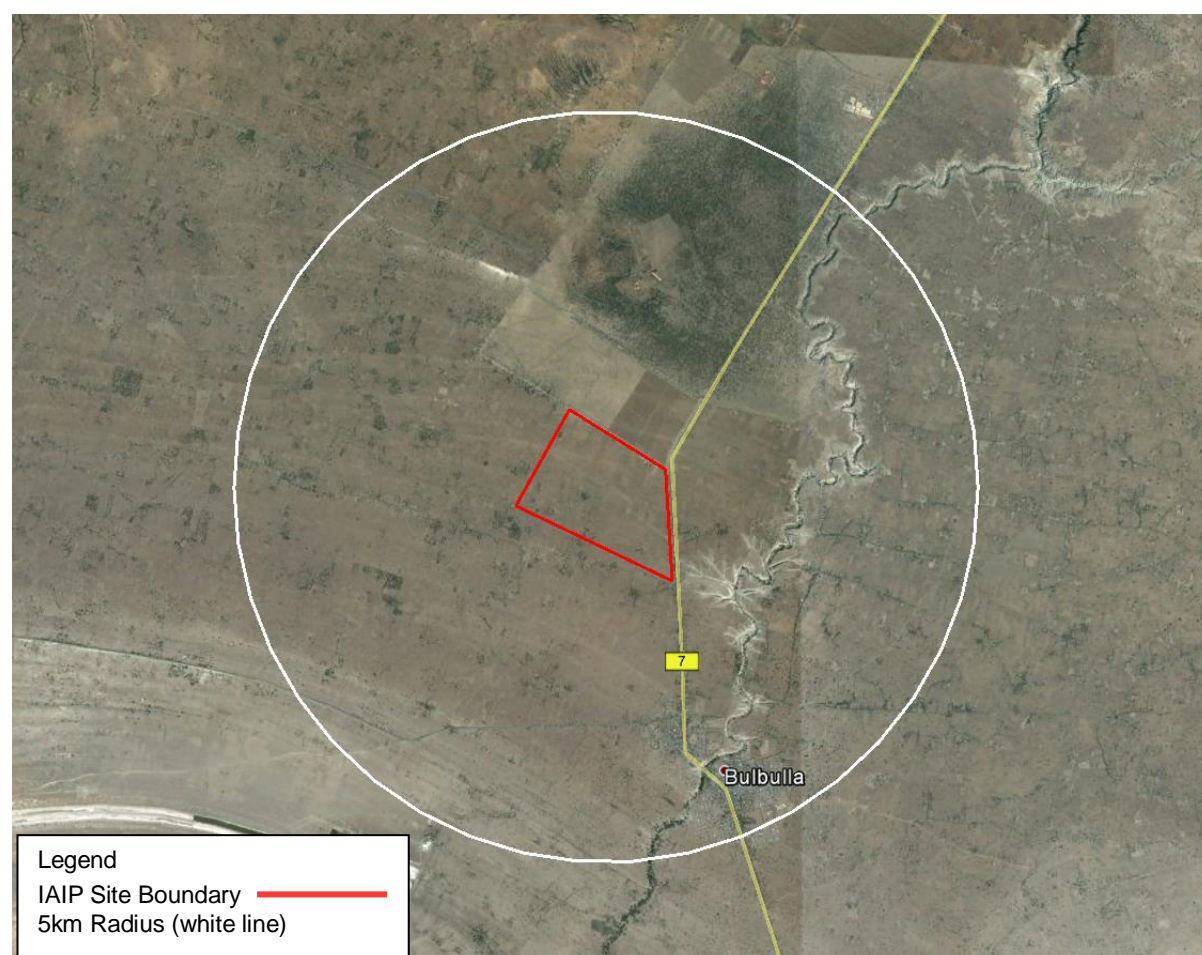


Figure 2-3: Image showing a 5km radius from the IAIP site.

2.1.3 DESCRIPTION OF THE PROPOSED BULBULLA IAIP

The 263 ha IAIP comprises a processing area of 239.73 ha and a non-processing area of 23.36 ha. Most residents in the region are subsistence farmers with practices including the rearing of live animals as well as growing several crop types. The IAIP is designed to focus on processing cereals, vegetables and livestock as well as the brewery processing industry.

The IAIP includes the associated infrastructure required to effectively process all the materials. These include water and electrical supply infrastructure, sewage treatment works, roads and storage areas and the like. Quality control and assurance facilities are also included within the park along with support and training facilities. The non-processing area of the site includes a residential area as well as supporting facilities such as a school, places of worship and commercial areas. The park also includes greenery and open spaces making up approximately 12% of the total area. **Figure 2-4** provides a layout of the proposed master plan of the Bulbulla IAIP.

Table 2-3 provides an indication of the raw material and growing area required for the effective operation of the IAIP according to the design process.

Table 2-3: IAIP operational requirements

Item	Quantity
Raw Materials Required	859,354 MTPA
Growing Area Required	334,971 ha

The preliminary details of the proposed Bulbulla IAIP are summarised in the **Table 2-4** below.

Table 2-4: Summary of preliminary details of the Bulbulla IAIP

Oromia – Central Eastern – Bulbulla IAIP		
Location of IAIP		Bulbulla town in East Shewa administrative zone
Size of IAIP		263 hectares considered for initial development
RTC locations		Shashemene , Dodola, Robe, Bekoji, Eteya, Welenchiti, Meki and Biyo Biske.
Agricultural potential and agri-facilities		Availability of two operational sugar plantations; Concentration of fattening dairy farms, abattoirs; Fishery potential, Koka dam, rift valley lakes (Zeway, Langano).
External infrastructure	<i>Energy</i>	Substation at Ziway town at a distance of approximately 17.5 km
	<i>Water</i>	Groundwater source to be investigated
	<i>Road network</i>	The site abuts federal highway connecting Addis Ababa & Hawassa
	<i>Railways, dry port, airport terminals</i>	Proximity to biggest airport terminal, dry port & Djibouti port Bole International airport, Addis Ababa – 180km
	<i>Telecommunication</i>	Telecom – communication facilities available in Bulbulla town can be extended
IAIP internal infrastructure details	<i>Total processing area</i>	239.73 hectares
	<i>Total non-processing area</i>	23.36 hectares
	<i>Total area</i>	263.09 hectares
	<i>Length of road</i>	14.06 km
	<i>Total water demand</i>	6,660 m ³ /day
	<i>Wastewater generation</i>	4,504.77 m ³ /day

Oromia – Central Eastern – Bulbulla IAIP

	Municipal Solid Waste generation	6.416 TPD
	Power demand	45.951 MVA

Source: UNIDO, Integrated Agro-Industrial Parks in Ethiopia, 2016



Figure 2-4: Master Plan of the Bulbulla IAIP (Source: MACE)

2.1.4 PROCESS UTILITIES

WATER REQUIREMENTS

Water supply to Bulbulla town is currently provided through a network of bore wells sunk in and around the town. The Bulbulla River flowing to the south of the site supplies the nearby agricultural fields. It was identified that there is no existing water supply network available in the vicinity of the site and that the river water is meant only for agricultural purposes and cannot be used for industrial purposes.

The estimated total daily water demand for the IAIP was calculated by MACE, including potable¹ and non-potable² water requirements (**Table 2-5**).

Table 2-5: Estimated average daily water demand for the Bulbulla IAIP

Land Use	Potable (m ³ /day)	Non-potable (m ³ /day)	Total (m ³ /day)
Processing areas	4,202	581	4,783
Non-processing area	223	136	359
Total daily water demand	4,425	717	5,142

To meet the water demand it was proposed that a minimum of 15 bore wells, with a 300 mm diameter and depth of up to 150 m, be installed in the IAIP or nearby vicinity depending on the actual yield of the bore wells. The IPDC undertook a drilling programme at the beginning of 2018 as a potential means of water supply for the Bulbulla IAIP site. Upon completion of the drilling, a pump test was conducted on the borehole in order to determine the hydraulic parameters of the aquifer units intersected and the safe abstraction yield for the borehole. A water quality sample was collected at the end of the constant discharge test and submitted to Oromia Water Works Design and Supervision Enterprise laboratory for chemical analysis (refer to Section 8.8 for detail).

The proposal is to install the required bore wells in a phased manner so as to meet the required water demand at the various phases of the development. **Table 2-6** provides the anticipated water demand on a yearly basis, for the eight years from commencement of the IAIPs, showing the annual increase in water demand.

Table 2-6: Water demand - annual pattern in m³/day

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026
Volume (m³/day)	519	1037	1945	2506	3284	3803	4193	4425	4425

To facilitate the adequate supply of water to the IAIP suitable water storage structures in the form of ground level storage reservoirs (GLSR) and elevated level storage reservoirs (ELSR), with associated pump house and water treatment plant, are to be established within the IAIP to facilitate receiving raw water, treating the water, collecting and storing the treated water (in the GLSR and ELSR respectively) for further distribution. An area of 2.52 ha is earmarked for the construction of the water treatment plant, GLSR and ELSR and Pump House within the IAIP. The design also includes a 'summer storage tank' for the capturing and storage of summer rainfall for use in the IAIP.

A suitable water treatment plant is to be established to treat the water supply in order to meet the acceptable limits of water quality as per Ethiopian drinking water standards.

WASTE WATER

A sewage treatment plant (STP) and effluent treatment plant (ETP) are to be established within the southern portion of the IAIP. It is anticipated that waste water produced by equipment and regular maintenance will be recycled in the operational process. Furthermore sanitary waste water from toilets and urinals shall be collected in an underground sewer system that is to be constructed as part of the processing plant's sanitary facilities. A self-contained treatment system is to be put in place to treat sanitary water.

Treated waste water is to be re-used in the production process as non-potable water. The estimated volume of sewage³ to be generated by the IAIP during operations is shown in **Table 2-7**.

¹ Potable water is to be used for drinking and sanitary needs and washing vessels.

² Non-potable water considered to be used for gardening, cleaning, cooling and toilet flushing.

³ Total sewage quantity includes effluent, sewage and sullage.

Table 2-7: Estimated average daily waste water generation for the Bulbulla IAIP

Processing and Non-processing areas	Quantity
Total	1,841.65 m ³ /day

SOLID WASTE

The estimated volume of municipal solid waste (MSW) to be generated by the IAIP during operations is shown in **Table 2-8**. Waste minimisation, recycling and treatment processes shall be included in the IAIP facility operational requirements.

Table 2-8: Estimated average daily solid waste generation for the Bulbulla IAIP

Solid Waste Generation	Quantity
Biodegradable	5.133 tons per day (tpd)
Non-biodegradable / Recycle waste	1.283 tpd
Total	6.416 tpd

ELECTRICITY

The total power demand for the IAIP during operation is anticipated to be 45.951 MVA, as indicated in **Table 2-9**. The total power demand is to be sourced from Ethiopian Electric Power (EEP) via the substation located at Ziway Town, approximately 17.5 km from the proposed site.

Table 2-9: Estimated power demand for the IAIP

Processing and Non-processing areas	Quantity
Total	45.951 MVA

2.1.5 ANCILLARY INFRASTRUCTURE

This Section provides a brief summary of the proposed ancillary infrastructure within the IAIP.

FUEL (DIESEL/PETROL) STORAGE

The IAIP includes a truck parking area with a fuel station. The storage of fuel will therefore take place on site.

TRANSPORT ROUTES AND ACCESS TO SITE

The proposed site abuts the federal highway no. 7 connecting Addis Ababa and Awassa. No specific infrastructure intervention is proposed regarding transportation routes and access roads.

The site has no connectivity by railway and the nearest airports are Addis Ababa and Awassa which are approximately 180 km and 90 km from the site respectively. The Shashemene RTC is located approximately 65 km south of the Bulbulla IAIP. All internal roads will be constructed and maintained by the IPDC while the FDRE is responsible for maintenance of the roads outside of the IAIP.

ELECTRICAL OVERHEAD POWER TRANSMISSION LINES

As identified in Section 2.1.4 above, it is proposed to bring in an overhead power transmission line from the Ziway substation, which is connected to the national grid, to a substation to be established on site for the provision of electrical supply to the IAIP.

COMMUNICATION FACILITIES

Communication facilities available in the town of Bulbulla are to be extended to the site.

2.2 SHASHEMENE RTC

2.2.1 LOCATION

The proposed Shashemene RTC site (**Figure 2-5**) is located on the northern edge of the town of Shashemene, 27 km north of Awassa, and 65 km south of the Bulbulla IAIP. The proposed site falls under the jurisdiction of Shashemene town, in the Shashemene Woreda which is located in the West Arsi Zone of the Central Eastern Oromia Region. The proposed RTC is located in close proximity to the federal highway no. 7 that links Addis Ababa with Awassa. The site is geographically located between 798692.665 N to 799112.659 N and 455882.924 E to 456165.923 E (UTM coordinates).

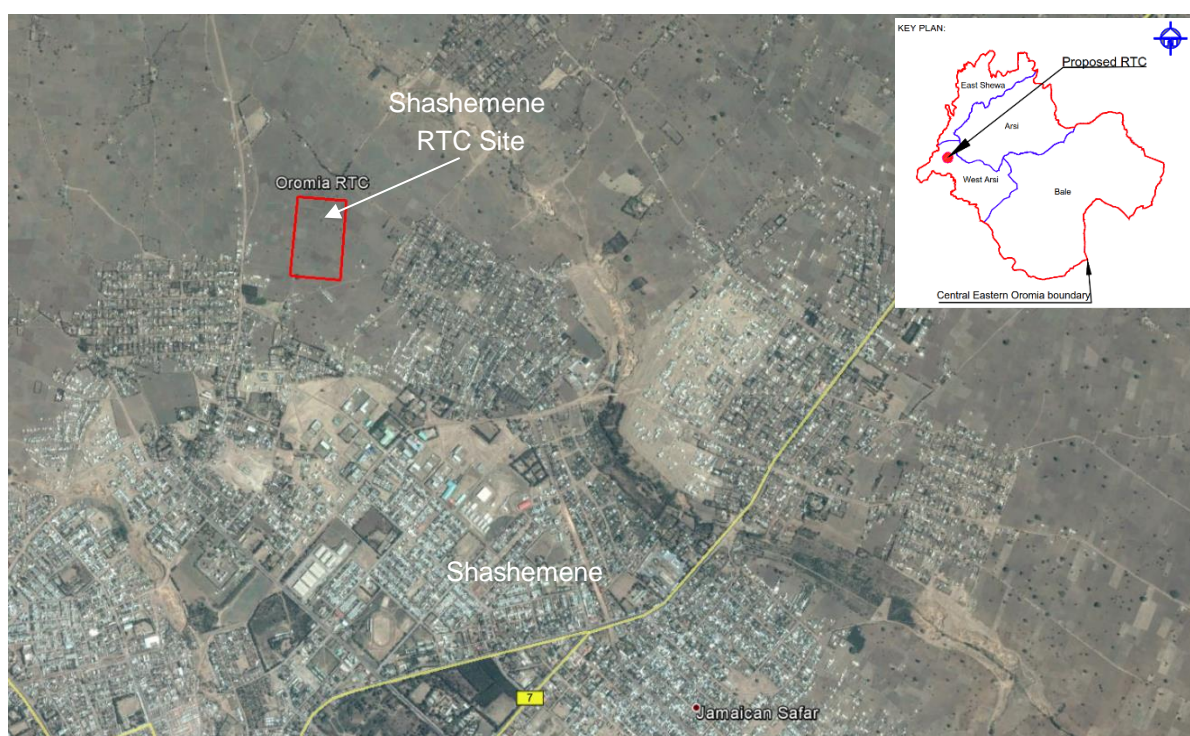


Figure 2-5: Location of the Shashemene RTC, Central Eastern Oromia Region

The coordinates of the Shashemene RTC area are provided in **Table 2-10**.

Table 2-10: Coordinates of the Shashemene RTC area

Point	Easting (m)	Northing (m)
1	455882.92	798714.66
2	455917.92	799112.66
3	456165.92	799091.67
4	456138.93	798692.66

Note: Coordinates are given in geographic format, zone 37, hemisphere N of the Adindan, Ethiopia datum (Ellipsoid: Clarke 1880)

Figure 2-6 shows the layout of the IAIP boundary.



Figure 2-6: Layout showing the boundary of the RTC area

2.2.2 SURROUNDING AREA

The site is located approximately 3 km north of the centre of Shashemene and approximately 2 km from the Federal Highway No. 7. The site is located on the northern edge of the town and is surrounded by agricultural land (predominantly crops) with low to medium density residential areas to the south and east of the site (as evident in **Figure 2-7**). A 33 kV overhead power line runs parallel to the northern boundary of the site.

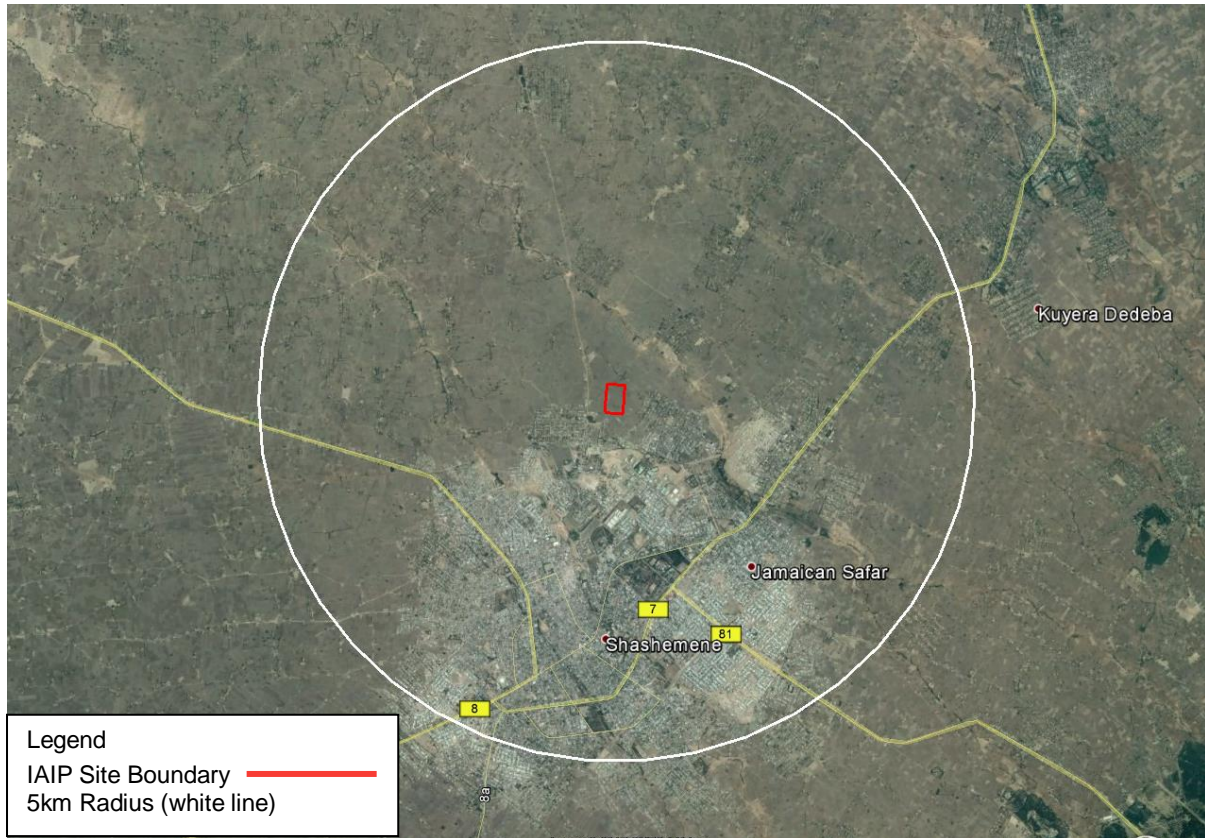


Figure 2-7: Image showing a 5km radius from the RTC site

2.2.3 DESCRIPTION

A RTC is a facility where rural communities are able to take their products (i.e. vegetables, fruits, coffee, livestock and other produce) for sale. The produce is in turn forwarded in bulk to the IAIP for further processing.

The Shashemene RTC site covers an area of 10.108 ha which consists of agricultural land (crops), occasional trees and a dirt cart track that runs through the centre of the site in a north-south direction. No dwellings are noted to exist on the site, however a grave site / tomb is located in the south-eastern portion of the site. **Figure 2-8** identifies the existing features identified in the area of the proposed RTC site.

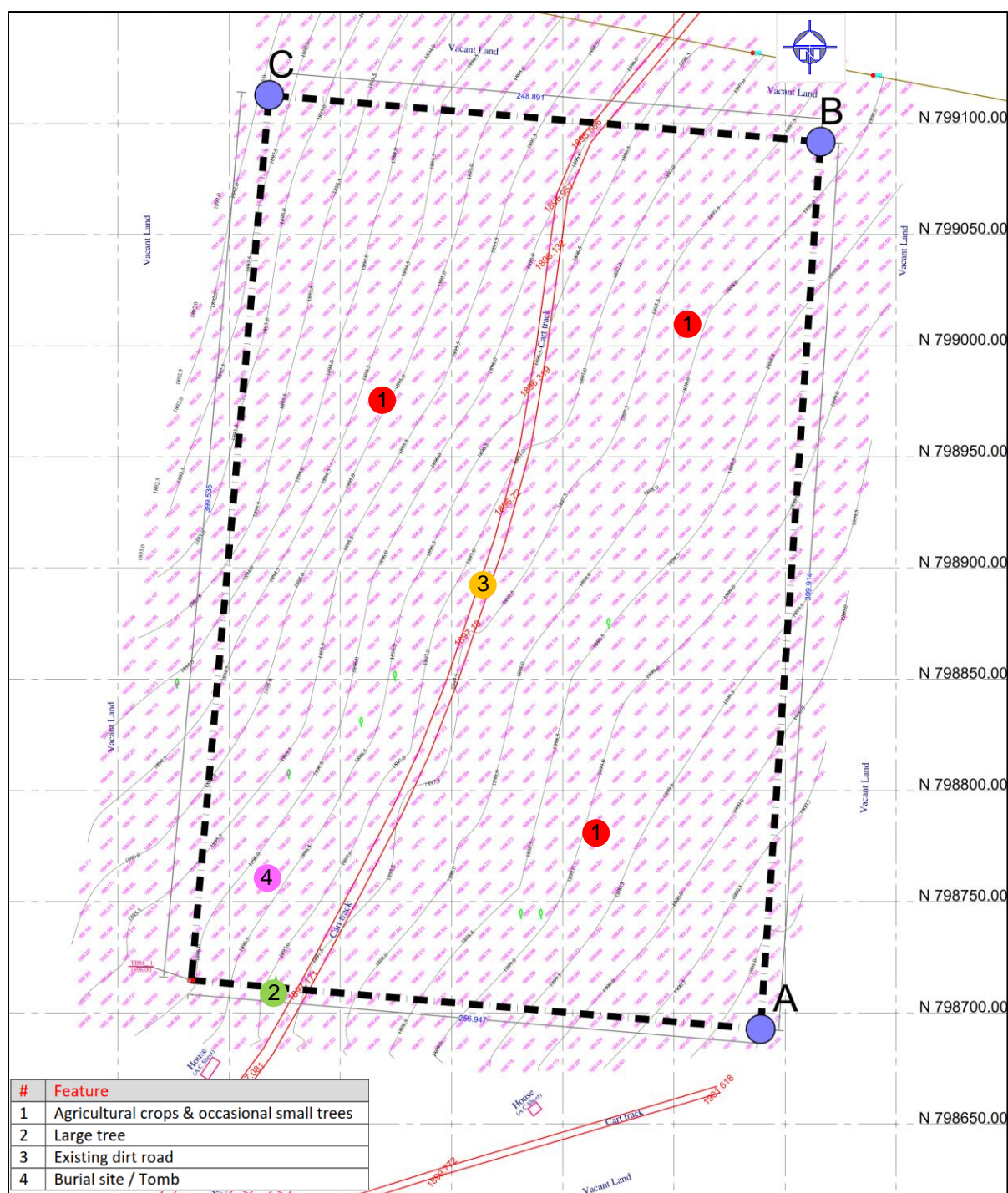


Figure 2-8: Existing features within the proposed RTC site (adapted from MACE site constraints drawing)

The RTC is to be focused on fruits, vegetables, cereals, livestock, milk, eggs and honey. Furthermore the RTC contains a quality control laboratory and other social infrastructure such as a rural market, training centre and crèche. The social infrastructure provides the necessary support for the occupant industries in the RTC. **Figure 2-9** provides a layout of the proposed master plan for the Shashemene RTC⁴.

⁴ **Note:** Based on the size and makeup of the RTC facility, should the internal layout of the proposed facility be amended this is considered to have a minimal effect on the identified impacts. This is only valid should internal amendments consist of

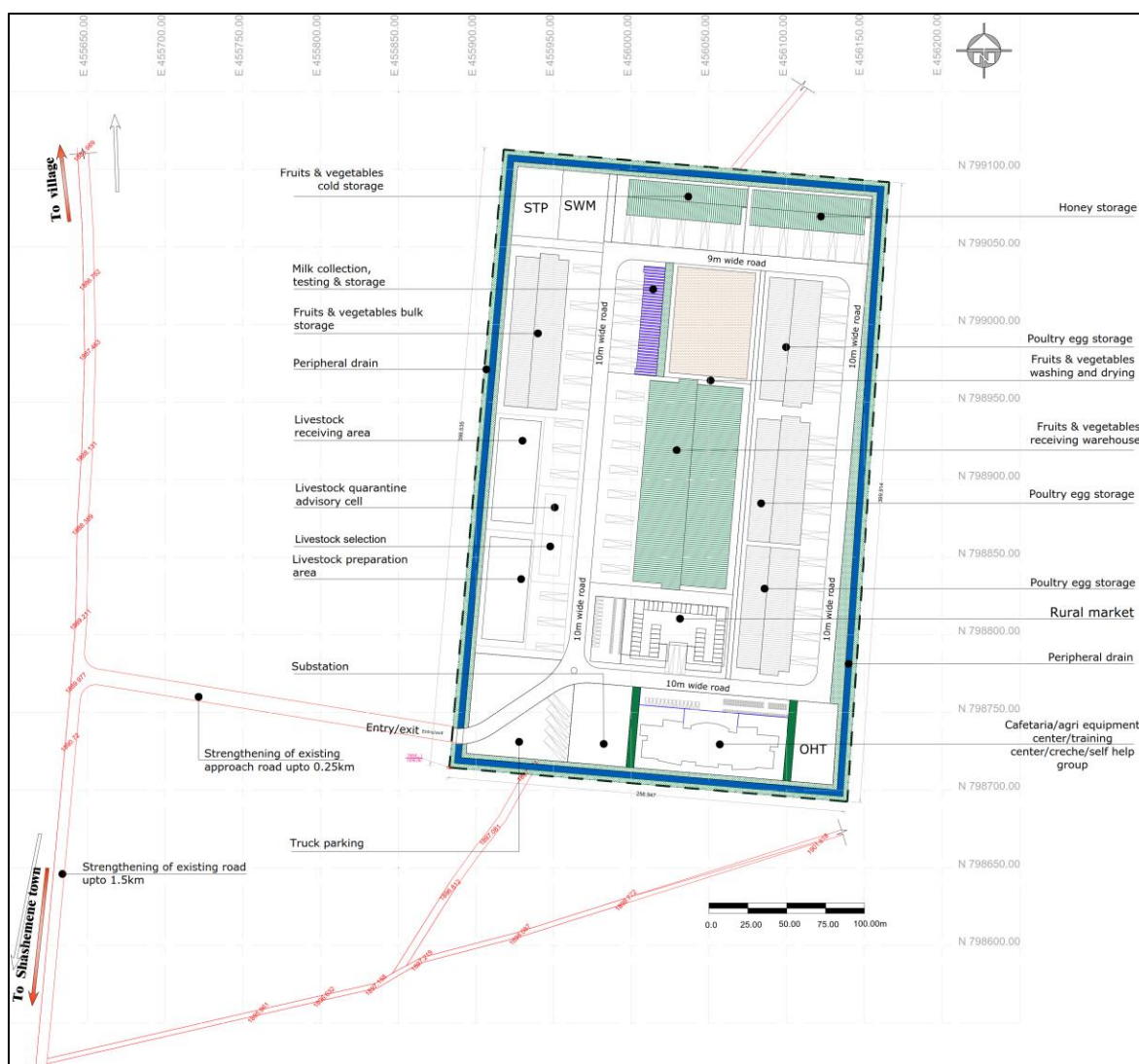


Figure 2-9: Master Plan of the Shashemene RTC (adapted from MACE master plan drawing)

2.2.4 PROCESS UTILITIES

WATER REQUIREMENTS

Water is supplied to the town of Shashemene by a series of 3 bore wells. It has been identified that there is no surplus water available in the existing scheme to supply the RTC. The estimated water demand for the RTC is expected to be 107 m³/day, including potable⁵ and non-potable⁶ water requirements (**Table 2-11**). It is therefore proposed to sink one deep bore well within the RTC site to meet the required demand.

rearranging the proposed internal facilities and infrastructure as indicated in Figure 2-9. Should additional facilities be added to an amended layout, this could result in additional impacts and would require assessment and approval prior to implementation.

⁵ Potable water is to be used for drinking and sanitary needs and washing vessels.

⁶ Non-potable water considered to be used for gardening, cleaning, cooling and toilet flushing

Table 2-11: Estimated average daily water demand for the RTC

Description	Potable (m ³ /day)	Non-potable (m ³ /day)	Total (m ³ /day)
Total water demand	83	24	107

To facilitate the adequate supply of water to the RTC suitable water storage structures in the form of an underground sump, elevated level storage reservoirs (ELSR) and pump house are to be established within the RTC to facilitate receiving raw water, treating the water, collecting the treated water and storing the water in a ELSR for further distribution. An area of 0.12 ha is earmarked for the construction of the water treatment plant, underground sump, pump house and ELSR within the RTC.

A suitable water treatment plant is to be established to treat the water in order to meet the acceptable limits of water quality as per Ethiopian drinking water standards.

WASTE WATER

A STP is to be established within the RTC which will treat the operational waste water generated within the RTC to a standard that is suitable for the treated waste water to be recycled in the operational processes. Furthermore sanitary waste water from toilets and urinals shall be collected in an underground sewer system that will be constructed as part of the processing plant's sanitary facilities. A self-contained treatment system will be put in place to treat sanitary water.

Treated waste water is to be re-used in the production process as non-potable water. The estimated volume of sewage⁷ to be generated by the IAIP during operations is shown in **Table 2-12**.

Table 2-12: Estimated average daily waste water generation for the Shashemene RTC

Processing and Non-processing areas	Quantity
Total	46.67 m ³ /day

2.2.5 ANCILLARY INFRASTRUCTURE

This Section provides a brief summary of the ancillary infrastructure is proposed for the RTC.

FUEL (DIESEL/PETROL) STORAGE

The RTC includes a truck lay bay area where it is anticipated that trucks will be able to refuel.

TRANSPORT ROUTES AND ACCESS TO SITE

Entrance to the RTC is to be gained from the south-west corner of the site via a network of secondary roads leading from the federal highway no. 7 through Shashemene (**Figure 2-9**). The existing dirt road running across the site will be removed. All internal roads will be constructed and maintained by the IPDC while the FDRE is responsible for maintenance of the roads outside of the IAIP.

ELECTRICAL OVERHEAD POWER LINES

It is understood that power for the RTC is to be sourced from the overhead power line currently passing in close proximity to the site.

⁷ Total sewage quantity includes effluent, sewage and sullage.

COMMUNICATION FACILITIES

Communication facilities available in the town of Shashemene are to be extended to the site. The installation of pipelines or infrastructure associated with the communication facilities is to be undertaken by the FDRE.

2.3 PHASES OF THE PROPOSED PROJECT

In general, development projects are undertaken in a series of set phases. Each of the phases have a different combination of activities and the commencement of each phase is dependent on the outcome and success of its predecessor. The identified Project phases are discussed below.

2.3.1 PLANNING AND DESIGN PHASE

As part of the preparation process MACE carried out the feasibility study and business plan for establishing IAIPs in Ethiopia. Following the feasibility study an engineering Scoping Study, based upon a simplified but more site-specific process, was undertaken along with the preparation of a preliminary design and associated project capital expenditure (CAPEX) and operational expenditure (OPEX) estimates corresponding to the design proposed. The engineering Scoping Study was approved by UNOPS/UNIDO resulting in the initiation of the detailed design process.

The planning and design phase of the proposed Project commenced in 2016 and will be completed once final authorisation has been issued by the relevant authorities.

2.3.2 CONSTRUCTION PHASE

The construction process is anticipated to continue for a period of approximately 36 months from commencement, following receipt of environmental certification, and is divided in three phases. Each phase is anticipated to continue for a 12 month period. Phase 2 is anticipated to commence after the first phase operational.

The following contracts have been awarded for the construction process of the IAIP and RTC facilities.

Table 2-13: Contracts awarded for construction phase 1

Site	Contract Awarded	Contractor	Duration
Bulbulla IAIP	Consultancy service of design review, supervision and contract administration	MH Engineering PLC	12 months
	Ground water Investigation, site selection and well drilling supervision	Oromia water works design and supervision enterprise	75 days
	Temporary fence	Two micro enterprise contractors	2 months
	Water well drilling and construction	Oromia Drilling Enterprise	1month
	IAIP phase I works	Walabu Construction	10 months

Site	Contract Awarded	Contractor	Duration
Shashemene RTC	Consultancy service of design review, supervision and contract administration	MH Engineering PLC	12 months
	Ground water Investigation, site selection and well drilling supervision	Oromia water works design and supervision enterprise	75 days
	Water well drilling and construction	Oromia Drilling Enterprise	1month
	RTC phase I works	Walabu construction	10 months
	Temporary fence	Two micro enterprise contractors	2 months

2.3.3 OPERATIONAL PHASE

Once the construction phase of the Project is complete, the operational phase will commence. As mentioned earlier the Project will consist of one IAIP and one RTC, with additional RTCs to be established in surrounding areas in the future based on the success of the pilot facilities (not included in this scoping report).

An IAIP is essentially a geographic cluster of independent firms grouped together to gain economies of scale and positive externalities by sharing infrastructure (i.e. roads, power, communication, storage, packaging, by-product utilisation, effluent treatment, logistics and transport, laboratory facilities, and the like) and taking advantage of opportunities for bulk purchasing and selling, training courses and extension services. Multiple agro-processing functions take place in an IAIP, such as final processing, storage, packaging, marketing and distribution. Support businesses and social infrastructure are also present. IAIPs include open area production zones, controlled environment growing, precision farming, knowledge hubs and research facilities, rural hubs, agri-infrastructure, collection centres, primary processing hubs, social infrastructure and agri-marketing infrastructure, among others. IAIPs are proposed to consist of state-of-the-art infrastructure including general infrastructure such as roads, power, water, communications, sewerage, sewage/effluent treatment plant, storm water systems, rain water harvesting, firefighting, etc., and specialised infrastructure such as cold storages, quarantine facilities, quality control labs, quality certification centres, raw material storage, controlled and modified atmospheric storage, central processing centres, etc.

RTCs also represent geographic clusters of infrastructure and services, though on a smaller scale than IAIPs. Farmers and farmer groups deliver their produce and receive agricultural inputs. At the RTCs, agricultural produce is collected, sorted, stored and may undergo primary processing before onward transport to an IAIP. For most farmers, the RTCs are the main point of contact with commercial agricultural value chains. Apart from their primary functions, RTCs are also intended to offer small-scale financial services to farmers as well as basic social services. RTCs are to include warehouses, input supply, sorting, grading, extension services, pre-processing activities and microfinance commercial activities. Via the FDRE and partners the RTCs will support farmers to increase productivity to supply raw material of required quantity and quality to the industries in the IAIPs. The centres will provide information on agro-food, business development, prices, market trend and current market demand in terms of products and quality, among other services.

The operational phase involves the day-to-day management of all operations undertaken at the Bulbulla IAIP and Shashemene RTC site and associated activities.

2.3.4 DECOMMISSIONING PHASE

The proposed IAIP and associated RTCs are intended to be long term operational facilities (i.e. are not intended to be decommissioned in the near future). As such decommissioning requirements and activities should be considered in the planning process however detailed requirements should be addressed in the future when / if decommissioning of the facilities is required. As such decommissioning is not considered further in this report.

2.4 PROJECT STATUS

As per **Table 2-13**, contracts have been awarded to various enterprises to undertake works as [art of the construction process. In preparation of the proposed development the following are being, or have been, undertaken.

2.4.1 BULBULLA IAIP

GROUNDWATER INVESTIGATION AND BOREHOLE DRILLING

Consultancy services for the hydrological investigation, site selection and well drilling supervision have been awarded to the Oromia Water Works Design and Supervision Enterprise. The following works have been undertaken:

- Hydrological investigation and site selection works have been completed;
- Supervision work is on progress.

The borehole drilling and well construction works contract has been issued to the Oromia Drilling Enterprise. The following works have been undertaken:

- Drilling and well construction works are completed;
- The decided depth of development is 259m;
- Pump test has been undertaken and the yield found be 26.6 l/sec; and
- Sample water chemistry analysis has been undertaken.

Refer to Section 8.8 for further detail.

COMPENSATION PROCESS

As identified by the IPDC and local authorities, the development of the Bulbulla IAIP facilities will affect two hundred and fifty two (252) PAPs. All 252 PAPs will be affected economically through losing access to the land plots where they cultivate crops, trees, shrubs. Amongst the 252 people, some of these PAPs will also be subject to physical displacement, where thirty one (31) tin-roofed houses and thirty seven (37) thatched-roofed houses will need to be removed from the project area. As a result, in total sixty eight (31+37=68) PAPs will be subjected to both economic and physical displacement out of the total number of 252 economically affected PAPs.

The authorities informed the WSP team that all but one of the identified PAPs had been issued with compensation by June 2017 (a Resettlement Action Plan has been developed as part of the Project, which focuses on displacement issues in more detail.)⁸.

⁸ A separate Relocation Action Plan (RAP) has been compiled and submitted for the proposed Oromia development, detailing the compensation process.

PHASE I WORKS

The contract for the construction of Bulbulla IAIP has been awarded to the Walabu Construction Share Company. To date the following works have been undertaken:

- Site hand over has been undertaken;
- Buildings profile work has been completed;
- Store and camp construction works are completed;
- Excavation and earth works of five blocks (Administration, Information Kiosk, Retail centre, Training centre and crèche) are completed; and
- Footing pad concrete casting work for all blocks are in progress.

PHASE II WORKS

Contracts for the establishment of the horizontal infrastructure have been awarded and the contractor is mobilising to commence these works at the IAIP site.

POWER SUPPLY

The IPDC has submitted the for the required power supply for the IAIP to the respective EELPA branch office.

2.4.2 SHASHEMENE RTC

GROUNDWATER INVESTIGATION AND BOREHOLE DRILLING

Consultancy services for the hydrological investigation, site selection and well drilling supervision have been awarded to the Oromia Water Works Design and Supervision Enterprise. The following works have been undertaken:

- Hydrological investigation and site selection works have been completed;
- Supervision work is on progress.

The borehole drilling and well construction works contract has been issued to the Oromia Drilling Enterprise. The following works have been undertaken:

- Drilling has been undertaken to a depth of 110 m.

COMPENSATION PROCESS

As identified by the IPDC and local authorities, the development of the Shashemene RTC will affect thirty five (35) PAPs in the Shashemene area. All 35 PAPs will be affected economically through losing access to the land plots where they cultivate crops, trees, shrubs. .

The authorities informed the WSP team that all the identified PAPs had been issued with compensation by June 2017 (a Resettlement Action Plan has been developed as part of the Project, which focuses on displacement issues in more detail.).

PHASE I WORKS

The contract for the construction of Shashemene RTC has been awarded to the Walabu Construction Share Company. To date the following works have been undertaken:

- Site hand over has been undertaken;
- Buildings profile work has been completed;
- Store and camp construction works are completed; and

- Excavation and earth works for all the blocks completed and footing pad concrete casting works are in progress.

PHASE II WORKS

Contracts for the establishment of the horizontal infrastructure have been awarded and the contractor is mobilising to commence these works at the RTC site.

POWER SUPPLY

The IPDC has submitted the for the required power supply for the RTC to the respective EELPA branch office.

3 NEED AND DESIRABILITY

The agricultural industry in Ethiopia faces the following challenges:

- Disorganised and fragmented land holdings;
- Absence of an integrated channel to link '*farm gate to food plate*';
- Weak infrastructure, limited support services to farmers;
- > 50% of food industries concentrated in and around Addis Ababa;
- Inability to tap the growing domestic and international markets;
- Lack of coordination of value chain and actors.

The above challenges mean that approximately 65 million farmers are not currently linked to industry. Ethiopia has a competitive advantage in several crops such as oil seeds and cotton, and horticultural crops such as fruits and vegetables which is often lost due to poor linkages with agro-industry and limited knowledge of efficient farming practices. The fragmented nature of the agricultural sector further compounds the inefficiencies inherent in the current market.

As identified in Chapter 1, although food-processing industries are present in Ethiopia, they are currently restricted in production by the availability of raw materials. The restriction on raw material input is related mainly to access, but also due to poor quality of the produce resulting in inefficient handling chains, post-harvest losses and higher prices. Investment and development of the agro-industrial sector will improve the economy by converting the agro-export from primary, unprocessed products to processed products, which uplift economic growth in this sector and the country as a whole. The primary limitation to this proposed agro-industrial growth is the lack of adequate infrastructure. The development of agro-industries presents Ethiopia with an opportunity to accelerate economic development and achieve its industrial development goals.

In addition, Ethiopia benefits from the United States' (US) African Growth and Opportunity Act, a law that gives many African countries duty-free export privileges to the US market. Opportunities also exist to obtain duty-free entry into the European Union (EU) countries, Canada and Japan. If addressed correctly, agro-industries can help fulfil the potential of agriculture and advance industrialisation in the country. The production of higher value products has been identified to be critical to achieving this transformation.

The IAIPs will have comparative advantages in terms of cost and efficiency allowing industries to '*pool resources and reduce shortages*' in the course of production. The intention is for the IAIPs to provide a '*one-stop-shop*' for agricultural industries and to facilitate and boost the export earnings for Ethiopia, which is currently restricted to coffee and vegetable product exports. Investors, both local and foreign will also be attracted to incentives ranging from 70 percent loans from state banks without collateral, duty free import of machineries and spare parts, to export tax exemption. The FDRE will be seeking to attract Ethiopian diaspora business investment into the IAIPs through incentives such as offering up to 85% loans without collateral allowing the Diaspora to place only 15% of financing at risk.

The overall objectives of the IAIPs are to:

- Drive the structural transformation of the Ethiopian economy;
- Reduce rural poverty through the integration of smallholder farmers, small-scale processing enterprises and allied industries in commercial value chains; and
- Create a better environment for increased investment in agro-food and allied sectors.

The IAIPs will:

- Encourage farmers to produce more quality products through better access to market;
- Create supply-chain infrastructure;
- Increase total flows of investment in agro-industry - both in terms of skills and capital;
- Foster linkages between agriculture and agro-industry;

- Provide a close interface between research, extension mechanisms, industry and farmers in the agricultural sector;
- Increase value addition and reduce wastages, thereby increasing the income of farmers;
- Produce better quality products to increase Ethiopia's share in manufacturing value addition in the GDP;
- Create rural employment, off-farm broad based income opportunities and improve quality of life in rural areas;
- Assist small-scale agro-industrial enterprises to remain competitive in global markets; and
- Facilitate commercialisation of agriculture and increase exports of processed and value added agro-products.

The overall goal of the Government's Industrial Development Strategy (IDS) is to bring about the accelerated structural transformation of the economy through enhancing industrialisation, raising the share of the industrial sector of GDP from the current 13% to 27% by 2025, and the GDP share of the manufacturing sub-sector from the current 4% to 18% by 2025.

The development of IAIPs is prioritised in Ethiopia's national development strategy and is a core component of the current Growth and Transformation Plan (GTP II, 2015-2020). This plan emphasises that economic structural transformation is central for sustainable growth and development in Ethiopia.

The proposed Project will be an important source of foreign currency inflows and taxes, as well as creating significant direct and indirect employment in the region. As a large regional project the IAIP and RTC has the potential to act as a catalyst for development of the region.

4 PROJECT ALTERNATIVES

4.1 INTRODUCTION

An ESIA process is to include an analysis of reasonable alternatives to the proposed project such as alternative sites, routes, engineering options, layouts and technologies in terms of their potential Environmental and Social impacts, the feasibility of avoiding these impacts and where this is not possible the approach to mitigating the identified impacts.

There are two types of project alternatives, these are:

- Concept Level Alternatives which relate to site, technology and process alternatives; and
- Detailed Level Alternatives which related to working methods and mitigation measures.

The higher level concept alternatives are addressed in this section as detailed level alternatives are addressed through the identification and implementation of mitigation measures. The objective of the comparison of alternatives is to outline how the Project represents an optimised design that is technically and financially feasible whilst minimising overall environmental and social impacts.

4.2 CONSIDERATION OF ALTERNATIVES

Based on the project summary published by UNIDO in 2016 (UNIDO, 2016), the IAIPs were selected on the basis of six broad criteria as described below. It is noted that the issue of environment was not considered during the site selection process; this can be sited as a limitation of the feasibility and screening phases of the proposed Project.

4.2.1 AGRICULTURAL PRODUCTION POTENTIAL FOR STRATEGIC COMMODITIES

The key consideration for identifying alternatives is understanding what the primary agricultural products are in the Oromia Region, such as livestock, coffee, sesame, cereals, pulses, fruits and vegetables, and honey, etc. Once this criteria was understood, the production potential for the region was calculated to assist in developing an understanding of the land requirements for the industrial park.

4.2.2 INTER-INDUSTRY LINKAGES AND TRIGGERING EFFECT

This consideration focused on the potential linkages with existing thriving industries that could trigger further industrial development. Specifically, the existence and location of agricultural/plantation projects and factories, and exportable cash crop commodities were identified to help in the site selection process.

4.2.3 INFRASTRUCTURE FACILITIES

Available infrastructure is an important consideration in the location and scaling of industrial parks. Therefore the presence of power, road network, water, railways, airport terminals and telecommunication infrastructure were taken into account.

- Power – Availability of power in the growth corridors was assessed based on the presence of power stations, sub-stations and transmission lines within or near the parks.
- Road network – Road network densities for the corridors were assessed by examining national road network data from official national zonal administration boundaries.

- Water – The availability of water was analysed for both agriculture and industrial processing by considering the mean annual rainfall, availability of river systems, availability of natural and artificial reservoirs, and groundwater potential.
 - Railways, dry port, airport terminals and telecommunication – Railways and dry ports were evaluated considering the current and oncoming national networks/projects.
-

4.2.4 MARKET POTENTIAL

A viable market for the products and services available in the park is essential for the successful establishment and the long-term commercial viability of the park. The urban sector is assumed to be the prime market for industrial agro-processed products. Thus, the urban population size of each corridor and proximity of parks to urban centres was considered.

4.2.5 ACCESS TO COMMERCIAL AND SUPPORT SERVICES

Commercial and support services such as universities, research centres, technical vocational education and training centres; farmers' cooperatives and unions; and financial institutions are very important in providing services demanded by the park. Their proximity to the parks was considered.

4.2.6 CONCENTRATION OF ENTERPRISES AND ATTRACTIVENESS FOR INVESTORS

The existence of an industrial base and facilities such as import/export logistics, housing, recreation centres, schools and other social facilities are very important for attracting investors/manpower and retaining those that may establish firms or work within the Park. The density and proximity of these facilities was taken into account.

4.2.7 STRATEGIC ALTERNATIVES

As part of the feasibility studies, 17 agro-industrial growth corridors (AIGC) were identified. One IAIP is planned to be developed in each of the AIGCs. Based on the results of the feasibility studies, the development of IAIPs and RTCs will take place in two phases. The first implementation phase began in February 2016 and will see a total of four pilot IAIPs and 28 RTCs developed. The selected sites are in Eastern SNNP, Central Eastern Oromia, Southwest Amhara and Western Tigray.

4.2.8 SITE ALTERNATIVES

The site selection process was undertaken by the Mol in collaboration with the local authorities and MACE.

The original number and location of potential sites identified for the location of the Oromia IAIP is unknown while it has been indicated that 24 initial sites were identified for the location of RTCs. This was limited to 8 sites following an assessment. This process was undertaken at a high level and little documentation exists on the process and methods used to determine the most preferred site.

4.2.9 SITE LAYOUT ALTERNATIVES

Site layout alternatives have been considered for the Bulbulla IAIP site. Following site selection, during the feasibility study, a site survey was undertaken to determine the sites opportunities and constraints. Based on the findings of the initial site screening assessment various layouts were generated and assessed based on efficiency. The proposed layout contained within this report is the preferred layout for the IAIP and RTC facilities.

4.2.10 TECHNOLOGY ALTERNATIVES

Various sewage treatment options were considered for the IAIP site. The sewerage treatment systems considered for selection are identified in **Table 4-1**.

Table 4-1: Sewage treatment systems considered.

No	Process	Units Required	Accessories
1	Activated sludge – extended aeration	Aeration tank and secondary clarifier	Surface aerators or membrane diffuser system for oxygen supply
2	Aerated lagoon	Earthen bund basins	Fixed or floating aerators for oxygen supply
3	Up-flow Anaerobic Sludge Blanket (UASB)	Reactor with liquid, solid and gas separation facilities	Gas collector, burner and influent distribution system
4	Trickling Filters	Circular tanks with media, under drain and secondary clarifier	Rotary distributor for influent and re-circulation pumps
5	Rotating Biological Contractors (RBC)	Trough with PVC/plastic discs, secondary clarifier	Drive mechanism for rotating the discs
6	Fluidized aerobic bio reactor	Reactor tank with poly propylene media & diffusers followed by secondary clarifier	Blowers for supply of oxygen through membrane diffusers
7	Sequencing Batch Reactor (SBR)	It uses deep RCC basins, and very efficient oxygen transfer equipment's (diffused aeration mechanism)	Diffusers, blowers and aeration grid, which provides highest aeration and oxygen transfer efficiency. Decanter assembly in Stainless steel equipped with variable frequency drive to automatically control rate of decanting based on input feed condition.
8	Membrane Bio Reactor (MBR)	Aeration tanks followed by balancing tank and membrane bio reactor	Diffusers, blowers to supply oxygen, air compressors for backwashing, chemical dosing for pre-treatment.

Factors that were considered in the selection of an appropriate treatment system included:

- Reliability;
- Vector nuisance;
- Area availability;
- Power requirement;
- Capital cost; and
- Operation and maintenance cost.

Overall the SBR system (Option 7) was identified as the preferred option as it has the lowest construction costs although the mechanical instrumentation cost is higher. In addition, the operating costs are low but this will depend on the inflow capacity of the system. The SBR system has very

minimal fouling with a constant output quality. Furthermore, the system is partially automatic with low power requirements.

4.2.11 NO-GO ALTERNATIVE (I.E. THE PROJECT IS NOT ESTABLISHED)

In the event of abandonment of the Project, especially because it requires investment from international financial institutions, it could send a negative message to other international investors as to the capacity of the FDRE to accommodate this type of industrial park project. In turn this could reduce the take up and success of other mega projects being planned / implemented in Ethiopia.

Without the Oromia IAIP and RTC project, economic development of the Oromia Region will be compromised in the short term. The Ethiopian Agricultural sector's potential to support the next generation will remain constrained as a result of restrictions in available land and limited diversity of income sources. The lack of industrialisation of the agricultural sector will limit the revenue base which would leave the GDP of the country still heavily dependent on the agricultural sector.

Finally, without the Project, there would be no additional impacts, either positive or negative, on the physical, biological and social environments, although existing pressures on resources and infrastructure will continue, in some cases leading to the deterioration of the quality of life for future generations. Since the ESIA demonstrates that the overall balance of impacts is positive, primarily as a result of the employment opportunities for the current and future generations and the anticipated contribution these projects will make to the Ethiopian GDP. Therefore the abandonment of the Project would deprive the country and local communities of these benefits. Job creation expected during the construction and operational phases, as well as the positive outfalls on the health and education sectors would also not materialise.

5 LEGAL FRAMEWORK

This Chapter provides a high-level overview of the institutional and legislative framework for the ESIA associated with the proposed Project.

5.1 INSTITUTIONAL FRAMEWORK

As per Chapter 2 the proposed IAIP site is located in the Central Eastern Oromia Region with the IAIP located in the East Shewa zone and the RTC located in the West Arsi zone.

The current system of government in Ethiopia is organised into a federal structure, comprised of the federal government, nine regional states and two city administrations. EIA administration in Ethiopia is shared between the federal government and regional states. The Environmental Protection Organs Establishment Proclamation (295/2002) established the institutions responsible for the enforcement and regulation of EIAs; these include the Federal Ministry of Environment, Forestry and Climate Change (MEFCC,) Regional Environmental Agencies and the Sector Environmental Units. In addition the delegated sector Ministries which, through Federal MEFCC delegation, have been assigned the dual role of ensuring timely and effective enforcement for preparation of sector specific EIAs authorised/licensed at Federal level as well as of reviewing EIA reports.

FEDERAL MINISTRY OF ENVIRONMENT, FORESTRY AND CLIMATE CHANGE (MEFCC)

The MEFCC is the lead agency responsible for formulating policies, strategies, laws and standards to ensure social and economic development activities sustainably enhance human welfare and safety of the environment (Article 6, Proclamation 295/2002). The enforcement and administration of EIAs is one of the key responsibilities entrusted to the MEFCC. In this respect, the MEFCC is responsible for establishing and updating the system for undertaking EIAs in public and private sector projects. The MEFCC is responsible for developing directives that identify categories of projects likely to generate adverse impacts and require a full EIA, and for issuing guidelines that direct preparation and evaluation of EIA reports (Proclamation 299/2002, Articles 5 and 8). As per proclamation 916/2015, the MEFCC have bestowed among others with the following powers and duties:

- Coordinate activities to ensure that the environmental objectives provided under the Constitution and the basic principles set out in the Environmental Policy of the Country are realised;
- Establish a system for evaluating and decision making, in accordance with the Environmental Impact Assessment Proclamation, the impacts of implementation of investment programs and projects on environment prior to approvals of their implementation by the concerned sectoral licensing organ or the concerned regional organ;
- Coordinate actions on soliciting the resources required for building a climate resilient green economy in all sectors and at all Regional levels; as well as provide capacity building support and advisory services;
- Establish an environmental information system that promotes efficiency in environmental data collection, management and use;
- Enforcing and ensuring compliance to the EIA proclamation which currently is being implemented through delegated authority provided to sector ministries;
- Reviewing EIAs and monitoring the implementation of EIA recommendations which is also in part being implemented through delegated authority provided to sector ministries;
- Regulating environmental compliance and developing legal instruments that ensure the protection of the environment;
- Ensuring that environmental concerns are mainstreamed into sector activities; and
- Coordinating, advising, assessing, monitoring and reporting on environment-related aspects and activities.

In addition, the Federal MEFCC is responsible for evaluating EIA reports of projects that need to be licensed and executed by the federal government and projects that are likely to generate inter-regional impacts. The Federal MEFCC is also responsible for monitoring and auditing the implementation and performance of such projects. The Federal MEFCC holds primary responsibility for providing technical support on environmental protection and management to regional states and sector institutions

REGIONAL ENVIRONMENT, FOREST AND CLIMATE CHANGE BODIES

Proclamation 295/2002 requires regional states to establish or designate their own regional environmental agencies. The regional environmental agencies are responsible for coordination, formulation, implementation, review and revision of regional conservation strategies as well as environmental monitoring, protection and regulation (Article 15).

Relating to EIA specifically, Proclamation 299/2002 gives regional environmental agencies the responsibility to evaluate EIA reports of projects that are licensed, executed or supervised by regional states. Regional environmental agencies are also responsible for monitoring, auditing and regulating implementation of such projects.

SECTOR ENVIRONMENT UNITS:

The other environmental organs stipulated in the Environmental Protection Organs Establishment Proclamation (295/2002) are 'Sector Environmental Units' which have been established in some of the line Ministries. These Sector Environment Units have the responsibility of coordinating and implementing activities in line with environmental protection laws and requirements (Article 14, Proclamation 295/2002). To this end, Sector Environmental Units play an important role in ensuring that EIA is carried out on projects initiated by their respective sector institution.

DELEGATED AUTHORITY:

The MEFCC has delegated authority to sector institutions to ensure implementation of EIAs in their sector and to undertake EIA reviews. For instance, the Federal Ministry of Industry, Agriculture, Mining as well as Water, Energy and Irrigation are responsible for ensuring that an EIA is undertaken on their sectoral projects and to review an EIA.

5.2 POLICY AND LEGAL FRAMEWORK IN ETHIOPIA

The following policies and legal frameworks are identified to be relevant to the proposed Project and associated ESIA.

- Constitution of the Federal Democratic Republic of Ethiopia (1995), specifically Articles 43, 44 and 92 as well as Article 40.
- Environmental Policy of Ethiopia (1997).
- Environmental Impact Assessment Proclamation (299/2002), which makes EIAs a mandatory requirement for the implementation of major development projects, programs and plans in Ethiopia.
- Ethiopian Water Sector Policy (2001), whereby the Ministry of Water, Irrigation and Electricity will need to be consulted with regards to what water permitting/licensing requirements will be necessary for the successful implementation of the proposed Project.
- Water Resources Management Proclamation (197/2000). For the protection of water resources (both surface- and groundwater) of Ethiopia.
- Water Resources Management Regulation (115/2005), which provides detailed provisions for the effective implementation of its parent legislation, the Water Resources Management Proclamation.
- Water Resources Utilisation Proclamation (92/1994), regulating the use of water resources, by requiring a government permit in respect of most water uses.

- River Basin Councils and Authorities Proclamation (534/2007), for the promotion and monitoring of integrated water resources management for Ethiopia's river basins.
- Environmental Pollution Control Proclamation (300/2002), which restricts release of gaseous, liquid or solid wastes to the environment exceeding the environmental standards and advocates a "polluter pays" policy.
- Prevention of Industrial Pollution Council of Ministers Regulation (159/2008), which is directed to detail the implementation of pollution control proclamation with focus on industry.
- Solid Waste Management Proclamation 513/2007, which aims to promote community participation to prevent adverse impacts and enhance benefits resulting from solid waste management.
- Policy for Rural Development (2003), given the dominance of agriculture in the Ethiopian economy, the rural development effort is presently associated with agricultural development. In order to facilitate agricultural development, there is a need to undertake rural infrastructure and social development programmes.
- Labour Proclamation (377/2003) as amended, requiring that the employer takes the necessary measures to adequately safeguard the health and safety of their workers.
- Public Health Proclamation (200/2000), which disallows the discharge of untreated effluent waste generated from septic tanks, seepage pits and industries into water resource. It also prohibits the disposal of solid or liquid wastes or any other waste in a manner which contaminates the biophysical, physical or social environments.
- The Federal Democratic Republic of Ethiopia Rural Land Administration and Land Use Proclamation (456/2005), which applies to all rural land in Ethiopia. The proclamation aims to conserve and develop natural resources through the development of and implementation of sustainable land use planning.
- Payment of Compensation for Property Situated on Landholding Expropriated for Public Purposes Regulation (135/2007), which provides a formal approach for the payment of compensation and to assist livelihood restoration for displaced persons.
- Accession to African Human and People's Rights Charter Proclamation (114/1998), formalising the Ethiopian Governments support for regional and international efforts to achieve normative standards for basic human rights.
- Convention for the Safeguarding of the Intangible Cultural Heritage Ratification Proclamation (484/2006), which formalises the adoption of the Convention for the Safeguarding of the Intangible Cultural Heritage in Ethiopia at the General Conference of the United Nations Educational, Scientific and Cultural Organisation in Paris on 17 October 2003. The Ethiopian Government ratified the said Convention on 24 January 2006.

5.3 SPECIFIC LEGAL FRAMEWORK FOR INDUSTRIAL PARKS IN ETHIOPIA

The legal instruments identified below have been specifically developed for the purposes of providing National controls and regulations to all industrial parks developed in Ethiopia. The IAIP developments will therefore be governed by this legal framework.

5.3.1 INDUSTRIAL PARK PROCLAMATION NO. 886/2015.

The Industrial Park Proclamation No. 886/2015 defines an industrial park as being an area with a distinct boundary designated by the appropriate organ to develop comprehensive, integrated, multiple or selected functions of industries, based on a planned fulfilment of infrastructure and various services such as road, electric power and water. These parks are intended to be a 'one stop shop'. The proclamation then identifies the key role players as the 'Industrial Park Developer', 'Industrial Park Operator' and the 'Industrial Park Enterprise'. Before any of these entities can commence with any construction or operation of a business or enterprise within the park they will require an 'Investment

Permit' issued by the commissioner. This permit will allow the Industrial Park Developer, Operator or Enterprise to carry out industrial park development related activities.

In terms of Article 6(4) of the proclamation the Industrial Park Developer is required to adhere to the performance requirements for the phased development of the industrial park as well as any financial obligations and time schedules for financial and debt financing, specified in the permit. The Developer will also be required to comply with other obligations specified in the Proclamation, the Regulation (see below), environmental protection legislation and other applicable laws. The Industrial Park Operator is obliged to meet the permit terms. Article 8(6) states that the Industrial Park Operator is also obligated to comply with social and environmental as well as any other obligations as provided for in this Proclamation, the Regulation, applicable laws and its permit or agreement.

Article 10(4) obligates the Industrial Park Enterprise to comply with this Proclamation and the Regulation in general and the environmental, social and employer obligations in particular contained therein and in other applicable laws. Article 28(1) states that the Labour Proclamation No 377/2003 (as amended) shall be applicable in any industrial park.

Article 24(2) requires the MEFCC to establish offices within the industrial parks for the application, supervision, protection and enforcement of environmental norms and standards, safeguards, management and mitigation plans within the industrial parks.

Article 28(5) requires the Ministry of Industry to facilitate technology transfer and skills development in general and domestic manufacturing sector capacity building in particular mainly through clustering and other best practice approaches.

This Proclamation does provide an avenue for enforcement of compliance with the contents of the Proclamation in that Article 30(a) allows for the issuance of a reprimand, suspension and revocation of the permit.

5.3.2 INDUSTRIAL PARKS COUNCIL OF MINISTERS REGULATIONS NO. 417/2017.

The Industrial Parks Council of Ministers Regulation provides more detailed requirements in relation to Industrial Parks. Article 5(5) states that 25% of the land set aside for the industrial park may not be developed. All land to be used for the purposes of factories, buildings, facilities for common use, infrastructure, residence and related buildings within the industrial parks area shall neither be less than 50% nor exceed 75% of the land under possession. Article 5(8) requires that an ESIA be undertaken and the necessary certificate received from the competent authority. Article 9(2) states that an environmental impact assessment report is required before an investment permit can be issued.

The Regulation also places controls over construction activities by requiring in Article 11(7) for the Commission to oversee and ensure construction of an enterprise confirms with the relevant laws.

Article 18(1) requires the Ministry of Industry and other relevant organs to make sure that industrial parks recruit workers, foster skills development and transfer, and transfer and upgrading of technology; they shall also ensure supply and render support in regard to the realisation of these. Article 18(2) requires that the Ministry of Industry shall design training programs that enable transfer of skills and knowledge to Ethiopian workers.

5.4 NATIONAL STRATEGIES AND PLANS

The following national strategies and plans have been identified to be relevant to the proposed Project and associated ESIA.

- Conservation Strategy of Ethiopia;
- Ethiopia's Climate-Resilient Green Economy Strategy
- National Growth and Transformation Plan II; and
- Ethiopian Agro-Industry Sector Strategy.

5.5 NATIONAL STANDARDS, DIRECTIVES AND GUIDELINES

The following national standards, directives and guidelines have been identified to be relevant to the proposed Project and associated ESIA.

- Environmental Standards for Industrial Pollution Control in Ethiopia - These standards present pollution limits for emissions to (i) atmosphere, (ii) water resources and (iii) noise emissions.
- EIA Directive No. 1/ 2008, A Directive to Determine Projects Subject to Environmental Impact Assessment - The directive lists the various activities that require the undertaking of an EIA prior to the commencement of that specific activity. This includes the construction of tanneries, abattoirs, industrial waste disposal facilities and industrial zones.
- Draft Guideline for Environmental Management Plan for the Identified Sectorial Developments in the Ethiopian Sustainable Development & Poverty Reduction Programme (ESDPRP), May 2004 - The guideline outlines the necessary measures for the preparation of an EMP for proposed developments in Ethiopia and the institutional arrangements for implementation of EMPs.
- EIA Guideline, July 2000, - This guideline provides a background to environmental impact assessments and environmental management in Ethiopia.
- The Federal Environmental Protection Authority, Environmental Assessment Reporting Guide, 2004, Addis Ababa - The guideline provides a standardised reporting framework for environmental assessments. It is however the responsibility of proponents and associated assessors to ensure that sufficient information is included in environmental assessments and that this information is forwarded onto all concerned and interested environmental agencies for review and consideration.

5.6 REGIONAL PLANS

Regional plans are to be reviewed and taken into consideration when developing mitigation / management measures during the ESIA process. Regional plans should align with national development plans to ensure project sustainability.

5.7 INTERNATIONAL CONVENTIONS, PROTOCOLS AND AGREEMENTS

Ethiopia is signatory to a number of international conventions and agreements, and in certain cases these have influenced the development of policies, guidelines and regulations. The ESIA will need to consider these conventions and agreements and ensure compliance during the planning, construction and operation phases of the proposed Project.

The following international conventions and protocols, to which Ethiopia is a signatory, are to be considered:

- International Labour Organisation (ILO) Forced Labour Convention, 1930 (No. 29);
- ILO Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87);
- ILO Right to Organise and Collective Bargaining Convention, 1949 (No. 98);
- ILO Equal Remuneration Convention, 1951 (No. 100);
- ILO Abolition of Forced Labour Convention, 1957 (No. 105);
- ILO Discrimination (Employment and Occupation) Convention, 1958 (No. 111);
- ILO Minimum Age Convention, 1973 (No. 138);
- ILO Worst Forms of Child Labour Convention, 1999 (No. 182);

- ILO Right of Association (Agriculture) Convention, 1921 (No. 11);
- ILO Tripartite Consultation (International Labour Standards) Convention, 1976 (No. 144);
- The United Nations Convention on the Rights of the Child, 1990;
- The Stockholm Convention on Persistent Organic Pollutants;
- Convention on Biological Diversity;
- The United Nations Framework Convention on Climate Change, 1992;
- The United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa;
- The United Nations Convention for the Safeguarding of the Intangible Cultural Heritage;
- The United Nations Convention on the Protection and Promotion of the Diversity of Cultural Expressions;
- The United Nations Convention Concerning the Protection of World Cultural and National Heritage;
- The Vienna Convention for the Protection of the Ozone Layer;
- Montreal Protocol on Substances that Deplete the Ozone Layer;
- The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;
- Libreville Declaration on Health and Environment in Africa;
- The United Nations Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora, 1973; and
- The United Nations Convention on Biological Diversity (Rio Convention), 1992.

5.8 INTERNATIONAL GUIDELINES AND STANDARDS

5.8.1 OVERVIEW

Environmental and social impacts as well as sustainability are key principles for many international financing organisations. Various guidelines and standards exist, each varying in the areas of focus and level of detail required, with regards to environmental and social requirements for proposed projects. These include the AfDB Integrated Safeguards System, World Bank Group (WBG) Operational Policies and Environmental, Health and Safety (EHS) Guidelines as well as the International Finance Corporation (IFC) Performance Standards.

Each of these above guidelines and standards cover essentially the same scope (environmental, labour, social, health and safety, supply chain etc.) The AfDB has their own integrated safeguards system based on the IFC standards, but exclude the extensive and detailed guidance notes for their standards. This typically provides more flexibility (and less stringency) in application of their standards.

In broad terms, all multilateral development banks include key common features in their safeguards in that they all require an environmental and social assessment, they all address the issue of involuntary resettlement, pollution prevention, biodiversity, indigenous peoples, and cultural heritage. There is some variation in relation to the level of inclusion by some banks of important social issues such as community impacts and labour conditions and environment flows.

The World Bank and IFC requirements are broadly identical. The primary differentiation is that the World Bank applies to projects where funding is going to government-affiliated projects/lenders (including parastatals), whereas IFC applies to funding going to pure private sector borrowers. The Ethiopian Government in collaboration with UNIDO have elected to apply the AfDB Integrated Safeguards System as the regulatory framework for the ESIA to follow.

The following sections identify the relevant AfDB Integrated Safeguards System which is applied to projects to promote growth that is socially inclusive and environmentally sustainable. The purpose of the safeguards is to avoid adverse impacts of projects on the environment and affected people while maximising potential development benefits. Where avoidance is not possible mitigation and compensation should be implemented to manage the environmental and social risks.

5.8.2 AFRICAN DEVELOPMENT BANK INTEGRATED SAFEGUARD SYSTEM

The AfDB adopted the Integrated Safeguard System (ISS) as a tool for identifying risks, reducing development costs and improving project sustainability. The ISS promotes best practices in these areas but also encourages greater transparency and accountability and protects the most vulnerable communities. The AfDB encourages member countries to observe international human rights norms, standards, and best practices on the basis of their commitments made under the International Human Rights Covenants and the African Charter of Human and Peoples' Rights.

The AfDB ISS builds on the two previous safeguard policies, Involuntary Resettlement (2003) and Environment (2004), and on three cross-cutting policies and strategies: Gender (2001), the Climate Risk Management and Adaptation Strategy (2009) and the Civil Society Engagement Framework (2012). The bank has now adopted five Operating Safeguards (OSs) to achieve the goals and the optimal functioning of the Integrated Safeguards System (ISS). These OSs are:

- **Operational Safeguard 1:** Environmental and Social Assessment: this is an overarching safeguard of determining a projects environmental and social category and the resulting environmental and social assessment requirements.
- **Operational Safeguard 2:** Involuntary resettlement land acquisition, population displacement and compensation: this consolidates policy commitments and requirements contained in the Bank's policy on involuntary resettlement, and incorporates a number of refinements designed to improve the operational effectiveness of those requirements.
- **Operational Safeguard 3:** Biodiversity and ecosystem services: this seeks to conserve biological diversity and promote the sustainable use of natural resources with a focus on integrated water resources management in operational requirements.
- **Operational Safeguard 4:** Pollution prevention and control, hazardous materials and resource efficiency: this covers the range of key impacts of pollution, waste, and hazardous materials for which there are agreed international conventions, as well as comprehensive industry-specific and regional standards, including greenhouse gas accounting. The Bank's new screening tool for climate change risk helps in screening and categorising a project in terms of its vulnerability to the risks of climate change.
- **Operational Safeguard 5:** Labour conditions, health and safety: this relates to workers conditions, rights and protection from abuse or exploitation.

The AfDB requires that an assessment be conducted according to the principles of proportionality and adaptive management. Therefore the level of assessment and management required should be proportionate to the level of risk that the project poses. This is determined through the project categorisation and scoping phase. Project categorisation follows the principle of using the appropriate type and level of environmental and social assessment for the type of operation. A Category 1 project is likely to cause significant environmental and social impacts and therefore must be subject to a full ESIA process, whereas a Category 2 project is likely to cause less adverse environmental and social impacts and a simplified ESIA is applicable.

The AfDB therefore categorises projects based on the anticipated significance of environmental and social impacts. One defining factor revolves around the level of resettlement a project is anticipated to result in. Where a project will involve 200 or more persons or the project is likely to have an adverse effect on vulnerable groups then the project will require a Full Resettlement Action Plan and is deemed a Category 1 Project. Where a project will displace fewer than 200 people and where land acquisition and potential displacement and disruption of livelihoods are less significant, then the project is deemed to be a Category 2 Project.

The proposed Oromia project will result in 295 PAPs being directly affected by the proposed development through a combination of physical and economic displacement. Therefore, as the project

will affect more than 200 individuals, the Oromia IAIP and RTC sites are undergoing a full ESIA assessment process.

The AfDB standards do not provide detailed guidelines on methodological requirements in some specialist areas and therefore in such cases the South African standards have been applied as these are more aligned with the IFC standards and are therefore considered to suitably meet international good practice.

6 THE ESIA PROCESS

The Environmental and Social Impact Assessments (ESIAs) and Resettlement Action Plans (RAPs) will be undertaken to African Development Bank (AfDB) requirements. AfDB requires that the level of assessment undertaken should be proportionate to the level of risk that the project poses. The AfDB therefore categorises projects based on the anticipated significance of environmental and social impacts. The defining factor revolves around the level of resettlement a project is anticipated to result in. Where a project will involve 200 or more persons or the project is likely to have an adverse effect on vulnerable groups then the project will require a full RAP and is deemed a Category 1 Project. Where a project will displace fewer than 200 people and where land acquisition and potential displacement and disruption of livelihoods are less significant, then the project is deemed to be a Category 2 project.

The Oromia IAIP and RTC site is considered a **Category 1** project based on the number of people affected by the Project. A Category 1 project must have a full ESIA process undertaken. The key steps to an AfDB ESIA are presented below.

6.1 SCOPING PHASE

The purpose of the scoping phase is to detail the key sensitivities and activities that have the potential to contribute to, or cause, potentially significant impacts to environmental and socio-economic receptors and resources and to evaluate siting, layout and technology alternatives for the proposed project.

The key objectives of scoping are to:

- Identify and detail the potentially most significant impacts;
 - Obtain stakeholder views through consultation; and
 - Develop the Terms of Reference (ToR) for the ESIA through consultation so as to ensure that the process and output are focused on the key issues.
-

6.1.1 STAKEHOLDER ENGAGEMENT

The key principle of consultation is to ensure that the views of stakeholders are taken into account and reported throughout the ESIA process. The objective is to ensure the assessment is robust, transparent and has considered the full range of issues or perceptions, and to an appropriate level of detail.

Stakeholders include those individuals, groups or organisations who themselves could be directly affected by the proposed Project (Project Affected People) and those individuals or organisations who, although not directly affected by the proposed Project, represent those affected or have a regulatory duty, an interest, influence or secondary involvement in the proposed Project (secondary stakeholders).

Stakeholder engagement commenced with the IPDC having undertaken discussions with Project Affected People (PAPs) and carried out a census and asset inventory survey to inform the relocation and compensation process.

During the site investigation stage, stakeholder engagement meetings were undertaken by the consultant to provide detailed information about the Project to the community as well as to obtain feedback from the local community in terms of the Project. The findings from the stakeholder engagement process undertaken to date are presented in Chapter 7 of the Scoping Report and reflected in the minutes of the stakeholders and community consultation meetings (attached in **Appendix B**).

Stakeholder engagement is to continue throughout the ESIA process ensuring that legislative requirements and Project standards are met, that stakeholder concerns are addressed in the assessment and that sources of existing information and expertise are identified.

6.1.2 BASELINE DATA COLLECTION

One of the main objectives of the Scoping stage of the ESIA process is to collect suitable data on the physical, biophysical and social environment, so as to understand what receptors and resources have the potential to be significantly affected by the proposed Project. The data will also describe the baseline conditions of the environment that will be used during the impact assessment phase for both social and environmental impacts.

Site investigations were undertaken by the consultant during August 2017 and September 2017. The findings of the site investigations, and description of the baseline environment of the sites, are presented in Chapter 8.

6.1.3 INTERACTION WITH DESIGN AND DECISION-MAKING

Interaction between the ESIA team and the design and decision-making process is one of the key areas in which an ESIA can influence how a project develops. It includes involvement in defining the Project and identifying those activities with the potential to cause environmental and socio-economic impacts (e.g. site clearing, noise, traffic, relocation, local employment).

Project planning, decision-making and refinement of the Project description are to continue throughout the assessment process as a result of the development of the proposed Project and in response to the identified impacts. This process has the potential to alter the site layout, processes or technology identified to prevent or, where prevention is not possible, mitigate identified impacts.

6.1.4 SCOPING REPORT

The steps detailed above are captured within a Scoping Report (dated November 2017). The Scoping Report included the terms of reference for the ESIA based on the baseline environment and the potential impacts identified. The Scoping Report provided recommendations in terms of the scope of the ESIA and the methods used to determine the significance of potential impacts. The Scoping Report was submitted to the MEFCC for approval on 2 December 2017.

The MEFCC issued comments on the Scoping Report on 21 December 2017. A formal response to the comments was issued to the client by the ESIA Team on 26 December 2017, addressing the comments raised by the MEFCC.

6.2 IMPACTS ASSESSMENT PHASE

6.2.1 IMPACT DESCRIPTION AND DEFINITION

IMPACT DEFINITION

Environmental impacts from planned and non-planned activities during all phases of the Project are assessed on the basis of detailed knowledge and industry experience of these activities. For the purpose of this ESIA an environmental or socio-economic impact is defined as:

“Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s activities or services.” (ISO 14001)

Prediction of impacts is an objective exercise to determine what is likely to happen to the environment as a consequence of the Project and its associated activities. From the potentially significant

interactions identified in scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the impact assessment process typically results in a wide range of prediction methods being used, including quantitative and semi quantitative techniques, for example noise impacts on sensitive surrounding community receptors, and qualitative techniques for assessing certain socio-economic impacts on communities.

DESCRIPTION OF IMPACTS

Environmental impacts arise as a result of Project activities either interacting with environmental or social receptors directly, or causing changes to the existing environment such that an indirect effect occurs.

Environmental and social impacts from a planned event are those resulting from the routine and intended construction or operations/activities associated with the IAIP and RTC facilities (e.g. regular truck movements to and from the facilities transferring produce to market). Environmental and social impacts from unplanned events occur as a result of incidents or 'upset conditions'. Typical examples of impacts occurring from unplanned events include (but are not limited to) spills, leaks, odours and fires.

The impacts identified for the proposed Project are described in Chapter 9 of this report.

NATURE OF IMPACT

The nature of an impact is defined as the type of change from baseline conditions. The nature of an impact is described as being either **positive (+ve)** or **negative (-ve)**.

TYPE OF IMPACT

Impact type indicates the relationship of the impact to the Project activity in terms of cause and effect, as either:

- **Direct impact** resulting from the direct interaction between a project activity and the receiving environment; or
- **Indirect impact** which include secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements); or
- **Cumulative impact**; where a Project impact acts together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project.

SCALE OF IMPACT

Impact extent relates to the geographic reach of the impact and is described as:

- **Local impact** would affect local resources or receptors and would be restricted to a single community (i.e. impacts in the footprint of Project activities and the immediate adjacent area);
- **Regional impact** would affect regional resources or receptors and would be experienced at a regional scale;
- **Trans-boundary impact** would be those that are experienced in one country as a result of activities in another.

DURATION OF IMPACT

Impact duration refers to the time period over which a resource or receptor will be affected, and includes:

- **Temporary impacts** would be of a very short duration, are reversible and intermittent or occasional in nature. The resource or receptor would return to the previous state when the effect ceases or after a short period of recovery;

- **Short-term impacts** would last for a short duration (2 to 5 years) and are usually limited to the construction period. The impact would cease when the effect ceases following a short period of recovery;
- **Medium-term impacts** would last for over five years but less than fifteen years (5 to 15 years). The impact would cease following rehabilitation and a period of recovery;
- **Long-term impacts** would continue for an extended period of time (e.g. beyond 15 years), or cause a more permanent change in the affected receptor or resource that endures substantially beyond the Project lifetime.

PROBABILITY

The *probability* of an event occurring and creating an impact on a given receptor is designated using a qualitative scale from 1 to 4, the higher values being more probable that an impact will occur, see **Table 6-1** below.

Table 6-1: Probability rating of impact

Rating Scale	Description
1	Unlikely - very improbable, never heard of in the industry, or an event with a short duration (probably will not happen).
2	Low probability - incident has occurred in the industry and so therefore could occur, or an event lasting up to a day (some possibility, but low likelihood).
3	Medium Probability - incident has (or is) expected to occur during the project or is very likely to, or an event which may occur up to 1 month (distinct possibility).
4	High probability - incident is expected to happen frequently a year or is almost certain to happen, or an event which is expected to occur multiple times (most likely).

SEVERITY

The severity of an impact, on a given receptor is designated using a rating scale from 1 to 4 and defined in **Table 6-2** (Environmental Severity) and **Table 6-3** (Socio-economic Severity) below, the high values denoting a more severe impact.

Table 6-2: Definitions of Severity used in the ESIA for Environmental Receptors

Category	Environmental Receptors – Physical And Biological	
	Negative	Positive
4 - High	<p>Major, long term national, international or transboundary effects.</p> <p>Deterioration/improvements of the existing habitat or ecosystem baseline conditions is significant.</p> <p>Rehabilitation is required or the baseline will not recover.</p> <p>Results in changes / reduction in the abundance and biodiversity of populations which may or may not recover.</p> <p>Such impacts are a major non-compliance with national and international regulatory standards and</p>	<p>Baseline will be significantly improved by the project.</p> <p>Results in changes / increase in the abundance and biodiversity of populations.</p> <p>Exceed national and international regulatory standards in protection and creation of natural habitats.</p>

Category	Environmental Receptors – Physical And Biological	
	may result in immediate intervention by governmental bodies and stakeholders.	
3 - Medium	<p>Moderate, medium term deterioration / impact on the ecosystem on a local / national level, leading to observable and measurable changes.</p> <p>Moderate deterioration / improvements and changes / reduction in the abundance and biodiversity of the area with moderate recovery periods to baseline conditions.</p> <p>Non-conformance with national and international regulatory standards which may result in the intervention by governmental bodies and stakeholders.</p>	<p>Moderate, medium term rehabilitation of ecosystems or national significance, leading to observable and measurable changes.</p> <p>Moderate deterioration/improvements and changes / increase in the abundance and biodiversity of the area with moderate recovery periods to baseline conditions.</p> <p>Conformance with national and international regulatory standards.</p>
2 - Low	<p>An effect will be experienced but they will be minor, short term and local, leading to observable and measurable changes recoverable within short durations.</p> <p>Potential non-conformance with regulatory standards. Unlikely to result in concerns being raised by governmental bodies or stakeholders.</p> <p>Minor deterioration of ambient environmental conditions and recovery requires little or no intervention.</p>	<p>An effect will be experienced but they will be minor, short term and local, leading to observable and measurable changes recoverable within short durations.</p> <p>Partial conformance with regulatory standards. Meets governmental and stakeholder requirements.</p> <p>Minor improvements to ambient environmental conditions.</p>
1 - Very Low	Deemed 'imperceptible' or indistinguishable from natural background conditions.	Deemed 'imperceptible' or indistinguishable from natural background conditions.

Table 6-3: Definitions of Severity used in the ESIA for Socio-Economic Receptors

Category	Socio Economic Receptors	
	Negative	Positive
4 - High	<p>Highly significant, loss or major damage with medium to long term effect on cultural and/or natural resources of national and regional importance which are essential for communities' livelihood.</p> <p>Highly significant negative impacts on the national and international community (regional, i.e. neighbouring countries). Those affected will be able to adapt to changes with some difficulty/ease, and will only be able to maintain pre-impact livelihoods with a degree of support.</p>	<p>Retention of all cultural and heritage resources of value on site.</p> <p>Highly significant positive impacts on the national and international community (regional, i.e. neighbouring countries). Those affected will be able to adapt to changes with some difficulty/ease, and will only be able to maintain pre-impact livelihoods with a degree of support.</p> <p>Project meeting and exceeding Government policies and plans.</p> <p>National and International media and community support.</p>

Category	Socio Economic Receptors	
	<p>Immediate intervention by governmental bodies requiring rapid implementation of response measures.</p> <p>National and International media and community concerns and ongoing long term complaints.</p>	
3 - Medium	<p>Moderate damage to archaeological, cultural or key natural resources of local or national importance.</p> <p>Moderate negative impacts on the regional or national population. Vulnerable groups significantly affected. Changes affecting livelihoods, amenity values, convenience and quality of life of study population.</p> <p>National and potentially international media and community concerns and ongoing long term complaints.</p>	<p>Retention of cultural heritage resources (of value) where possible and appropriate recording of resources that cannot be retained.</p> <p>Moderate positive impacts on the regional or national population. Vulnerable groups significantly affected. Changes affecting livelihoods, amenity values, convenience and quality of life of study population;</p> <p>National media and community support.</p>
2 - Low	<p>An effect will be experienced but they will be Minor, short term effects recoverable within short durations.</p> <p>Unlikely to result in concerns being raised by governmental bodies or stakeholders.</p> <p>Measurable negative impacts that are intermittent or effect a small minority of the local population and / or vulnerable groups. May result in concerns from local communities.</p>	<p>An effect will be experienced but they will be Minor, short term effects of short durations.</p> <p>Meets governmental and stakeholder requirements.</p> <p>Measurable positive impacts that are intermittent or effect a small minority of the local population and / or vulnerable groups.</p>
1 - Very Low	<p>Deemed 'imperceptible' or indistinguishable from natural background conditions. No public interest.</p>	<p>Deemed 'imperceptible' or indistinguishable to current social norms and variations.</p> <p>No public interest.</p>

EVALUATION OF SIGNIFICANCE OF IMPACT

Based on the above methodology, the impacts resulting from the project are classified within this ESIA as either positive or negative with a specific severity rating.

All environmental and social impacts have been identified based on the information summarised in this ESIA and their significance is assessed and classified by combining the probability and severity scores as shown in **Table 6-4**, which relates to negative impacts, or **Table 6-5** which relates to positive impacts below.

In assessing whether an impact is significant, reference has been made, where appropriate, to criteria on which the evaluation is based. These may include legislative requirements, policy guidance or accepted practice and past experience.

Table 6-4: Significance Matrix Negative Impacts

SIGNIFICANCE			PROBABILITY RATING			
			Very low	Low	Medium	High
			1	2	3	4
Severity Rating	Very low	1	Negligible	Minor	Minor	Minor
	Low	2	Minor	Minor	Moderate	Moderate
	Medium	3	Minor	Moderate	Moderate	Major
	High	4	Minor	Moderate	Major	Major

Table 6-5: Significance Matrix Positive Impacts

SIGNIFICANCE			PROBABILITY RATING			
			Very low	Low	Medium	High
			1	2	3	4
SEVERITY RATING	Very low	1	Negligible	Minor	Minor	Minor
	Low	2	Minor	Minor	Moderate	Moderate
	Medium	3	Minor	Moderate	Moderate	Major
	High	4	Minor	Moderate	Major	Major

CATEGORIES OF IMPACT SIGNIFICANCE

The different significance categories reflected by the colour scheme used in the above matrix and within this ESIA reflect the following:

- **Negligible** - no additional action is required and the impact is already reduced to as low as reasonably practicable (ALARP);
- **Minor** - where the level of risk is broadly acceptable and generic control measures are already assumed in a design process but, where appropriate, require continuous improvement.
- **Moderate** - where the level of risk is tolerable but control measures are required to reduce the risk as far as is practicable (i.e. tolerable if as low as reasonably practicable (ALARP)).
- **Major** - changes to the project are required which requires a re-assessment of applicable mitigation and / or reconsideration of alternatives and options by the project design team.

6.2.2 CUMULATIVE IMPACTS / EFFECTS

Cumulative impacts and effects are those that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect. These are termed cumulative impacts and effects. The ESIA considers the cumulative effects that could arise from a combination of IAIP and RTC project effects with those of other existing or planned developments in the surrounding area (refer to Chapter 10).

Typical examples arise from impacts of nearby pre-existing or proposed new developments on local communities who may also be exposed to further impacts from the proposed Project. In addition, the cumulative impact assessment include other developments which might take place as a consequence

of the project, e.g. to provide access, power or water supplies, sewage treatment or waste disposal, or to house or provide jobs for people attracted to the area by the project.

6.2.3 DEALING WITH UNCERTAINTY

Even with a final design and an unchanging environment, impacts are difficult to predict with certainty, but in projects such as the proposed Project where the design process is currently in progress, uncertainty stemming from on-going development of the Project design is inevitable. Additional uncertainty may stem from issues such as variability in the natural environment between seasons and from one year to another. Where such uncertainties are material to the ESIA findings, they are clearly stated and conservatively approached ('the precautionary approach') in order to identify the broadest range of likely residual impacts and necessary mitigation measures.

6.2.4 MANAGEMENT SYSTEMS INTEGRATION

Stakeholders and external decision-makers for the proposed Project will rely on the findings of the ESIA (e.g. as regards significance of residual impacts) in coming to their ultimate views. As an ESIA is based on predictions made in advance of an activity taking place, it effectively makes assumptions that the project will implement certain controls and mitigation measures. If the controls do not happen, then the ESIA is undermined as a tool for stakeholders and external decision-makers. It is important, therefore, that these 'assumptions' (i.e. the mitigation measures), are commitments that will be implemented through the environmental and social management plan (ESMP) and associated management and monitoring plans that have and will be developed together with the proponent as part of the ESIA.

Once potential impacts have been identified and mitigation measures developed and described in the ESIA, their integration within the proposed Project is required in order to ensure their future implementation. In order for this to be successful, management plans including the responsibility, timing and reporting requirements associated with each measure, or set of measures, are compiled and form part of the authorisation.

Refer to the Chapter 11 for the ESMP for the proposed Project.

7 STAKEHOLDER ENGAGEMENT

This Chapter presents a summary of general stakeholder engagement activities to be undertaken as part of the ESIA process.

7.1 APPROACH TO STAKEHOLDER ENGAGEMENT

Stakeholder engagement for the ESIA has been undertaken using a staged approach in line with the various phases of the ESIA process. The engagement process generally involved the following five key phases.

7.1.1 INITIAL ENGAGEMENT

The Ethiopian Constitution makes reference to the right of the public and communities to full consultation and participation as well as to the expression of their views in the planning and implementation of projects that would affect them. The Ethiopian EIA Guidance also identifies that all interested and affected parties have the opportunity to participate meaningfully in the ESIA processes.

The Oromia IPDC obtained official correspondence from the FDRE on 29 May 2016 providing the IPDC with the mandate to lead, manage and administer the IPDC development in the region. Initial engagement with the local administrations, concerned sector offices and PAPs was undertaken by the IPDC during December 2016, prior to ESIA team involvement on the project, including the introduction of the project census of the PAPs. The local Authorities provided the WSP team with the record of when these meetings were held, their location and how many people attended. In addition, the more recent consultations (2017) were also captured. This information is provided **Table 7-1**.

In January 2017 official community meetings were held which were facilitated by the concerned Regional, Zonal and District representatives. The representatives included the Oromia IPDC and the relevant regional Bureaus and offices including; the Planning office, Urban Development, Agriculture Development, Zonal Land Administration and Woreda/ District Administration. During February 2017 a second community meeting was held, post IPDC establishment, to address issues raised in the initial meeting and introduce the official organisation and task force / committee.

From February through March the task force undertook surveys for the required value assessments regarding likely PAPs and assets to be affected. In May 2017 the approved survey and asset estimation report was issued by the concerned authority. The IPDC commenced the compensation process in June 2017.

Specific meeting dates and content of meetings held are presented in **Table 7-1** below

Table 7-1: Record of initial engagement and relocation process engagement carried out by the local authorities for the Oromia IAIP and RTC project

Date of Meeting	Site	Content	Attendees
Dec. 31, 2016	Bulbulla IAIP and Shashemene RTC	Briefing about the project's benefit, nature, size required resources including land and related development activities and conducted physical reconnaissance survey.	Local administration, concerned sector offices and likely PAPs and community members (approximately 273 in total at the IAIP and 35 at the RTC)
Jan. 24, 2017 Jan. 25, 2017	Bulbulla IAIP Shashemene RTC	Briefing about the project's benefit, nature, size required resources including land and related development activities.	Likely PAPs and broader community

Date of Meeting	Site	Content	Attendees
		General principles and approach about compensation and resettlement issues. Evaluating degree of public interest towards the project and obtain critical/outstanding social issues in relation to the project. Obtaining feedback and opinions.	
Feb. 14, 2017 Feb. 15, 2017	Bulbulla IAIP Shashemene RTC	Similar agenda with the first meeting and introduction of the official organization and deployment of task force / committee.	Likely PAPs and local community
Feb. 20, 2017	Bulbulla IAIP and Shashemene RTC	Discussion on compensation method and approach.	PAPs (273 at the IAIP and 35 at the RTC)
Feb. 14 – March 30 2017	Bulbulla IAIP and Shashemene RTC	Task force survey of likely affected PAPs and value assessments.	PAPs
March 30 2017	Bulbulla IAIP and Shashemene RTC	Present proposed resettlement process and how and when compensation will be issued.	PAPs (287 at the IAIP and 35 at the RTC)

The community meeting consultees identified the following important issues:

- PAPs requested to get substitute land in addition to cash compensation (IAIP / Bulbulla: particularly those who are living on the site. # 84 households)
- Concern about adequacy of the local water resource both for the domestic demand and the anticipated project. (IAIP / Bulbulla)
- Concern, among some PAPs, both from Bulbulla and Shashemene that the estimated compensation is minimal.
- Requested to get priority regarding job opportunities to be created as a result of the project.
- Asked about the possibility or opportunity of being share holder of the proposed industry.
- The need to give value and pay respect to cemeteries in the proposed sites.

Responses to these concerns included:

- Provision of substitute land for those who don't have alternative land and whose houses are built in the project site (IAIP / Bulbulla).
- Provide training related with entrepreneurship, technical skill in addition to in kind and in cash compensation.
- Job opportunity priority.
- Cemeteries found shall be protected.
- Oromia IPDC to follow-up implementation of the above promise.

These meetings focused on sourcing information on primary agricultural products for the area and the product value as well as compensation calculations and the valuing of assets. More detail on the resettlement has been provided within the RAP which is a separate standalone document.

7.1.2 STAKEHOLDER IDENTIFICATION AND ANALYSIS

Stakeholder identification and analysis is an essential component of effective and meaningful stakeholder engagement activities. A comprehensive stakeholder engagement plan has been

developed identifying who the key stakeholders are and how they should be engaged. The Stakeholder Engagement Plan (SEP) is provided in **Appendix B1**.

The objective of the analysis was to provide a general overview of all stakeholders and their stake in the project. Specifically, the stakeholder analysis sought to:

- Identify institutions, groups, and individuals likely to impact or be impacted by the proposed project;
- Categorise identified stakeholders in relation to their operation scope and mandate; and
- Assess the identified stakeholder's interests, significant and influence in relation to the proposed project.

Key stakeholders groups are listed, but not limited to, those listed below:

- Project Affected Peoples;
- Compensation task force;
- Regional Bureau of Trade and Industry;
- Zone Administration;
- Woreda Administration;
- Planning office,
- Urban Development,
- Zonal Land Administration
- Agriculture Development & Natural resource Management (Regional, Zonal and District offices);
- Construction and Housing (Zonal and District Office);
- Trade and Industry (Regional, Zonal and District Office).

7.1.3 MODE OF INFORMATION DISSEMINATION

Stakeholders were engaged and identified through:

- One-on-one consultations with key stakeholder representatives;
- Focus group workshops;
- Community public meetings; and
- Distribution of project background information document (copy is included within **Appendix B2**).

Table 7-2 provides a stakeholder engagement plan matrix outlining key stakeholders, their importance and roles within the Project.

Table 7-2: Stakeholder Engagement Plan Matrix

Stakeholder	Impact <i>How much does the project impact them? (Low, Medium, High)</i>	Influence <i>How much influence do they have over the project? (Low, Medium, High)</i>	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
Ministry of Industry	<i>High</i>	<i>High</i>	<i>Successful development and implementation of the IAIP and RTC projects</i>	<i>As project proponent and owner, it has all the leverage towards Successful development and implementation of the IAIP and RTC projects</i>	<i>As project proponent and owner, it has all the leverage towards Successful development and implementation of the IAIP and RTC projects</i>	<i>Continued reporting and consultation on preparation and implementation issues of the ESIA and RAP</i>
Ministry of Environment, Forest and Climate Change (MEFCC)	<i>Low</i>	<i>High</i>	<i>Implementation of the IAIP and RTC development projects in environmentally and socially sustainable way.</i>	<i>The MEFCC will review the ESIA and RAP reports and will supervise the implementation of the ESMP.</i>	<i>As regulatory body it has all the mandate to correct unsustainable environmental and social practices of the projects</i>	<i>Continued reporting and consultation on preparation and implementation issues of the ESIA and RAP</i>
Oromia IPDC	<i>High</i>	<i>High</i>	<i>Job creation, Agriculture Value chain enhancement, improved standard of living of farmers</i>	<i>Facilitate the smooth progress of the development project by allocating budget for resettlers, and relevant offices</i>	<i>As the ultimate benefactor and proponent of the project, it will work towards the successful completion of the project.</i>	<i>Continued reporting and consultation on implementation issues of the ESIA and RAP</i>
Environmental Protection and Forest and Climate	<i>Low</i>	<i>High</i>	<i>Implementation of the IAIP and RTC development projects in</i>	<i>The EPFCC is the regulatory body responsible to ensure</i>	<i>As regulatory body it has the entire mandate to correct unsustainable</i>	<i>Continued reporting and consultation on implementation</i>

Stakeholder	Impact <i>How much does the project impact them? (Low, Medium, High)</i>	Influence <i>How much influence do they have over the project? (Low, Medium, High)</i>	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
Change Woreda Office			<i>environmentally and socially sustainable way.</i>	<i>environmental compliance of the development projects during construction and operation.</i>	<i>environmental and social practices of the projects.</i>	<i>issues of the ESIA and RAP</i>
Town Administration	<i>Medium</i>	<i>Medium</i>	<i>Resettlement of PAPs and compensation to clear site for construction</i>	<i>Responsible for spearheading the resettlement and compensation process</i>	<i>Handing over the site for IAIP is already done but successful resettlement process including livelihood restoration will have an impact on the project.</i>	<i>Invite to all stakeholder engagement activities as part of the ESIA</i>
Woreda Education Office	<i>Medium</i>	<i>Low</i>	<i>Stress on existing services due to influx of labour force</i>	<i>Engage with IPDC identifying requirements</i>	<i>Limited ability to block the project.</i>	<i>Invite to all stakeholder engagement activities as part of the ESIA</i>
Woreda Health Office	<i>Medium</i>	<i>Low</i>	<i>Stress on existing services due to influx of labour force</i>	<i>Engage with IPDC identifying requirements</i>	<i>Limited ability to block the project.</i>	<i>Invite to all stakeholder engagement activities as part of the ESIA</i>
Land Administration and Land Use Office	<i>Medium</i>	<i>Medium</i>	<i>Involved in land identification and allocation for</i>	<i>Responsible for identification and allocation of land for</i>	<i>Handing over the site for IAIP is already done but</i>	<i>Invite to all stakeholder engagement</i>

Stakeholder	Impact <i>How much does the project impact them? (Low, Medium, High)</i>	Influence <i>How much influence do they have over the project? (Low, Medium, High)</i>	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
			<i>resettlement of households and compensation to clear site for construction</i>	<i>the resettlement and compensation process</i>	<i>successful resettlement process including livelihood restoration will have an impact on the project.</i>	<i>activities as part of the ESIA</i>
Woreda Agricultural Office	<i>Medium</i>	<i>Medium</i>	<i>Improved agricultural activities in the Woreda</i>	<i>Responsible for overseeing agricultural activities</i>	<i>Limited ability to block the project.</i>	<i>Invite to all stakeholder engagement activities as part of the ESIA</i>
Trade and Market Development Office	<i>Medium</i>	<i>Medium</i>	<i>Improved economic activity in the Woreda</i>	<i>Responsible for overseeing trade and market development activities</i>	<i>Not in the interest of the stakeholder to block the project..</i>	<i>Invite to all stakeholder engagement activities as part of the ESIA</i>
Project Affected Farmers and Residents	<i>High</i>	<i>Medium</i>	<i>Provision of adequate compensation, support for smooth resettlement and livelihood restoration.</i>	<i>The project affected farmers and residents will promptly evacuate from project site upon compensation and resettlement support.</i>	<i>Project affected farmers and residents can remain on project site.</i>	<i>Active and continuous consultation and engagement with the PAPs till the resettlement and livelihood restoration is complete.</i>
Community Representatives, including elderly,	<i>Medium</i>	<i>Medium</i>	<i>Delivering positive impacts of the project such as job</i>	<i>The community representatives can create a bridge of</i>	<i>Negative attitude of the community in the project area</i>	<i>Active and continuous engagement with</i>

Stakeholder	Impact <i>How much does the project impact them? (Low, Medium, High)</i>	Influence <i>How much influence do they have over the project? (Low, Medium, High)</i>	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
women, youth and PAPs			<i>creation, enhanced commercial and economic activities, community health and wellbeing during operation and infrastructure development in the town and the neighbourhood such as roads, electricity, etc.</i>	<i>communication with the community to positively contribute towards the project</i>	<i>can hamper the construction and operation of the development project</i>	<i>community representatives during all stages of the development project.</i>

7.1.4 SCOPING ENGAGEMENT AND BASELINE DATA GATHERING

Engagement during the Scoping phase was undertaken by the ESIA team with an initial introductory meeting with representatives of the local community held on 18 August 2017 at the Bulbulla IAIP site and 19 August 2017 at the Shashemene RTC site (meeting notes attached in **Appendix B3**).

These meetings were followed with stakeholder and community meetings held within the period from 6 - 8 September 2017.

The objective of the engagements were to:

- Formally notify stakeholders of the proposed Project and the ESIA process;
- Formally initiate the engagement process and introduce the engagement team;
- Table and elicit comment from the affected parties; and
- Provide stakeholders with an opportunity to ask questions and give input on the proposed Project.

Relevant engagement materials were generated by the ESIA consultants to support the engagement activities. The content thereof was written in a non-technical / accessible language in English and Amharic. The material included information on the following:

- A background and description of the proposed Project;
- The environment in which the proposed Project is to be developed;
- Information on the client;
- Information on the ESIA process and timelines;
- Typical impacts associated with similar Projects; and
- Information on the ESIA consultants and their independence.

Due to the potential for high instances of illiteracy amongst potentially impacted groups in the proposed Project area, community meetings were held to be able to present the information and obtain feedback verbally as well as in writing. Engagement during the Scoping phase has involved consultation with stakeholders at the federal, regional, and local levels.

Additionally this phase included gathering of primary data for the socio-economic baseline. It is noted that the collection of this information involved one on one engagement with stakeholders. This provided stakeholders additional opportunities to provide feedback and ask questions regarding the proposed Project. Initial baseline data gathering was also previously undertaken by MACE as well as the IPDC prior to commencement of the ESIA process.

Stakeholder engagement included key government stakeholders at the Town, Woreda and Kebele level, as well as community based organisations and local community members.

Table 7-3 and **Table 7-4** provide a summary of consultation meetings held in the Bulbulla and Shashemene areas.

Table 7-3: Summary of stakeholder consultation undertaken at Bulbulla IAIP

Meeting	Date	Consultation with	Participants
1	September 6, 2017	Land Administration and Land Use Office	Mr. Bedaso Mamo
2	September 7, 2017	PAPs and local community members	PAPs and community representatives
3	September 8, 2017	Education Office, Adami-tulu Jido Combolcha Woreda	Mr. Ibrahim Daliyo
4	September 8, 2017	Environmental protection and Forest and Climate Change Woreda Office	Mr. Tekeste Negabo Mr. Endria Essa

Meeting	Date	Consultation with	Participants
5	September 8, 2017	Adami Tulu Judo Kombolcha Woreda Administration	Mr. Abishu Aman
6	September 8, 2017	Woreda Health Office	Mr. Huluku Kufa

Table 7-4: Summary of stakeholder consultation undertaken at Shashemene RTC

Meeting	Date	Consultation with	Participants
1	September 6, 2017	Community	PAPs and local community representatives
2	September 6, 2017	Shashemene Woreda Environment, Forest and Climate change	Mr. Dejene Megerssa
3	September 6, 2017	Woreda Agricultural Office	Mr. Abu Julu
4	September 6, 2017	Trade and Market Development Office	Mr. Jeletto wate
5	September 7, 2017	Shashemene Education Office	Mr. Sisay Regassa
6	September 7, 2017	Shashemene Woreda Administration Office	Mr. Wariso Hayeso
7	September 7, 2017	Shashemene Woreda Health Office	Mr. Mohamed Gamidu Mr. Temam Adella

The community meeting consultees identified the following important issues:

- Need for engaging work force from the local community and generate employment for the youth to assist in creating peace and stability in the area.
- Promise made by the Government to provide land in the town to construct houses as part of the compensation.
- Potential stress on the education services in the area due to influx of labour force.
- Lack of safe waste disposal facilities in the area and disposal of the waste that will be generated from the development is to be addressed.
- The need to fence the boundaries of the sites.
- Slow implementation of the project and the resulting problem due to the idleness of the land.
- Shortage of available land in the area to provide 500 m² for each of the affected people and 200 m² for the youth as stipulated in the regulation.
- Potential stress on the health services due to influx of work force.
- Issue of dust from the RTC site.
- Lack of high school near the RTC site for the community children to continue their education after they graduated from the elementary school. Currently forced to travel 5kms on foot to Shashemene Town to attend high school.
- Security of water supply in the community around the RTC
- Poor road infrastructure to access the RTC site.
- The need to advise and guide the farmers around the developments to increase production in terms of quantity and quality to supply their products.
- Assistance with crop disease and supply of improved seeds to increase productivity.

Minutes of the meetings and supporting photographs are provided within **Appendix B4**.

7.1.5 ESIA DISCLOSURE ENGAGEMENT

In November 2017 the Impact Assessment process had been completed and the engagement team returned to site to gather stakeholder comment and feedback on the ESIA. This engagement was targeted at allowing local stakeholders an insight into the predicted impacts and mitigation and to contribute their local knowledge to the assessment and mitigation process. This process afforded stakeholders the opportunity to confirm that their needs, fears and aspirations have been recorded and where possible appropriately considered in the specialist investigations and Project design **Table 7-5** provides a summary of ESIA consultation meetings held in the Bulbulla and Shashemene areas. Minutes of the meetings and supporting photographs are provided within **Appendix B4**.

Table 7-5 : Summary of ESIA Phase consultation meetings held within the Project area.

Meeting	Date	Venue	Stakeholders
1	20 November 2017	Shashemene - Alelo Kebelle	More than 40 participants representing different sections of the community including elderly, women, youth and PAPs
2	20 November 2017	Bulbulla, Arba Kebele	More than 30 participants representing different sections of the community including elderly, women, youth and PAPs

The community meetings consultees identified the following important issues:

Shashemene RTC

- Community is in full support of the project, however have some issues of concern.
- Delay of the construction of the RTC.
- Some of the portions of land extend beyond the RTC boundary, compensation was only paid for the section within the boundary. Farmers unsure of future plans for the area, want to utilise land for farming.
- Concern that the PAPs and local community won't be given priority for jobs as promised. It was noted that Shashemene town has a very large number of unemployed people who also come from the neighbouring region and are willing to work at a small daily rate. This should be managed properly.
- The government should clearly instruct contractors during construction process and undertake proper management of the RTC itself when operating.
- PAPs indicated that they had been paid compensation and that they are happy at the value and quick payment made.

Bulbulla IAIP

- All the community representatives and stakeholders expressed their desire, interest and support for the project and complained for the delay in starting the construction of the industrial park.
- Raised concern with regard to the job opportunities promised to them, including provision of construction materials. These opportunities are not occurring.
- Initially the community had a very strong and smooth relationship with Oromia Industrial Parks Bureau. But very recently there has been a lack of communication.
- Requested that representatives visit another industrial park located in another region which is already operating. They said, this can increase their understanding of the industrial park operation, how they manage their employees, waste, environment and surrounding community.
- The PAPs indicated that they have received compensation and are happy at the amount of compensation paid to them and the short period of time it took.

Responses to these issues include:

- A separate RAP process is being undertaken in which the compensation process and valuation will be reviewed against the requirements of the national legal requirements as well as against the AfDB requirements. Where shortfall are identified these will be indicated and additional compensation is to be paid (should it be required).
- A management plan is being compiled as part of the ESIA process which identifies requirements that the IPDC have to abide by. This includes that priority for jobs are to be provided to the PAPs and local communities, especially women and youth.

It is important to note that complaints will and must be solved properly and in time through consultation among the stakeholders and the IPDC in order to ensure the success of the project.

Minutes of the meetings and supporting photographs are provided within **Appendix B5**.

7.2 PROJECT STAKEHOLDERS

For the purposes of this process, a stakeholder is defined as any individual or group which is potentially affected by the proposed Project or who has an interest in the proposed Project and its potential impacts. A diverse range of stakeholders have been identified that could be involved in the stakeholder engagement process. Furthermore, different issues are likely to concern different stakeholders.

Project stakeholders identified to date are identified in the Stakeholder Engagement Plan included in **Appendix B1** and in the stakeholder minutes provided in **Appendix B3, B4 and B5**.

7.3 FEEDBACK MECHANISM

Each round of engagement undertaken has provided stakeholders with an opportunity to provide input and feedback on the proposed Project. However, it remains important to offer opportunities to people to both provide feedback and receive response at other times in-between formal rounds of engagement.

A feedback mechanism is therefore in place during the Scoping and ESIA process to ensure that potential concerns raised by stakeholders during engagement are acknowledged and addressed in a timely, structured and culturally appropriate manner.

8 THE RECEIVING ENVIRONMENT

8.1 INTRODUCTION

It is important to gain an understanding of the physical attributes of the Project area and its surroundings, as it will provide for a better understanding of the receiving environment in which the Project is being considered.

The description of the baseline environment is essential in that it represents the conditions of the environment before the construction of the proposed Project. The description of the baseline environment therefore provides a description of the current or status quo environment against which environmental impacts of the proposed Project can be assessed and future changes monitored.

The information presented in Chapter 8 has been collected from desktop studies and supplemented with site visits to the Project area. It must be noted that very little secondary data is available for the Oromia Region as a whole, and in many instances, data is currently wholly unavailable. As such, the objective of primary data collection served to minimise these significant data gaps. The methodologies used to aid data collection are discussed in the respective sections below.

The following characteristics of the receiving environment for the Bulbulla IAIP site and the Shashemene RTC site are described.

Table 8-1: Characteristics of the receiving environment for Project area considered.

Receiving Environment	Characteristics
Physical	<ul style="list-style-type: none">• Climate;• Topography and Geomorphology;• Geology;• Soils;• Surface Water (Hydrology);• Groundwater (Hydrogeology);• Wetlands;• Air Quality;• Noise;• Traffic;• Waste Management.
Biological	<ul style="list-style-type: none">• Biodiversity
Socio-Economic	<ul style="list-style-type: none">• Demographics;• Ethnicity, religion and languages;• Social Infrastructure and services;• Economy and livelihood activities;• Cultural heritage;• Visual.

8.2 CLIMATE

8.2.1 TEMPERATURE

The area in general has a dry to sub-humid climate. The lowland area (rift floor) near Bulbulla Area is semi-arid while the Aluto Volcano Centre (AVC) can be categorized as sub dry humid. The climate therefore varies with a mean annual rainfall and temperature ranging from 700 mm and 25°C respectively in the lakes region (i.e. in the vicinity of the sites), to 1200 mm and 15°C respectively on the humid plateaus and escarpments (Tenalem, 2002; Dagnachew et al., 2004, 2007; Wolter, 2007).

The heaviest rainfall is experienced in the summer (kiremt) months in Ethiopia and is known as the 'kiremt' rain. The 'kiremt rain' represents 50 – 70% of the mean annual total rainfall, and occurs in the months of June, July and August (Degafu, 1987; Tenalem, 1998; Dagnachew, 2002). The dry period occurs in autumn (Belg) and winter (Bega) which extends from September to February, when the line of low pressure of Inter Tropical Convergence Zone (ITCZ) lies south of Ethiopia. 20–30% of the annual rainfall is experienced during spring (tseday), occurring in the months of March to May, when the ITCZ moves from south to north over the country.

Temperature and wind speed data for three years (2013 - 2015) was collected from Adami Tulu Station which is near to the project site. Mean maximum and minimum monthly temperature are 28.9°C and 12.28°C (**Table 8-2**). The daily variation in temperature in the area is more pronounced than the annual variation.

Table 8-2: Mean maximum and minimum temperature (°C) from the Adami Tulu Station

Year	Range	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual Mean
2013	Max	28.9	31.8	29.6	31.2	29.0	27.3	23.8	24.5	26.8	28.0	28.9	28.4	28.18
	Min	11.3	10.6	12.2	13.2	15	14.5	13.6	13.4	11.8	10.2	9.9	6.2	11.83
2014	Max	29.9	29.7	31.7	30.9	29.5	29.3	26.0	25.1	21.8	27.2	28.4	28.1	28.13
	Min	9.2	11.9	12.6	11.4	14.2	14.2	14.5	13.7	12.7	11.0	9.1	7.6	11.84
2015	Max	29.0	31.9	32.4	32.6	30.8	28.4	27.9	26.9	28.2	33.1	32.0	31.0	30.35
	min	8.0	9.1	11.4	13.3	16.0	16.7	15.7	15.3	14.6	12.7	12.4	12.8	13.17

This data was supplemented with additional rainfall data collected from Bulbulla Town for forty three years (1967 - 2010) and used for analysis.

8.2.2 PRECIPITATION

Based on the forty three years (1967-2010) summarised rainfall data obtained from Bulbulla meteorological station, the total monthly average annual rain fall in the area is 666.4 mm (**Table 8-3**).

Table 8-3: Monthly Average Annual Rainfall (mm) from the Bulbulla Station

Period	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Total Annual
1967 to 2010	15.8	29.2	48.2	71.3	66.2	76.7	128	105	71.9	38.7	10.8	4.6	666.4

8.2.3 WIND

Based on the meteorological data obtained from Adami Tulu station, the mean annual wind speed for the period 2013 to 2015 ranged between 1.26 m/s and 1.39 m/s (**Table 8-4**). With the average highest wind speeds generally being experienced between May and August.

Table 8-4: Mean monthly and annual wind speed (m/s) from the Adami Tulu Station

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean Annual
2013	1.13	1.17	1.12	1.16	1.42	1.89	1.50	1.51	1.00	0.94	1.21	1.07	1.26
2014	1.08	1.06	1.32	3.61	1.20	1.80	1.70	1.26	0.96	0.91	1.05	0.76	1.39
2015	1.13	1.01	1.15	1.28	1.36	1.90	1.94	1.54	0.98	1.02	1.14	1.11	1.30

According to the meteorological data obtained from Adami Tulu station, the prevailing wind direction for the season from November to April is towards northeast direction while it blows towards southwest direction from May to September.

8.2.4 EXISTING AIR POLLUTION SOURCES

Potential sources of emission surrounding the proposed site include:

- Vehicle entrainment on unpaved roads;
- Vehicle tailpipe emissions;
- Domestic fuel burning; and
- Agricultural activities.

VEHICLE ENTRAINMENT ON UNPAVED ROADS

Vehicle-entrained dust emissions from the unpaved roads potentially represent a significant source of fugitive dust. When a vehicle travels on an unpaved road, the force of the wheels on the road surface causes the pulverisation of surface material. Particles are lifted and dropped from the rolling wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed (USEPA, 2006).

The quantity of dust emissions from a given segment of unpaved road varies linearly with the volume of traffic. Emissions depend on source parameters that characterise the condition of a particular road and the associated vehicle traffic. Dust emissions from unpaved roads have been found to vary directly with the fraction of silt in the road surface materials. Other parameters include vehicle speeds, mean vehicle weight, average number of wheels per vehicle and road surface moisture. Although vehicle entrainment on unpaved roads has been found to result in high fugitive dust emissions, these impacts are often limited to close to the source (USEPA, 2006).

VEHICLE TAILPIPE EMISSIONS

Atmospheric pollutants emitted from vehicles include hydrocarbons, CO, CO₂, NO_x, SO₂ and particulates. These pollutants are emitted from the tailpipe, from the engine and fuel supply system, and from brake linings, clutch plates and tyres. Hydrocarbon emissions, such as benzene, result from the incomplete combustion of fuel molecules in the engine. Carbon monoxide is a product of incomplete combustion and occurs when carbon in the fuel is only partially oxidized to carbon dioxide. Nitrogen oxides are formed by the reaction of nitrogen and oxygen under high pressure and temperature conditions in the engine. Sulphur dioxide is emitted due to the high sulphur content of the fuel. Particulates such as lead originate from the combustion process as well as from brake and clutch linings wear (Samaras and Sorensen, 1999).

DOMESTIC FUEL BURNING

Pollutants released from these fuels include CO, NO₂, SO₂, inhalable particulates and polycyclic aromatic hydrocarbons. Particulates are the dominant pollutant emitted from the burning of wood. Smoke from wood burning contains respirable particles that are small enough in diameter to enter and deposit in the lungs. These particles comprise a mixture of inorganic and organic substances including aromatic hydrocarbon compounds, trace metals, nitrates and sulphates. Polycyclic aromatic hydrocarbons are produced as a result of incomplete combustion and are potentially carcinogenic in

wood smoke (Maroni et al., 1995). The main pollutants emitted from the combustion of paraffin are NO₂, particulates, carbon monoxide and polycyclic aromatic hydrocarbons.

Domestic fuel burning shows a characteristic diurnal and seasonal signature. Periods of elevated domestic fuel burning, and hence emissions, occurs in the early morning and evening for space heating and cooking purposes. During the colder months, an increase in domestic fuel burning is recorded as the demand for space heating and cooking increases with the declining temperature.

A national survey conducted by the Central Statistical Agency in 2011 indicated that biomass fuel (solid fuel) is used by nearly all Ethiopian households (95%), with the vast majority (85%) using firewood for cooking (**Table 8-5**). The household fuel use pattern is mixed, in that more than one type of fuel can be used in a household. With respect to the main source of energy, however, the pattern varies between rural and urban settings. For instance, firewood is used by 90.8% of rural households as the main fuel source for cooking, while nearly two thirds (63.3%) of urban household dwellers use wood (WMS, 2011).

Charcoal is the second most frequently used type of fuel (17.5%) in urban areas, although it is not used frequently (0.2%) as fuel in rural areas. The remainder of rural households (8.4%) are noted to use leaves/dung cakes as fuel. The use of relatively cleaner energy sources such as kerosene, LPG, and electricity for cooking is almost non-existent in rural settings, whereas in urban areas kerosene (4.9%) and gas/electricity (7.7%) are used in small proportions. Kerosene is reportedly used, however, for lighting in urban (88%) and rural (64.4%) households (WMS, 2011).

Table 8-5: Household energy use for cooking in Ethiopia (WMS, 2011).

Fuel Used for Cooking	Country (%)	Urban (%)	Rural (%)
Wood	85	63.3	90.8
Leaves / Crop Residue / Animal Dung	7.2	2.7	8.4
Charcoal	3.9	17.5	0.2
Solid Fuel (Biomass)	95	87.4	99.6
Kerosene	1.2	4.9	0.2
LPG / Electricity	1.9	7.7	0.2

AGRICULTURAL ACTIVITIES

Emissions from agricultural activities are difficult to control due to the seasonality of emissions and the large surface area producing emissions (USEPA, 1995). Expected emission resulting from agricultural activities include particulates associated with wind erosion and burning of crop residue, chemicals associated with crop spraying and odiferous emissions resulting from manure, fertilizer and crop residue.

Dust associated with agricultural practices may contain seeds, pollen and plant tissue, as well as agrochemicals, such as pesticides although the use of pesticides is believed to be limited. The application of pesticides during temperature inversions increases the drift of the spray and the area of impact. Dust entrainment from vehicles travelling on gravel roads may also cause increased particulates in an area. Dust from traffic on gravel roads increases with higher vehicle speeds, more vehicles and lower moisture conditions.

8.3 TOPOGRAPHY AND GEOMORPHOLOGY

8.3.1 BULBULLA IAIP

A detailed topography survey was carried out by MACE during November 2016 ((**Figure 8-1**). In general the topography of the site varies between +1605.951 m at the southeast corner of the site

(Point B) to +1625.361 m at the north-west corner of the site (Point D) with undulations at some portions of the site. The site gently slopes from the northwest to the southeast.

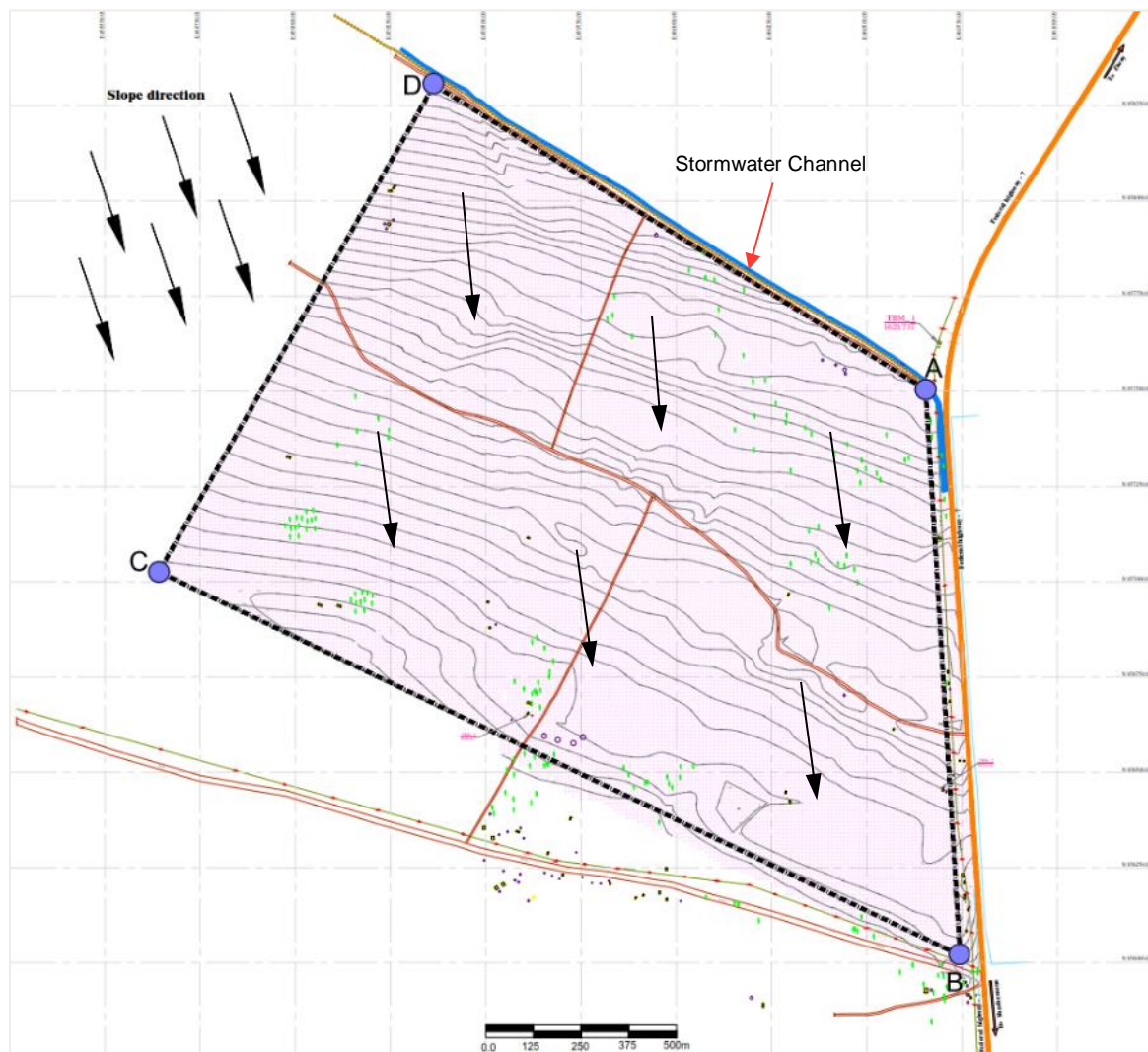


Figure 8-1: Topography survey drawing of the IAIP site indicating predominate slope (Source: MACE)

8.3.2 SHASHEMENE RTC

A detailed topography survey was carried out by MACE during November 2016 (**Figure 8-2**). In general the topography of the site varies between +1892.0 m at the northwest corner of the site (Point C) to +1901.162 m at the southeast corner of the site (Point A) with slight undulations at some portions of the site. The site gently slopes from the southeast to the northwest.

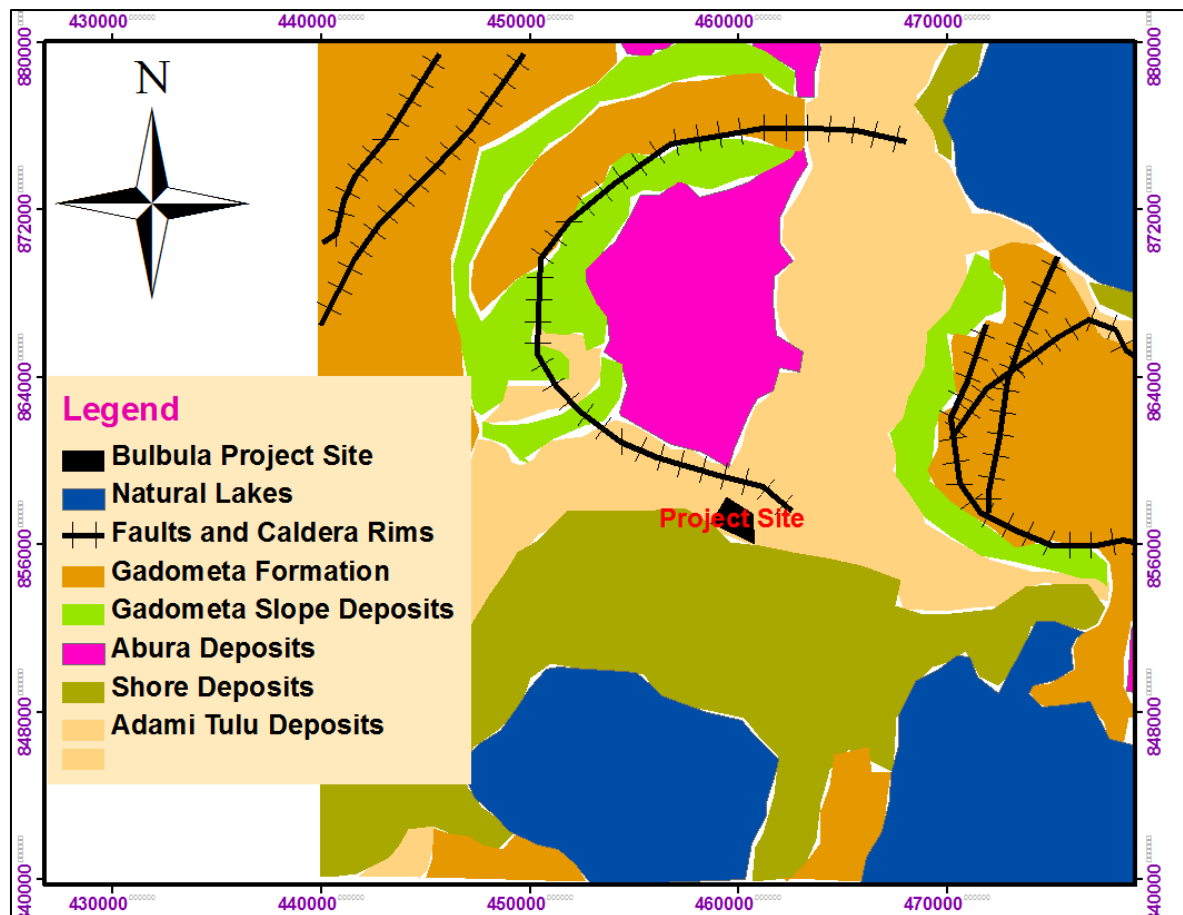


Figure 8-3: Geological Map of the area (Modified from Geological Map of Lakes Region)

Brief descriptions of the stratigraphy and geochronology of the deposits indicated on the map are provided below, starting from the oldest unit.

GADEMOTTA FORMATION (PLIO–PLIESTOCENE RHYOLITIC IGNIMBRITES, LAVA FLOWS, BASALTS & COLLUVIAL DEPOSITS)

Silicic pyroclastic materials cover most of the escarpments and the rift floor. They are mainly peralkaline rhyolitic ignimbrites, interlayered with basalts and tuffs and associated with layered, unwelded pumices. The thickness of the ignimbrites is not known, but outcrops and well data suggest it exceeds 500–600 m (Mohr, 1962; Di Paola, 1972; Woldegabriel et al., 1990).

ABURA DEPOSITS

These are part of the late quaternary fluvio-lacustrine sediments cover a large area of the rift floor. This oldest sedimentary deposit is represented by colluvial, lacustrine, fluvio-deltaic, and volcanoclastic sediments, arranged in lesser unconformity bounded units. They are bounded on top by erosive or non-depositional surfaces. On the whole, it is late pleistocene in age and composed of sands, laminated diatomaceous silts and marls, pumice.

GADEMOTTA SLOPE DEPOSITS

This deposit is composed of very thin alluvio-colluvial, volcanoclastic and fluvio-deltaic deposits, resting erosively on older deposits. This unit is represented by alluvial sands and gravels, overlain by alluvially reworked fine-grained greyish tuffs. In the Bulbulla River Plain, 15–20 m thick subaerial pumice fall deposits, corresponding to the Abernosa Pumice Member.

ADAMI TULU DEPOSITS

The Oromia IAIP site is situated on this geology. The deposit is made up of lacustrine, fluvio-deltaic, colluvial, and volcanoclastic sediments, with intervening buried soils. They are dominantly represented by alluvial and colluvial sands and silts, bearing a well-developed Luvisol. Lacustrine deposits are represented by massive diatomites.

SHORE DEPOSITS

This deposit is represented by alluvial–colluvial sediments, filling paleo valleys incised in the deposits of underlying units. The fills are characterised by basal alluvial gravelly sands, topped by fine-grained alluvial–colluvial.

In the west Shala, the deposit is represented by alluvial gravelly sands, overlain by low angle cross stratified sands. Sands of the recessional stranded beach are visible close to the present Lake Shala shore.

8.4.2 SHASHEMENE RTC

The Tertiary-Quaternary tectonic system known as the rift system is one of the largest structural features of the earth's crust, extending for a distance of over 6000km from Mozambique to Syria. The rift valley in the major tectonic system does not form one continuous unit and they run mostly NNE-SSW and partly NNW-SSE although in general the Rift System runs north-south.

The average width of the Rift Valley in the area is about 70-80km. All faults in the area are tensional and most faults run in a NNE-SSW direction, some in a NW-SW direction, and a few faults in either a NE-SW or N-S direction. A large number of these faults run for long stretches, even hundreds of kilometres, and they show displacements greater than 300m.

The area is covered with formation which includes basalts and ignimbrites of the plateau Trap Series, as mapped by Di Paola (1972). The Nazareth Group includes alkaline and peralkaline straioid silicics; ignimbrites, unwelded tuffs, ash-flows, rhyolites and trachytes while the Dino formation is made up of Dino ignimbrites. The ignimbrites, tuffs, waterlain pyroclastics are overlain by coarse unwelded pumiceous pyroclastics. The lithic fresh Ignimbrite shows light gray to gray colour the weathered colour is light brown. Most contain rhyolitic and trachytic rock fragments with fine and compacted ground mass, making columnar joints. The fresh rhyolite shows pink colour, medium to coarse grains and slight to high weathering.

8.5 GEOLOGICAL HAZARD – SEISMICITY

In terms of overall seismic risk, the presence of part of the East African Rift, which runs through the centre of the country, means that Ethiopia is prone to seismic activity and related natural disasters: earthquakes and volcanic eruptions (Abebe, 2010). Based on the seismic risk map zone of the country (**Figure 8-4**) the centre of Ethiopia faces a medium risk of earthquake hazard (World Health Organisation E-Atlas, Ethiopia). The country has experienced a number of earthquakes and these have caused some deaths, and damage to buildings. Within the Rift Valley, the greatest risk from earthquake-related ground shaking is concentrated where the population density is greatest. Disaster management activities in Ethiopia have tended to focus most on drought disaster management. Less attention has been paid to other types of disasters, like earthquakes and volcanic eruptions (Herbert, 2013). It is noted that due to the relative infrequency of large damaging earthquakes in the region, the risk from seismic hazard is not an annual concern like the other hazard types such as flooding, drought etc. (Bartel and Muller, 2007).

Mitigation from earthquake hazards is primarily accomplished through building codes, which mandate construction practices that can withstand expected levels of seismic ground shaking, this includes aspects such as building height, shape, type.

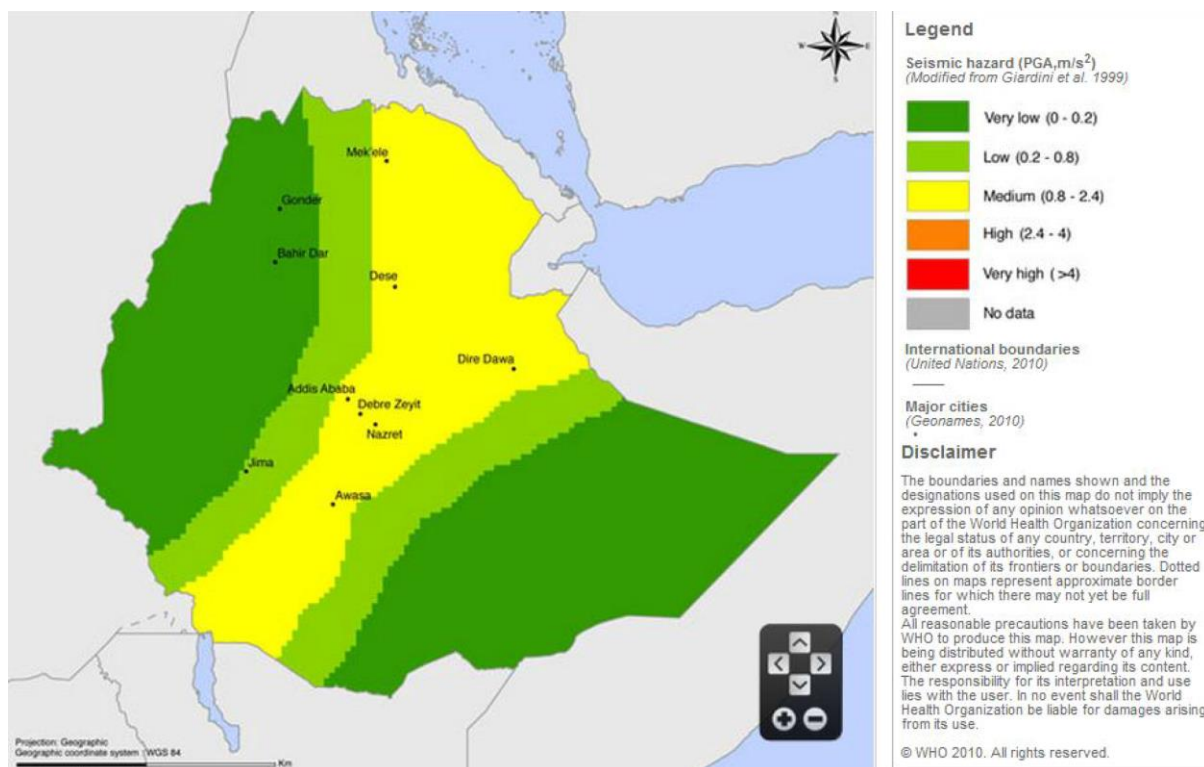


Figure 8-4: Seismic risk map of Ethiopia

8.6 SOILS

A detailed desktop assessment was undertaken for the Oromia IAIP and RTC sites. This included assessing the ISRIC World Soils Database, based on the World Reference Base Classification System (WRB, 2006) in order to establish the soil types according to an international standard system. Information associated with the outcomes of the ISRIC world soils database outcomes was reviewed, as was general information associated with Ethiopian soils, and, specifically, those found in the Oromia region.

8.6.1 SITE ASSESSMENT

Site visits were conducted on 17 and 18 August 2017 at the Oromia IAIP and RTC sites. Soil survey, classification, field mapping and sample analysis were undertaken. Six soil samples were taken at the IAIP site and two soil samples were taken at the RTC site. The following steps were performed:

1. Survey of the study area was undertaken on foot, using a hand-held bucket auger to identify soil forms present. Current activities at the site were also noted, and specific areas of land use and infrastructure were noted.
2. Auger points were assessed to a depth of approximately 1.5m for classification purposes, roughly according to a pre-determined set of points (see **Figure 8-5** and **Figure 8-6**) drawn along zig-zagged transects. Free survey was undertaken using the points as a guideline.
3. A hand-held GPS was used to record the location of each auger point.
4. Soil forms were described in the field according to local soil characteristics (with assistance from local partners), the World Reference Base classification system (WRB, 2006) and the South African Soil Classification Taxonomic System (Soil Classification Working Group, 1991), published as a Memoir on the Agricultural Natural Resources of South Africa No.15.

- [illegible]

UNOPS - INTEGRATED
AGRO-INDUSTRIAL PARK
STUDY
OROMIA RTC SITE

Legend

- Sampled Point
- Surveyed Points
- Site Boundary

0.00 0.01 0.02 0.03 0.04 Miles

PROJECTION: WGS84

PROJECT TITLE: SOIL LAND-USE AND DATA
ANALYSIS

SCALE: 1:5000

DATE: 05/05/2017

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8.6.2 SOIL CLASSIFICATION

WORLD REFERENCE BASE CLASSIFICATION SYSTEM

The World Reference Base for Soil Resources (WRB, 2006) is the international standard taxonomic soil classification system endorsed by the International Union of Soil Sciences (IUSS). It was developed by an international collaboration coordinated by the International Soil Reference and Information Centre (ISRIC) and sponsored by the IUSS and the FAO via its Land & Water Development division. It replaces the previous FAO soil classification. The WRB borrows heavily from modern soil classification concepts, including USDA soil taxonomy, the legend for the FAO Soil Map of the World 1988, the *Référentiel Pédologique* and Russian concepts. The classification is based mainly on soil morphology as an expression of pedogenesis. A major characteristic the USDA soil taxonomy system is that climate is not part of the system, except insofar as climate influences soil profile characteristics. As far as possible, diagnostic criteria match those of existing systems, so that correlation with national and previous international systems is as straightforward as possible. The WRB is meant for correlation of national and local systems.

ETHIOPIAN CLASSIFICATION SYSTEM

No Ethiopian classification system was identified through local partners, local university enquiries and literature searches. Soils papers published in Ethiopian journals utilise the FAO or WRB classification system (depending on when they were written) as these systems are widely used throughout Ethiopia (Assefa, 2002; Mishra *et al.*, 2004; Ayalew, 2015).

SOUTH AFRICAN CLASSIFICATION SYSTEM

The soils identified in the field were classified by form in accordance with the South African soil taxonomic system (Soil Classification Working Group, 1991) as a great deal of information is available about the various South African soil forms. In this way, more information could be given about the characteristics of the types of soils identified in the field. All South African soil forms fall within 12 soil types; Duplex (marked accumulation of clay in the B horizon), Humic (intensely weathered, low base status, exceptional humus accumulation), Vertic (swelling, cracking, high activity clay), Melanic (dark, structured, high base status), Silicic (Silica precipitates as a durban horizon), Calcic (accumulation of limestone as a horizon), Organic (peaty soils where water inhibits organic breakdown), Podzolic (humic layer forms beneath an Ae or E), Plinthic (fluctuating water table causes iron re-precipitation as ferricrete), Oxidic (iron oxides weather and colour soils), Hydromorphic (reduced lower horizons) and Inceptic (young soils - accumulation of unconsolidated material, rocky B or disturbed) soils.

SOIL CAPABILITY ASSESSMENT

The area's soils capability was assessed and mapped, based on the results of the classification study and the sample results. The South African land capability classification system by Scotney *et al.* (1987) was used to identify and map land capability and soil potential (**Table 8-6**). This system is useful in that it is able to quickly give one an overview of the agricultural capability and limitations of the soils in question, and is useful for soil capability comparisons. Criticisms of this system, however, include its lack of consideration of the local setting, land use planning and a lack of financial resources (Nethononda *et al.*, 2014). For this reason the site's soil capability has also been assessed taking the local setting into account.

Table 8-6: Land Capability Classification System (Scotney et al., 2014)

Land Capability Group	Land Capability Class	Increased intensity of use										Limitations
Arable	I	W	F	LG	MG	IG	LC	MC	IC	VIC		No or few limitations. Very high arable potential. Very low erosion hazard
	II	W	F	LG	MG	IG	LC	MC	IC	-		Slight limitations. High arable potential. Low erosion hazard
	III	W	F	LG	MG	IG	LC	MC	-	-		Moderate limitations. Some erosion hazards
	IV	W	F	LG	MG	IG	LC	-	-	-		Severe limitations. Low arable potential. High erosion hazard.
Grazing	V	W	-	LG	MG	-	-	-	-	-		Water course and land with wetness limitations
	VI	W	F	LG	MG	-	-	-	-	-		Limitations preclude cultivation. Suitable for perennial vegetation
	VII	W	F	LG	-	-	-	-	-	-		Very severe limitations. Suitable only for natural vegetation
Wildlife	VIII	W	-	-	-	-	-	-	-	-		Extremely severe limitations. Not suitable for grazing or afforestation.
W - Wildlife		F - Forestry				LG - Light grazing						
MG - Moderate grazing		IG - Intensive grazing				LC - Light cultivation						
MC - Moderate cultivation		IC - Intensive cultivation.				VIC - Very intensive cultivation						

8.6.3 REGIONAL OVERVIEW

According to the World Reference Base for Soil Resources (WRB, 2006), the soils of Ethiopia can be classified into five principal types.

Soil Type	Composition and Description
1	The first type is composed of Nitosols and Andosols and is found on portions of the Western and Eastern highlands. These soils are formed from volcanic material and, with proper management, have medium to high potential for rain-fed agriculture.
2	The second group of soils; Cambisols and Luvisols, are found in the Simien plateau of the Western Highlands. They are highly weathered with a subsurface accumulation of clay and are characterized by low nutrient retention, surface crusting, and erosion hazards. With proper management, they are of medium agricultural potential.
3	The third group of soils is the dark clay found in the Western Lowlands and at the foothills of the Western Highlands. Composed of Vertisols, they have medium to high potential for both food and agriculture but pose tillage problems because they harden when dry and become sticky when wet. Some of the rich coffee-growing regions of Ethiopia are found on these soils.
4	The fourth group is composed of Yermosols, Xerosols and other saline soils that cover desert areas of the Eastern Lowlands and the Denakil Plain. Because of moisture deficiency and coarse texture, they lack potential for rain-fed agriculture. However, the wetter margins are excellent for livestock, and even the drier margins respond well to irrigation.
5	The fifth soil group is Lithosols found primarily in the Denakil Plain. Lack of moisture and shallow profile preclude cultivation of these soils.

Of the 25 World Reference Base/FAO soil orders, 17 exist in Ethiopia. Lithosols, Cambisols, Nitisols, Vertisols, Xerosols, Solonchaks, Fluvisols and Luvisols cover more than 80% of the country, and are the most important soils. Vertisols are very important soils in Ethiopian agriculture.

According to the WRB Reference Soil Group (2006), Andosols dominate the Oromia IAIP and RTC sites.

8.6.4 BULBULLA IAIP

DESKTOP REVIEW

The ISRIC World Soils Database shows that the Oromia IAIP site to be dominated by Andosols. These have an average particle size distribution of 68% sand, 26% silt and 6% clay, which works out as an average texture classification of a Sandy Loam soil (USDA, 1939). Andosols are defined by their iron or aluminium chemistry and are typically soils of active volcanic areas, but can also be found outside active volcanic regions when environmental conditions favour their formation. Andosols cover a limited extent (1–2%) of the Earth's land surface, but many such areas are densely populated (Dahlgren *et al.*, 2016).

According to the preliminary geotechnical assessment undertaken for the Oromia study (MACE, 2016), the Oromia IAIP site comprised soils that exhibited silty sands with a 60cm - 1m deep brown, loose silty sand layer overlying a non-plastic silty/sandy layer comprising gravel from volcanic ash deposits to a depth of 2m.

LAND USE ASSESSMENT

At the Oromia IAIP site, 100% of the area is used for agricultural activities (grazing and crop production).

SOIL CLASSIFICATION

WITBANK / ANTHROSOL SOILS

In most soil classification systems, a soil name exists to describe soils that have been modified such that they do not resemble their original soil type. These soils can include those that have been used for agriculture where ploughing has modified the soil. For the purposes of this study, where previously ploughed soils are clearly identifiable (and ploughing is generally not deep in the area), these have been treated as their original soil type, so, while some of the soils identified could technically be classified as modified soils, the original soil forms could always be identified, so were used instead to make the outcomes of the study more useful. In the South African soil classification system, the closest soil form to a type of soil that has been formed or heavily modified due to long-term human activity is called a Witbank, which is an Orthic A horizon over man-made deposits. An Anthrosol in the World Reference Base for Soil Resources is a type of soil that has been formed or heavily modified due to long-term human activity, such as from irrigation, addition of organic waste or wet-field cultivation used to create paddy fields. Such soils can be formed from any parent soil, and are commonly found in areas where agriculture has been practised for centuries. Anthrosols can be found worldwide. The Witbank and Anthrosol soils thus both describe soils that have been modified through anthropogenic processes.

CLOVELLY / FERRALSOL SOILS

The Clovelly soil form was identified over 188.6 ha or 67% of the Oromia IAIP site. This soil is characterised by an Orthic A horizon over a yellow-brown apedal B horizon over an unspecified horizon (see photograph in **Figure 8-7**). The photograph was taken during the soil survey, and indicates the horizons from the top of the image (the dark upper layer is the Orthic A, followed by the yellow-brown apedal B horizon and the unspecified horizon). No water was encountered on the site.

The Clovelly soil form falls into the South African Oxidic soil group. These soils develop as oxides of iron accumulate through weathering and colour the soils - uniformly if the conditions are well drained and aerated. Oxidic soils are not necessarily highly weathered and may be found over a wide spectrum of climatic conditions.

As highlighted in the desktop assessment section, like Oxidic soils, Andosols are characterised by their iron or aluminium chemistry. Andosols are typically soils of active volcanic areas, and the geotechnical study undertaken for the site (MACE, 2016) identified a silty/sandy layer within the Oromia soils comprising gravel from volcanic ash deposits to a depth of 2m. Oxidic (Cloveley) soil forms and Andosols describe similar types of soils, but Andosols are typically more structured soils than Clovely soils. The Clovely form is more like the WRB Ferralsol classification; Ferralsols are red and yellow weathered soils whose colours result from an accumulation of metal oxides, particularly iron and aluminium (from which the name of the soil group is derived). They are typically formed on geologically old parent materials.



Figure 8-7: Photograph showing a Clovely/Ferralsol soil profile at the Oromia IAIP site

MOLOPO / CALCISOL SOILS

The Molopo soil form was identified over 95 ha or 33% of the Oromia IAIP site. This soil is characterised by an Orthic A horizon over a yellow-brown apedal B horizon over a soft carbonate horizon (see photograph in **Figure 8-8**). The photograph was taken during the soil survey, and indicates the horizons from the top of the picture (the dark upper layer is the Orthic A, followed by the yellow-brown apedal B horizon and the soft carbonate horizon). The Molopo soil form falls into the South African Calcic soil group. The carbon-rich lower horizons that characterise calcic soils result from an accumulation of calcium carbonate over a long period (Fey, 2010). These soils are typical of drier areas such as the Oromia site (MAP of 696mm). In the WRB classification system Calcisols are soils with a significant secondary accumulation of calcium carbonate resulting from precipitation from solution brought about by evaporation under arid or semi-arid conditions (Chesworth *et al.*, 2016). Calcic and Calcisol soils clearly describe the same types of soils.



Figure 8-8: Photograph showing a Molopo / Calcisol soil profile at the Oromia IAIP site.

The distribution of the soil forms at the IAIP site can be seen in **Figure 8-9**.



Figure 8-9: Distribution of the soil forms at the IAIP site.

SOIL CAPABILITY ASSESSMENT

The soil profiles at the study sites indicated a relatively uniform depth of around 1.5m at the auger points assessed. Water was not encountered at the base of the profiles. Andosols are highly porous, dark-coloured soils usually developed from parent material of volcanic origin such as volcanic ash, tuff, and pumice. Andosols typically have a high aluminum content, and their reactions with inorganic phosphate render the phosphate essentially insoluble and unavailable for uptake by plants. Although the soils have excellent water-holding and nutrient capacity (unless leached extensively), their strong reaction with phosphate can make agriculture without fertilizing problematic (Dahlgren *et al.*, 2016). Owing to their physico-chemical properties, Andosols are largely considered fertile soils that are very resistant to water erosion, but a paper by Khamsouk *et al.* (2002) found that erosion associated with runoff increases significantly with increased slope on Andosols. With proper management Andosols have medium to high potential for rain-fed agriculture. Ferralsols (Clovelly) have low fertility and require additions of lime and fertilizer if they are to be used for agriculture as a result of residual metal oxides and leaching of mineral nutrients. Tree crops such as oil palm, rubber, or coffee are suitable, but pasture is often their main agricultural use.

Calcic (Molopo) soil capabilities are typically severely limited by climate, as well as shallow effective rooting depth, high pH, high salinity, low plant-available P and trace elements (especially Fe), toxic levels of extractable B and stoniness (Fey, 2010).

Using the South African soil classification guidelines (Scotney *et al.*, 1987), the land capability of the Clovelly soils was established as Land Capability Group 'Arable Soils' and Land Capability Class II, as it has 'Slight limitations' and 'Low erosion hazards' and can be used for (in order of increased intensity of use) 'Wildlife, Forestry, Light Grazing, Moderate Grazing, Intensive Grazing, Light Cultivation, Moderate Cultivation and Intensive Cultivation' (Table 8.1, Scotney *et al.*, 1987). In the context of the Oromia sites, this is accurate in that these Oxidic soils do pose a low erosion hazard and are deep soils that pose no structural impediment to roots, but these soils do pose a limitation to crops in areas of variable rainfall such as Oromia (Game and Korecha, 2015) owing to their well-drained characteristics when water is scarce. For this reason these soils should be considered in Land Capability Class VI in this context, suitable for moderate grazing. The distribution of land capability classes at the IAIP site can be seen in **Figure 8-10**.

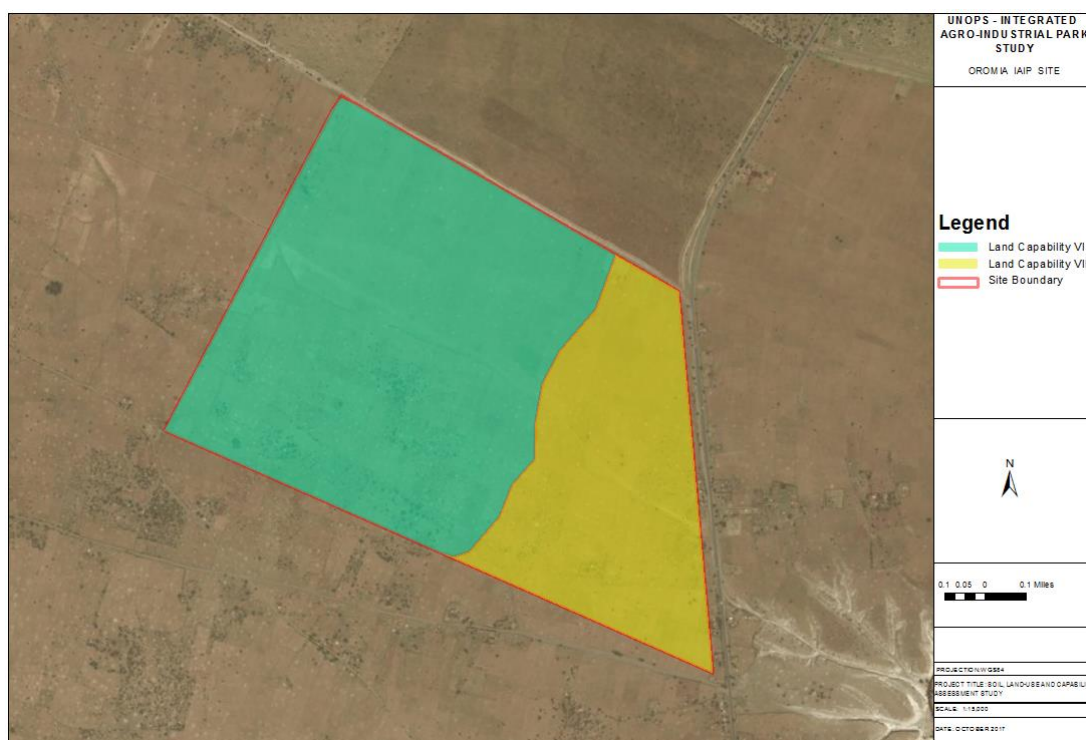


Figure 8-10: Distribution of land capability classes at the IAIP site.

The land capability of the Molopo soils was established as Land Capability Group, 'Grazing' and Land Capability Class VI as it has severe limitations that preclude cultivation. While, under irrigation these soils could be used for perennial vegetation, in the context of the Oromia site this is not financially feasible, so a better classification would be Land Capability Class VII as this soil has very severe limitations in this context. These soils could thus be used for Wildlife, Forestry and Light Grazing according to this classification system, and are frequently used for light grazing (Fey, 2010).

8.6.5 SHASHEMENE RTC

DESKTOP REVIEW

The ISRIC database shows that the Shashemene RTC site to be dominated by Andosols, as described in Section 8.6.4. According to the preliminary geotechnical assessment undertaken for the Oromia study (MACE, 2016), the Shashemene RTC site comprises soils that exhibited silty sands with a 60cm-1m deep brown, loose silty sand layer overlying a non-plastic silty/sandy layer comprising gravel from volcanic ash deposits to a depth of 2m.

LAND USE ASSESSMENT

At the Shashemene RTC site 100% of the area is used for agricultural activities (grazing and crops).

SOIL CLASSIFICATION

MOLOPO / CALCISOL SOILS

The Molopo soil form, as described in Section 8.6.4, was identified over 10 ha or 100% of the Shashemene RTC site (**Figure 8-11**).



Figure 8-11: Layout showing the soil form of the RTC site.

SOIL CAPABILITY ASSESSMENT

As stated in Section 8.6.4, the land capability of the Molopo soil was established as Land Capability Class VII as this soil has very severe limitations in this context. The distribution of land capability classes at the RTC site can be seen in **Figure 8-12**.



Figure 8-12: Figure showing distribution of land capability classes at the RTC.

8.7 SURFACE WATER HYDROLOGY

The Oromia IAIP and RTC site is situated within the Rift Valley Lakes Basin which is one of the eleven major basins in Ethiopia with a total area of approximately 52,000 km². The basin is characterised by a chain of lakes varying in size as well as in hydrological and hydrogeological settings. It constitutes eight lakes, Lake Ziway, Lake Langano, Lake Abiyata, Lake Shalla, Lake Hawassa, Lake Abaya, Lake Chamo, and Lake Beseka (**Figure 8-13**), and all are located southwest of the Ethiopian capital, Addis Ababa (Belete, Diekkruiger, & Roehrig, 2015).

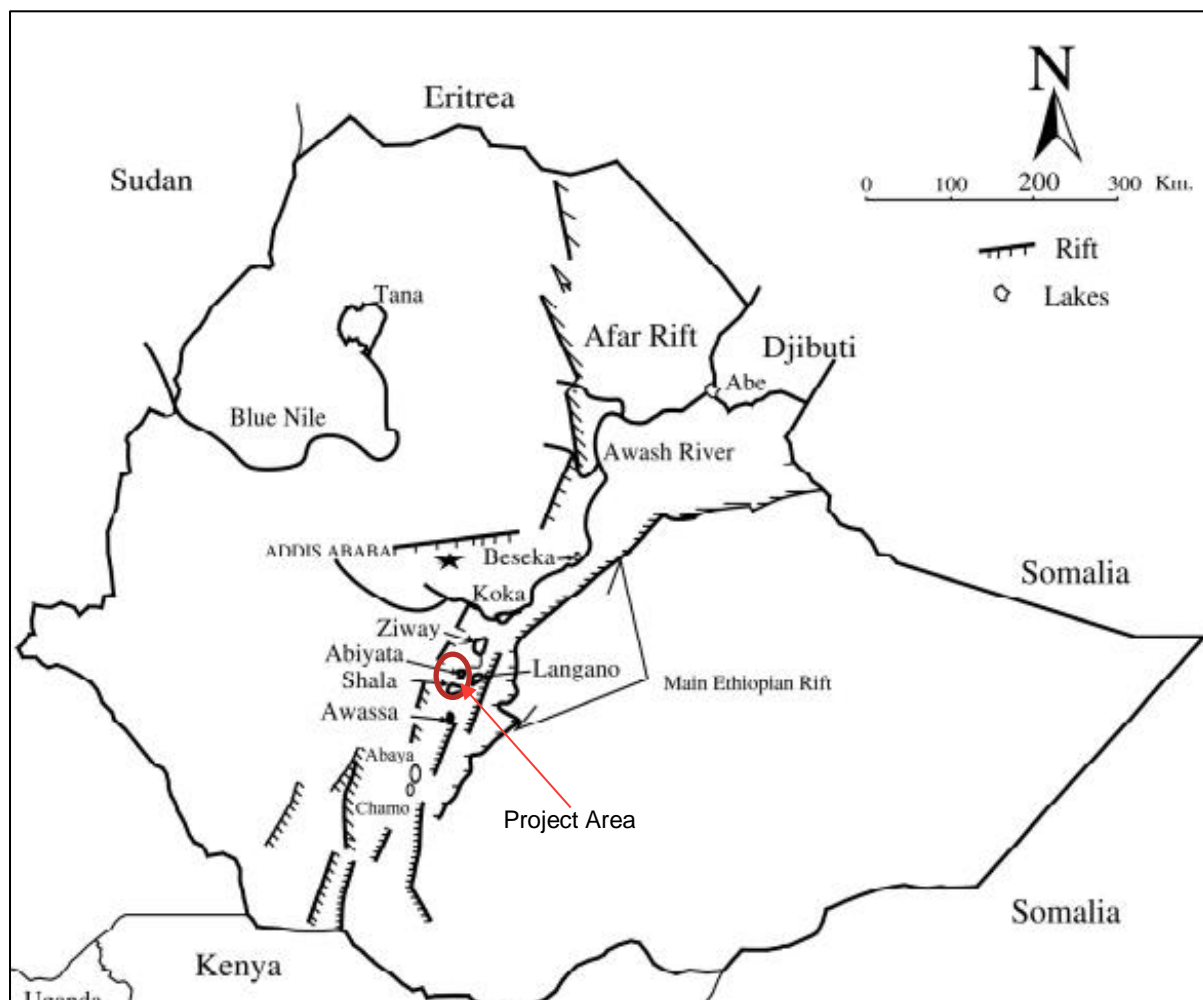


Figure 8-13: East African Rift Valley (Belete, Diekkruiger, & Roehrig, 2015)

The Oromia IAIP site is located within the Central Rift Valley of the Rift Valley Lakes Basin. The Central Rift Valley covers an area of approximately 10,000 km² and consists of three main lakes which are Lake Ziway, Lake Abiyata and Lake Langano. The major rivers draining this valley are the Meki, Ketar and Bulbula Rivers (see **Figure 8-14**). Fault systems associated with the rift have affected the drainage of the area both by determining the river courses and by impounding river water and causing some marshy areas such as Arata Swamp on the way from Kulumsa to Abura.

The entire outflow from Lake Ziway is carried by the Bulbula River, which flows south for 30 km before discharging to Lake Abiyata, a terminal lake. Except periodically during the wet season, the flow in the Bulbulla River usually derives entirely from Lake Ziway. However, the Bulbulla River does have significant catchments of its own with ephemeral tributaries from the east occasionally contributing to the flow. The Oromia IAIP site is located approximately 1 km from the Bulbulla River.

The Mean Annual Precipitation (MAP) expected at the project site is approximately 666 mm with the wettest months occur during June, July and August and the driest months occurring during November,

December and January. MACE has undertaken an analysis of the 40-year dataset (1967-2006) for their storm water hydraulic analysis to determine the rainfall intensity. The dataset showed that the project site experienced a maximum rainfall event of 113.2mm during the 8 April 1989 and 80.3mm during the 8 July 1985. During the period of 2007-2016, the maximum rainfall event experienced was 108mm on the 4th of July 2011 and 86.3mm during the 2nd of November 2008. The recorded intensity of rainfall experienced ranged between 1 to 3 hours period per day (MACE, 2017).

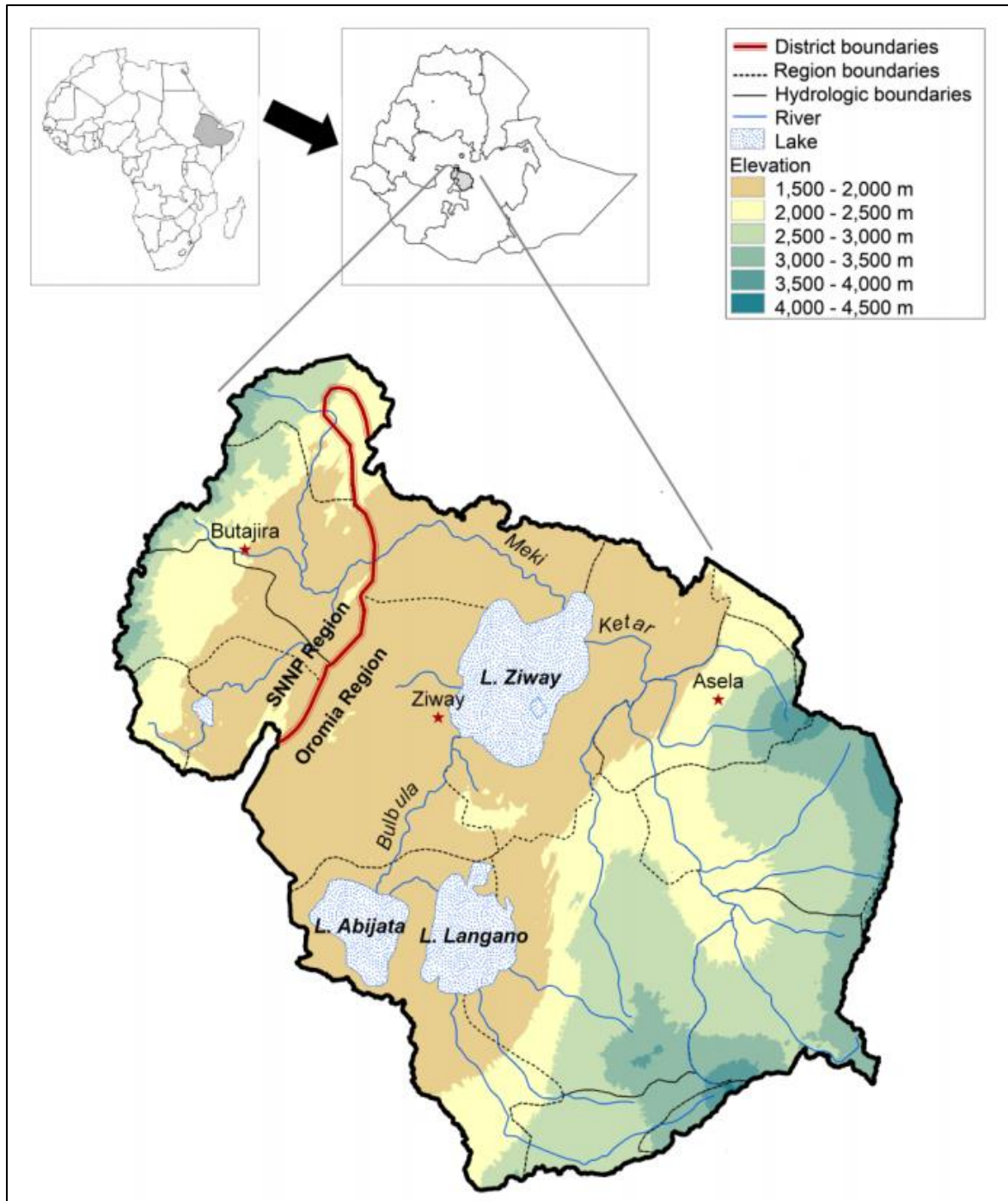


Figure 8-14: Locality Map of the Central Rift Valley (Pascual-Ferrer & Candela, 2015)

Flow data for the Bulbulla River was sourced and analysed for the period 1980-2004 (**Table 8-7**). The highest average monthly flow occurs in October and 60% of the average annual flow occurs during September, October and November. The average minimum flow occurs during May and June with a volume of 2.9Mm³.

Table 8-7: Mean Monthly Flow of Bulbulla River (Mm³)

Gauge	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual (Mm ³)
Bulbulla	11.5	6.8	4.4	3.3	2.9	2.9	4.7	14.6	32.9	40	29.9	19.7	173.7

Similar to lake levels, the Bulbulla River attained mean peak flow in the month of October (40.0 Mm³) and mean minimum flow depth during months of May and June (2.9 Mm³). But during medium to dry years, the river bed was almost dry after the month of April and extended to the month of June.

There is no surface water resource on the IAIP site. The closest river, the Bulbulla River, is situated approximately 1 km east of the site, on the eastern side of the Federal Highway 7. A stormwater diversion channel (open trench) has been established along the northern boundary of the site that diverts runoff away from the site and into the culvert under the road which drains into the Bulbulla River, as shown in **Figure 8-1** above. Agriculture is reportedly the biggest water user in the region.

During the site investigation it was noted that the stormwater channel has resulted in significant erosion, specifically adjacent to the federal highway (**Figure 8-15**).



Figure 8-15: Erosion along eastern boundary of the IAIP site (Source: WSP Site Investigation)

The Oromia RTC site is situated approximately 20km south of Lake Shala. Drainage from the site occurs in a northern direction towards Lake Shala through a network of unnamed drainage lines. Several perennial streams start from the highlands on both sides of the rift valley and they enter the lakes which occupy the low lying middle part of the rift valley. There is a river locally named 'Guta' on the north side of the RTC site flowing in a SW-NE direction. Downstream, the Guta River is named the 'Dembi River'. Therefore, surface water from the site is drained into Guta (Dembi) River during rainy season. There is no surface water resource on the RTC site.

8.8 HYDROGEOLOGY

8.8.1 OVERVIEW

In the basin the hydrogeological behaviour of the volcanic rocks deposits and the hydro chemical signature of natural waters are diversified and influenced by the:-

- Wide compositional, structural and textural variability of the volcanic rocks;
- Complex spatial and temporal distribution of the volcanic rocks; and
- Different reciprocal stratigraphic relationships of the volcanic rocks with the different level of weathering and variable topographic position of the volcanic rocks.

The hydrogeology of the area is largely governed by the geometry of the rift, the variability and lateral discontinuity of the volcanic rocks and the disruption of lithologies by faults, resulting in vertical structuring and spatial heterogeneity across the region. The aquifers are largely the product of

volcanic eruptions which occurred in the area at different times and different locations throughout the regions geological history.

As groundwater use is very limited throughout the region and boreholes and wells are scarce, very little information could be gathered regarding the local hydrogeological conditions at the IAIP and RTC sites. It has been reported by local hydrogeologists that the reason for the lack of groundwater development as a water source is due to the high fluoride content naturally contained in the groundwater system as a result of the Rift Valley hydro-geochemistry.

Based on the hydraulic conductivity data of existing wells during literature review, the various formations in the area have been classified into three groups of High (greater than 40 m/day), Moderate (1-40 m/day) and Low (less than 1 m/day) permeabilities.).

Due to the limited available information, the IPDC undertook a drilling programme at the beginning of 2018 at the Bulbulla IAIP site. At the time of the assessment one borehole had been completed. The data gathered from this borehole indicate that groundwater flow in the region is predominantly in fractures within the host rock, which produce preferential groundwater flow paths. These preferential flow paths have relatively high groundwater exploitation potential, based on the results of the pump testing programme. The static groundwater level in the borehole was 38.7 meters below ground level (mbgl).

8.8.2 HYDRAULIC PARAMETERS

The hydraulic parameters of an aquifer describe the ease with groundwater (and thus potential contaminants contained within the groundwater) move through the subsurface and is used to predict the rate of groundwater movement. The higher the hydraulic conductivity and/or transmissivity, the faster groundwater will move through an aquifer. The hydraulic parameters are obtained by conducting aquifer tests on borehole drilled into the relevant aquifer units.

A summary of the aquifer testing results for the Ziway Borehole and the UNOPS drilled borehole on the Bulbulla IAIP Site were obtained from the respective pump testing programmes. The Ziway Borehole details are provided for regional reference purposes only, as it is located a considerable distance from the Site. The borehole drilled on site provides more site specific hydraulic parameters. The results obtained are summarised in **Table 8-8**.

Table 8-8: Summary of Calculated Aquifer Parameters

BOREHOLE ID	STATIC WATER LEVEL LEVEL (M)	DISCHARGE (L/S)	DRAW DOWN(M)	SPECIFIC CAPACITY (L/S/M)	TRANSMISSIVITY CALCULATED (M ² /S)	TRANSMISSIVITY ESTIMATED FROM PUMPING TEST (M/S)
Ziway Borehole	76.6	4.4	1.52	2.90	3.50E-03	5.40E-03
UNOPS Drilled Borehole	38.7	26.6	3.12	8.52	6.29E-03	7.72E-01

8.8.3 GROUNDWATER QUALITY

In the majority of waters from the rift floor boreholes, cold spring and dug wells; sodium dominate their cation species and bicarbonate dominate their anions. These groundwaters fall in the Na–HCO₃ type in the Piper plot and most of them have moderately high total dissolved solids (TDS).

The groundwater of the area is widely known for its high concentration of fluoride ion. In nature fluoride comes from chemical weathering products of igneous rocks, magmatic emission, atmospheric dust from continental sources and industrial pollution (Hem, 1970).

In the study area, the geothermal waters between Lake Ziway and Langano show enrichment with fluoride this may be resulted from deep magmatic source. The closed terminal lakes attain the highest

fluoride concentration, salinity and alkalinity as a result of evaporation and the groundwater flux that comes from thermal wells.

Table 8-9 describes the existing well points identified in the vicinity of the IAIP site. While **Figure 8-16** indicates the location of the identified wells in relation to the IAIP site.

Table 8-9: Well inventory around the Bulbulla IAIP site

GW point ID	Northing (m)	Easting (m)	Type	Static water level (mbgl)	Status
OMAGW01	853507.87	461212.88	Hand dug well	Unable to measure	In use
OMAGW02	858166.17	460341.12	Deep borehole	Unable to measure	No in use
OMAGW03	854398.42	460746.06	Hand dug well	Well filled in	No in use
OMAGW04	856642.51	460893.40	Hand dug well	Well filled in	No in use
IPDC – Drilled Borehole	459580	857893	Deep Borehole	38.7	Not in use (planned future use)

Note: Coordinates are given in geographic format, zone 37, hemisphere N of the Adindan, Ethiopia datum (Ellipsoid: Clarke 1880)

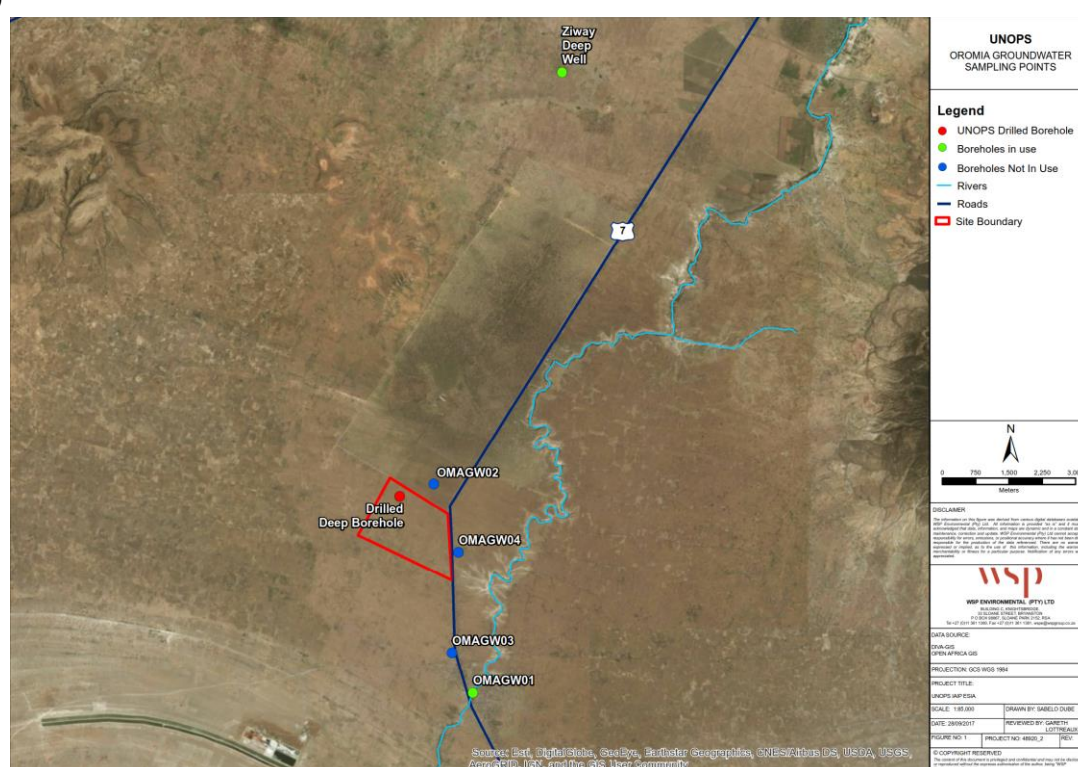


Figure 8-16: Layout showing the location of the identified well points around the IAIP site.

One water quality sample was collected from a shallow hand dug well (OMAGW01), located in a local tavern within Bulbulla Town, in close proximity to the Bulbulla River. However, the shallow nature of this well and the potential interaction with surface waters from the nearby River result in the quality being unrepresentative of the groundwater quality in the region. Water quality results for a limited number of parameters analysed for a deep borehole located approximately 10km north east of the IAIP site was obtained from local NGOs in the region.

The water sample collected during the August 2017 site visit was submitted to an internationally accredited laboratory for analysis. The results of the analysis, and of the data gathered for the additional deep borehole drilled by the IPDC, are presented in **Table 8-10**.

Table 8-10: Water Quality Results for Oromia Project

TEST	UNITS	ETHIOPIAN STANDARD	WHO GUIDELINES	OMAGW01	ZIWAY DEEP WELL	IPDC DRILLED DEEP BOREHOLE
Aluminium	µg/l	200	100	<20	Not analysed	Not analysed
Antimony	µg/l	-	20	<2	Not analysed	Not analysed
Arsenic	µg/l	10	10	<2.5	Not analysed	Not analysed
Barium	µg/l	700	700	13	Not analysed	Not analysed
Boron	µg/l	300	500	99	Not analysed	40
Cadmium	µg/l	3	3	<0.5	Not analysed	Not analysed
Total Chromium	µg/l	50	50	<1.5	Not analysed	Not analysed
Copper	µg/l	2000	2000	<7	Not analysed	Not analysed
Total Iron	µg/l	300	-	<20	20	180
Lead	µg/l	10	10	<5	Not analysed	Not analysed
Manganese	µg/l	500	400	870	100	0
Mercury	µg/l	-	6	<1	Not analysed	Not analysed
Nickel	µg/l	-	70	<2	Not analysed	Not analysed
Selenium	µg/l	-	10	<3	Not analysed	Not analysed
Sodium	mg/l	200	40	89.5	246.00	664.9
Uranium	µg/l		15	<5	Not analysed	Not analysed
Zinc	µg/l	5000	3000	25	Not analysed	Not analysed
Fluoride	mg/l	1.5	1.5	1.8	5.1	2.1
Sulphate as SO ₄	mg/l			3.7	2.0	25.4
Chloride	mg/l	250	-	17.6	21.16	181.9
Nitrate as N	mg/l	50	50	0.47	0.37	0.32
Nitrite as N	mg/l	3	3	1.064	Not analysed	0.04
Total Cyanide	mg/l	70	70	<0.01	Not analysed	Not analysed
Electrical Conductivity	µS/cm	-		622	Not analysed	1906
Free Ammonia as N	mg/l	1.5	1.5	<0.006	0.15	0
Free/Residual Chlorine	mg/l	0.5	5	<0.02	Not analysed	Not analysed
pH	pH units	6.5 - 8.5	6.5 - 8.5	7.58	8.46	8.8
Total Dissolved Solids	mg/l	1000	600	475	Not analysed	953
Turbidity	NTU	-	5	0.7	Not analysed	Not analysed

The results of the sample collected from the hand dug well in Bulbulla Town (OMAGW01) is not expected to be representative of the groundwater environment in the area, and should thus not be considered with regards to the local groundwater conditions.

The water quality results obtained for the deep well drilled by the IPDC within the northern portion of the IAIP site confirm the high levels of fluoride and sodium, which are above the WHO and Ethiopian Guidelines and Standards for drinking water quality, as noted from the Ziway deep well located to the

north of the site. The elevated fluoride and sodium levels in the groundwater are likely to be a result of rift valley geology interacting with the groundwater on a regional scale and thus reflects the natural baseline of levels of these elements, rather than an anthropogenic contamination source. As a result groundwater in the area is unfit for human consumption without treatment.

8.9 WETLANDS

A wetland desktop screening and infield assessment, relating to the proposed Oromia IAIP development and the associated RTC site (the 'sites') was undertaken as part of the scoping phase. This assessment was undertaken to determine whether the proposed sites may intrude into the delineated boundary of a wetland and potential significance of the impacts on the system.

8.9.1 BULBULLA IAIP

The desktop screening and infield assessments of the Bulbulla IAIP determined that there were no wetland habitats within the site boundaries or in close proximity to the site, where there was a potential for wetland habitats to be indirectly impacted. Therefore no further functional assessments, impact assessment or mitigation measures were required for the proposed IAIP site.

8.9.2 SHASHEMENE RTC

The desktop screening and infield assessments of the Shashemene RTC determined that there were no wetland habitats within the site boundaries or in close proximity to the site, where there was a potential for wetland habitats to be indirectly impacted. Therefore no further functional assessments, impact assessment or mitigation measures were required for the proposed RTC site.

8.10 AIR QUALITY

8.10.1 BULBULLA IAIP

To assess the current baseline ambient air quality situation at the Bulbulla IAIP site, dust fallout is being conducted at four sites from 19 September 2017 to (estimated) 22 November 2017 (**Table 8-11** and **Figure 8-17**). Passive monitoring of SO₂ and NO₂ concentrations was also undertaken at the same sites for a 14 day period from 25 September 2017 to 9 October 2017. The exposed passive samplers have been received at UNOPS, Addis Ababa and will be couriered to South Africa with the dust fallout samplers at the end of the monitoring campaign.

As per the terms of reference, dust fallout monitoring was proposed to be undertaken for a three-month period. However, due to the tight project timeframes as well as the high rainfall experienced at the start of the project, the monitoring was delayed until September 2017, and as such, monitoring was limited to a two-month period. In addition, a number of constraints have also been experienced over the monitoring period, including security issues, possible contamination of samples and other external factors that may influence the final results.

Table 8-11: Coordinates of dust fallout and passive monitoring locations at Bulbulla IAIP.

Sampling Site	Latitude (°N)	Longitude (°E)
DFO 1	7°45'29.17"	38°38'35.79"
DFO 2	7°45'58.15"	38°37'53.60"
DFO 3	7°45'00.66"	38°37'26.00"
DFO 4	7°44'38.06"	38°38'39.24"

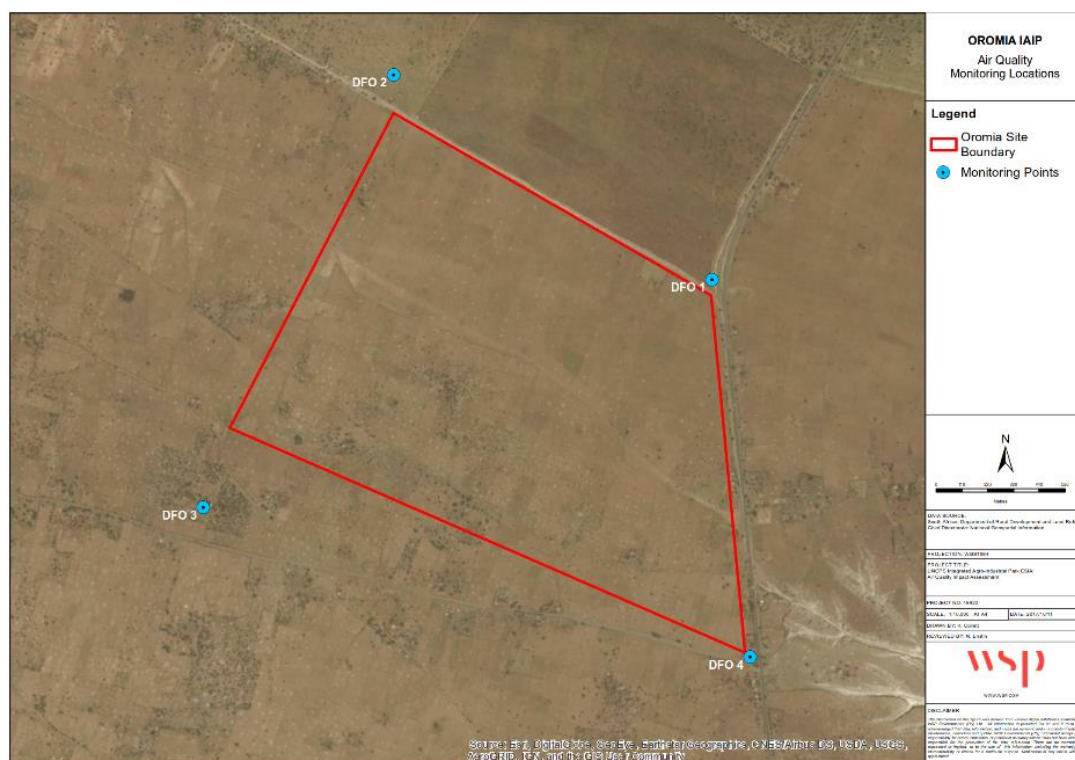


Figure 8-17: Dust fallout and passive monitoring locations at Bulbulla IAIP.

DUST FALLOUT MONITORING

Deposition of large ($>10\ \mu\text{m}$) solid particles is a function of the airborne concentration and the particle gravitational speed. The monitoring of fugitive dust is therefore conducted principally by passive dust deposition gauges, whereby an open-mouthed container is partially filled with distilled water and exposed for a designated period of time. The container is then collected and the insoluble particles are removed by filtering the water and weighing, whilst the soluble particle mass is determined after evaporation of a sample of the filtered solution. This is a standardised sampling technique in South Africa, commonly referred to as 'bucket-monitoring' that was originally derived from the American Society for Testing and Materials standard method for collection and analysis of dust fallout (ASTM D1739).

The sampling equipment consists of a non-directional fallout bucket with a circular opening of 19 cm and a depth of 33 cm (ASTM D1739-98). The specifications are as close as possible (with available materials) to those recommended by the ASTM D1739-98 Standard. The low aspect ratio (i.e. the height to width ratio) is required to keep collected particulates in the bucket before they settle in the sample water that is treated with a small quantity of biocide to prevent algal growth. The ASTM method stipulates that the stand which supports the container needs to be two metres above the ground as there is a large variability in the concentration of particles subject to settling at heights less than two metres.

PASSIVE SAMPLING

Passive samplers do not involve the pumping of any air. Instead gases diffuse onto the surface of the sampler and adsorb onto filter material contained inside a collection cartridge. The rate of adsorption of the samplers is known and, with the recorded exposure period, a gas concentration can be calculated. **Figure 8-18** shows the adsorption process. Passive samplers are deployed for specific time periods to allow for adequate adsorption of the gas onto the sorbent material for analytical measurement, but to avoid saturation point or a result below the detection limit (BDL). Air flow along the central duct is at $\sim 2\ \text{m/s}$ with a temperature of 13°C and relative humidity of 70%. These are within the limits appropriate to the samplers (Radiello, 2006).

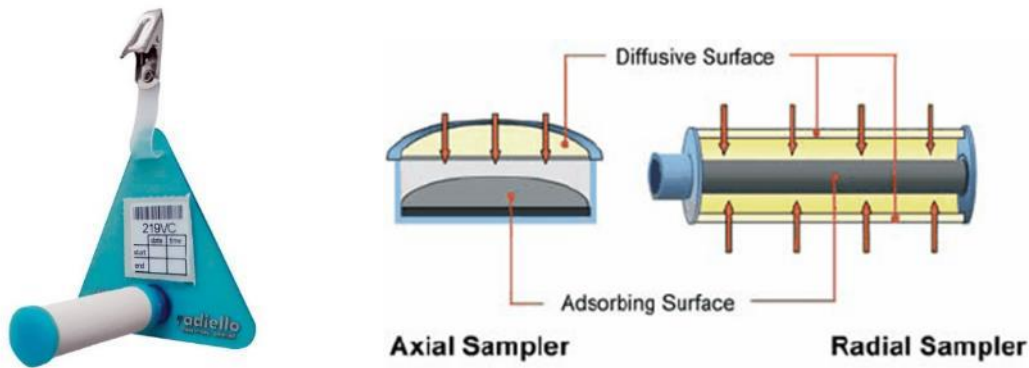


Figure 8-18: Diffusive and absorbing surfaces of a passive sampler

SITE ASSESSMENT RESULTS

No monitoring data is available to date to assess the baseline air quality situation. This information will be utilised in the impact assessment phase to assess the potential impacts the proposed Project may have on the surrounding receptors.

8.11 NOISE

8.11.1 BULBULLA IAIP

The current noise climate is typically rural, with very limited anthropogenic influences. The site currently consists of farming activities which do not generate significant levels of noise. Various dwellings are distributed across the site. The federal highway no. 7, which connects Addis Ababa and Awassa, borders the site on the east. This is the most significant noise source at the proposed Bulbulla IAIP site.

NOISE MONITORING METHODOLOGY

In order to assess the current noise climate in the vicinity of the Bulbulla IAIP, ambient environmental acoustic monitoring was undertaken on 18 and 19 August 2017 at five locations in and around the proposed site (**Table 8-12** and **Figure 8-19**). All sound level measurements were free-field measurements (i.e. at least 3.5 m away from any vertical reflecting surfaces). Measurement procedures were undertaken according to the relevant South African Code of Practice SANS 10103:2008 which is in line with the IFC requirements. This guides the selection of monitoring locations, microphone positioning and equipment specifications. Sound level measurements were taken with a SABS-calibrated Type 1 Integrating Sound Level Meter. The sound level meter was calibrated before and after measurements were conducted and no significant drifts (differences greater than 0.5 dB(A)) were found to occur. The make and model as well as serial number and calibration validity of the sound level meter and calibrator are presented in **Table 8-13**.

Day-time and night-time measurements were conducted for fifteen minutes, allowing monitoring to be adequately representative. In accordance with the IFC EHS Guidelines, monitoring was conducted during the relevant timeframes for day (07:00 to 22:00) and night (22:00 to 07:00).

The noise parameters recorded included:

- L_{Aeq} - The equivalent continuous sound pressure level, normally measured (A-weighted);
- L_{Amax} - The maximum sound pressure level of a noise event measured (A-weighted);
- L_{Zpeak} - The peak noise level experienced during the measurement (Z-weighted); and
- L_{A90} - The average noise level the receptor is exposed to for 90% of the monitoring period.

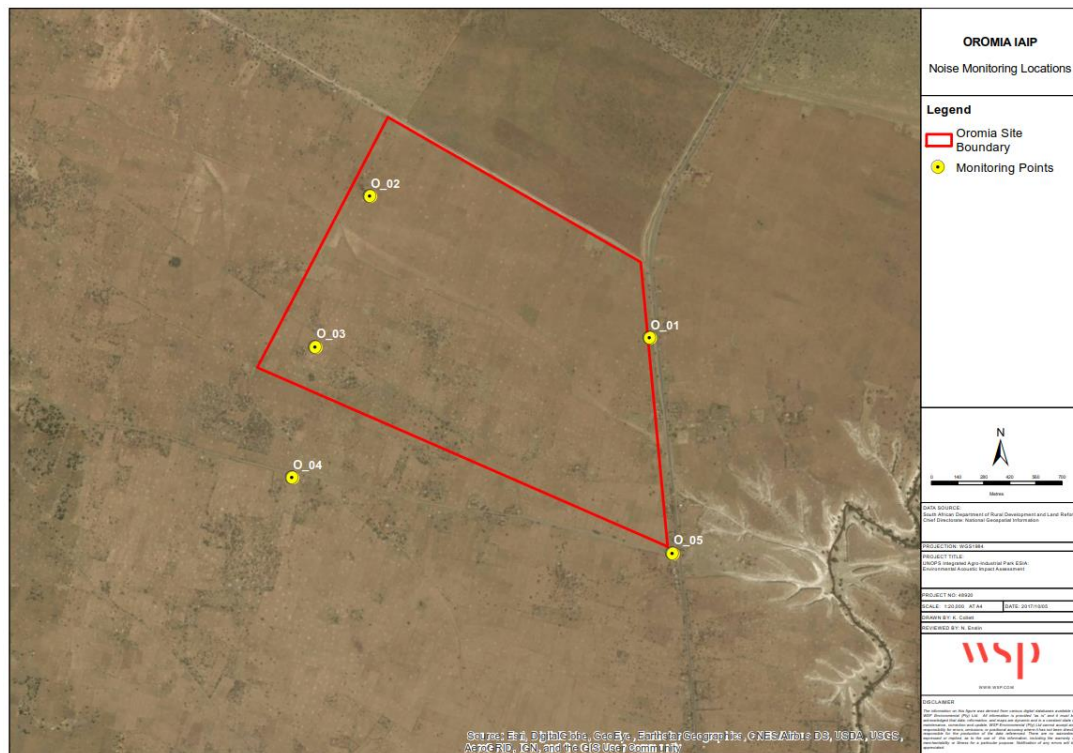


Figure 8-19: Noise monitoring locations surrounding the Bulbulla IAP.

Table 8-12: Noise monitoring locations.

ID	Latitude (°N)	Longitude (°E)	Classification
O_01	7.754139	38.643361	Residential
O_02	7.761194	38.630528	Residential
O_03	7.754111	38.627806	Residential
O_04	7.748000	38.626472	Residential
O_05	7.743832	38.644317	Residential

Table 8-13: Sound level meter and calibrator specifications.

Sound level meter	Calibrator
Make & model: CEL 63X	Make & model: CEL-120/1
Serial number: 3134723	Serial number: 3939145
Date calibrated: November 2016	Date calibrated: November 2016
Calibration due date: November 2017	Calibration due date: November 2017

DAY-TIME MONITORING RESULTS

The results from the day-time noise monitoring campaign conducted on 18 August 2017 are presented in **Table 8-14** and **Figure 8-20**. Noise levels were compared to the typical day-time guideline level for noise in residential areas (55 dB(A)). Noise levels at three of the five monitoring locations were below the guideline level. Noise levels at O_01 and O_05 (both located alongside the federal highway) exceeded the guideline level. The main source of noise at these locations was traffic operating on the road, with a total of 60 vehicles and 77 vehicles counted passing the O_01 and O_05 locations respectively during the fifteen-minute monitoring period.

Table 8-14: Day-time noise monitoring results.

Location	Time	L_{Aeq} (dB(A))	L_{Amax} (dB(A))	L_{Amin} (dB(A))	WHO Guideline (dB(A))	Compliant
O_01	10:06	57.6	75.6	26.4	55	No
O_02	10:31	42.3	70.4	25.9	55	Yes
O_03	10:55	42.4	60.1	29	55	Yes
O_04	11:22	42.4	70.1	27.7	55	Yes
O_05	11:51	60.9	78.9	35.9	55	No

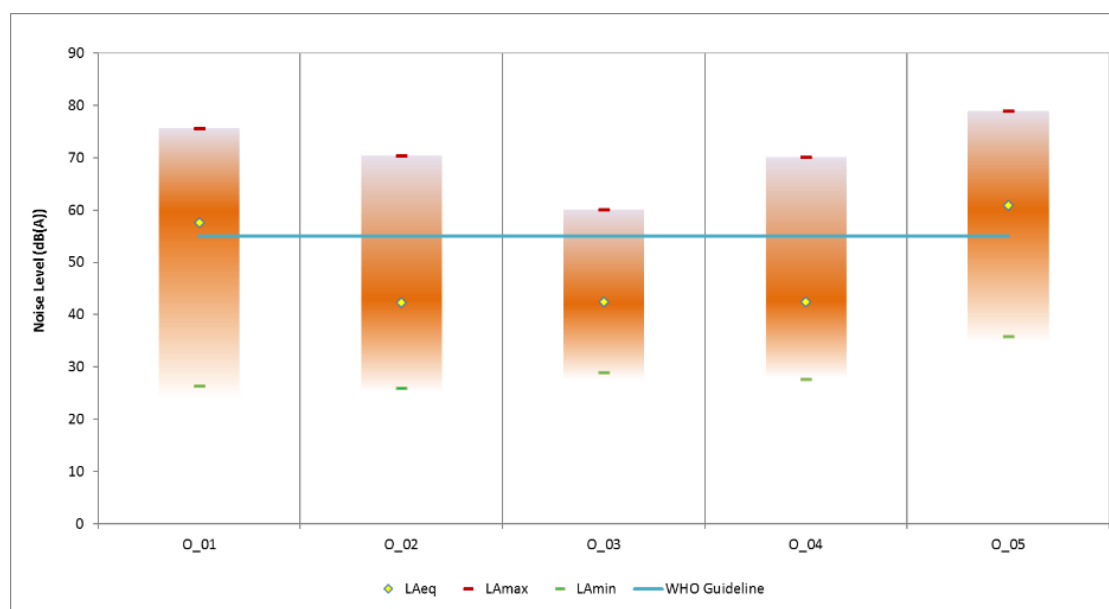


Figure 8-20: Day-time monitored noise levels. L_{Aeq} (yellow diamond) is compared with the WHO guideline.

NIGHT-TIME MONITORING RESULTS

The results from the night-time noise monitoring campaign conducted on 18 and 19 August 2017 are presented in **Table 8-15** and **Figure 8-21**. Noise levels were compared to the typical night-time guideline level for noise in residential areas (45 dB(A)). Noise levels at three of the five monitoring locations were below the guideline level. Noise levels at O_01 and O_05 (both located alongside the federal highway) exceeded the guideline level. The main source of noise at these locations was traffic operating on the road, with a total of 42 vehicles and 57 vehicles counted passing the O_01 and O_05 locations respectively during the fifteen-minute monitoring period.

Table 8-15: Night-time noise monitoring results.

Location	Time	L_{Aeq} (dB(A))	L_{Amax} (dB(A))	L_{Amin} (dB(A))	WHO Guideline (dB(A))	Compliant
O_01	22:50	58.1	75.7	28.8	45	No
O_02	06:25	43.8	64.1	30.2	45	Yes
O_03	06:45	40.6	56.9	30.4	45	Yes
O_04	22:00	33.0	60.7	21.7	45	Yes

Location	Time	L_{Aeq} (dB(A))	L_{Amax} (dB(A))	L_{Amin} (dB(A))	WHO Guideline (dB(A))	Compliant
O_05	22:27	61.6	76.9	32.1	45	No

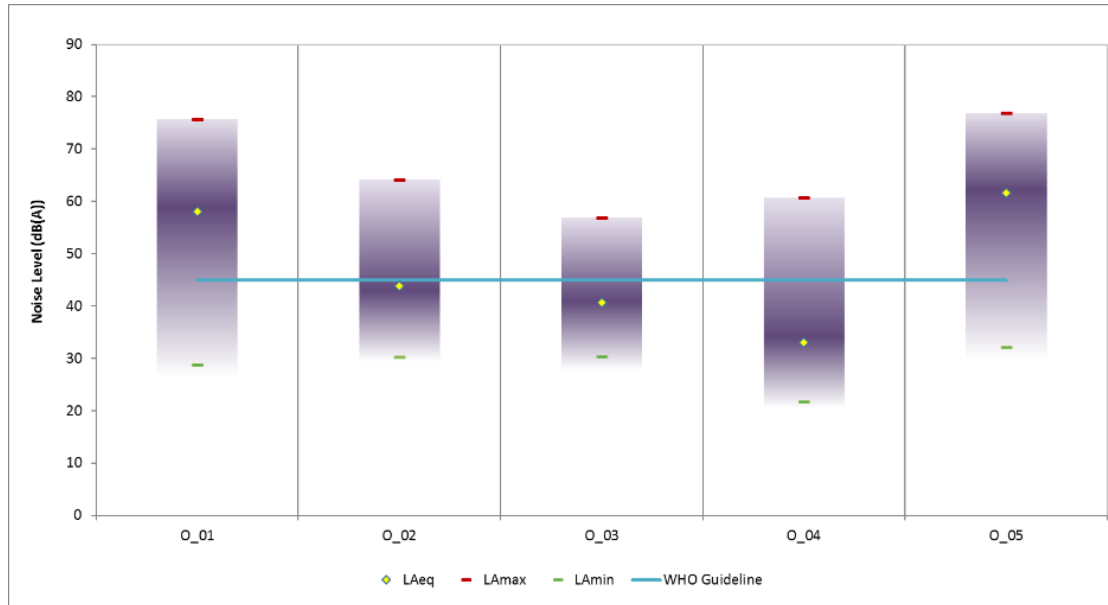


Figure 8-21: Night-time monitored noise levels. L_{Aeq} (yellow diamond) is compared with the WHO guideline.

8.11.2 SHASHEMENE RTC

The Shashemene RTC site is located approximately 3 km from the centre of Shashemene and approximately 2 km from the Federal Highway No. 7. The site is located on the northern edge of the town and is surrounded by agricultural land (predominantly crops) with low to medium density residential areas to the south and east of the site. Based on the location of the site, the volume of vehicles utilising the road are not anticipated to be significant. Additionally no major industrial activities have been reported to be operational in close proximity to the site. As such, no major sources of noise are anticipated in close proximity to the site.

With limited associated noise sources from the proposed RTC, it is anticipated that acoustic impacts will be negligible and as such an acoustic scoping assessment of the RTC site has not been conducted.

8.12 TRANSPORT / ACCESS

8.12.1 BULBULLA IAIP

ROAD NETWORK

The Bulbulla IAIP is located adjacent to the Federal Highway No. 7 (Modjo-Hawassa main road). The Modjo–Hawassa section of the road is a single carriageway surfaced road, with 1 lane per direction and narrow shoulders in the vicinity of the site (**Figure 8-22**). The road has reportedly served its design life and requires upgrading. According to the Woreda official, there are four roads that connect Bulbulla town to other Woredas and towns: Bulbulla-Batu (27km, asphalt), Bulbulla-Jiddo (22km, all

weather gravel), Bulbulla-O'ituu (12km, all weather gravel) and Bulbulla-Shashemene (72 km, asphalt).



Figure 8-22: Image of Federal Highway No. 7 opposite the access location (south and north directions).

TRANSPORT ACCESS

From Bulbulla town there are public and freight transportation services to different locations. This includes Batu-Bulbulla, Bulbulla-Shashemene, Bulbulla-Jiddo, and Bulbulla-Oituu. Currently the total daily transportation volumes from Bulbulla include 67 public transport vehicles, including a mix of buses, small vehicles, mini-buses and four-wheel drive vehicles, and 24 freight transportation vehicles including trucks and lorries. This figure does not include the vehicles that cross the town.

TRAFFIC LOAD AND SAFETY

A brief traffic survey was carried out on the Ziway-Bulbulla road near the project site. The number of vehicles movement counted for an hour during the day and night time was used for estimation of daily traffic volume. According to this estimation, the daily average traffic volume is 5,622 in both directions, which is less than ERA's 2016 survey on the Modjo-Shashemene road which is 6,132 (Ethiopian Roads Authority, 2016a). The Modjo-Hawassa road is one of the main roads that has high traffic accidents due to deteriorated road and increasing traffic volume. According to Bulbulla town municipality head, the traffic accident rate is in the increasing trend. However there is no quantitative data to justify this assertion.

The road is however considered suitable to provide vehicle access and connectivity to the IAIP development, pending the provision of a suitable access design that takes cognisance of vehicle and non-motorised transport (NMT) safety.

ASSOCIATED MANAGEMENT PLAN

According to the Ethiopian Road Authority (ERA) officials, the Modjo–Hawassa Express Highway Project which is passing near Bulbulla is part of Ethiopia's 5 year development plan (GTP I). Currently the first two lots (Lot-1 Modjo-Meki and Lot22 Meki-Ziway) are under construction and the remaining two lot (Lot-3 Ziway-Arsi Negele and Lot-4 Arsi Negelle-Hawassa) is due to commence.

The expressway, which passes nearby Bulbulla, is incorporated under Lot-3. Lot-3 starts west of Ziway town and the alignment traverse the east side of the existing road until it crosses the existing road just after Bulbulla to avoid interference with the Abijata Shalla Lakes National Park (ASLNP) whose boundary lies entirely on the west side of the existing road.

The Modjo–Hawassa Express Highway project objective is to improve road transport connectivity between Modjo and Hawassa by increasing the traffic-carrying capacity of the road. The outcomes include improved road transport, reduced travel times and costs, creation of inclusive green economy at grass root, and improved road safety (AfDB, 2013).

The road generally traverses in a southward direction and it is a branch south from the Addis Ababa-Adama expressway. The project road will be a high speed, free flowing road that traverses through rural areas by passing settlement areas and provides controlled access connections at reasonable distance to link the expressway with the existing road and urban centres. The Modjo-Hawassa Road Project will be constructed on a green-field alignment to a 4 lane dual carriageway standard involving

new construction of pavement layers and various other road components such as bridges, culverts, underpasses, over bridges and construction of ancillary works. To minimise the risks to pedestrians and animals from the high-speed traffic, fences will be provided along the edge of the road reserve: access to the road will be limited to vehicular traffic (Ethiopian Roads Authority, 2016b).

The expressway will minimise the traffic load of the existing road and reduce the impact from the operation of the proposed IAIP.

8.12.2 SHASHEMENE RTC

ROAD NETWORK DESCRIPTION

The Shashemene RTC site is located off the main road and connected by dirt road which traverses from *Alelu-ilu* kebele to *Kubi Guta* woreda. The local road network consists of unsurfaced and surfaced roads through the town, a route of approximately 3.4km will link the site access to the Modjo-Hawassa main road (Federal Highway No. 7). The local unsurfaced road is suitable to provide vehicle access and connectivity to the development, pending the provision of a suitable local access road that takes cognisance of vehicle and Non-motorised transport (NMT) safety.

The asphalt main road is a newly constructed road provided as part of the wider road development activity of Shashemene and which is not fully functional. Since the road is not finished yet, the traffic load along this road is very low. The damaged dirt road from *Alelu-ilu* to *KubiGuta* connects different villages in the neighbouring Woredas. The road is very busy especially on market days on Saturday and Tuesday. The main transportation types are motor bikes, donkey-drawn carts and on foot. A brief traffic survey on the volume of the traffic utilising this section of the road was conducted for an hour during the field visit and 132 donkey-drawn carts and 136 motor bikes were counted during the market day.

Alelu-ilu woreda has a big market place which is located near by the newly constructed asphalt road and very recently Alelu-ilu bus station has become operational nearby the market place. The Alelu-ilu bus station currently provides services to about 90 mini buses on daily base.

TRANSPORT ACCESS

Shashemene is a central location for public and freight transportation into five major directions: namely to *Addis Ababa*, *Hawassa*, *Bale*, *Arbaminch*, and *Wondo*. Shashemene has two major bus stations that give services to a total of 1,550 small, medium and cross country public transport vehicles that transport people to and from 27 destinations. The city has about 2000 three wheeled vehicles (Bajaj), 13 taxis (minibus) and two buses for urban public transportation services. The total road coverage of the city is about 655 km that divides into asphalt, gravel road, red ash, cobble stone and compacted earth. This does not include the federal highways that administered by ERA.

TRAFFIC LOAD AND SAFETY

According to the Ethiopian Roads Authority (ERA) annual average daily traffic survey (2016), the average daily traffic volumes for different routes from Shashemene are shown in **Table 8-16**.

Table 8-16: Traffic volumes for identified routes from Shashemene

Route	Traffic Volume
Shashemene-Wondo genet	2,285
Shashemene-Hawassa	3,943
Modjo- Shashemene	6,132
Shashemene-Langano	940
Shashemene-Dodolla	531
Shashemene-Soddo	1,167

ASSOCIATED MANAGEMENT PLAN

Shashemene is one of the major towns that the Modjo–Hawassa Express Highway Project which is incorporated under Lot-4. According to the design, Shashemene will have a 3km access road to the Modjo–Hawassa Express Highway.

There is a plan by the Municipality to initiate the construction of a ring road for Shashemene city by 2018 (i.e. 2011 Ethiopian Calendar).

8.13 VISUAL

8.13.1 BULBULLA IAIP

The IAIP site, and surrounding areas, consists predominantly of agricultural land (crops) activities and very low density rural settlements (**Figure 8-23**) and abuts the Federal Highway No. 7 (**Figure 8-24**). Overhead electrical power lines run adjacent to the eastern boundary of the site as well as along the dirt road which runs in a west-east direction to the south of the site (**Figure 8-25**). The site is relatively flat, limiting the visibility of the site from adjacent properties as well as from users of the Federal Highway running adjacent to the site.



Figure 8-23: Images showing farmland and dwellings on the site (Source: WSP Site Investigations)



Figure 8-24: Images showing the Federal Highway No. 7 (Source: WSP Site Investigations)



Figure 8-25: Images showing the electrical power lines (Source: WSP Site Investigations)

8.13.2 SHASHEMENE RTC

The RTC site consists of transformed land utilised for agricultural activities (crops and grazing) and is traversed by a single lane dirt track (**Figure 8-26**). The site and surrounding area has a very slight gradient, limiting the visibility of the site from the surrounding areas. The area around the site includes agricultural land and low density rural settlements (**Figure 8-27**).



Figure 8-26: Images showing the site including the road and grazing land (Source: WSP Site Investigations)



Figure 8-27: Images showing rural settlements adjacent to the site (Source: WSP Site Investigations)

8.14 WASTE

8.14.1 BULBULLA IAIP

There are two towns in close proximity to the Bulbulla IAIP; namely Bulbulla and Batu (Ziway) towns. Bulbulla town is very close to the Industrial Park (about 3 km from the Park). Batu town is further away from the Park (~23 km), but the establishment of the IAIP could affect Bulbulla and Batu towns at different levels from the inflow of new activities related to the Park. Therefore, both towns' current

solid and liquid waste management practices are assessed in order to gain adequate baseline information for the possible environmental impact assessment and mitigation measures

CURRENT WASTE MANAGEMENT OF BULBULLA TOWN

SOLID WASTE MANAGEMENT

Generation, Collection and Transportation

The daily solid waste generation rate of Bulbulla town is estimated to be 30 m³. There is no formalised solid waste management system in the town that incorporates waste minimisation starting from generation, collection, transportation to disposal. Solid waste is collected by individuals and associations and disposed of in the temporarily allocated solid waste dumping site. There is no waste segregation occurring and therefore all solid wastes are being co-disposed.

Furthermore there is no municipal service for the collection of municipal waste. There are two associations for solid waste collection with members of ten individuals each which using two hand pushed carts to collect waste from individual homes and institutions and transfer the waste to the temporary disposal site. Indiscriminate disposing and burning of wastes are common practice.

Waste Disposal

Bulbulla does not have a formal, well-designed solid waste disposal site. There is currently only a temporary waste dumpsite (not a formal landfill with proper design and surface lining) located at the outskirts of the town called *Kera Sefer* to the north of the town.

Associated Solid Waste Management Plan

According to the Bulbulla town municipality official, the town does not have any waste management strategy or major plan to improve its solid waste management system due to critical financial constraints.

LIQUID WASTE MANAGEMENT

There is no liquid waste management system for both greywater and faecal sludge (sewage). Liquid wastes from individual houses are collected in individual septic tanks. Vacuum trucks from Batu town are hired by each septic tank owner to empty the septic tank. As there is no formal liquid waste disposal facility in the area, the vacuum trucks illegally dump the liquid waste outside the borders of the town. Open defecation, on site sanitation, and dumping of liquid waste are common practices. The municipality has no controlling system over the collection and disposal liquid wastes.

CURRENT WASTE MANAGEMENT OF BATU (ZIWAY) TOWN

SOLID WASTE MANAGEMENT

Generation, Collection and Transportation

The total annually generated volume of waste is estimated to be 32,100 m³. Household waste accounts for 42% of the waste followed by hotels, restaurants, cafes, and bars (16%), commercial waste (13%), municipal waste (11%) and industrial and agro business waste (9%).

In terms of solid waste collection services, there are five Small and Micro Enterprises (SMEs) that offer the service in addition to the municipality. The SMEs collect solid waste from houses and take it to solid waste containers located in specific sites within the town. Solid waste is collected door-to-door at household level with the help of animal drawn carts, open truck and a tractor. The collected waste is either transported directly to the municipal dump site after primary collection or disposed of in skip bins for secondary collection (i.e. collection containers at specific sites within the town). There are no properly established transfer stations for temporary storage.

There is no established integrated solid waste management system for the town. Waste is not segregated at the sources either at household or commercial levels. There are some informal waste reuse and recycling practices (plastic bottles and metals) at the dumpsite by individuals.

Waste Disposal

The collected solid waste are transported and disposed of on the dumpsite located 2.5 km away from the town centre without any treatment. The dumping site is administrated by the Batu Municipality

Sanitation and Greenery Office. It is noted that the dumpsite is not a formally designed landfill with appropriate lining. Permission is not required to dump waste at the site, as such capacities are unknown.

Associated Solid Waste Management Plan

The municipality planned to outsource and scale up its waste collection services by organizing new small medium enterprises (SMEs) to involve in the solid waste collection activities. For this purpose approximately 20 push carts are prepared to be distributed to the SMEs in the coming fiscal year 2017 (i.e. 2010 Ethiopian Calendar). It has also a plan to draw lesson from the composting experience of Adama Town. In addition, a proposal has been developed for submission to development partners for possible funding of the establishment of a standardised solid waste landfill.

LIQUID WASTE MANAGEMENT

Generally there is limited greywater management in Batu Town. Most greywater is disposed of on-site and allowed to infiltrate into the soil (estimated about 60%) and the remaining 40% flows to open drains and water bodies. There is no technical support or preliminary design of sanitation facility to deal with greywater.

Sewage management is also very limited. About 30% of the people have access to private on-site sanitation facility. An estimated 15% of the faecal sludge produced at household level is safely managed (pit properly managed, covered and abandoned). The remaining is disposed unsafely without any treatment including open defecation, overflow on site sanitation, and illegal dumping of sludge. The total amount of faecal sludge generated per year at household level in Batu is estimated to be 9,100 m³.

The sewage emptying service is provided by one private enterprise that operates with one vacuum truck with a capacity of 14 m³. The Municipality has one vacuum truck but it does not function. There is no liquid waste treatment facility in Batu. Collected liquid waste is disposed of in a dump site close to the solid waste dumpsite.

Associated Liquid Waste Management Plan

Batu town does not have a liquid waste management strategic plan or a master plan. According to the municipality's manager there is a plan to establish a standard liquid waste management system in the near future.

In summary there is no existing waste infrastructure such as sewage mains into which the IAIP facility can connect in order for liquid waste to be managed at municipality level. In addition, there is a limited formalised solid waste system operating in Bulbulla and Batu as such it is recommended that the IAIP facility be developed with a centralised solid and liquid waste management facility that can be utilised by both towns for the disposal of wastes.

8.14.2 SHASHEMENE RTC

Shashemene RTC is located at Alelu-ilu kebele. Shashemene town is an administrative capital of the West Arsi Zone. It is the major commercial and transportation centre for the southern part of Ethiopia. According to Shashemene municipality the current population is estimated to be 265,000 with an average growth rate of 4.5%.

Shashemene is a hub for five major transport routes that connect the south and southeast of Ethiopia with the rest of the country. With ample agro raw materials and fertile surroundings, Shashemene is considered to be one of the best centres for agricultural raw materials accumulation and distribution.

CURRENT WASTE MANAGEMENT OF SHASHEMENE TOWN

SOLID WASTE MANAGEMENT

Generation, Collection and Transportation

The daily per capita waste generation rate of the city is estimated to be 0.273 kg. Waste segregation at the source is not common practice at all levels. Primary solid waste collection in Shashemene is performed by 8 SMEs by using 9 donkey-pull carts and 16 hand push carts with capacity 1.8 m³ each.

The municipality own two skip loaders for temporary collection and transportation of waste from temporary waste transfer sites (28 waste containers with 6m³ capacity each) to the dumping site.

Waste Disposal

The city does not have a sanitary landfill (has only a dumpsite), and there is no formal sorting or recycling activities occurring at the landfill. According to the municipality, it is estimated that about 60% of the collected solid waste is transported and disposed of at the new solid waste dumpsite located at *Chabi dida Nyata* about 14 km away from the centre of the city. The remaining 40% of the waste is either burnt or dumped inside streams, bridges or ditches.

Associated Solid Waste Management Plan

The city has developed a solid waste management strategy and started its implementation. The strategy clearly states what should be done for proper management of waste from generation to safe disposal. During the next fiscal year (2018, i.e. 2010 Ethiopian Calendar), the municipality planned to meet the standards set by federal and regional governments for proper management of solid waste (especially safe disposal).

LIQUID WASTE MANAGEMENT

Liquid waste management of the city is not well established. There is no central sewerage system and therefore household and commercial liquid wastes (mostly greywater) are often disposed of into streets, ditches and streams. Open defecation, overflow on site sanitation, and illegal dumping of faecal sludge into streams, ditches and streets are common practice. There is one municipality owned and four private owned vacuum trucks for liquid waste (faecal sludge) suction and transportation from individual and institutional septic tanks. The collected waste is disposed of into a dumpsite without any form of waste treatment at *Meja Dema* dumpsite which is located 7km from the city centre.

During the current fiscal year (2017, i.e. 2009 Ethiopian Calendar), about 14,700 m³ liquid waste was collected and disposed of at the dumping site. The municipality collects a fee of 75 Birr per each load disposal.

Associated Liquid Waste Management Plan

The municipality planned to initiate the designing of a standard liquid waste disposal facility for the town and to increase the sewage collection volume to 17,500 m³ for the coming year (2018, i.e. 2010 Ethiopian Calendar).

8.15 BIODIVERSITY

This section provides a description of the existing biodiversity components and associated key features which include typical flora and fauna, protected areas and non-protected sensitive resources that are found inside and within the vicinity of the project sites. The baseline conditions within the survey area have been determined through desk-based reviews of available information, field surveys and consultations with concerned authorities.

8.15.1 BULBULLA IAIP SITE

FLORA

There is no significant variation in altitude and habitat range at the IAIP site and therefore the vegetation types of the project area are very homogenous and are categorised into transformed scattered woodland and open grassland. From site investigations it is evident that the site has been transformed by agricultural activities including growing of crops and grazing for livestock (**Figure 8-28**). The scattered woodland areas are characterised by *Acacia seyal*, *Acacia tortilis*, *Acacia senegal* and *Balanites aegyptiaca*. Along the edge of the abandoned and present cultivation areas of crops mainly maize, *Opuntia cactus* and *Euphorbia tirucalli* have been used as enclosures and thus predominantly occur (**Figure 8-29**). The grassland areas are dominated by *Cynodon dactylon* (**Figure 8-29**), *Hypharrena spp.* and *Pennisetum plicatulum*.



Figure 8-28: Photo showing scattered woodland and open grassland areas of the site as well as agricultural activities (growing of crops) during different seasons.



Figure 8-29: Images showing (A) Grassland areas covered by *Cynodon dactylon*, (B) *Euphorbia tirucalli* and (C) *Opuntia cactus*.

Based on the preliminary survey conducted, a total of 10 species of plants have been recorded (**Table 8-17**). All of the species identified on the site are not threatened (according IUCN Red List Category), however, most of them (83%) with exception to grasses are included in the list of 'useful trees and shrubs of Ethiopia' as they are considered very important for various purposes.

Table 8-17: Checklists of common plant species recorded at Bulbulla IAIP

No.	Species Scientific Name	Local Name	Conservation Status (IUCN Red List Category)	Usefulness Category List*
1	<i>Acacia seyal</i>	Girar	LC	L
2	<i>Acacia tortilis</i>	Girar	LC	L
3	<i>Acacia senegal</i>	Girar	LC	L
4	<i>Balanites aegyptiaca</i>	Bedeno	LC	L
5	<i>Opuntia cactus</i>	Beles	LC	NL
6	<i>Euphorbia tirucalli</i>	Kinchib	LC	L
7	<i>Cynodon dactylon</i>	Sar	-	Grass Species
8	<i>Hypharrena spp.</i>	Sar	-	Grass Species
9	<i>Pennisetum plicatulum.</i>	Sar	-	Grass Species
10	<i>Eragrostis spp.</i>	Sar	-	Grass Species

*According to Azene Bekele (2007) categorisation of 'Useful Trees and Shrubs of Ethiopia'; where L= Listed; NL= Not Listed.

FAUNA

Surprisingly, this specific site is named after the African elephant (Arba – in Oromifa) since it used to be a potential range during the 1930s. However, no wild mammal was observed during the field survey except foot prints of Spotted Hyena (*Crocuta crocuta*) and Egyptian Mongoose (*Herpestes ichneumon*). In addition, local informants indicated that the area is located within the home range of Warthog (*Phacochoerus africanus*), Aardvark (*Orycteropus afer*), Common Jackal (*Canis aureus*), Bat-eared Fox (*Otocyon megalotis*), Wild Cat (*Felis sylvestris*), Abyssinian Hare (*Lepus habessinicus*) and Crested porcupine (*Hystrix cristata*).

Cattle (ox, cow), sheep, goat and equids (donkeys, mules and horses) are among the domestic animals largely reared by the local residents and thus they are part of the existing biodiversity.

This site is also a location for a considerable number of species of birds. During the survey, 40 species which constitute 18 avian families were recorded in the site and its environs (**Appendix D-1**). The dominant bird species in the area include Ruppell's Long-tailed Starling (*Lamprolornis pururopterus*), Superb Starling (*Lamprolornis superbus*), White-browed Sparrow weaver (*Plocepasser mahali*), Northern Masked Weaver (*Ploceus taeniopterus*), Fan-tailed Raven (*Corvus rhipidurus*), Emerald-spotted Wood Dove (*Turtur chalcospilos*), Ring-necked Dove (*Streptopelia capicola*), Spur-winged Plover (*Vanellus spinosus*), Gabar Goshawk (*Melierax gabar*) and Augur Buzzard (*Buteo augur*).

Considering the specific project site, no threatened wild mammal is found in the area. However, among the avian species observed at the proposed Bulbulla IAIP 4 species of birds (all vultures) are critically endangered or endangered and one species (Bateleur (*Terathopius ecaudatus*)) is near threatened though they are found abundantly throughout Ethiopia (**Table 8-18**).

Table 8-18: List of Threatened Bird Species of the Project Site

No	Species Common Name	Scientific Name	Conservation Status (IUCN Red List Category) *
1	Bateleur	<i>Terathopius ecaudatus</i>	NT
2	Hooded Vulture	<i>Necrosyrtes monachus</i>	EN
3	White-backed Vulture	<i>Gyps africanus</i>	CEN
4	Ruppell's Vulture	<i>Gyps rueppellii</i>	CEN
5	White-headed Vulture	<i>Trigonoceps occipitalis</i>	EN

* Where NT – Near Threatened; EN – Endangered; CEN – Critically Endangered

8.15.2 PROTECTED AND NON PROTECTED SITES IN THE AREA

PROTECTED AREAS

According to the existing wildlife laws of Ethiopia, there are four clearly defined and one indirectly explained category of Protected Areas (PAs) and all PAs and their IUCN conservation status is indicated below (**Table 8-19**).

Table 8-19: Categories of Protected Areas (PAs) in Ethiopia and their Conservation Status

Type of Protected Area	Possible IUCN Category	Definition (as per the existing wildlife laws**)
1. National Park	II	An area designated to conserve wildlife and associated natural resources to preserve the scenic and scientific value of the area which may include lakes and other aquatic areas.

Type of Protected Area	Possible IUCN Category	Definition (as per the existing wildlife laws**)
2. Sanctuary	IV	An area designated to conserve one or more species of wildlife that require high conservation priority.
3. Wildlife Reserve	V	An area designated to conserve wildlife where indigenous local communities are allowed to live together with and conserve the wildlife.
4. Controlled Hunting Area	VI	An area designated to conserve wildlife and to carry out legal and controlled hunting.
5. Community Conservation Area *	VI	PAs owned and administered by local Communities; they can practice both consumptive (hunting) and non-consumptive (tourism) utilization types.

*Its definitions is not directly stated in the existing laws,

**Development, Conservation and Utilization of Wildlife Proclamation (No.541/2007); Ethiopian Wildlife Development and Conservation Authority Establishment Proclamation (No.575/2008); and Wildlife Development, Conservation and Utilization Regulation (No.163/2008).

In this context, the proposed Bulbulla IAIP is found at a close distance to a couple of PAs; namely: the Abijata-Shala Lakes National Park (ASLNP) and Aluto Controlled Hunting Area (ACHA). The National Park and the Controlled Hunting Area are located 7 km south and 7 km east of the project site, respectively (**Figure 8-30**).

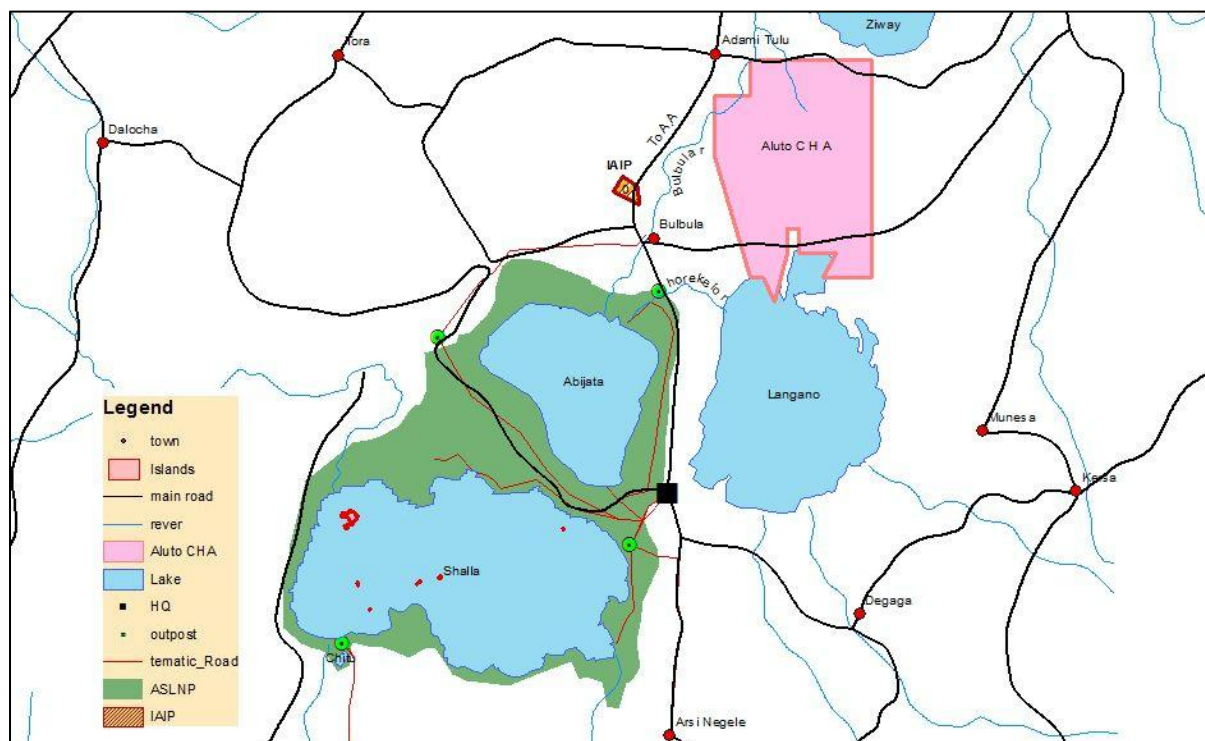


Figure 8-30: Location of the Project Area in relation to the Surrounding PAs (ASLNP & ACHA) and Wetlands

ABIJATA-SHALA NATIONAL PARK

Abijata-Shala National Park (ASNP) was established in 1970 and it is one of the Great Rift Valley protected areas in the central part of the country situated 207 km south of Addis Ababa. It lies between 7022'04.8" to 7042'47.7" N and longitudes 38022'32.8" to 38040'36.4" E covering a total

area of 887 km² that comprises of both land and water bodies. A larger proportion (59.9%) of the park area is covered by the three lakes; namely: Lake Abijata, Shalla and Chitu.

The land areas are characterised by *Acacia* and *Euphorbia* woodland and riverine vegetation cover of which *Acacia* woodland is the dominant one. The dominant tree species include *Acacia tortilis*, *Acacia Senegal*, *Acacia seyal*, *Acacia gerrardii*, *Dicrostachys cinerea* and *Balanites aegyptiaca* (Hillman, 1993b).

The park has been renowned for its rich avian diversity and being a wintering ground for various migratory birds that visit the lakes from Euro-Asia and Africa. Recent records show that ASNP provides a habitat for 439 species of birds and this represents about 51% of the total bird species recorded in Ethiopia.

In general, ASNP deserves considerable values from biodiversity conservation perspective. The potential values and significant features of the park are summarised as follows.

- ASNP is the richest wetland in avian diversity and abundance in the Country;
- The park is the location for three lakes and it is one of the few protected areas of Africa established to conserve wetland diversity;
- It is one of the scenically beautiful spots of Ethiopia that comprise of hot springs and blue Lakes fringed with flat-topped *Acacia* trees;
- It is a location for four islands of that secure nesting and breeding sites for large number of waterfowls;
- It is a place where thousands of Lesser Flamingos are reportedly observed;
- The park is an important feeding ground for Great White Pelican in the Country;
- It comprises 122 out of the 196 wetland bird species listed by IWRB for eastern Africa waterfowl census;
- ASNP serves as wintering ground for 108 Palearctic migrant bird species; and
- It is selected as Important Bird Area (IBA) for holding globally threatened species (Lesser Flamingo, Pallid Harrier, Basra Reed Warbler and Black-winged Pratincole).

However, ASNP has been under serious threat from overexploitation of its natural resources including water extraction, overgrazing, expansion of cultivation and settlements that are accompanied by excessive deforestations, siltation, key wild habitat loss and fragmentation as well as transformation of the natural ecosystems. These serious challenges are still threatening much of the park area and its vegetation and water coverage has been dwindling overtime and population of key species is dramatically declining (Fekadu and Abdi, 2013; EWCA, 2015; ERM and ESSD, 2013).

ALUTO CONTROLLED HUNTING AREA

Aluto Controlled Hunting Area (ACHA) is one of the eighteen protected areas in Ethiopia set aside to practice regulated hunting of wild animals. ACHA which covers 280 km² of an area is located about 200 km south of Addis Ababa. The geographical location of the controlled hunting area lies between: UTM 37N 467000 up to 480000 Easting and UTM 37 N 848000 up to 868000 N. The topography of the controlled hunting is characterised by hilly terrain that ranges between 1700 and 2367 m above sea level in altitude (Kahsay et.al, (2008); Temesgen and Endaweke, 2014).

The vegetation of the area is mainly characterised by semi– arid zone shrubs and tree species. The dominant woody plant species include *Dodonaea viscosa*, *Combretum molle*, and *Erica arborea*, *Carissa edulis*, *Ficus sycomorus*, *Ficus vasta*, *Rhus natalensis*, *Acacia albida* (*Faidherbia albida*), *Acacia tortilis* and *Acacia seyal*.

ACHA provides habitats for at least 22 and 82 species of mammals and birds, respectively (**Appendix D-2 and D-3**). It is renowned for its huntable ungulate populations. These include Greater kudu (*Tragelaphus strepsiceros*), Mountain reedbuck (*Redunca fulvorufula chanleri*), and Common bushbuck (*Tragelaphus scriptus*). Other wild animals found within the controlled hunting area comprises of Leopard (*Panthera pardus*), Spotted hyena (*Crocuta crocuta*), Striped hyena (*Hyaena*

hyaena), Black backed jackal (*Canis mesomelas*), Bat-eared fox (*Otocyon megalotis*), Caracal (*Felis caracal*) and Serval cat (*Leptailurus serval*).

The dominant bird species in ACHA are White-browed sparrow weaver, Hemprich's hornbill, Black-shouldered kite, Black kite, Gabar goshawk, Common kestrel, Bare-faced Go-away Bird, Black wood hoopoe and considerable number of starling and vulture species.

According to IUCN Red Listing, six species of mammals and birds that are found in the ACHA fall into near threatened, vulnerable, endangered and critically endangered categories. Both Stripped Hyena (*Hyaena hyaena*) and Bateleur (*Terathopius ecaudatus*) are near threatened and Leopard (*Panthera pardus*) is vulnerable. The endangered or critically endangered category is filled by three species of vultures (Hodded, White-backed and Ruppell's vultures).

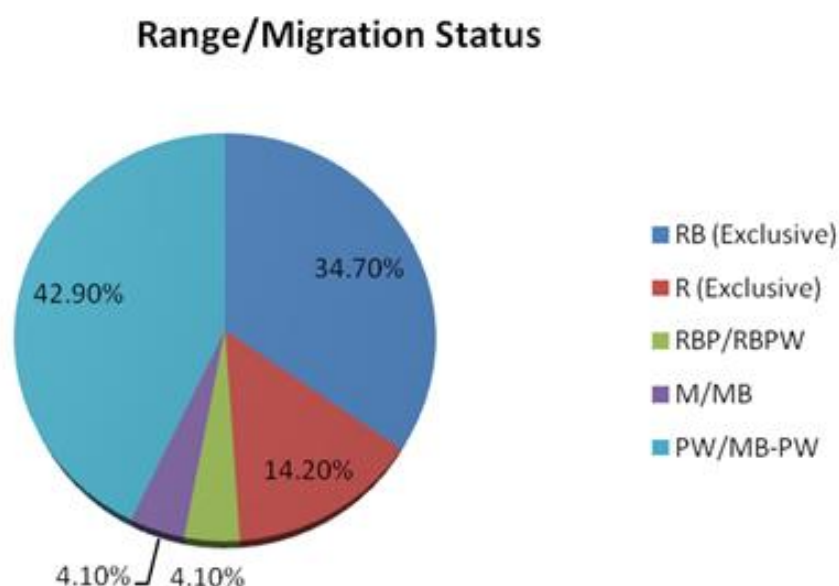
WETLANDS

The main wetlands located closer to Bulbulla IAIP are Lake Langano and Bulbulla River and their surroundings. In the past, Bulbulla River was known to be the main feeder to Lake Abijatta and now days, the River is dry throughout all seasons due to unsustainable utilisation of water at lake Ziway and other upstream areas.

LAKE LANGANO

Lake Langano is situated 11 km (~10 kms of surrounding wetlands) southeast of the IAIP (**Figure 8-30**). Geographically, it is located at the co-ordinates of N07° 032' 18" E038° 41'05.4" and its altitude is 1586 masl. It has a total surface area of 241 km² and this lake is one of the biggest lakes in the rift valley system of Ethiopia with an unusually reddish brown water colour because of its geological formation which is attributed to high amount of silt containing iron compounds (Wood and Talling 1988; EWCA, 2015). This lake is known to support a high diversity and abundance of birds and it is a feeding and roosting site of birds like the Grey-headed Gulls, Cormorants, Herons and Pelicans.

Lake Langano and its surroundings support over 20,000 populations of water birds and it is used as wintering and breeding sites for significant number of them. As a result, this lake is recognised by Birdlife International as an Important Bird Area (IBA ET047). Recent studies show that the lake harbours about 49 species of water birds (**Appendix D-4**) and majority of the recorded species (42.9%) are migratory breeding either in Africa or Palaearctic region and considerable number of them (34.7%) are resident and confirmed to breed in Ethiopia (**Figure 8-31**).



Where B- Breeding record confirmed; **M -** Migrant including on passage through Ethiopia; **P -** Breeds in Palaearctic; **R –** Resident; **W -** Winters (non-breeding season); **RB -** Resident in the country and breeding records confirmed; **PW -** breeds in the Palaearctic and winters in the country; **RB/PW -** there is both a resident breeding population and a wintering population

Figure 8-31: Status of the Birds Recorded In the lake areas.

Besides, Lake Langano supports significant number of fish species which include Nile tilapia and African Catfish. However, the commercial fish catch has been declining over the past decade and this shows the population of important fish is declining overtime. The lake is also location for significant population of Hippopotamus (*Hippopotamus amphibius*) though studies show they are at their population decline stage. According to IUCN Red listing, Hippopotamus is categorised as vulnerable. Lesser flamingo (*Phoeniconaias minor*) which is threatened is also another species of conservation concern inhabiting in the lake.

8.15.3 SHASHEMENE RTC

FLORA

As there is no significant variation in altitude and habitat range, the vegetation types of the project area are categorised into transformed scattered woodland and open grassland. From site investigations it is evident that the site has been transformed by agricultural activities including growing of crops and grazing for livestock.

FAUNA

No wild mammals were observed during the field survey. Cattle (ox, cow), sheep, goat and equids (donkeys, mules and horses) are among the domestic animals largely reared by the local residents and thus they are part of the existing biodiversity.

8.16 SOCIO-ECONOMIC ENVIRONMENT

8.16.1 GENERAL

This Section of the report provides a demographic, cultural and economic overview of the Project Area and also describes the physical infrastructure and services available in the Social Study Area. The data was collection through desktop research (on national and regional data) and also household survey and interviews with key informants and project affected people (for the site-related data). The purpose of collecting this information was to obtain baseline data for conducting the impact assessment and to monitor and measure the progress against the potential future changes to the Social Study Area due to the implementation of the Project.

The proposed Bulbulla IAIP site is located approximately 1.5km north of the Bulbulla Town within the East Shewa administrative zone in the Central Eastern Oromia Region. Bulbulla town is located approximately 130 km South of Addis Ababa, the country's capital city. The Shashemene site designated for the RTC development is located on the northern edge of the town of Shashemene, 27 km north of Awassa, and 65 km south of the Bulbulla IAIP

The proposed Bulbulla IAIP is a pilot facility with a site area of 263.007 hectares (ha) out of a total 1,000 ha of land that has been identified for potential use. Based on the success of the project the IAIP will be expanded within the remainder of the identified land. The 263 ha IAIP is comprised of a processing area of 239.73 ha and a non-processing area of 23.36 ha. The Shashemene RTC site covers an extent of 10.108 ha which consists of mixed agricultural land, occasional trees and a dirt cart track that runs through the centre of the site in a north-south direction.

In total, 287 PAPs were identified as those whose land, house or crops/trees can be affected by the development of the Bulbulla IAIP and Shashemene RTC facilities.

As identified by the IPDC and local authorities, the development of the **Bulbulla IAIP** facilities will affect two hundred and fifty two (252) PAPs, while the development of the **Shashemene RTC** facilities will affect thirty five (35) PAPs in the Shashemene area. All 287 PAPs will be affected economically through losing access to the land plots where they cultivate crops, trees, shrubs.

Amongst the 287 people, some of these PAPs will also be subject to physical displacement, where thirty one (31) tin-roofed houses and thirty seven (37) thatched-roofed houses will need to be removed from the project area. As a result, in total sixty eight (31+37=68) PAPs will be subjected to both economic and physical displacement out of the total number of 287 economically affected PAPs.

More details on economic and physical displacement on the Bulbulla and Shashemene sites can be found in the Resettlement Action Plan (RAP).

The Area of Influence (Aol) can be defined as the area likely to be affected by the proposed Project activities during the pre-construction, construction, operations and closure / decommissioning phases. Given the nature of the Project and its anticipated impacts, the Project Aol for socio-economic aspects and the associated baseline description covers:

- The area likely to be affected by the proposed Project activities during the pre-construction, construction operations and closure / decommissioning phases;
- The IAIP and RTC areas which the affected PAPs will be resettled from, and;
- New locations where the affected PAPs will be moved to.

8.16.2 BASELINE ENVIRONMENT

ADMINISTRATIVE AND DEMOGRAPHIC ENVIRONMENT

The IAIP site is located within the Oromia Region. The Oromia region is one of the nine regional state members of FDRE government established by the 1995 constitution provisions. Administratively, Oromia is divided into 20 administrative zone and 261 Weredas. Important cities and towns in the Oromia region include: Adama, Ambo, Asella, Bishoftu, Chiro, Dembidolo, Fiche, Gimbi, Robe, Goba, Dello Buna, Jimma, Metu, Negele Boran, Moyale, Nekemte, Shashamane, Haramaaya and Waliso.

The proposed Bulbulla IAIP site falls under the jurisdiction of Bulbulla Town within the East Shewa administrative zone which is located in the Central Eastern Oromia Region, connecting the western regions to the eastern ones. This zone is bordered on the south by the West Arsi Zone, in which the Shashemene RTC is located. The East Shewa zone is further bordered on the southwest by the SNNP Region, on the west by South west Shewa and Oromia Special Zone, on the northwest by North Shewa, on the north by the Amhara Region, on the northeast by the Afar Region, and on the southeast by Arsi.

East Shewa includes 12 Woredas: Ada'a, Adama Zuria, Adami Tullu and Jido Kombolcha, Bora, Boset, Dugda, Fentale, Gimbichu, Liben, Lome and Ziway Town. The main towns and cities in East Shewa include: Bishoftu (Debre Zeit), Metehara, and Ziway.

Based on the national population data published in 2014, there are 31,153,434 people living in the region in total, where less than 16% of the region's population live in the urban areas and close to 84% live in the rural areas. 51% of the total region's population is represented by men and the remaining 48% is represented by women.

The Oromia Region is the most populous in the country and accommodates around 39% of the entire nation. With 353,690 square kilometres (km²) of land area (32% of the country), Oromia represents the largest regional State.

Based on the latest available national data published by the Central Statistical Agency of Ethiopia (CSA) in 2009, the East Shewa Zone in the Oromia Region has a total population of 1,356,342, of whom 696,350 (51%) are men and 659,992 women (49%); with an area of 8,370.90 km², East Shewa has a population density of 162.03 people per 1km². A total of 309,726 households were registered in this Zone, or on average 4.38 persons per household.

The proposed Shashemene RTC site is located in the West Arsi zone and falls under the jurisdiction of Shashemene town. The main towns and cities in the West Arsi zone include: Adaba, Arsi Negele, Dodola, Asasa, Kofele, Kokosa, Kore, Werka, Ropi, Busa, Shashemene and Bishan Guracha.

The West Arsi zone has a population of 2,253,423 people (Government data, 2011), where 50.4% are represented by women (1,136,018 females). The majority of the Zone population reside in rural areas

(85.5%). 47.6% of the population are children of 0-14 years old, and 49% of the population are between 15 and 65 years old.

The 2007 National Census data show that the two largest ethnic groups in the West Arsi zone are the Oromo (84.15%) and the Amhara (14.3%); all other ethnic groups made up 1.55% of the population. Oromiffa is spoken as a first language by 81.38% and Amharic is spoken by 17.76. The majority of the inhabitants are Muslim, with 58.1% of the population having reported they practised that belief, while 40.01% of the population professed Ethiopian Orthodox Christianity and 1.43% of the population professed Protestantism.

The National Labour Force Survey results published in 2014 demonstrate that out of the total population of the Shashemene area (98,953) only 42% are economically active (looking only at working age population between 18-65 year olds), and the chances of being employed drop significantly for those who are older than 39. For Shashemene residents the chance of being employed in their 50s are around 20% among this group of people, while about 75% of people are employed in the 25-29 age category.

MIGRATION PATTERN

Ethiopia experiences significant cross-border immigration from surrounding countries including farmers in search of grazing grounds and water, traders and merchants as well as frequent and significant influx from Somalia, Sudan, and Eritrea caused by conflict and drought. According to the United Nations High Commissioner for Refugees (UNHCR), Ethiopia received a substantial number of new immigrants in late 2014 (particularly from South Sudan), leading to a total population of more than 729,000 immigrants in early 2015, who are mainly accommodated in camps throughout the country (UNHCR, 2017).

Furthermore, reports of the Ministry of Labour and Social Affairs (MoLSA) registered 460,000 legal migrants leaving Ethiopia between September 2008 and August 2013, the majority of whom obtained overseas jobs as domestic workers. 79% of such people were travelling to Saudi Arabia, 20% to Kuwait and the rest to Dubai and other countries.

One of the major reasons for such significant migration is believed to be the shortage of land that can be made available to the youth and young families. Only vacant land whose owners are deceased is usually transferred to the youth on the basis of age of the applicants. However, the amount of such land being available for internal re-distribution among community members is limited.

Local communities are witnessing the changes brought by such migration, where the improved well-being in the families with migrant members are pushing other families to take the same decision and send one of their members to work overseas.

LAND USE, LIVELIHOOD AND VULNERABILITY

In Ethiopia all land belongs to the State; whilst land can be leased to private individuals, they cannot own it. The Constitution provides for equal access, use, transfer and administration over land. It grants access to agricultural land for rural residents, and allows all inhabitants to utilise the land for farming. Farmers and pastoralists could be granted lifetime 'holding rights' giving them rights to farm the land except for its sale and mortgage.

Based on the data presented below in Table 8-20, only 28% of the region's land is cultivated in one way or another, while the remaining 72% stand uncultivated and covered by bush, shrubs, forests, etc.

Table 8-20: Regional data - Land Use and Land Cover type

No.	Land Use and Land Cover Type	Spatial Coverage in	
		km ²	%
1	Intensively Cultivated Land	46,980	12.93
2	Moderately Cultivated Land	42,401	11.67
3	State Farm	2,252	0.62

No.	Land Use and Land Cover Type	Spatial Coverage in	
		km ²	%
4	Perennial Crop Cultivated Land	11,408	3.14
5	Afro-Alpine Heath Vegetation	1,271	0.35
6	Dense and Mixed High Forests	29,579	8.14
7	Dense and Open Riparian Woodland	11,517	3.17
8	Bush Land	38,513	10.60
9	Shrub Land	45,744	12.59
10	Open, Bushed, Shrubby and Wooded Grassland	123,063	33.87
11	Swamp and Marshes	1,126	0.31
12	Salt Flats, Exposed Rock and Sand	6,866	1.89
13	Water Body	2,652	0.73
14	Urban or Built-Up land	7	0.002
	Total	363,375	100

ETHNICITY, RELIGION AND LANGUAGES

The three largest ethnic groups that exist in the East Shewa zone include the Oromo (74.06%), the Amhara (15.39%) and Gurage (3.82%) people; all other ethnic groups made up 6.73% of the population. The majority of the inhabitants practice Ethiopian Orthodox Christianity (69.33%), while 16.18% of the population is Muslim, 8.4% of the population practice Protestantism and 5.08% practice traditional beliefs (CSA, 2007).

Afan Oromo is the official language of Oromia National Regional State. It is also the most widely spoken language in Ethiopia. Other local languages also include: Amharic, Guragigna, Somali, Tigrigna and others. Many people in government offices and major towns speak English which is also used at schools and for international business communication.

EDUCATION

At the country level (National Census Data, CSA website, 2017), the majority of Ethiopians do not have sufficient education, with females being less educated than males. Based on the latest National Census data, 48% of females and 37% of males have never attended school. 42% females and 48% males have only primary education, while 3% of females and 4% of males completed primary education and did not attend secondary school. Only 5% of females and 6% of males have attended but not completed secondary education, and an additional 3% of females and 5% of males have completed secondary or higher education. In urban areas, 42% of the population are illiterate.

Furthermore, according to a 2013 survey undertaken by the Central Statistical Agency and the World Bank, the literacy level (for reading and writing in any language) reached 53 % for males and only 36 % for females (CSA and WB 2015). About 40 % of boys and 37 % of girls (7-18 years) are not in school and about 60 % are enrolled in primary schools and the remaining few (less than 3 %) are enrolled in secondary school.

Education plays a crucial role in the process of social and economic transformation and stands as a key poverty reduction method. Taking into account the role education plays in the socio-economic development, the Ethiopian government has paid great attention to promoting education in various regions of the country including the study project area. Accordingly, the project area regional bureau has also made various efforts for the development of education in the region to this end.

Access to education has significantly improved in the region over the last five years. In 2009-2010 Oromia had 10,742 elementary schools (including 537 non-government schools) with 5,512,565 enrolled students (incl. 2,570,674 female students) and 101,301 teachers. Similarly, there were 447 secondary and 163 senior schools with 622,426 enrolled students (incl. 256,867 female students) and 15,800 teachers in the same year.

The number of elementary schools in the region has increased from 10,742 in 2009/10 to 11,378 in 2010/11, with about 5.9% annual growth. Similarly, the number of secondary and senior schools in the region has increased from the total of 610 in 2009/10 to 1,222 in 2010/11, with the annual growth rate of about 100%.

HOUSEHOLD INCOME AND EXPENDITURE

Based on the information published by the Commercial Department of the Oromia Region in 2015 (Oromia Invest, 2015), agriculture, services and industry are the three major economic activities within the Oromia region, accounting for a respective share of 56.2%, 32.9% and 10.9% of the overall regional economy.

Oromia has fertile soils that contribute to the active agricultural sector in the region. Crop production, livestock and forestry account for 49%, 14% and 4% of the respective volume of the agricultural activities.

The major crops grown in the region are coffee, cereals, oilseeds, pulses, vegetables and fruits. Over 60% of Ethiopia's top export earner commodity coffee comes from the Oromia region.

About 36% of the total livestock, 37% of the poultry and 50% of the beehive resources are registered in the Oromia National Regional State. Oromia is the leading national milk producer with annual production of 1.4 billion litres. This accounts for over 40% of the overall national milk production.

EXISTING INFRASTRUCTURE AND SERVICES

All major cities in the Oromia Regional State are connected through a telecommunication network. Mobile phone is the primary medium of communication, while Internet access is available in major cities and towns. Areas closer to Addis Ababa get 3G mobile internet while others still get 2G. However, the telecommunication network in general and the internet connection in particular is intermittent - as in any part of the country. On most rural sites outside of the cities there is often no internet connection for days. Steps are being taken by Ethio Telecom at the national level to resolve this longstanding issue.

Based on the data obtained from the Zonal Finance and Economic Development Office, Oromia National Regional State had 17,723 km of all-weather roads in 2010/11. The road density of the Region in that year was about 48.8 km per 1000 km², while all-weather road to population ratio is about 0.58 km per 1000 people.

Based on the data obtained from the National WASH Inventory Result (2010), only about 74%, 50% and 62% respectively of the total urban, rural and total population of the region had access to water supply in 2010. Access to water supply in rural areas on average is within 1.5 km distance. The water coverage is almost similar with that of the national level. The majority of the population in the Region (mainly in rural areas) use unprotected water, such as spring water; boreholes, hand dug wells, rivers, lakes and rain water. The data obtained from the Oromia Bureau of Water, Mineral and Energy indicated that in 2010/11 about 74.9% of the total rural water schemes were functional compared to that of 74.48% of the National.

Firewood is the most important source of domestic energy supply both in urban and rural areas of Oromia. This high dependency on such biomass energy sources, of course, accelerates deforestation in the region. Even though most of the total hydroelectric power of the country is generated in the Oromia Region, many towns and villages in the Region lack reliable and non-intermittent access to electricity. As the data obtained from the Zonal Office of Finance and Economic Development indicate, from 528 towns in the region (including smaller towns), only about 408 towns (77%) had hydro-electric light service in 2010/11.

The health status of Oromia Region is generally poor, and the same is true for the most of the country. General poverty along with the low income level of majority of the population, low educational levels, inadequate access to clean water and sanitation facilities, high population growth, and poor access to health services are the major factors contributing to this situation in the region, as well as in the country. As the data obtained from the Zonal Office of Finance and Economic Development indicates, there were 32 hospitals, 696 health centres, 3,817 health posts, 826 clinics and 1,647

hospital beds in total in the entire Oromia Region in 2009/10. There are two hospitals and 52 Health Centres in the East Shewa zone.

Based on the ESIA team site reconnaissance, it was noted that infrastructure and basic services such as sanitation, water, electricity, waste management and telecommunication are largely absent or unreliable on the proposed Bulbulla IAIP site. Of the services and infrastructure available, the majority provide a low level of service for the local population's needs. An outline of the status of social infrastructure and services in the project area is provided in **Table 8-21**.

Table 8-21: Summary of Local Level Infrastructure and Services

Infrastructure & Services	Details
Electricity	Majority of households do not have reliable and non-intermittent access to electricity, although some residents are reported to have access to electricity through the use of private generators.
Water	Local settlements customarily access water through hand dug wells, and any seasonal streams where the level of water depends on the seasonal availability of water. The use of such water sources often results in water borne diseases. Availability of water to the site area is limited. Groundwater is not a source used by inhabitants of the site and its surrounds as there were no accessible boreholes or wells in close proximity to the site. The majority of people living around the site rely on municipal water supply.
Waste Management Facilities	Waste Management facilities or services are largely absent across the local area. The construction of the IAIP and RTCs could lead to increased levels of waste and litter dumped in open areas, so this issue will be explored further at the ESIA stage.
Telecommunications	Bulbulla has access to the national mobile telephone network. Access in other settlements is variable; however it is increasingly common for local residents in all villages to have mobile phones. It was noted however, that the network is not always reliable, and there is frequent loss of signal in settlements.
Education	Bulbulla has one high school teaching children up to grade eleven.
Health	Healthcare infrastructure in Bulbulla includes a health centre and clinic, however both are semi-functional. During Screening local government officials reported that both the health centre and clinic do not have electricity, and are unable to store medication.

8.16.3 SOCIO-ECONOMIC PROFILE OF PEOPLE IN THE PROJECT AREA (BASED ON WSP SURVEY)

The ESIA team, made up of local specialists guided by WSP, carried out a household survey in the area of the Bulbulla IAIP and Shashemene RTC.

The ESIA team was targeting mainly those people who were identified by local authorities as “affected by the project” and who still reside at the site. The ESIA team thus interviewed people from 51 heads of households who confirmed to they are affected by the project and currently reside in the vicinity of either the Bulbulla IAIP or Shashemene RTC sites. As the resettlement process had already been started by local authorities prior to the ESIA team involvement in the project, it was not possible or practical to locate and interview all of the individuals who were covered by the census and asset inventory survey organised by the government authorities back in February/March 2017.

In order to better understand the wider socio-economic profile of the local communities, the ESIA team also conducted surveys in the areas close to the project site that were identified as being unaffected by the project, interviewing a further 18 people.

The questions posed to the interviewees were aimed at collecting the relevant household and demographic information relevant not only to the person who was interviewed but also members of

their family, thus collecting the data on the wider circle of local residents and obtaining more detailed socio-economic profile of local people

GENDER AND AGE

Both women and men were encouraged to participate in the household survey. Both resulted in similar outcomes, with approximately 78.3 % and 21.7 % of the questionnaires being answered by men and women, respectively (**Figure 8-32**).

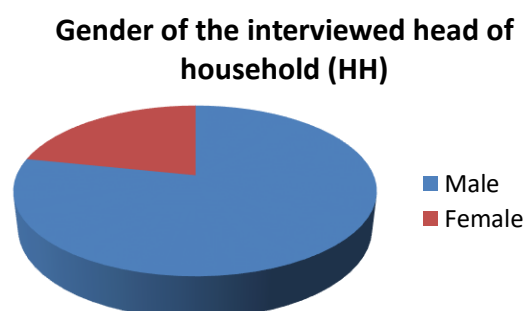


Figure 8-32: Respondents' gender

All of the respondents chose to disclose their age. 24.6 % of the questionnaires were answered by people who were between 20-30 years of age, 30.4 % were between 31-40 year olds, 23.2 % were between 41-50 year olds, 15.9 % were between 51-60 year olds and 5.8 % were >66. Over half of all respondents were noted to be young, i.e. being in their twenties to 40s (68 %) (**Figure 8-33**). Some respondents stated that they had up to 10 members living in the main residential property. When considering the total household population, close to 60 % of the interviewed heads of households were between 18 and 20 years old, 20 % were between 20-30 years of age, 9.4 % were between 31-40 year olds, 3.6 % were between 41-50 year olds, 3.5% were between 51-60 year olds and only 1.3 % were >66 (**Figure 8-34**).

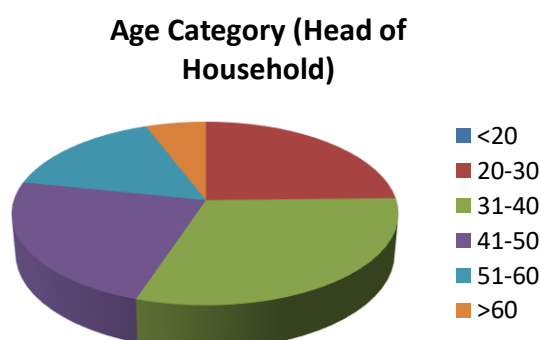


Figure 8-33: Age of Heads of Household

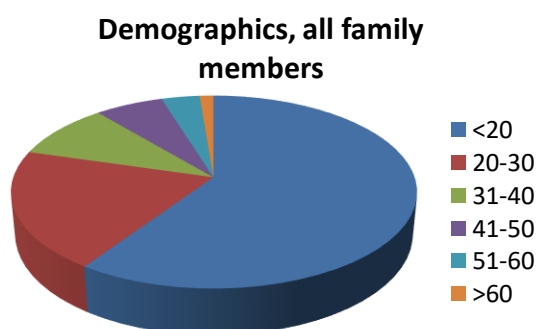


Figure 8-34: Demographics, all family members

EDUCATION

The educational profile has been further enhanced by the additional analysis of the education level of the interviewee's family members within each household visited. The extended collection of the education data on other family members revealed that 100% of respondents who are over 40 years old (41-50, 51-60 and >60 age) reported as having had only primary (39%) or no form of education (61%).

However, in the 18-30 year age bracket the majority had either a primary education (51.9%), high school education (17.7%), a Technical Diploma (5.1%) or a Higher/University Degree (2.5%). In other words, the opposite is true for the younger generation in the project area, where 51.9% of the younger category has received at least primary education and 25.3 % have undertaken secondary education or higher. 22 % of 20-30 year old respondents had still received no education.

In total, close to 40% of all respondents had not finished their basic schooling or had no education. Over half of all family members (52.3%) included in the surveys finished a primary school education at a minimum. This figure is lower than the reported national statistics, with 48% of females and 37% of males having never attended school, receiving only some or no primary education.

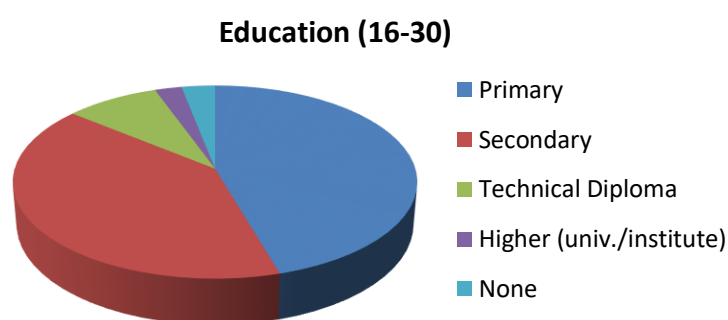


Figure 8-35: Reported education level (16-30)

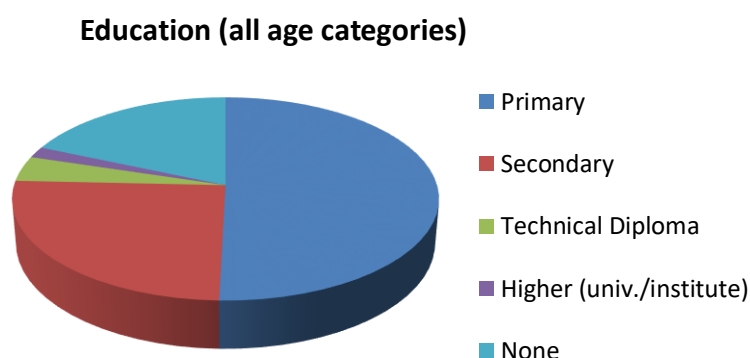


Figure 8-36: Reported education level (all age categories)

The surveys showed that a lower percentage of family members went on to further education, with 1.6% and 0.5% as having a technical diploma and a Higher/University Degree education level, respectively. In summary, low education attainment levels were noted among the interviewed respondents, where the majority of interviewees and their immediate adult family members mostly had either no education or finished at primary school, while the opposite is true for the younger generation who received a much better level of education. This disparity is shown in the two figures above.

EMPLOYMENT

87 % of the interviewed heads of household stated that they were self-employed farmers. Other types of occupation among the interviewed heads of households included business and trade (11.6 %) and

other (1.4 %). It should be noted that no additional details were recorded if the respondent selected 'other'.

The employment profile of the rest of the family members shows that over a quarter (28 %) of all adult family members (spouses, sisters, brothers, etc.) defined themselves as a farmer, while 13.8 % of them defined themselves as unemployed, 0.5 % defined themselves as being a civil servant and 52% of the respondents selected 'other'.

Employment (Head of Household)

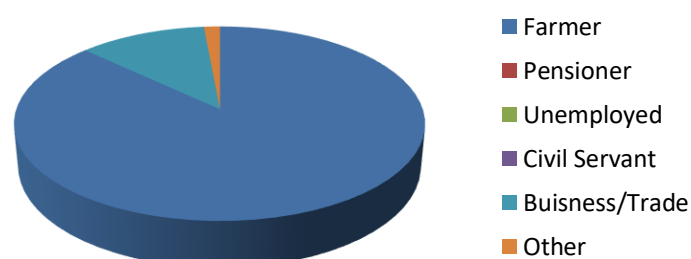


Figure 8-37: Employment among Heads of HH

Employment among family members (Total)

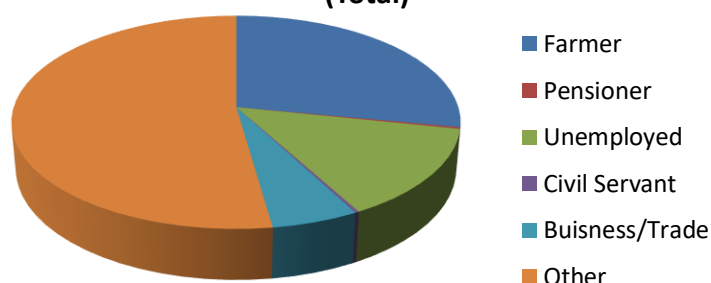


Figure 8-38: Employment in total among family members

The survey revealed that 16.4% of all family members were unemployed.

ASSET OWNERSHIP

Most of the respondents have irregular and unpredictable income (derived mainly through agricultural activities) and ownership of electronic goods in the interviewed households was low.

70% and 52% of the surveyed respondents stated that they owned a mobile phone and radio, respectively. A much lower percentage of respondents confirmed they owned other electrical items, with a television owned by 2.9%, a satellite dish by 1.4%, a refrigerator by 1.4% and none of the respondents stated that they owned either a washing machine, landline telephone or the internet at their homes.

All of the surveyed respondents are currently living in houses (mostly on 1 floor) or have a plot of land that they cultivate. The average size of land currently in use, including agricultural and the property was 2,310 m². Furthermore, the results demonstrate how important animal husbandry is for supplementary income in the survey area, with 68 % owning goats, 72.5 % owning chickens, 76.8 % owning cows and 29 % owning sheep. In addition, 58% stated that they owned donkeys, 50.7 % owned an ox and 1.4% owned a horse.

The majority of surveyed respondents did not own any form of personal transport (car or bike), with only 2.9% owning a car and 23.2 % owning a bike/moped.

The survey asked respondents to list any areas of cultural heritage within the area. 68% of the respondents stated that there were areas of cultural significance located nearby, which ranged from 0.2 km to 10 km. Respondents were also asked the distance to the nearest cemetery from their home, this ranged from 0.1 km to 5 km, with an average of 0.9 km.

HOUSEHOLD INCOME AND EXPENDITURES

Questions about people's income and expenses are traditionally challenging and a high percentage of people often opt out and chose not to answer such questions. In the case of this socio-economic survey, the survey team made an effort to engage with people and explained at length why this data is being collected. As a result all of the respondents agreed to share the details on their income.

All of the respondents indicated that they derive most of their income from farming/ agricultural activities or from other forms of employment (business/trade or formal employment). In addition, 7.2 % of interviewed households supplemented their income from other economic undertakings. The alternative forms of income (separate from occupational/salaried employment) were reported by the respondents who regularly source their income from rented property, social security benefits and remittances from other family members.

Among the respondents, the average household income from all livelihood sources and obtained from all working age family members totals to approximately 5,706 Birr/month (equivalent to \$145/month, Feb 2018 exchange rate). The estimated annual household income data from the WB report (2016) shows that an average household annual income in Ethiopia is \$660/person. Assuming that there are at least four working adults in an average household (statistically, 4.8 people per household in Ethiopia), the obtained income data is broadly in line with the World Bank 2016 data.

When asked about their monthly expenditures, 92.8% of respondents indicated that they spend most of their monthly income on food. Thus, most of the people cultivating land in the project area will be severely affected if their access to land is disrupted, leading to significant reduction of their income and in most cases, future livelihood.

The next most important expenditures for the respondents appeared to be 'schooling', an answer given by 7.2 % of respondents.

SOURCES OF FRESHWATER

The **main source of freshwater was identified as pipe water or from a tap, with 62.3% of households stating it as their main source**, whilst 36.2% obtained freshwater from a well and a further 1.4% reported that they attain freshwater through 'a water pump'.

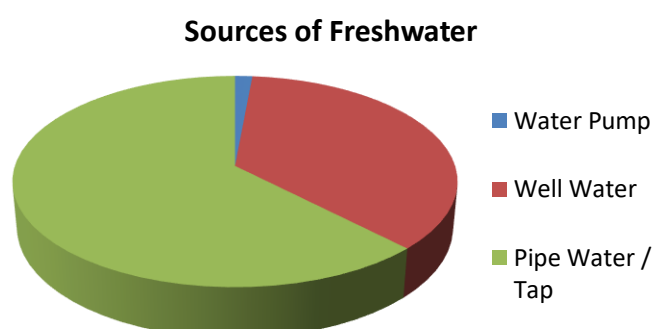


Figure 8-39: Sources of freshwater

HEALTH SITUATION

Only 6.3% of the respondents indicated that at least 1 member of their household has a disability or an illness. The disabilities or illness within the households were noted down in the questionnaires as either a mental disorder, paralysis, blindness, broken leg and hearing problems or deafness.

The respondents listed the following top diseases to have affected members of their household in the past three years: common cold, typhoid, malaria, tuberculosis and hypertension.

The survey asked questions regarding recent deaths and births in families. 10% of the respondents reported that there had been one birth in the household within the last year, whilst only one head of a household stated that a death had occurred within the last year. The cause of death was not stated.

PROJECT EXPECTATIONS

All of the respondents were aware of the Project, of which most (92.7%) of them have primarily learnt about through local government officials and the resettlement process. Others respondents stated they learnt about the Project through other sources of information, including, friends and community members (5.8%) and the media (1.4%).

88.5 % of the respondents had a positive attitude towards the Project. The positive opinions were largely reported to be due to expectations related to an increase in the number of available jobs as well as the Project contributing to the development of area and country.

Only 5.8 % of respondents reported expecting some negative impacts from the Project, which was due to the concern of displacing of farmers with insufficient compensation. 5.8% of the respondents had a neutral outlook on the project.

VULNERABILITY AMONG INTERVIEWED PAPS

The results of the survey show that based on the definition of Vulnerable Groups, over two thirds of the PAPS could be classified as vulnerable. In addition, very low levels of education or high levels of illiteracy were noted among the interviewees. As such, it is highly likely that a considerable number of PAPS will not be able to understand the agreements or contractual documentation related to compensation.

Based on the obtained WSP household data, it is estimated that vulnerable people could make up to two thirds of the affected individuals, or approximately 190 PAPS.

8.17 CULTURAL HERITAGE

No cultural heritage resources were identified within the proposed Bulbulla IAIP footprint or immediately adjacent thereto.

In terms of the proposed RTC site, no churches are located on the site however a tomb / grave site is located in the south-eastern section of the site (**Figure 8-40**).



Figure 8-40: Photograph showing the burial site within the proposed Shashemene RTC site.

During consultation with the local community it was determined that the grave sites are more than 50 years old and it is difficult to trace back the relatives of the persons buried. The community indicated that the graves have no significance to them. Furthermore the burial site is no longer used by the community and is located in an area that has been actively farmed for an extended period of time. No any other cultural heritage sites were found within Shashemene RTC, furthermore the area was not indicated to be known for palaeontological and/or archaeological resources.

9 IDENTIFICATION OF POTENTIAL IMPACTS

The purpose of the ESIA process is to assess and investigate the identified potential impacts that are most likely to be significant. This chapter includes physical, biological and social impacts associated with the proposed project.

The information which is presented below is a consolidation of the identified impacts associated with the proposed Oromia IAIP and RTC developments. These impacts have been sourced from various specialist reports included within **Appendix C**, refer to Appendices C-1 to C-12 for the full reports.

The technical impact assessment ratings tables have been provided for all specialist studies within **Appendix D**.

9.1 SOILS

The purpose of this section is to establish the extent to which agricultural soils will be removed from the site as a result of the proposed Oromia IAIP and RTC site developments and to identify potential risks to the identified soils and recommend associated mitigation measures. This was established by undertaking a fertility analysis of the soils sampled at the sites and calculating the potential risks that the proposed development will pose to the soils, with and without mitigation measures being put in place.

The description is based on primary data obtained from site investigations. **Table 9-1** summarises the impacts identified at both the Oromia IAIP and RTC sites as being significant in terms of soil, land use and land capability. To view the full report with regards to potential impacts on soils within the Oromia Region, refer to **Appendix C-1**.

Table 9-1: Potential Impacts on Soils in the Oromia Region

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Erosion Soil erosion is not a significant concern at the Oromia sites as the soils are not inherently erosive, but the sparse grassland cover does leave the soil vulnerable to the erosive influences of wind and water. Erosion was evident in the South East corner of the IAIP site, around a culvert leading under the road. Development of both of these areas will lead to some erosion during the construction phase.	Negative	Low	Moderate	Moderate
2	Sedimentation The risk of sedimentation is directly linked to the risk of erosion, as eroded soil	Negative	Low	Moderate	Minor

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	particles will end up in nearby watercourses as sedimentation. Concentration of runoff and erosion results in associated risks to watercourses in the area due to sedimentation.				
3	Loss of topsoil Although the topsoil will be lost from these sites during the construction phase, it can potentially be transferred to an alternative area for continued cultivation.	Negative	High	Moderate	Negligible
4	Soil compaction Significant soil compaction will occur in some areas of the sites during the construction phase, changing the soils' original structure.	Negative	Moderate	Major	Moderate
5	Change in surface profile In order to create level platforms for the agri-industrial zone buildings, the surface profile of the sites will be changed during the construction phase. This will affect water flow, sedimentation and erosion patterns.	Negative	No mitigation possible	Major	Major
6	Change in land use The proposed development activities will result in a permanent change of land use. Land use will change from mixed agriculture to an agri-industrial zone.	Negative	No mitigation possible	Major	Major
7	Change in land capability The proposed development will permanently alter the land capability of the site.	Negative	No mitigation possible	Major	Major
8	Dust creation Bare surfaces and soil stockpiles pose the risk of high amounts of dust creation.	Negative	Moderate	Moderate	Minor
9	Soil Contamination Contamination of the soils may occur due to the large vehicles; on-site pollutants' contact with the well-	Negative	Moderate	Major	Minor

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	drained soils will need to be limited.				
OPERATIONAL					
1	Erosion Soil erosion is not a big problem at the Oromia sites as the soils are not inherently erosive. Changes in the surface profile and increased hardstanding will change surface water flow patterns and could potentially lead to some erosion during the operational phase.	Negative	Low	Moderate	Minor
2	Sedimentation The risk of sedimentation is directly linked to the risk of erosion, as eroded soil particles will end up in the nearby watercourses as sedimentation. Concentration of runoff and erosion results in associated risks to watercourses in the area due to sedimentation.	Negative	Low	Moderate	Minor
3	Soil compaction Large amounts of compaction will occur during this phase, resulting in the soil structures being permanently changed.	Negative	No mitigation possible	Major	Major
4	Dust creation Bare surfaces and soil stockpiles pose the risk of high amounts of dust creation.	Negative	Moderate	Moderate	Minor
5	Contamination Contamination of soils could take place during operation due to contaminants utilised in processing activities coming in contact with soils or discharged off site.	Negative	Moderate	Moderate	Minor
DECOMMISSIONING					
1	Erosion Decommissioning activities may lead to some erosion.	Negative	Low	Moderate	Moderate
2	Sedimentation	Negative	Low	Moderate	Minor

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	The risk of sedimentation is directly linked to the risk of erosion, as eroded soil particles will end up in the nearby watercourses as sedimentation. Concentration of runoff and erosion results in associated risks to watercourses in the area due to sedimentation.				
3	Dust creation Bare surfaces and soil stockpiles pose the risk of high amounts of dust creation.	Negative	Moderate	Moderate	Minor
4	Soil Contamination Contamination of the soils may occur due to the large vehicles; on-site pollutants' contact with the well-drained soils will need to be limited.	Negative	Moderate	Major	Minor

The more easily mitigatable risks identified to the soils at both sites include loss of topsoil, dust creation and contamination. Erosion, sedimentation and soil compaction can be avoided to some extent but to a large degree cannot be mitigated against. The inevitable changes in the surface profile, land use and land capability as a result of the development cannot be mitigated against. Mitigation measures to be implemented will be most important during the construction phase.

The soil impacts identified above can be suitably mitigated through the implementation of protection strategies, refer to the Environmental and Social Management Plan (ESMP) included in **Chapter 11**.

The residual impacts on the soil as a result of the development will include the following (refer to impact tables attached in **Appendix D** for reference):

- **Soil Erosion:** Excavating the soils in order to develop the Oromia IAIP and RTC sites could lead to some soil erosion. This can be mitigated against through the measures described in the previous sub-section, but excavation of these soils is likely to lead to some erosion.
- **Sedimentation:** A residual soil erosion impact will lead to a residual sedimentation impact as eroded soil particles will enter the nearby watercourses as sediment.
- **Compaction:** All soils that have been compacted will have lost their original structure permanently.
- **Change in surface profile:** As the site will be levelled for the development, the land surface profile will be permanently altered.
- **Change in land use:** As the soils will be excavated, compacted and possibly sterilized, the land use will very likely change from arable permanently.
- **Change in land capability:** As the soils will be excavated, compacted and possibly sterilized, the land capability will very likely change from arable permanently.
- **Soil Contamination:** Contaminated soil is expensive to rehabilitate and contamination entering the soils of the Oromia sites may enter the nearby water resources.

Mitigation measures can be very expensive and require appropriately-skilled personnel to be a part of the impact mitigation team.

9.2 SURFACE WATER (HYDROLOGY)

This section of the report is to identify the potential risks associated with the surface water at the proposed project site.

The storm water management plan developed by MACE was reviewed⁹. The objective of the storm water management plan review is to determine if the design appropriately manages the storm water runoff according to applicable legislation highlighted below¹⁰.

- African Development Bank Group - Safeguards and sustainability series, Volume 2, Issue 1, December 2015: Integrated Safeguards System;
- UNOPS - Design Planning Manual, Version 1, 2014;
- IFC World Bank Group - Environmental Health and Safety (EHS) Guidelines: General Environmental Guidelines, 2007;

The water quality analysis was undertaken in accordance to the general liquid effluent quality with regards to discharge to surface water within the IFC World Bank Guidelines (IFC, 2007). The water quality monitoring programme was thus developed in accordance with the IFC World Bank Group Guidelines (IFC, 2007).

The main issues and potential impacts associated with the proposed project were determined at a desktop level, based on existing information, as well as from site investigations and specialist input.

The Oromia IAIP (Bulbulla) drainage system acts as a closed system where all runoff generated on the site drains towards the summer storage tank situated at the southeast corner of the site. The diversion channel is to be redirected to discharge within the summer storage tank. Any overflow from the summer storage tank will be discharged into the tributary of the Bulbulla River on the eastern side of the highway.

The Oromia RTC (Shashemene) drainage system is a collection of pipes and channels that direct water to one discharge point located at the north western point of the site. Water will then drain towards the natural drainage line located approximately 900m from the discharge point.

Table 9-2 identifies the potential impacts on surface water and the significance of the impacts. To view the full report with regards to potential impacts on soils within the Oromia Region, refer to **Appendix C-2**.

Table 9-2: Potential Impacts on Surface Water in the Oromia Region

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Contamination Hydro-carbon contamination of surface water features from earth-moving machinery and vehicles.	Negative	Moderate	Moderate	Minor
2	Sedimentation Sedimentation of the Bulbulla River.	Negative	Moderate	Moderate	Minor

⁹ For a comprehensive list of drawings and document that were reviewed refer to the specialist report attached as Appendix C-2.

¹⁰ Please note that the sizing of storm water infrastructure was not considered as part of the review.

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
OPERATIONAL					
1	Hydrological regime The proposed development will alter the hydrological regime and thereby result in a change in runoff volume.	Negative	Moderate	Moderate	Minor
2	Hydrological regime The proposed development will alter the hydrological regime and thereby result in a change in runoff velocity.	Negative	High	Moderate	Minor
DECOMMISSIONING					
1	Contamination Hydro-carbon contamination of surface water features from earth-moving machinery and vehicles.	Negative	Moderate	Moderate	Minor
2	Sedimentation Sedimentation of the Bulbulla River.	Negative	Moderate	Moderate	Minor

The surface water impacts identified above can be suitably mitigated through the implementation of protection strategies, refer to the ESMP included in Chapter 11. Limited to no residual impacts on the surface water as a result of the development are anticipated if the mitigation measures are implemented correctly.

9.3 GROUNDWATER (GEOHYDROLOGY)

Based on primary data obtained, groundwater use within the region is extremely limited. Local communities in both the IAIP and RTC areas typically rely on municipally supplied treated surface water as their main water source.

The hydrogeology of the area is largely governed by the geometry of the rift, the variability and lateral discontinuity of the volcanic rocks and the disruption of lithologies by faults, resulting in vertical structuring and spatial heterogeneity across the region. The aquifers are largely the product of volcanic eruptions which occurred in the area at different times and different locations throughout the regions geological history. As indicated in Section 8.8, groundwater use is very limited throughout the region and boreholes and wells are scarce, as such very little information could be gathered regarding the local hydrogeological conditions at the IAIP and RTC sites. It has been reported by local hydrogeologists that the reason for the lack of groundwater development as a water source is due to the high fluoride content naturally contained in the groundwater system as a result of the Rift Valley hydro-geochemistry.

Water quality results for the deep drilled by the IPDC within the northern portion of the IAIP site confirms the high levels of fluoride and sodium in the groundwater, which are above the WHO and Ethiopian Guidelines and Standards for drinking water quality. The naturally high fluoride and sodium concentrations render the groundwater unsuitable for use as a source of drinking water without treatment. Furthermore, the presence of septic tanks, sewage systems and unlined pit latrines poses potential microbiological contamination sources to the groundwater system.

The potential impacts on the groundwater is presented **Table 9-3** below. To view the full report with regards to potential impacts on ground water within the Oromia Region, refer to **Appendix C-3**.

Table 9-3: Potential Impacts on Groundwater in the Oromia Region

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
No construction phase impacts to the hydrogeological environment are expected					
OPERATIONAL					
1	Lowering of groundwater levels through abstraction of groundwater for use at the IAIP and RTC sites	Negative	Moderate	Moderate	Minor
2	Contamination of groundwater resources from contaminated surface water runoff or subsurface leakages from underground chemical storage and/or effluent systems	Negative	Moderate	Minor	Minor
3	Groundwater quality unfit for human consumption due to naturally high levels of fluoride and sodium. This impact will only be relevant if groundwater is selected as a source of water supply for the Operation	Negative	Moderate	Major	Minor
DECOMMISSIONING					
No decommissioning phase impacts to the hydrogeological environment are expected					

Based on the findings of the impact assessment, it has been concluded that the development and operation of the Oromia IAIP and RTC will potentially have a minor negative impact on the receiving groundwater environment with the proper implementation of mitigation measures (refer to the ESMP included in Chapter 11).

9.4 WETLANDS

The desktop screening and infield assessments of the Bulbulla IAIP and Shashemene RTC determined that there were **no wetland habitats within the site boundaries or in close proximity to the site**, where there was a potential for wetland habitats to be indirectly impacted.

Therefore no further functional assessments, impact assessment or mitigation measures were required for the proposed Oromia sites.

9.5 AIR QUALITY

The purpose of the Air Quality Impact Assessment was to identify the potential impacts and associated risks posed by the proposed IAIP site on the air quality of the area and make informed decisions on the way forward in order to ensure that these risks do not result in unacceptable social or environmental risk.

Table 9-4 below provides a breakdown of potential construction, operational and decommissioning phase impacts on air quality and presents the associated ratings. To view the full report with regards to potential impacts on air quality within the Oromia Region, refer to **Appendix C5**.

Table 9-4: The Potential Impacts on Air Quality in the Oromia Region

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Increased particulate and gaseous concentrations impacting residential receptors located within immediate vicinity of site boundary.	Negative	Moderate	Moderate	Minor
2	Increased particulate and gaseous concentrations impacting residential receptors beyond site boundary.	Negative	Moderate	Minor	Negligible
OPERATIONAL					
1	Increased particulate and gaseous concentrations impacting residential receptors located within immediate vicinity of site boundary.	Negative	Moderate	Moderate	Minor
2	Increased particulate and gaseous concentrations impacting residential receptors beyond site boundary.	Negative	Moderate	Minor	Negligible
DECOMMISSIONING					
1	Increased particulate and gaseous concentrations impacting residential receptors located within immediate vicinity of site boundary.	Negative	Moderate	Moderate	Minor
2	Increased particulate and gaseous concentrations impacting residential	Negative	Moderate	Minor	Negligible

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	receptors beyond site boundary.				

It should be noted that the above ratings are based on a qualitative assessment of the potential impacts. Further quantification of the potential impacts with dispersion modelling is recommended once detailed source and emissions information is available to accurately assess the potential impacts based on compliance/non-compliance with the applicable guidelines/standards.

Based on the findings of the impact assessment, it has been concluded that the development and operation of the Oromia IAIP and RTC will have a minor impact on the receiving air quality environment. The impacts identified above can be suitably mitigated through the implementation of protection strategies, refer to the ESMP included in **Chapter 11**.

9.6 CLIMATE CHANGE

Climate change will have key impacts on agriculture, livestock, water and human health in Ethiopia. In particular, this will result in:

- Reduced yields and/or crop failure, reduced soil moisture availability; and increased evapotranspiration and water stress;
- Increased incidence of pests and diseases, reduced feed and water sources, and increased livestock mortality;
- Changing ranges of vector-borne diseases and increased risk from waterborne diseases;
- Reduced water quality and quantity, drying of wetlands and freshwater sources, disruption of hydropower generation;
- Changing ranges of vector-borne diseases; and
- Increased risk from waterborne diseases.

Despite the challenges, Ethiopia hopes to capitalise on its current economic growth by becoming more resilient to the impacts of climate change while developing its economy in a carbon neutral way by transforming development planning, investments and outcomes.

The country's Climate Resilient Green Economy Strategy (CRGE), which was published in 2011, sets out this vision (International Institute for Environment and Development). It is viewed as an opportunity to transform the country's development model by leaping to modern energy-efficient development trajectories.

Ethiopia is one of the few countries to have formally merged its aims of developing a green economy and greater resilience to climate change under a single policy framework in support of its national development objectives. While the government is still preparing its climate resilience objective, the Green Economy component of the CRGE has already been developed (International Institute for Environment and Development). It aims to develop Ethiopia's green economy by:

- Improving crop and livestock production practices to improve food security and increase farmer's incomes while reducing emissions;
- Protecting and re-establishing forests for their economic and ecosystem services, including as carbon stocks;
- Expanding electricity generation from renewable energy sources for domestic and regional markets; and
- Advancing to modern and energy-efficient technologies in transport, industrial sectors, and buildings.

To view the full report with regards to potential impacts on climate change, refer to **Appendix C6**.

9.7 GREENHOUSE GAS EMISSIONS

Greenhouse gas (GHG) emissions in Ethiopia increased by 86% from 1993 - 2011. Through the Intended Nationally Determined Contribution, Ethiopia pledges to cap 2030 greenhouse gas emissions at 145 MtCO₂e, a 64% reduction from projected business as usual emission levels in 2030. The pledge includes greenhouse gas reductions from agriculture, forestry, industry, transport and buildings sectors.

The total GHG emissions recorded at the Oromia site was estimated to be 171 349.59 t CO₂eq. Scope 2, coal-fired operations to generate electricity from the IAIP, contributes to the highest GHG emissions emitted at the Oromia site (making up approximately 83% of the total GHG emissions emitted). CH₄ and N₂O emissions are marginal from all sources, being significantly over shadowed by CO₂ emissions (accounting for 99.5% of total CO₂eq emissions associated with the Oromia activities **Table 9-5** and **Figure 9-1**).

Table 9-5: Estimated greenhouse gas emissions for the Oromia IAIP and RTC

Scope	Source	Main Activity	CO ₂ (tons/year)	CH ₄ (tons/year)	N ₂ O (tons/year)	CO ₂ e (tons/year)
Scope 1	Coal consumption	Coal-fired boiler operations	29 833.06	7.88	140.97	29 981.91
Scope 2	Electricity generation at IAIP	Coal-fired operations	137 085.88	36.23	647.75	137 769.86
	Electricity generation RTC	Coal-fired operations	3 579.97	0.95	16.92	3 597.83
TOTAL GHG EMISSIONS						171 349.59

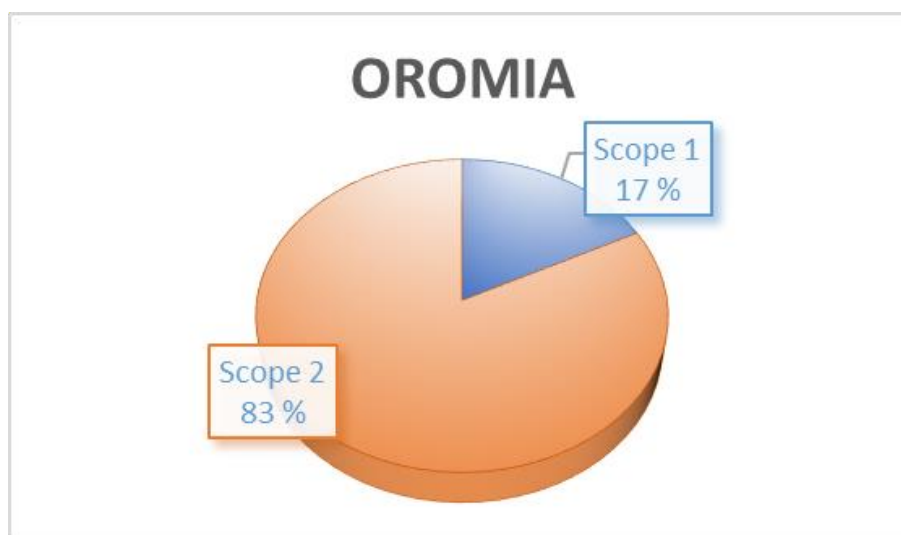


Figure 9-1: CO₂eq percentage contribution from Scope 1 and Scope 2 sources at Oromia

It is important to note that GHG emissions from vehicles have not been accounted for as accurate vehicle counts from the IAIP to the RTC is unknown. Credibility of such data is key to ensure that the footprint is transparent, accurate and reliable for reporting and without such information, a true representation of the GHG emissions emitted from vehicles cannot be determined.

Furthermore, according to the Ethiopian Electric Power Corporation (EEPCo), Ethiopia's total electricity generation in 2010 was 3,981.07 GWh. Hydropower generates approximately 88% of the total electricity generation and is thus the country's dominating electricity resource, followed by Diesel (11%) and geothermal (1%) electricity generation.

It is therefore noted that the total greenhouse gas emissions estimated for the Project are considered a worst case scenario. Should the IAIP and RTC facilities be provided electricity from the national grid the greenhouse gas emissions resulting from the generation of the required electricity is drastically reduced (in the region of 80% reduction) due to the use of renewable resources as the predominant energy source for the generation of electricity.

To view the full report with regards to potential impacts on climate change, refer to **Appendix C6**.

9.8 NOISE

The current noise climate is typically rural, with very limited anthropogenic influences. The site currently consists of mixed agricultural activities which do not generate significant levels of noise. Various dwellings are distributed across the site. The federal highway no. 7, which connects Addis Ababa and Hawassa, borders the site on the east. This is the most significant noise source at the proposed Bulbulla IAIP site.

In terms of the construction phase, based on a worst-case cumulative sound power level of 116.3 dB(A) stemming from all construction equipment operational during the construction phase, the resultant noise levels are anticipated to be highest closest to the source and tapers off as distance from the source increases, as would be expected. Beyond 50 m from the source, noise levels will reduce considerably, with noise levels at around 78 m from the source dropping to below the industrial guideline rating level of 70 dB(A). From 438 m from the construction activities, noise levels will decrease to below the residential guideline level of 55 dB(A).

Based on this worst-case assessment, there will be no resultant acoustic impacts on the surrounding towns, which are all located greater than 1.5 km from the site. Neighbouring homesteads (up to 500 m from the site boundary) will be directly impacted by construction activities, particularly when construction is occurring on the nearest site boundary to a receptor in question. Receptors further than 500 m from the IAIP site will be minimally impacted by construction activities and owing to the low current background noise levels may experience slight increases in existing noise levels as a result of the construction activities.

Noise impacts are much more discernible at night, due to the lower existing noise levels. It is envisaged that the construction of the IAIP will only occur during the day-time hours and as such no project-related acoustic impacts are anticipated at night.

In terms of the operation phase, based on a worst-case cumulative noise level of 107.6 dB(A) stemming from activities at the livestock processing unit, the resultant noise levels are anticipated to be highest closest to the source and tapers off as distance from the source increases, as would be expected. At further distances from the source, noise levels will reduce considerably, with noise levels at around 30 m from the source dropping to below the industrial guideline rating level of 70 dB(A). From 160 m from the processing activities, noise levels will decrease to below the residential guideline level of 55 dB(A). Noise impacts are much more discernible at night, due to the lower existing noise levels. It is understood that the operation of the IAIP will only occur during the day-time hours and as such no project-related acoustic impacts are anticipated at night.

It must be noted that these calculations are based on the fact that the noise sources are all exposed to the open air and not enclosed within a building. It is most likely that most units and processes will be enclosed within buildings with particular reference to the boiler and livestock processing units. Boilers are generally enclosed within boiler houses. For hygiene purposes, any food processing facility will also be enclosed. This will result in significantly lower noise levels experienced in the ambient environment.

Table 9-6 identifies the potential impacts of increased noise levels which may be caused by the proposed project, as well as the severity of the impacts associated with each phase of the project. To

view the full report with regards to potential impacts on noise levels within the Oromia Region, refer to **Appendix C7**.

Table 9-6: Potential Impacts of Noise in the Oromia Region

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Construction phase impacts of noise on residential receptors within 500 m of the site boundary.	Negative	Moderate	Major	Moderate
2	Construction phase impacts of noise on residential receptors beyond 500 m of the site boundary.	Negative	Moderate	Moderate	Minor
OPERATIONAL					
1	Operational phase impacts of noise on residential receptors within 200 m of the site boundary.	Negative	Moderate	Moderate	Minor
2	Operational phase impacts of noise on residential receptors beyond 200 m of the site boundary.	Negative	Moderate	Minor	Negligible
DECOMMISSIONING					
1	Decommissioning phase impacts of noise on residential receptors within 500 m of the site boundary.	Negative	Moderate	Major	Moderate
2	Decommissioning phase impacts of noise on residential receptors beyond 500 m of the site boundary	Negative	Moderate	Moderate	Minor

The impact assessment has identified that the construction and decommissioning phases will generate the most significant impacts, however these can be effectively managed through the implementation of mitigation measures as identified in the ESMP (refer to Chapter 11).

9.9 TRANSPORT AND ACCESS

The exact expected produce through-put and related vehicle volumes for deliveries and distribution to and from the IAIP and the RTC is not known. MACE calculated the expected trip generation of the

sites to determine the pavement structure requirements for the design life of the facilities. The method to calculate the Average Annual Daily Traffic (AADT) was as per the Ethiopian Roads Authority Manual for agri-processing and non-agri processing land-uses. The transport and access assessment was therefore based on these calculations. It is however noted that the interaction between community members using these routes with the increased Project traffic from the construction phase onwards, may increase the risk of traffic accidents.

A breakdown of potential construction phase, operational phase and decommissioning phase traffic related impacts and ratings are provided in **Table 9-7**.

To view the full report with regards to potential impacts on transport and access within the Oromia Region, refer to **Appendix C8**.

Table 9-7: Potential Impacts on Transport and Access in the Oromia IAIP

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Increased vehicle/vehicle and vehicle/NMT accident risks due to increased traffic volumes on the local road network.	Negative	Low	Minor	Minor
OPERATIONAL					
1	Increased vehicle/vehicle and vehicle/NMT accident risks due to increased traffic volumes on the local road network.	Negative	Low	Moderate	Minor
DECOMMISSIONING					
1	Increased vehicle/vehicle and vehicle/NMT accident risks due to increased traffic volumes on the local road network.	Negative	Low	Minor	Minor

From the above assessment it is evident that the proposed Bulbulla IAIP and Shashemene RTC facilities will have traffic and safety impacts on the local road networks and residents within each area. However; the impact assessment has identified that the identified impacts can be effectively managed through the implementation of mitigation measures as included within the ESMP (refer to Chapter 11).

During the assessment additional recommendations have been identified, these are as follows:

- The vehicle accesses to the IAIP and the RTC must be designed to the relevant National standards, namely the Ethiopia Road Authority design standards.
- All parking provision is to be provided on-site, and parking on individual erven will be subject to the Development Control Regulations of the sites. The parking provision will be in-line with the zoning of each internal erf of the IAIP and RTC.
- There are limited residential dwellings / villages in the vicinity of the Bulbulla IAIP, and it is located in excess of 4 km from the town of Bulbulla. Public transport will therefore be required to transport workers to the site. The type and extent of the services cannot be assessed at this stage, and

may have to be provided in incremental stages as the number of workers on-site increases. These include:

- A suitable public transport stop should be provided on-site, to ensure safety of passengers waiting for transport.
- Due to the remote location of the site, non-motorised transport will be low along the highway, and no special requirements are recommended.
- As the Shashemene RTC is located on the northern edge of the town of Shashemene, public transport may be required to transport workers to the site from the further part of town. The type and extent of the services cannot be assessed at this stage, and may have to be provided in incremental stages as the number of workers on-site increases.
 - A suitable public transport stop should be provided on-site, to ensure safety of passengers waiting for transport.
 - Due to the location of the site, non-motorised transport will be high in the vicinity, and sidewalks should be provided to improve pedestrian safety.
- It is recommended that due to the high traffic volumes to and from the IAIP, the configuration of the access should be improved to improve safety and operation of the access. This will assist to decrease the risk of vehicle/vehicle and vehicle/NMT accidents in the vicinity of the site. The required road signs, road markings and street lighting should also be implemented at the accesses to ensure good intersection operation and safety.
- It is recommended that the trip generation of the IAIP be monitored annually to ensure that the access intersections operate safely and with sufficient capacity and acceptable levels of service. Through traffic on the access road must also not be obstructed. It is noted that the implementation of the Modjo-Hawassa Expressway will divert a large proportion of traffic from the Federal Highway in the vicinity of the IAIP site access. It is therefore unlikely that the intersection performance deteriorates in future.
- The very low traffic volumes to and from the RTC does not justify additional turning lanes at the access intersections or along the access roads. No intersection upgrades are recommended. Mitigation measures in the form of the required road signs, road markings and street lighting should be implemented along the route to ensure good intersection operation and safety.

9.10 WASTE MANAGEMENT

The Bulbulla and Shashemene towns lack formally organised waste management systems, however there are informal systems in operation. Identifying the risks associated with waste management at the proposed IAIP and RTC sites is necessary to ensure the impacts from increase waste production are suitably managed. **Table 9-8** below highlights the risks at each phase of the proposed project, by taking into account the current waste management programs at the IAIP site and RTC site.

Table 9-8: Potential Risks Associated with Waste Management in the Oromia Region

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Inappropriate disposal of construction waste including discarded or broken bricks, packaging and hazard demarcation tape.	Negative	Moderate	Minor	Minor

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
2	Hazardous waste materials being stockpiled on bare ground presenting a potential for contamination of soils, surface and ground water.	Negative	Moderate	Moderate	Minor
3	Domestic waste such as food/meal debris, packaging and sanitary waste generated by construction staff.	Negative	High	Major	Minor
OPERATIONAL					
1	Overfull waste bins littering streets and blockage of drainage channels.	Negative	High	Major	Minor
2	Hazardous waste materials being stockpiled on bare ground presenting a potential for contamination of soils, surface and ground water.	Negative	Moderate	Moderate	Minor
3	Any wastes being ultimately disposed of at a landfill will contribute to the volumes of waste and hence the lifespan of the landfill.	Negative	High	Major	Minor
4	Where disposal occurs within an unlined landfill there is the potential for leachate to develop and drain into surface and groundwater resources.	Negative	Moderate	Major	Minor
DECOMMISSIONING					
1	Decommissioning waste: rubble, steel, glass, packaging and hazard demarcation tape.	Negative	High	Major	Minor
2	Hazardous waste materials being stockpiled on bare	Negative	Moderate	Major	Minor

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	ground presenting a potential for contamination of soils, surface and ground water.				
3	Domestic waste such as food/meal debris, packaging and sanitary waste generated by construction staff.	Negative	Moderate	Moderate	Minor

These impacts can be mitigated through proper management and control measures which are contained within a Waste Management Plan (WMP). A WMP has been developed for the Oromia IAIP and RTC sites and is attached as **Appendix C9**.

The WMP provides details on what waste management practices should be applied within the facilities, how waste will be managed and what responsibilities fall to the IPDC, Contractors and Enterprises. The WMP provides an order of preference for waste management options in line with the waste hierarchy. This is an organic document that will need to be regularly updated to include any changes that may occur in the science of waste management. Better waste management reduces environmental pollution; diversion of waste from landfill decreases the need for additional landfills; waste recovery, reuse and recycling reduce the consumption of natural resources, likewise the minimisation of waste.

9.11 VISUAL

The proposed IAIP development is situated in a semi-rural area north of Bulbulla town. The area is of low visual value.

In the context of the development level of Ethiopia, visual impacts arising from such mega projects are considered by the local community receptors to be positive in general. This is because the IAIP/RTC structures adds up to the overall modernization and development of the towns.

Therefore no further functional assessments, impact assessment or mitigation measures were required for the proposed Oromia sites.

9.12 BIODIVERSITY

A biodiversity baseline survey of the Project area was undertaken in line with the AfDB Operational Safeguard 3 – Biodiversity, renewable resources and ecosystem services. The baseline sought to determine the occurrence and approximate abundance of sensitive species within the IAIP site footprint as well as those species in the area that would potentially be impacted upon by the proposed Project. The desk top and field assessment involved the following:

- Identification of protected biodiversity sites within 10km radius of the project area and include distance and direction to sites with appropriate mapping to show locations; including status of sites (i.e. are they internationally, nationally, regionally or locally protected under what legislation or not) and brief description of why sites are protected (i.e. habitat type, red list species etc.);
- Identification of non-protected areas within the vicinity of the Project area that may be sensitive to the development project (i.e. watercourses / wetland habitats);
- Descriptions of general habitat types located on site and provide a table outlining typical flora and fauna;

- Identification of all IUCN red list fauna and flora species that could potentially be present on site and identify all possible red data list species and their current status.

An assessment of the potential impacts associated with the proposed project was undertaken based on the findings of the baseline survey. **Table 9-9** below indicates how the biodiversity within the Bulbulla IAIP region may be impacted by the proposed development. While **Table 9-10** below indicates how the biodiversity within the Shashemene RTC region may be impacted by the proposed development.

To view the full report with regards to potential biodiversity impacts within the Oromia Region, refer to **Appendix C10**.

Table 9-9: Potential Impacts on Biodiversity at the Bulbulla IAIP

Impact number	Receptor / Impact	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Fauna & Flora Loss of Acacia trees	Negative	Moderate	Moderate	Minor
2	Fauna and Flora Nesting sites destruction	Negative	Moderate	Moderate	Minor
3	Fauna Road kills	Negative	Moderate	Minor	Minor
4	Fauna Pollution	Negative	High	Moderate	Minor
5	Fauna and Flora Expansion of alien species	Negative	Moderate	Minor	Minor
OPERATIONAL					
1	Biodiversity Re-vegetation of indigenous plant species in greenery areas	Positive	None required	Moderate	Moderate
2	Avifauna Disturbance and Electrocutions (by electrical transmission lines) of avian species	Negative	Moderate	Minor	Minor
3	Fauna and Flora Water quality deterioration / pollution of surrounding water resources	Negative	Moderate	Moderate	Minor
4	Fauna Attraction of wild animals by food wastes	Negative	Moderate	Moderate	Minor

Impact number	Receptor / Impact	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
DECOMMISSIONING					
1	Biodiversity Contamination of the ecosystem during replacement of machineries, removal of pipelines and associated infrastructures	Negative	Moderate	Minor	Negligible
2	Flora Abandonment of roads and rehabilitation of affected areas	Positive	None required	Minor	Minor

Table 9-10: Potential Impacts on Biodiversity at the Shashemene RTC

Impact number	Receptor / Impact	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Fauna and Flora Loss of indigenous trees	Negative	Moderate	Minor	Negligible
2	Fauna and Flora Pollution	Negative	High	Moderate	Minor
OPERATIONAL					
1	Biodiversity Re-vegetation of indigenous plant species in greenery areas	Positive	None required	Moderate	Moderate
2	Fauna Attraction of scavenger wild animals by wastes	Negative	Moderate	Moderate	Minor
DECOMMISSIONING					
1	Biodiversity Contamination of the ecosystem during replacement of machineries, removal of pipelines and associated infrastructures;	Negative	Moderate	Minor	Negligible

Impact number	Receptor / Impact	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
2	Flora Rehabilitation of affected areas	Positive	None required	Minor	Minor

In both the Bulbulla IAIP and Shashemene RTC sites, effective implementation of the identified mitigation measures is expected to reduce the potential negative impacts to minor significance.

The impact assessment has concluded that the identified impacts can be effectively managed through the implementation of mitigation measures identified within the ESMP (refer to Chapter 11).

9.13 SOCIO-ECONOMIC IMPACTS

This section describes the potential impacts and consequences of interaction between the Project activities and receptors. Where significance of the impacts is assessed as moderate to major, mitigation measures, management and monitoring are proposed. The proposed mitigation and management measures will be implemented at the Bulbulla IAIP and Shashemene RTC sites and by their contractors.

The identified impacts include effects associated with in-migration. Rather than assessing in-migration separately, where in-migration is a contributing or driving factor for a particular impact, this is noted in the sections below.

To view the full report with regards to potential socio-economic impacts within the Oromia Region, refer to **Appendix C-11**.

9.13.1 EMPLOYMENT AND THE ECONOMY

The construction stage of the Project will generate new jobs/employment opportunities during construction. Estimates on employment numbers were not provided within the MACE Feasibility Report since the facility will be developed in a phased manner and therefore construction will happen concurrently with operation. However it can be projected that Oromia will create approximately 212 new jobs for local residents who could be engaged in building the IAIP fencing, gravel road, ditch canal and building maintenance.

For this scale of construction it is anticipated that temporary workers will be employed on the project (for the construction period), and the temporary worker facilities/camps will be located close to Bulbulla, although the precise location of the construction camp is unknown. New jobs are expected to be created which is a combination of jobs for local communities and construction workers in total.

During operation the proposed facilities are anticipated to result in a large number of direct employment opportunities. In addition, the proposed facilities will require goods and services throughout their lifecycle. There are opportunities for local businesses to provide these goods and services (e.g. catering for the workers camp, office-related supply opportunities and services such as cleaning, etc.). As a result, existing local businesses may expand or new businesses may be established locally to meet these demands – providing further employment opportunities. This is referred to as indirect employment.

The MACE Feasibility Report presented direct and indirect employment estimates for the short, medium and long term scenarios, see **Table 9-11** of the operational phase of the proposed project.

Table 9-11: Predicted employment numbers as a result of the operational phase - Oromia IAIP and RTC

Description	Short term – within 2 years	Medium term – 3 to 4 years	Long term – more than 4 years
Direct and indirect employment numbers	213 249	546 326	552 637

POTENTIAL IMPACT

The development will generate skilled and unskilled positions, with the number of unskilled positions dropping substantially after the construction period. Given that most working age local people are engaged in the agricultural farming activities, it is possible that the existing skills set among local people of working age would not always be a perfect match for the direct employment opportunities that will be created by the project.

Therefore, the developer should consider organising training workshops to create new skill sets among local residents and also capitalising on some skills that are transferrable from the agricultural farming activities to the project in order to maximise local employment.

In terms of indirect employment, the realisation of opportunities will depend not only on the project, but also on the initiative and business abilities of local entrepreneurs. Given the potential on a much higher demand for new businesses in the region and the limited number of existing businesses, it is anticipated that the number of business development opportunities and/or indirect employment will be significant.

SIGNIFICANCE

The impacts on employment and economy that are likely to be triggered during the construction stages of the project would be **positive, direct, regional, long-term** and of **medium** severity. The probability of the impacts is considered to be **high** because the project is a significant and strategic development in the area. The significance of these positive impacts on employment and economy is therefore considered to be **major** and as a **major positive** impact does not need mitigation.

The operational impacts on economy and employment are also considered to be **positive, direct, regional, mid-term** and of **low** severity (as the number of new jobs generated by the project would tail off at the operation phase). The probability of the impacts occurring is considered to be **medium**. The significance of the impacts is considered to be **moderate** and as **moderate positive** impact does not need mitigation.

For transparency purposes, the social impacts are presented within a significance rating table included in Appendix A of the Socio-economic report (refer to **Appendix C11**).

9.13.2 LAND ACQUISITION AND IMPACT ON LIVELIHOODS

The ESIA team conducted site observations and consultations with the affected people prior to the construction stage of the Oromia IAIP Project. It is worth noting that although all land in Ethiopia belongs to the state, a number of individual farmers either officially (through a land rental agreement) or unofficially (often, a verbal or no agreement), still cultivate land and grow crops on the plots in the project area. The local authorities in Oromia started the resettlement process a year ago and It is highly likely that the local authorities followed the national resettlement process and not best international practice, because the national and federal legislation on land acquisition does not cover, for example assistance to vulnerable people, consultations and agreement whether it is better to compensate certain families in cash rather than in-kind/land, coordination of activities to ensure people do not lose harvest opportunities, etc.

Further impact and mitigation for the resettlement process is provided in a separate resettlement action plan (RAP).

POTENTIAL IMPACT

The land acquisition process that involves physical displacement will have a long term irreversible negative impact on the agricultural activities of local farmers. Although such farmers could be compensated for the lost crops (and residential buildings), they often lose at least one or two harvests while looking for an alternative plot which is not guaranteed to be of the same quality and size. This situation could have a long term impact on the entire household's livelihood and food security.

SIGNIFICANCE

The impacts on livelihood that are likely to be triggered during the construction and operation stages of the project would be **negative, direct, local, long-term** and of **high** severity (even though the PAPs will be compensated and most are planning to acquire tenants' rights on an alternative/ new plot using the compensation received - it will take years of agricultural efforts to make sure that the alternative/new plot is at least of the same quality of soil and productivity as the "old" one which has been improved over years but "taken away" by the project). The probability of the impacts is considered to be **high** (the government already started the resettlement process about a year ago – which to-date included census and asset inventory survey as well as an estimation of compensation amounts per each PAP). The significance of this negative impact on project affected people's livelihood is therefore considered to be **major negative** and will require mitigation. Provided that mitigation actions are implemented by the project implementation team according to the AfDB OS2 requirements (see the Oromia RAP for more information), the post-mitigation impact would be reduced to moderate.

Although the PAPs will receive compensation, further best international practice mitigation measures are suggested in the Oromia RAP.

9.13.3 COMMUNITY HEALTH

Although an accurate number of total workers that will be employed during construction is currently unknown, there will be potential for the workforce to introduce and/or increase the rate of spread of communicable diseases in the project area. This includes the introduction of a new disease and/or a more virulent strain of an existing disease.

However, the workforce is not the only factor that may contribute to the transmission of communicable diseases. The project is also likely to result in in-migration (from other parts of Ethiopia). Similar to the workforce, there is potential for in-migration to introduce and increase the rate of spread of communicable diseases in the Project area (including sexually transmitted diseases/STDs).

There are a number of diseases that are already prevalent in the project area, which is contributing to the current rates of morbidity and mortality. This includes malaria, typhoid (communicable disease) and influenza (communicable disease) which during the household survey in the project area have been identified as a key contributor in the local communities' rates of morbidity.

Similarly to the community health impacts during the construction stage, there is potential for the workforce to introduce and/or increase the rate of spread of communicable diseases in the project area during operation. This includes the introduction of a new disease and/or a more virulent strain of an existing disease.

The transmission of communicable diseases in the project area during construction and operation can be exacerbated by a number of factors. Health care facilities are limited in the project area. Therefore, the capacity (e.g. availability of diagnostic equipment, availability of medicine) to respond to an increase in the transmission of communicable diseases could be limited.

POTENTIAL IMPACTS

An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area. In terms of communicable diseases and in addition to the existing prevalence of the malaria rates in the project area, of particular note and concern could be: tuberculosis and HIV/AIDS (mainly through drug abuse/blood transfusions/sexual relationship, etc.).

If left untreated communicable diseases can lead to long-term health issues and therefore the impact can be characterised as being long-term and in some instances permanent.

The existing local health care facilities have limited capacity to respond to an increase in the transmission of communicable diseases, potentially leaving the local residents vulnerable.

SIGNIFICANCE

The impact on community health that is likely to be triggered during the construction stage of the project would be **negative, direct, local, long-term** and of **low** severity (primarily due to low population density). The probability of the impacts is considered to be **medium**. The significance of this negative impact on community health is therefore considered to be **moderate** and requires mitigation.

The operational impact on community health is also considered to be **negative, direct, local, long-term** and of **low** severity (as the number of workers and associated in-migration would drop during the operation phase). The probability of the impacts occurring is considered to be **medium**. The significance of the impacts is considered to be **moderate** and requires mitigation.

9.13.4 COMMUNITY SAFETY AND SECURITY

There are a number of safety related issues that are likely to arise during the construction stage of the project. These include:

- Traffic accidents - the Project will increase the number of vehicles on the local road network through the transport of workers, goods, materials and machinery to and from the project site during construction. With an increase in vehicles, particularly heavy haulage vehicles, comes the increased potential for accidents and injuries to occur. Given the relatively low level of current road use, this is unlikely to occur. Instead, the key issue is likely to be the potential for an increase in accidents or incidents (particularly during construction), which can lead to injuries and/ or fatalities;
- The presence of new infrastructure. There are often safety issues with the establishment of new infrastructure – for example, community members interacting with unsecured equipment. This can lead to onsite accidents and injuries; and
- The management of hazardous materials and waste. There are a number of Project activities that will generate hazardous waste or perishable waste that if not being properly managed, could contribute to spread of infectious and other diseases.
- In addition, the Project will require security. Security personnel will be employed through Government contracts during construction and operation.

POTENTIAL IMPACTS

Impacts on community safety (e.g. possibility of accidents) and security (e.g. incidence of crime) can result from an increase in traffic and in-migration in the project area, the establishment of onsite infrastructure and the management of hazardous materials.

SIGNIFICANCE

The impact on community safety and security that is likely to be triggered during the construction stage of the project would be **negative, direct, local, long-term** and of **low** severity (primarily due to low population density). The probability of the impacts is considered to be **low mainly** due to robust management plans that will be implemented by the IPDC.

The operational impact on community health is also considered to be **negative, direct, local, long-term** and of **low** severity (as the number of workers and associated in-migration would drop during the operation phase). The probability of the impacts occurring is considered to be **low**.

Due to the existing management measures, the local extent and significance of the potential impact, the overall impact is assessed as **minor negative** during construction and operation and requires mitigation.

9.13.5 ENVIRONMENTAL EMISSIONS

The construction activities will generate:

- Noise, which can result from a variety of onsite civil works activities (e.g. construction of infrastructure, reversing sensors on large vehicles);
- Vibration, which may result from construction activities; and
- Dust, which can be generated through site grading, driving on dry, dusty and dirty roads. This can impact the surrounding air quality, disrupting the amenity value of an area and potentially impacting community health (e.g. further aggravating respiratory illnesses).

During construction the noise levels at receptors close to the site (within 500 m of the site boundary) will exceed the IFC residential day-time noise guideline. Any receptors beyond 500m are expected to be below the guideline. The construction activities will not occur at night.

During the operation activities the levels of noise and vibration are expected to reduce. Operational noise levels are expected to meet the residential guideline at all receptors beyond 200 m from the site.

POTENTIAL IMPACTS

In terms of noise, a detailed noise impacts assessment has been completed and should be referred to (**Appendix C7**). Increase in dust levels could generate impacts on local residents and the appropriate management measures will be put in place by subcontractors. A detailed air quality impact assessment has been completed and should be referred to (**Appendix C5**)

SIGNIFICANCE

The off-site construction noise impacts identified would be **negative, direct, local, short-term** and of **low to medium** severity. Given the variable nature of the construction activities and worst-case assumptions adopted, the probability of the impacts occurring is **medium** (i.e. there is a fair chance the impacts would be lower than predicted). The significance of the impacts is therefore considered to be **moderate** and requires mitigation.

The off-site operational noise impacts identified would be **negative, direct, local, and long-term** in consideration of the baseline noise environment, the predicted levels are expected to be above the applicable guideline criteria, and the impact severity is therefore considered **medium**. Given the dependence on weather conditions and the worst-case assumptions adopted, the probability of the impacts occurring is **medium** (i.e. there is a fair chance the impacts would typically be lower than predicted). The significance of the impacts is therefore considered to be **moderate** and requires mitigation.

9.13.6 COMMUNITY INFRASTRUCTURE AND SERVICES (INCLUDING HEALTH FACILITIES)

The construction period will be phased with operation commencing while construction continues, this is expected to last for over 32 years until construction phases are completed entirely. The majority of construction workers will be from outside the area (as well as the influx associated with in-migration).

An increase in population in the wider Oromia Region (due to employment opportunities and in-migration during construction) is likely to place additional pressure on existing infrastructure and services (e.g. healthcare). This often results in a reduction in capacity of existing infrastructure and services to meet the needs of the local residents (as well as the additional population added by the Project); leading to diminished quality of services as well as reduced access to the existing infrastructure.

However, during construction the workforce will be accommodated at a camp and it is assumed that sub-contractors will provide a range of on-site amenities inside the camp. This will, to some extent minimise the need for the workforce to use (or rely on) local infrastructure, i.e. minimising the pressure

that may be experienced by community infrastructure and services. It is anticipated that at the conclusion of the construction phase, the workers brought in from outside the area will leave.

In terms of the operation phase, it is anticipated that new direct and indirect jobs will be generated by the operational activities. Given the duration of the project, it is anticipated that the operational workforce will relocate to the region, potentially bringing their families with them which could place some additional pressure on the local infrastructure. However given the nature of the project, it has the potential to attract new and private investments in improved infrastructure, and assuming that some workers will be sourced from the local area, it is anticipated that this additional pressure can be accommodated.

POTENTIAL IMPACTS

During both the construction and operation phase, the project may place additional pressure on existing healthcare facilities, for instance, should a worker become sick or an incident on site resulting in an injury occur. However, there is limited capacity for the existing healthcare facilities to respond to this demand (due to the limited number of health care workers, number of existing hospitals and diagnostic equipment). For this reason, if healthcare is required, workers will likely need to use a medical point located within their workers' camp or other medical facilities located in the Oromia Region. A Community Health Management Plan will help reduce any pressure that may be placed on local health care facilities.

In terms of the construction phase, the road infrastructure may be affected by increased traffic, however, this impact is expected to be local in terms of the extent and occur over a short period of time. The above impacts may be greater depending on the degree of in-migration that occurs. This will need to be monitored closely – and the impact revisited if this become an issue.

SIGNIFICANCE

The potential strain on existing infrastructure (roads & infrastructure wear and tear, and reduced ability of local clinic to cope with the increased number of patients) would be **negative, direct, local, temporary** and of **medium** severity. Given the variable nature of the potential transportation activities (both timing-wise and with regards to precise identification of the roads that will be used most) and difficulty to predict the extent and the number of medical cases that would require medical facilities, worst-case assumptions were adopted. As such, the probability of the impacts occurring is **high**. The significance of the impacts is therefore considered to be **major** and requires mitigation.

The potential strain on existing infrastructure (congested and/or closed roads, infrastructure wear and tear, and reduced ability of local clinic to cope with the increased number of patients) would recede when the project moves into the operational stage and will be of medium severity, while the probability of the impacts occurring is **low**. The significance of the impacts is therefore considered to be **moderate** and requires mitigation.

9.13.7 SUMMARY OF SOCIO-ECONOMIC IMPACTS

A breakdown of potential construction phase and operational phase impacts and ratings are provided in **Table 9-12**. To view the full reports with regards to potential socio-economic impacts within the Oromia Region, refer to **Appendix C11**.

Table 9-12: Potential construction and operation risks associated with socio-economic activities

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Employment and Economy	Positive	Not Applicable	Major	Major

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	An increase in employment opportunities and demand for goods and services are positive. The Project will provide employment opportunities for the wider Oromia region.				
2	Land Acquisition Loss of access to agricultural land plots and in some cases, loss of residential buildings and other assets (crops). The impact is long-term because the effect will be long-lasting. The Project will impact local farmers, where some of them received compensation and moved on to other areas, but others have stayed because they did not want to lose their harvest - as they had no information when the site clearing activities will start.	Negative	Moderate	Major	Moderate
3	Community Health Potential for the workforce to introduce and/or increase the rate of spread of communicable diseases in the project area. The project is also likely to result in in-migration (from other parts of Ethiopia). Similar to the workforce, there is potential for in-migration to introduce and increase the rate of spread of communicable diseases in the Project area (including sexually transmitted diseases/STDs).	Negative	Moderate	Moderate	Moderate
4	Community Safety and Security Potential safety and security risks in the local area. The impact is long-term due to 15 year construction period. The	Negative	Moderate	Minor	Negligible

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	impact is limited to local settlements. The impact likely occurs during the construction phase with the rare frequency.				
5	Environmental Emissions Noise, which can result from a variety of onsite civil works activities (e.g. construction of infrastructure, reversing sensors on large vehicles); Vibration, which may result from construction activities; and dust, which can be generated through site grading, driving on dry, dusty and dirty roads. This can impact the surrounding air quality, disrupting the amenity value of an area and potentially impacting community health (e.g. further aggravating respiratory illnesses).	Negative	Moderate	Moderate	Minor
6	Additional Pressure on Community Infrastructure and Services Potential strain, congestion, and wear and tear for roads and strain on medical facilities in the local area. The impact is limited to local settlements. Temporary impacts are expected at irregular intervals during the construction phase. This would happen due to workers influx.	Negative	Low	Major	Moderate
OPERATIONAL					
1	Employment and Economy An increase in employment opportunities and demand for goods and services are positive. The impact is long-term	Positive	Not Applicable	Moderate	Moderate

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	because it occurs during the operation phase. The Project will provide employment opportunities for the wider Oromia region.				
2	Livelihood/Sources of Income Loss of access to agricultural land plots and in some cases, loss of residential buildings and other assets (crops). The impact is long-term because the effect will be long-lasting. The Project will impact local farmers, where some of them received compensation and moved on to other areas, but others have stayed because they did not want to lose their harvest - as they had no information when the site clearing activities will start.	Negative	High	Major	Moderate
3	Community Health There is potential for the workforce to introduce and/or increase the rate of spread of communicable diseases in the project area during operation. This includes the introduction of a new disease and/or a more virulent strain of an existing disease. The impact is long-term because if diseases are untreated the impact could be long-lasting.	Negative	Low	Moderate	Minor
4	Community Safety and Security Potential safety and security risks in the local area. The impact is long-term due to 15 year construction/operation period. The impact is limited to local settlements. The impact likely occurs during the	Negative	High	Minor	Negligible

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	operational phase with rare frequency.				
5	Environmental Emissions The impact is limited to local settlements. Short-term impacts with the rare frequency during the operation phase. During the operation activities the levels of noise and vibration are expected to reduce. Operational noise levels are expected to meet the residential guideline at all receptors beyond 200 m from the site.	Negative	Moderate	Moderate	Minor
6	Community Infrastructure and Services Potential strain, congestion, and wear and tear for roads and strain on medical facilities in the local area. The impact is limited to local settlements. The transmission of communicable diseases in the project area during operation and strain on limited health and other facilities and infrastructure the existing capacity of the infrastructure to cope with more people in the area (i.e. new staff and their families attracted to the area by the IAIP operations).	Negative	Low	Moderate	Minor
DECOMMISSIONING					
1	Employment The impact is long-term because after decommissioning the permanent operation employment opportunities will be lost. It is expected that some training/retrenchment will	Negative	Low	Major	Moderate

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	be provided prior during the decommissioning stage and thus people will be able to find other jobs. Furthermore, the Project will provide employment opportunities for the wider Oromia region. However in response to the IAIP development it is anticipated that a number of local businesses will have been created which may assist in the support of some of the individuals that will lose their employment after the IAIP is decommissioned. In addition, due to the nature of their livelihood strategies (through agricultural activities) there won't be a massive and sharp rise in unemployment after the IAIP is gone because although the farmers would scale back their farming they will not stop doing it.				

The categorisation in the above table (High, Moderate, Minor, Negligible or Not Applicable) represents a qualitative evaluation of the seasonal variation in socio-economic activity (relevant to the project). These evaluations are based on the details provided in the sections above.

From the table it is clear that land acquisition caused by the project will have a major negative impact on the affected farmers, both during construction and operation phases. The start of the resettlement process prior to an international consultant's involvement led to the situation where some PAPs have moved on. In addition, any changes in the IAIP footprint will inevitably call for a new survey to make sure that all people who might be affected (by the design changes) are identified and compensated accordingly. Moreover, because the national and federal land acquisition laws have gaps (if compared to best international practice), it is possible that not all affected people were identified, and some vulnerable groups did not receive the necessary assistance earlier. This and other issues are covered in detail in a separate Oromia RAP.

Generally, in both the Bulbulla IAIP and Shashemene RTC sites, effective implementation of the identified mitigation measures is expected to reduce the potential negative impacts to moderate or minor significance. The impact assessment has identified that the identified impacts can be mitigated through the implementation of mitigation measures identified within the ESMP (refer to Chapter 11).

It is noted that, based on the information collected during the field visits, consultation sessions and site observations the existing infrastructure and particular medical facilities are inadequate even for the existing population of the area. As a result it is highly likely that the existing facilities and infrastructure in the project area will struggle to cope fully with the (temporary) increased demand for services during the construction stage in particular.

9.14 CULTURAL HERITAGE IMPACTS

Establishment of the proposed Project will result in the relocation of a gravesite / burial tomb present within the RTC footprint.

A breakdown of the potential impacts and ratings are provided in **Table 9-13**. To view the full report with regards to potential cultural heritage impacts within the Oromia Region, refer to **Appendix C12**.

Table 9-13: Potential construction and operation risks associated with cultural heritage

Impact number	Receptor	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
CONSTRUCTION					
1	Loss of cultural resources (gravesite / burial tomb) at the RTC	Negative	Moderate	Moderate	Minor
OPERATIONAL					
N/A					
DECOMMISSIONING					
N/A					

Effective implementation of the identified mitigation measures is expected to reduce the potential negative impact to minor significance. The identified impact can be effectively managed through the implementation of mitigation measures identified within the ESMP (refer to Chapter 11).

10 CUMULATIVE IMPACTS

The ESIA investigates potential cumulative impacts that could occur as a result of the proposed development. This chapter includes physical, biological and social cumulative impacts associated with the proposed Project.

The information which is presented below is a consolidation of the identified impacts associated with the proposed Oromia IAIP and RTC. These impacts have been sourced from various specialist reports, refer to **Appendix C** for the full specialist reports. This chapter considers the cumulative effects that could arise from a combination of the Oromia IAIP and RTC project effects. In addition, consideration has been given to the project impacts in combination with those of other existing or planned developments in the surrounding area. The cumulative impact assessment includes consideration of other developments which might take place as a consequence of the project, e.g. to provide access, power or water supplies, sewage treatment or waste disposal, or to house or provide jobs for people attracted to the area by the project.

10.1 SOILS

The purpose of this section is to identify the likely project cumulative effects on soils. The description is based on primary data obtained from site investigations. **Table 10-1** summarises the impacts identified at both the Oromia IAIP and RTC sites as being significant in terms of soil, land use and land capability. To view the full report with regards to potential impacts on soils within the Oromia Region, refer to **Appendix C1**.

Table 10-1: Potential Cumulative Impacts on Soils in the Oromia Region

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Erosion Eroded areas will continue to spread, unless stopped, resulting in a cumulative negative effect identified soils resulting in large scale losses of valuable topsoil and erosion gullies forming resulting in risk to infrastructure in the area.	Negative	Low	Major	Moderate
2	Sedimentation Eroded soil particles may end up in nearby watercourses, as sedimentation.	Negative	Low	Major	Major
3	Loss of topsoil Topsoil will be lost, however lost topsoil can be transferred to an alternative area to continue cultivation.	Negative	High	Moderate	Moderate
4	Compaction	Negative	Low	Moderate	Minor

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	Soil compaction results in the change of the original structure of the soils.				
5	Change in surface profile The surface profile of the sites will be changes to create a platform for buildings and associated infrastructure.	Negative	No mitigation possible	Minor	Minor
6	Change in land use The land will undergo permanent changes as the land use will change from farming to other uses.	Negative	No mitigation possible	Moderate	Moderate
7	Change in land capability The proposed development will permanently alter the lands capability of the affected areas.	Negative	No mitigation possible	Moderate	Moderate
8	Dust creation If bare surfaces and soil stockpiles are not watered and vegetated, there is a potential for high amounts of dust creation.	Negative	Moderate	Moderate	Minor
9	Soil Contamination Contamination may occur due to the large vehicles on site. This should be prevented, otherwise well-drained after contact with the pollutants, to decrease chances of contaminating water resources.	Negative	Low	Major	Minor

The most significant cumulative impacts relate to soil erosion, sedimentation and contamination. Proposed mitigation measures have been identified in the ESMP. Refer to Chapter 11 for the full ESMP to be applied at the Oromia IAIP and RTC.

10.2 SURFACE WATER

This section of the report identifies the potential risks associated with the surface water at the proposed project site. There is no permanent flowing surface water resources on the sites, however the Bulbulla River runs to the east of the IAIP site. Erosion areas around the IAIP site have been identified which are associated with concentrated stormwater runoff. Increased hardstanding may result in increased volumes and velocities of water entering and flowing through these existing drainage channels and ultimately entering the nearby watercourses.

Table 10-2 below identifies the potential cumulative impacts on surface water and the significance of the impact. To view the full report with regards to potential impacts on surface water within the Oromia Region, refer to **Appendix C2**.

Table 10-2: Potential Cumulative Impacts on Surface Water in the Oromia Region

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Altering the hydrological regime of the nearby water sources and drainage lines.	Negative	Moderate	Moderate	Minor

The primary cumulative impact of concern relates to the potential for negative impacts to occur on the Bulbulla River and associated drainage lines. The primary mitigation measures to be implemented in order to minimise this impact include keeping hard standing areas to a minimum. The implementation of the requirement set within Article 5(15) of the Industrial Parks Council of Ministers Regulation No 417/2017 will ensure that 25% of each of the development plots within the IAIP remain undeveloped. For the remaining 75% of the site that is developed the Enterprises should be required to make use of permeable paving. All pavements and car parks in communal areas are to be built with the use of permeable paving. Finally, where surface water exits on the site, energy dissipators should be incorporated in order to ensure erosion does not occur as a result of the concentrated runoff.

Proposed mitigation measures have been identified in the ESMP. Refer to Chapter 11 for the full ESMP to be applied at the Oromia IAIP and RTC.

10.3 GROUNDWATER

Based on primary data obtained, it was identified that groundwater use within the region is extremely limited. Local community members typically rely on municipally supplied treated surface water as their main water source.

Activities undertaken associated with the development of the Project and other activities resulting from the development could result in an increased risk of contamination of the groundwater resources.

The potential cumulative impacts on the groundwater is presented in the **Table 10-3** below. To view the full report with regards to potential impacts on ground water within the Oromia Region, refer to **Appendix C3 (report to be concluded following receipt of identified information)**.

Table 10-3: Potential Cumulative Impacts on Ground Water in the Oromia Region

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Contamination of groundwater resources from contaminated surface water runoff or subsurface leakages from underground chemical storage and/or effluent systems	Operation	Moderate	Minor	Minor

In order to minimise this impact, the IPDC is to contain and treat surface water runoff in order to prevent it entering the groundwater environment. The IPDC must continually monitor groundwater quality in the vicinity of the site in order to quickly identify if contamination has occurred. Based on the findings of the impact assessment, it is concluded that the development and operation of the Oromia

IAIP and RTC will have a minor impact on the receiving groundwater environment should the implementation of the proposed mitigation measures be undertaken effectively.

Proposed mitigation measures have been identified in the ESMP. Refer to Chapter 11 for the full ESMP to be applied at the Oromia IAIP and RTC.

10.4 WETLANDS

The desktop screening and infield assessments of the Bulbulla IAIP and Shashemene RTC determined that there were **no wetland habitats within the site boundaries or in close proximity to the site**, where there was a potential for wetland habitats to be indirectly impacted.

Therefore no further functional assessments, impact assessment or mitigation measures were required for the proposed Oromia sites.

10.5 AIR QUALITY

The cumulative impacts of air quality include the residents living near the IAIP and RTC sites being affected by a change in particulate and gaseous concentrations in the greater project area.

Table 10-4 below highlights the cumulative impacts of air quality. To view the full report with regards to potential impacts on air quality within the Oromia Region, refer to **Appendix C5**.

Table 10-4: The Potential Cumulative Impacts on Air Quality in the Oromia Region

Impact number	Description	Character	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Increased particulate and gaseous concentrations Residential receptors within immediate vicinity of site boundary	Negative	Moderate	Moderate	Minor
2	Increased particulate and gaseous concentrations Residential receptors beyond site boundary	Negative	Moderate	Minor	Negligible

The cumulative interactions of the air quality impacts are deemed to be of moderate significance for receptors located within the immediate vicinity of the site boundary, however with mitigation this can be reduced to a minor significance with implementation of the recommended mitigation measures. With mitigation the receptors beyond the site boundary will experience a negligible cumulative impact.

Proposed mitigation measures have been identified in the ESMP. Refer to Chapter 11 for the full ESMP to be applied at the Oromia IAIP and RTC.

10.6 NOISE

The current noise climate is typically rural, with very limited anthropogenic influences. The site currently consists of mixed agricultural activities which do not generate significant levels of noise. Various dwellings are distributed across the site. The federal highway no. 7, which connects Addis Ababa and Hawassa, borders the site on the east. This is the most significant noise source at the proposed Bulbulla IAIP site. Therefore noise levels are anticipated to increase substantially away from the federal highway with the introduction of the Oromia IAIP, based on the fact that there is a lack of significant noise generators in these areas prior to the development of the proposed project.

Table 10-5 below identifies the potential cumulative impacts of noise levels which may be caused by the proposed project, as well as the severity of the impacts. To view the full report with regards to potential impacts on noise levels within the Oromia Region, refer to **Appendix C7**.

Table 10-5: Potential Cumulative Impacts of Noise in the Oromia Region

CUMULATIVE					
1	Degradation of noise climate / annoyance Residential receptors within 200m of the site boundary	Negative	Moderate	Moderate	Minor
2	Degradation of noise climate / annoyance Residential receptors beyond 200m of the site boundary	Negative	Moderate	Minor	Negligible

The cumulative interactions of the noise impacts are deemed to be of moderate significance for receptors located within the immediate vicinity of the site boundary, however with mitigation this can be reduced to a minor significance. With mitigation the receptors beyond the site boundary will experience a negligible cumulative impact.

Proposed mitigation measures have been identified in the ESMP. Refer to Chapter 11 for the full ESMP to be applied at the Oromia IAIP and RTC.

10.7 TRANSPORT AND ACCESS

There are no known large-scale planned developments in the vicinity of this development, therefore no cumulative transport impacts are expected on the local road network

To view the full Traffic and transport report with regards to potential impacts within the Oromia Region, refer to **Appendix C.8**.

10.8 WASTE MANAGEMENT

The Bulbulla and Shashemene towns lack formally organised waste management systems. The closest town with an active landfill is Batu Town which is 23km away from the IAIP site. The municipality of Batu Town has plans for a new sanitary landfill to be development in the future. The table below highlights the cumulative impacts of the proposed project, by taking into account the current waste management programs at the IAIP site and RTC site. To view the full Waste Management Plan (WMP) with regards to potential cumulative impacts on biodiversity within the Oromia Region, refer to **Appendix C9**.

Table 10-6: Potential Cumulative Impacts Associated with Waste Management in the Oromia Region

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Residual wastes and industrial hazardous waste and bio-medical wastes are the only wastes that will cumulate outside the IAIP and	Negative	Low	Major	Moderate

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	RTC. The remainder of the waste streams will be prevented, reused or recovered.				

No hazardous wastes shall be permitted to be disposed of outside the boundary of the IAIP or RTC unless being transported to a sanitary landfill. The IPDC must place the responsibility of safe disposal of hazardous waste on the generator. It will be the generators responsibility to ensure that the waste collector which will be transporting the waste for disposal has obtained a permit from the Urban Administration to do so in terms of Article 4(1) of the 'Solid Waste Management Proclamation 513/2007'. In addition, the Generator will need to provide evidence in writing from the receiving disposal site of its capacity to recycle or dispose of the waste in an environmentally sound manner (Article 6(3)). Proof of safe disposal should be provided to the IPDC, such as a waste disposal ticket issued and date stamped by the sanitary landfill. This waste stream is anticipated to be small, limited to cleaning materials and small quantities of bio-medical waste since most of the processing to be undertaken on site is for the food industry and therefore hazardous process materials should be limited.

10.9 BIODIVERSITY

The existing biodiversity components and associated key features which include typical flora and fauna, protected areas and non-protected sensitive resources that are found inside and within the vicinity of the project sites were identified in order to assess the potential impacts on the biodiversity of the IAIP and RTC site associated with the proposed project. The baseline conditions within the survey area have been determined through desk-based reviews of available information, field surveys and consultations with concerned authorities. To view the full report with regards to potential cumulative impacts on biodiversity within the Oromia Region, refer to **Appendix C11**.

Table 10-7 below indicates how the biodiversity within the Bulbulla IAIP may be impacted by the proposed development, respectively.

Table 10-7: Potential Cumulative Impacts on Biodiversity in the Oromia Bulbulla IAIP

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Biodiversity / Ecosystem Maintenance Erosion and top soil removal during excavation	Negative	Moderate	Minor	Negligible
2	Biodiversity / Ecosystem Maintenance Alteration of the watershed of the area	Negative	Moderate	Minor	Negligible
3	Biodiversity / Ecosystem Maintenance Alteration of the watershed of the area	Negative	Moderate	Moderate	Minor

Table 10-8 below indicates how the biodiversity within the Shashemene RTC may be impacted by the proposed development.

Table 10-8: Potential Cumulative Impacts on Biodiversity in the Oromia Shashemene RTC

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Biodiversity / Ecosystem Maintenance Erosion and top soil removal during excavation	Negative	Moderate	Minor	Negligible
2	Biodiversity / Ecosystem Maintenance Contamination of the ecosystem due to spill over and dusting of some construction materials and wastes	Negative	Moderate	Minor	Negligible

The cumulative interactions of the biodiversity impacts are deemed to be of moderate to minor significance, however with mitigation these can be reduced to minor or negligible significance.

Proposed mitigation measures have been identified in the ESMP (refer to Chapter 11).

10.10 SOCIO-ECONOMIC

Development of the proposed project has the potential to result in significant socio-economic impacts. The table below provides a summary of the anticipated cumulative impacts to the Social Study Area due to the presence of the Project.

To view the full report with regards to potential impacts on socio-economics within the Oromia Region, refer to **Appendix C10**.

Table 10-9: Potential Cumulative Impacts on the Socio-Economic Sector in the Oromia Region

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
1	Influx of people Pressure on existing infrastructure within IAIP and RTC sites, in particular medical facilities/water supply/sanitation and education facilities.	Negative	Moderate	Major	Minor
2	Resettlement and Land Acquisition Resettlement and land acquisition displacing farmers, their agricultural activities including crops and other assets	Negative	Moderate	Major	Minor
3	Increase in Employment An increase of employment and diversity of employment will benefit	Positive	Not Applicable	Major	Major

Impact number	Description of Impact	Stage	Ease of Mitigation	Pre-mitigation Rating	Post-mitigation Rating
	the next generation by generating alternative revenue streams				
4	Gross Domestic Product The combined impact on the economy of the regional IAIP site and the RTC sites will help diversify the Gross Domestic Product of Ethiopia from being primarily dependent on agriculture. The potential is great that these projects combined will uplift the economy.	Positive	Not Applicable	Major	Major

The cumulative interactions of the socio-economic impacts are deemed to be of minor negative significance, with mitigation measures implemented, as well as major positive impacts in terms of employment and the economy.

Proposed mitigation measures have been identified in the ESMP (refer to Chapter 11).

10.11 CULTURAL HERITAGE

There are no known cultural heritage resources of significance in the vicinity of this development, other than the identified gravesite within the RTC site, therefore no cumulative heritage impacts are expected.

To view the full cultural and heritage report with regards to potential impacts within the Oromia Region, refer to **Appendix C13**.

10.12 CUMULATIVE IMPACTS SUMMARY

CUMULATIVE EFFECT OF COMBINED PROJECT IMPACTS

Cumulative impacts are generated as a result of a number of project effects interacting as well as where an effect is not mitigated and continues causing increasing impacts. While some impacts may be insignificant by themselves, cumulative impacts accumulate over time, from one or more sources and can result in the degradation of important resources. Not all impacts will result in cumulative impacts, however those that have been identified and are predicted to potentially occur have been listed below in **Table 10-10**.

A cumulative interactions table illustrates how an impact on one variable can affect another and how severe the cumulative impact is. To read the table, follow the y-axis from the top to the bottom of the table, and see how severe the cumulative interactions are anticipated to be.

Table 10-10: Cumulative Interactions between Multiple Potential Impacts for the IAIP and RTC

	Soils	Surface water	Ground water	Air quality	Noise	Waste management	Biodiversity	Socio-economic
Socio-economic	Moderate	Minor	Minor	Minor	Minor	Moderate	Minor	
Biodiversity	Negligible	Negligible	Negligible	Negligible	Negligible	Minor		Minor
Waste management	Negligible	Minor	Negligible	Negligible	Negligible		Minor	Moderate
Noise	Negligible	Negligible	Negligible	Negligible		Negligible	Negligible	Minor
Air quality	Minor	Negligible	Negligible		Negligible	Negligible	Negligible	Minor
Ground water	Minor	Minor		Negligible	Negligible	Negligible	Negligible	Minor
Surface water	Major		Minor	Negligible	Negligible	Minor	Negligible	Minor
Soils		Major	Minor	Minor	Negligible	Negligible	Negligible	Moderate

CONSIDERATION OF CUMULATIVE IMPACTS WITH OTHER DEVELOPMENTS

It is also important for the ESIA to analyse the proposed projects in light of the surrounding land uses and proposed developments. The Bulbulla IAIP is located a short distance, approximately 1.5km, away from the urban edge of Bulbulla Town while the Shashemene RTC is located on edge of Shashemene Town.

Currently the land use taking place on the sites is predominantly mixed agricultural, where people living in the local vicinity are engaged in the production of the major crops grown in the area, and residential with dispersed dwellings located on the sites.

As the Bulbulla IAIP site is located outside of Bulbulla Town the towns Master Plan does not reflect the proposed development. The largest known development to have occurred recently in the area is Frigorifico Boran Foods Plc abattoir located near Adami Tulu, approximately 5.5km north of the proposed IAIP site (**Figure 10-1**). The abattoir is located on a 75 hectare portion of land and reportedly has a capacity of slaughtering 3,000 cattle and 6,000 sheep and goats daily upon operating at full capacity, enabling the company to produce 300 tonnes of meat a day. The facility has received an authentication certificate from the Ministry of Livestock Development & Fisheries to export processed meat. The plant creates job opportunities for 200 people, of which 25 were taken to India for six months of training. The company also plans to increase this figure by 10 fold when the business starts to operate at its full capacity (AllAfrica, 2017). The construction phase of the abattoir is complete, as such only operational activities will potentially result in cumulative impacts, however with the implementation of the proposed mitigation measures as detailed in the ESMP these are anticipated to be negligible.

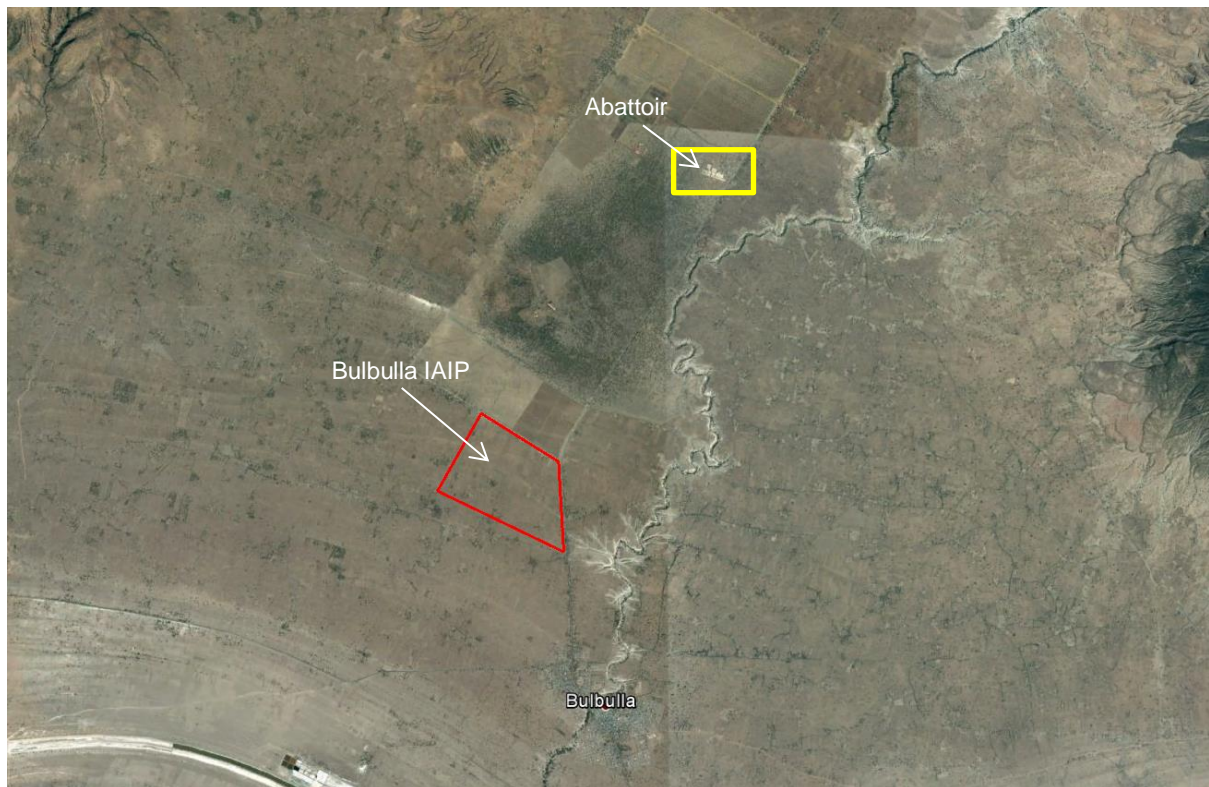


Figure 10-1: Layout showing Frigorifico Boran Foods Plc abattoir in relation to the IAIP site.

There will be associated infrastructure requirements such as roads, power lines and sanitation services infrastructure required as a result of the IAIP and RTC developments. All of these infrastructure projects will have a limited footprint for which mitigation of impacts can be simply achieved. Where applicable these associated infrastructure projects will be subject to an Environmental Impact Assessment which will need to consider the IAIP and the impacts captured herein.

The proposed IAIP will generate a new large population that will place significant pressure on some of the existing infrastructure in the area such as healthcare facilities, schools etc. and therefore the Park will incorporate community facilities such as a clinic, schools and churches to alleviate these pressures. The existing population will be able to utilise these. This will have a beneficial cumulative effect on the existing communities living close to the IAIP.

There are residential dwellings located around both sites and therefore dust and noise control measures will need to be closely monitored and the ESMP implemented fully in order to manage the potential cumulative impacts. The grievance mechanism for the community must be well implemented and tracked to ensure any issues are dealt with in a timely manner.

11 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

11.1 INTRODUCTION AND OBJECTIVES

This chapter presents the Environmental and Social Management Plan (ESMP) which is aimed to prevent, minimise or mitigate potential adverse environmental and social impacts, and enhance the Project's beneficial impacts throughout the design, construction and operational phases.

The purpose of the ESMP is to ensure that environmental and social impacts and risks identified during the ESIA process are effectively managed during the implementation of the proposed Project. This ESMP has been prepared to identify the environmental and social management and mitigation actions required to address any potential adverse impacts, enhance the Project's beneficial impacts, and monitoring requirements to ensure the implementation of the project is undertaken in accordance with the requirements of the AfDB and applicable national legislation and regulations of the FDRE.

The objectives of this ESMP are therefore to:

- Set out an action plan of environmental and social management measures to be implemented that aim to achieve the avoidance, minimisation or mitigation (including offset or compensation) of adverse environmental and social impacts and enhance positive impacts of the project;
- Define specific actions to be taken, responsibilities for these actions, timeframes for implementation; associated budget;
- Identify monitoring requirements in relation to positive and negative effects, environmental performance, and compliance with statutory environmental and social regulations requirements that are to be undertaken to ensure compliance or continued improvement throughout the specified periods; and
- Outline consultative requirements and training / capacity building requirements deemed necessary for effective implementation of the plan.

The ESMP is to be implemented and monitored by the Oromia IPDC as the project's implementing entity and will form the basis of site-specific management plans that will be prepared by the contractors and sub-contractors as part of their construction methodology prior to works commencing.

The ESMP forms an integral part of an ESIA. It is considered a dynamic instrument as its management actions may be subject to change as a result of feedback received during project implementation and/or in response to unexpected impacts or impacts with a magnitude different to that predicted in the ESIA. Monitoring will provide the information for periodic review and subsequent alteration of the ESMP as necessary. This will ensure that undesirable impacts are detected early and remedied effectively.

Best practice principles require that every reasonable effort is made to reduce and preferably to prevent negative impacts while enhancing the benefits. These principles have guided the ESIA process. In many cases, potential negative impacts have been avoided through careful design. The ESIA involved concurrent and ongoing data collection and public consultation activities to date.

Since an ESMP continues to evolve in scope and depth with subsequent stages of the Project preparation and implementation, the ESMP of this ESIA provides a first outline. Detailed stand-alone sub-plans may be developed to specify ESMP issues in its further progress, such as detailed Monitoring Plans, Emergency Response Plans, and Community Development Plans.

Annual monitoring reports shall be compiled and made available to the relevant authorities and relevant financial lenders. The reports shall cover the status of environmental and social, including health and safety related aspects like permits, status of compliance with obligations arising from such permits / licences, exceedances of regulatory environmental standards with root cause analyses and details of corrective measures implemented.

11.2 SUMMARY OF IMPACTS

Chapter 9 of the ESIA identifies the potential impacts, both positive and negative, associated with the proposed Project. **Table 11-1** summarises the identified potential impacts and the associated post-mitigation significance rating for the various phases of the Project.

Table 11-1: Summary of impacts and post mitigation significance

Environment	No.	Impact	Character	Ease of Mitigation	Post-mitigation Rating		
					Construction	Operation	Decommission
Soils	1	Erosion	Negative	Low	Moderate	Minor	Moderate
	2	Sedimentation	Negative	Low	Minor	Minor	Minor
	3	Loss of topsoil	Negative	High	Negligible	-	-
	4	Soil compaction	Negative	Moderate	Moderate	Major	-
	5	Change in surface profile	Negative	Nil	Major	-	-
	6	Change in land use	Negative	Nil	Major	-	-
	7	Change in land capability	Negative	Nil	Major	-	-
	8	Dust creation	Negative	Moderate	Minor	Minor	Minor
	9	Soil Contamination	Negative	Moderate	Minor	Minor	Minor
Surface Water	1	Contamination Hydro-carbon contamination from the earth-moving machinery and vehicles	Negative	Moderate	Minor	-	Minor
	2	Sedimentation of the Bulbulla River	Negative	Moderate	Minor	-	Minor
	3	Altering the hydrological regime Change in runoff volume	Negative	Moderate	-	Minor	-
	4	Altering the hydrological regime Change in runoff velocity	Negative	High	-	Minor	-
Ground Water	1	Lowering of groundwater levels through abstraction of groundwater for use at the IAIP and RTC sites	Negative	Moderate	-	Minor	-
	2	Contamination of groundwater resources from contaminated surface water runoff or subsurface leakages from underground chemical storage and/or effluent systems	Negative	Moderate	-	Minor	-
	3	Groundwater quality unfit for human consumption due to naturally high levels of fluoride and sodium. This impact will only be relevant if groundwater is selected as a source of water supply for the Operation	Negative	Moderate	-	Minor	-

Environment	No.	Impact	Character	Ease of Mitigation	Post-mitigation Rating		
					Construction	Operation	Decommission
Air Quality	1	Increased particulate and gaseous concentrations within immediate vicinity of site boundary	Negative	Moderate	Minor	Minor	Minor
	2	Increased particulate and gaseous concentrations on surrounding receptors	Negative	Moderate	Negligible	Negligible	Negligible
Noise	1	Degradation of noise climate / annoyance Within 500m from the site boundary during construction and decommissioning and 200m during operation	Negative	Moderate	Moderate	Minor	Moderate
	2	Degradation of noise climate / annoyance Beyond 500m from the site boundary during construction and decommissioning and 200m during operation	Negative	Moderate	Minor	Negligible	Minor
Transport and Access	1	Increased vehicle/vehicle and vehicle/NMT accident risks due to increased traffic volumes on the local road network	Negative	Low	Minor	Minor	Minor
Waste Management	1	Public Nuisance - Inappropriate disposal of construction waste	Negative	High	Minor	-	Minor
	2	Hazardous waste materials being stockpiled on bare ground presenting a potential for contamination of soils, surface and ground water.	Negative	High	Minor	Minor	Minor
	3	Domestic waste generated by construction staff	Negative	High	Minor	-	Minor
	4	Overfull waste bins littering streets and blockage of drainage channels	Negative	High	-	Minor	-
	5	Any wastes being ultimately disposed of at a landfill will contribute the volumes of waste and hence the lifespan of the landfill.	Negative	High	-	Minor	-
	6	Disposal to unlined landfill impacting surface and groundwater resources.	Negative	High	-	Minor	-
Biodiversity (Bulbulla IAIP)	1	Fauna & Flora Loss of Acacia trees	Negative	Moderate	Minor	-	Negligible
	2	Fauna and Flora	Negative	Moderate	Minor	-	Negligible

Environment	No.	Impact	Character	Ease of Mitigation	Post-mitigation Rating		
					Construction	Operation	Decommission
		Nesting sites destruction					
	3	Fauna Road kills	Negative	Moderate	Minor	-	Negligible
	4	Fauna Pollution	Negative	High	Minor	-	Negligible
	5	Fauna and Flora Expansion of alien species	Negative	Moderate	Minor	-	Negligible
	6	Biodiversity Re-vegetation of indigenous plant species in greenery areas	Positive	None Required	-	Moderate	-
	7	Avifauna Disturbance and Electrocutions (by electrical transmission lines) of avian species	Negative	Moderate	-	Minor	-
	8	Fauna and Flora Water quality deterioration / pollution of surrounding water resources	Negative	Moderate	Negligible	Minor	Negligible
	9	Fauna Attraction of wild animals by food wastes	Negative	Moderate	-	Minor	Negligible
	10	Biodiversity Contamination of the ecosystem during replacement of machineries, removal of pipelines and associated infrastructures	Negative	Moderate	-	-	Negligible
	11	Abandonment of roads and rehabilitation of affected areas	Positive	None Required	-	-	Minor
Biodiversity (Shashemene RTC)	1	Fauna and Flora Loss of indigenous trees	Negative	Moderate	Negligible	-	-
	2	Fauna and Flora Pollution,	Negative	High	Minor	-	-
	3	Biodiversity Re-vegetation of indigenous plant species in greenery areas	Positive	None Required	-	Moderate	-
	4	Fauna Attraction of scavenger wild animals by wastes	Negative	Moderate	-	Minor	-
	5	Biodiversity Contamination of the ecosystem during replacement of machineries, removal of pipelines and associated infrastructures;	Negative	Moderate	-	-	Negligible
	6	Flora	Positive	None Required	-	-	Minor

Environment	No.	Impact	Character	Ease of Mitigation	Post-mitigation Rating		
					Construction	Operation	Decommission
		Rehabilitation of affected areas					
Socio-Economic	1	Employment and Economy An increase in employment opportunities and demand for goods and services (although this will reverse to moderate negative during the decommissioning stage).	Positive	None Required	Major	Moderate	Moderate
	2	Land Acquisition / Resettlement / Livelihood Loss of access to agricultural land plots and in some cases, loss of residential buildings and other assets (crops).	Negative	Moderate	Moderate	Moderate	-
	3	Community Health Potential for the workforce to introduce and/or increase the rate of spread of communicable diseases in the project area.	Negative	Moderate	Moderate	Minor	-
	4	Community Safety and Security Potential safety and security risks in the local area.	Negative	High	Negligible	Negligible	-
	5	Environmental Emissions Nuisance from noise; vibrations and dust.	Negative	Moderate	Minor	Minor	-
	6	Additional Pressure on Community Infrastructure and Services Strain, congestion, and wear and tear for roads and strain on medical facilities in the local area.	Negative	Low	Moderate	Minor	-
Cultural Heritage	1	Loss of cultural resources (gravesite / burial tomb) at the Shashemene RTC	Negative	Moderate	Minor	-	-

The **non-implementation** of the project will impede development and delay the industrialisation of the agricultural industry in the Oromia Region.

11.3 MITIGATION AND ENHANCEMENT MEASURES

The ESIA stipulates the environmental standards to be adhered to by the parties involved in the various phases of the project life cycle. As such the ESMP comprises of a section for each of the following project life cycle phases:

- Planning and design;
 - Construction;
 - Operation; and
 - Decommissioning.
-

11.3.1 PLANNING AND DESIGN PHASE

The planning and design phase of the project is not expected to have any direct impacts on the environment. Consequently no management control measures are required and/or proposed.

Various layout options were considered to minimise the environmental impacts and the currently proposed layout plan has been chosen on the basis of these considerations.

11.3.2 CONSTRUCTION PHASE

The proposed mitigation measures for the construction phase are detailed in **Table 11-2**.

11.3.3 OPERATION PHASE

The proposed mitigation measures for the operation phase are detailed in **Table 11-3**.

11.3.4 DECOMMISSIONING PHASE

As the project is considered to be a permanent facility, detailed Decommissioning activities have not been included. Consequently no management control measures are required and/or proposed at this stage. These are to be identified prior to decommissioning, should such activities be required in the future.

Table 11-2: Construction Phase Environmental and Social Management Plan

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
Soils	S1	Erosion Eroded areas will continue to spread, unless stopped, resulting in a cumulative effect on the site's identified soils	Soil protection strategies: (i) Placement of soil stockpiles so as to prevent exposure to wind and water erosion. (ii) Access and haul roads should have gradients or surface treatment to limit erosion, and road drainage systems should be provided. (iii) Terracing, slope reduction, runoff velocity limitation and the installation of appropriate drainage; should be incorporated into the site management plan to limit soil erosion. (iv) Reduce negative impacts to the site and surroundings by controlling erosion and sedimentation. (v) Soil erosion control measures shall conform to the best management practices highlighted in the appropriate code. (vi) Regular inspections will be undertaken to assess erosion and sediment migration from topsoil stockpiles. Where unacceptable rates of erosion are identified, remedial works will be undertaken, or the stockpile will be relocated. (vii) The size and area of stockpiles of soil will be minimised. Stockpiles that may be susceptible to erosion must be terraced, covered or have suitable erosion control measures such as silt fences. (viii) Soil stockpiles should be revegetated to protect the soils against erosion	IPDC / Contractor	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(2)	AFDB OS1 IFC (World Bank) EHS Guidelines for Mining, 2007 Development Corporation Regulations (Oromia), 2017
	S2	Sedimentation Eroded soil particles may end up in a nearby watercourse as sedimentation	Sedimentation control management measures: (i) Reduce and prevent off-site sediment transport by using measures such as settlement ponds and silt fences. (ii) The implementation of soil erosion mitigation measures will also mitigate against enhanced sedimentation.	IPDC / Contractor	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref.11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	S3	Loss of topsoil Topsoil will be lost, however lost topsoil can be transferred to an alternative area to continue cultivation; there is limited topsoil at the IAIP site	Topsoil management measures: (i) Topsoil stripped should be stockpiled for rehabilitation. (ii) Irrespective of where topsoil is stockpiled, it should be kept moist and vegetated as soon as possible. (iii) Topsoil stockpiles should be kept low (between 3 and 5 meters tall). It is recommended that the top 50cm of soil be stripped, where possible according to the guidelines below; - Demarcate the area to be stripped clearly, so that the contractor does not strip beyond the demarcated boundary. - The top 50cm of the entire area should be stripped, where the soils are deep enough, and relocated by truck along set removal paths. - The area to be stripped requires storm water management; the in-flow of water should be prevented with suitable structures. - Prepare the haul routes prior to stripping.	IPDC / Contractor	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref.11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			<ul style="list-style-type: none"> - Stripping should not begin in wet conditions. (iv) Within each stripping unit, segments should be stripped progressively, ensuring that the dump truck used to move the soils does not drive over the area to be stripped, but rather behind it on the basal layer, in order to avoid compaction and degradation of the topsoil properties (Humphries Rowell Associates, 2000). (v) When stockpiled soils are to be used elsewhere, the soil fertility should be assessed to determine the level of fertilisation required to sustain normal plant growth. The fertility remediation requirements need to be verified at the time of rehabilitation. The topsoil should be uniformly spread onto the rehabilitated areas and care should be taken to minimise compaction that would result in soil loss and poor root penetration (Viljoen and Associates, 2012). (vi) The MEFCC generally requires that maximum stockpile heights for material management or resource recovery activities be in the range of 3 to 5 metres. These stockpile height limits are largely based on stockpile manageability, dust impacts, stability, potential impacts to underlying infrastructure and fire risk. The height of stockpiles should generally be lower than surrounding structures. Greater stockpile heights will need careful and adequate assessment of all the additional risks the increased height poses and it must be demonstrated that these risks can be managed, as excess height can also lead to other safety risks such as instability. (vii) Fertile topsoil is to be stockpiled before construction, for future reuse or donation. The term 'fertile' is not defined here, so in the case of the Oromia sites' topsoil, it would depend on the need for this soil elsewhere. The topsoil at the site had been successfully used to grow crops in previous years. (viii) Topsoil within the top 25cm should be carefully extracted and secured. Please note that the IFC (2007) guidelines refer to the top 50cm being topsoil but the Industrial Parks Development Corporation Document should be adhered-to in this case as it is site-specific. Based on the soils identified at the sites, the deeper topsoil's are closer to 25cm in depth than 50cm and some are extremely shallow. (ix) Topsoil mounds of 1-2m high are recommended. Please note that the IFC (2007) guidelines specify stockpiles of 3-5m high, but, again, as the Industrial Parks Development Corporation Document is site specific, it should be adhered-to. (x) Stockpiled topsoil must be revegetated to protect against erosion, discourage weeds and maintain active soil microbes. 					
	S4	Compaction Soil compaction results in the change of the original structure	<p>Compaction management measures:</p> <ul style="list-style-type: none"> (i) Pre-defined, essential road routes should be clearly demarcated and adhered-to on site to restrict soil compaction to certain areas. (ii) Vehicles should not drive on soil when it is wet to avoid further soil compaction. Having said this, once soil is well-compacted, little further damage or rehabilitation can be done. 	IPDC / Contractor	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref.11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			(iii) Soils must not be stripped when they are wet as this can lead to compaction and loss of structure.					
	S7	Dust creation If bare surfaces and soil stockpiles are not watered and vegetated, there will be high amounts of dust creation	Dust suppression management measures: (i) When stockpiling soil one runs the risk of producing dust. The advised longer-term solution to this problem is to vegetate the soil as plant roots bind soil and protect the soil against the wind. Good vegetation coverage is necessary for this to be successful. (ii) As a shorter-term solution – for the period between stockpiling and plant growth – keeping the stockpiles damp will mitigate against the risk of dust creation. (iii) The MEFCC generally requires that maximum stockpile heights for material management or resource recovery activities be in the range of 3 to 5 metres. These stockpile height limits are largely based on stockpile manageability, dust impacts. (iv) Stockpiled soils should be located in areas where trees can act as buffers to prevent dust pollution.	IPDC / Contractor	During site clearing and throughout construction		See Monitoring Plan Ref.11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	S8	Soil Contamination Contamination occurs due to the large vehicles on site; this should be prevented otherwise well-drained after contact with the pollutants to decrease chances of contaminating water resources	Contamination management measures (i) On-site vehicles should be well-maintained, (ii) Drip trays should be placed under vehicles. (iii) On-site pollutants should be contained in a bunded area and on an impermeable surface. (iv) One should identify potentially toxic overburden and screen with a suitable material to prevent mobilisation of toxins. (v) Maintain control of substances entering the site, (vi) Provide adequate disposal facilities. (vii) Enforce a non-polluting environment.	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(1) and 11.4.3(8)	AFDB OS1, OS4 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Surface Water	SW1	Hydro-carbon contamination from the earth-moving machinery and vehicles	Contamination management measures: (i) Maintenance of on-site vehicles; (ii) Placement of drip trays under vehicles and relevant equipment when stationary; (iii) Fuel, lubricant and waste oil storage, dispensing and operating facilities must be designed and operated in a way to prevent contamination of water.	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(3)	AFDB OS1, OS4 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	SW2	Sedimentation of the Bulbulla River	Sedimentation management measures: (i) Appropriate placement and terracing of soil stockpiles, (ii) Appropriate drainage to be in place before construction takes place; (iii) Minimise the movement of heavy machinery around the areas that are prone to erosion; (iv) Construct during the dry season in close proximity to surface water features.	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(3)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Air Quality	AQ1 & AQ2	Air quality impacts Increased particulate and gaseous concentrations affecting residential receptors within	(i) Apply methods to control open dust sources at construction sites, these include wet suppression and wind speed reduction measures as a source of water and material for wind barriers tend to be readily available. General control methods for open dust sources, as recommended by the USEPA, 1995)	IPDC / Contractor	Throughout construction phase	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(4)	AFDB OS1, OS4 USEPA, 1995 World Bank Group EHS Guidelines

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
		immediate vicinity of site boundary and receptors beyond site boundary	See Annexure 11.1 for general control methods					Development Corporation Regulations (Oromia), 2017
Noise	N1	Noise impacts Degradation of noise climate / annoyance on residential receptors within and beyond 500m of the site boundary	<p>Management and technical options:</p> <p>(i) Plan construction activities in consultation with local communities so that activities with the greatest potential to generate noise are planned during periods of the day that will result in least disturbance. Information regarding construction activities should be provided to all local communities. Such information includes:</p> <ul style="list-style-type: none"> - Proposed working times; - Anticipated duration of activities; - Explanations on activities to take place and reasons for activities; - Contact details of a responsible person on site should complaints arise. <p>(ii) When working near a potential sensitive receptor, limit the number of simultaneous activities to a minimum as far as possible;</p> <p>(iii) Using noise control devices, such as temporary noise barriers and deflectors for high impact activities, and exhaust muffling devices for combustion engines when working in close proximity to sensitive receptors;</p> <p>(iv) Selecting equipment with the lowest possible sound power levels as practically possible;</p> <p>(v) Ensuring equipment is well-maintained to avoid additional noise generation;</p> <p>(vi) Provide and ensure the use of ear protection equipment for personnel working onsite in close proximity to noise sources;</p> <p>(vii) Ensure that noise emanating from machinery, vehicles and noisy construction activities (e.g. excavation, blasting) are kept at a minimum for safety, health and protection of workers in the vicinity of high noise levels and nearby communities; and</p> <p>(viii) Noise levels reaching the communities from blasting activities (if applicable) shall not exceed 90 dB(A).</p> <p>(ix) Advise community on the grievance mechanism and grievance submission procedure.</p>	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(5)	AFDB OS1, OS4 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Transport and Access	T1	Increased vehicle/vehicle & vehicle/NMT accident risks on the local road network	<p>(i) It is recommended that due to the anticipated higher traffic volumes to and from the IAIP during operation, a typical access configuration of at least one of the accesses should include the following:</p> <ul style="list-style-type: none"> - Access with 2 lanes In and 2 lanes Out; - Main road with short (80 m) right-turn In lane; - Main road with short (80 m) left-turn In lane; - Additional road signage & markings along the main road at all the accesses; and - Street lighting along the main road along the full length of the property frontage. 	IPDC / Contractor	Throughout construction	FDRE to determine – outside of project budget	See Monitoring Plan Ref. 11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			<p>Note, the configuration must be approved by the Ethiopian Roads Authority.</p> <p>These upgrades should be implemented for the construction phase to ensure safe access to all construction vehicles, and the future operation phase traffic.</p>					
Waste Management	WM1 WM2 WM3	Construction waste Hazardous waste Domestic waste	<ul style="list-style-type: none"> (i) Provide segregated waste receptacles within the construction camp. (ii) Provide dedicated bins for hazardous waste, located on hardstanding within the construction camp. (iii) Ensure waste receptacles are easily available. (iv) Operate a clean site policy. (v) All construction staff must be educated in waste management procedures. (vi) All staff must be responsible to keeping all food and packaging waste on them to be disposed of at the waste bins within the construction camp. (vii) Sufficient temporary ablution facilities must be provided for staff so they do not relieve themselves in the fields. (viii) Effective implementation of the Waste Management Plan. 	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(6)	AFDB OS1. OS4 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017 Waste Management Plan (Appendix 9.9 of ESIA)
Biodiversity (Bulbulla IAIP)	B1 B2 B3 B4 B5	Biodiversity (Fauna & Flora) Loss of Acacia trees; Nesting sites destruction; Road kills; Pollution; and Expansion of alien species.	<p>The following mitigation measures are to be implemented.</p> <ul style="list-style-type: none"> (i) Avoiding damage to and loss of large mature trees and minimize vegetation clearance as much as possible; (ii) Rehabilitating and re-vegetating the areas affected during construction process; (iii) Avoiding damage to nesting sites; (iv) Minimize numbers of temporary camps during construction phase; (v) Identification and monitoring of main nesting sites; (vi) Establishing speed bumpers and precaution sign posts on the sensitive wild animal crossing points; (vii) Launching awareness creation programs for the construction staff; (viii) Developing effective management of waste and hazardous materials; (ix) All fine earth materials must be enclosed during transportation to the site to prevent spillage and dusting; (x) Spilled earth and construction material on the main roads should be cleaned up regularly; (xi) The transportation of lubricants and fuel to the construction site should only be done in the appropriate vehicles and containers; (xii) All machinery must be keenly observed not to leak oils on the ground (drip trays recommended); (xiii) Maintenance must be operated/carried out in a designated area (protected service bays) and where oils are completely restrained from reaching the ground; 	IPDC / Contractor Ministry of Environment, Forest and Climate Change (MEFCC), Oromia Regional Environmental Agency and at woreda level	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(7)	AFDB OS1, OS3 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			(xiv) Avoiding introduction of materials from areas where alien species occur and make sure that there are no new succession of exotic ones; and (xv) Undertake local monitoring on habitat change/prevalence of invasive species.					
Biodiversity (Shashemene RTC)	B1 B2	Loss of indigenous trees and Pollution	The following mitigation measures are to be implemented. (i) Avoiding damage to and loss of large mature trees and minimize vegetation clearance as much as possible; (ii) Rehabilitating and re-vegetating the areas affected during construction process; (iii) All fine earth materials must be enclosed during transportation to the site to prevent spillage and dusting; (iv) Spilled earth and construction material on the main roads should be cleaned up regularly; (v) Trucks used during construction should be fitted with tailgates that close properly and with tarpaulins to cover the materials; (vi) The transportation of lubricants and fuel to the construction site should only be done in the appropriate vehicles and containers; (i) All machinery must be keenly observed not to leak oils on the ground (use of drip trays recommended)	IPDC / Contractor Ministry of Environment, Forest and Climate Change (MEFCC), Oromia Regional Environmental Agency and at woreda level	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(7)	AFDB OS1, OS3 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Socio-Economic	SE1	Employment and Economy	The potential impacts on employment and economy are positive and therefore it is suggested that they do not require mitigation. However, these potential positive impacts can be enhanced through the following complementary (i) Through its website, IPDC will inform local businesses of contracting opportunities in a timely manner; (ii) The developer's Community Relations/CSR Policy, detailing contributions to local employment, training of young local specialists and any other community-benefit initiatives. (iii) Grievance mechanism – The developer to ensure that EPC contractors are aware of the grievance submittal process. (iv) Prior to construction, create and populate a database of all suitable local service providers to encourage more opportunities for local businesses. (v) Maintain and regularly update a separate web page on the developer website dedicated to local tenders for the provision of goods and services. Such webpage should be widely publicised by the developer. (vi) A Worker Influx Management Plan will need to be prepared to define labour practices in line with international standards that will need to be applied by EPC Contractors and their subcontractors, as well as in the Project's supply chain. The Worker Influx Management Plan will need to be aligned with the developer's Grievance Procedure to ensure that the procedure is consistently implemented across all Project activities.	IPDC / Contractor	Prior to construction and throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	SE2	Impact on Livelihoods through Land Acquisition	(i) Resettlement, land acquisition and any other displacement impacts on PAPs will be carried out in compliance with Ethiopian	IPDC / PIU	Immediate	TBD	See Monitoring Plan Ref:	AfDB OS2

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			<p>law and AfDB Operational Safeguard 2- Involuntary Resettlement (OS2).</p> <p>(ii) The Mol and the IAIP Developer will seek to avoid physical displacement where possible, and to minimise economic displacement.</p> <p>(iii) Impacts on land and livelihoods shall be compensated.</p> <p>(iv) Any affected standing crops will be compensated at current market value to make sure farmers do not lose harvest.</p> <p>(v) The affected Orphan land, i.e. the remaining portion of the land plot that remains with the farmer but made uneconomic and/or too small to use, will be compensated in full;</p> <p>(vi) Affected people will have access to a grievance mechanism, including a first tier of internal grievance review by the IAIP Developers, with the possibility for aggrieved individuals to resort to a second tier of independent review of the grievance.</p> <p>(vii) Vulnerable people will be identified and specifically assisted as needed.</p> <p>(viii) Stakeholder Engagement Plan (SEP) implementation with regards to keeping a regular dialogue with local communities, and in particular, with affected people.</p> <p>(ix) The IPDC/PIU need to follow the Resettlement Action Plan and monitor internally and externally the resettlement and land acquisition progress to ensure compliance the AfDB OS2 and National policies.</p>					
	SE3	Community Health	<p>(i) To minimise the impact, a number of steps can be taken – most of the measures largely include reducing the interaction between the workforce and local residents. It is assumed that the project will use dedicated workers camp to accommodate its non-local workforce during construction. This will help to reduce the interaction between workers and local communities.</p> <p>(ii) Implementation of Construction Environmental Management Plan (CEMP) procedures and schedule, as well as Environmental Monitoring Plan (Air Emissions, Dust) to see how air quality data is changing.</p> <p>(iii) Early notification of local authorities on critical or exceptionally busy construction periods and air-polluting/dust- and noise-generating activities.</p> <p>(iv) Dust suppression by water spraying in dry seasons, particularly in the areas close to sensitive residential and community receptors.</p> <p>(v) As part of the induction process for new employees and workers, the EPC contractors will provide training for all workers on the transmission routes and common symptoms of communicable diseases. This training will be supported by an ongoing awareness campaign (posters located in common areas within the camp). These measures can help reduce the potential for workers to unknowingly transmit communicable diseases.</p> <p>(vi) The workers camp will include an internal first-aid ward and medical staff being present at the camp which to some extent will help to minimise the interaction between the workforce (particularly temporary construction workers) and local residents.</p>	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			<ul style="list-style-type: none"> (vii) The Community Health Management Plan will cover details on a Workforce Code of Conduct including code specific measures that target anti-social behaviour. (viii) Contractors' compliance with national HSE legislation and the UNDP HSE Policies, evaluate contractors' HSE performance. (ix) Implementation of the Health and Safety Management Policy and Worker Influx Management Plan. (x) Provide project HSE and Worker Influx Management Policies to all subcontractors during formal induction, including the security firms. (xi) One "umbrella" Project Grievance Mechanism, extended and accessible to all workers, those who directly work for the IAIPs development and also employed by contractors. (xii) The IPDC will ensure that EPC Contractors will provide onsite first-aid tents (one tent per site) to ensure that basic medical attention and first aid treatment can be provided by a trained first-aider during the hours that the work is being undertaken at the Project site. For all medical incidents that require medical attention, the EPC contractors will quickly provide transportation to the Workers' Camp clinic which will also help reduce the potential pressure on local healthcare facilities. 					
	SE4	Community Safety and Security	<ul style="list-style-type: none"> (i) The project site will be fenced, while any activities outside the main footprint will be appropriately signposted. This will help ensure that accidents associated with new infrastructure will be minimised. (ii) Traffic Management Plans, which will need to be prepared by EPC Contractors during construction, will further minimise the potential risk of accidents, injuries and near misses. (iii) Provide the project HSE and Worker Management Plans to all subcontractors during formal induction, including the security firms. (iv) Ensure that a Project Code of Conduct and appropriate training for security personnel are implemented to ensure best practice in running a secure site and implementing the Code of Conduct that fosters behaviours that help to avoid, eliminate or minimise the use of excessive force in potential conflict situation. (v) The project Health, Safety and Security Management Plan are implemented by all EPC Contractors. (vi) Contractors' compliance with national HSE legislation and the UNDP HSE Policies and evaluation of contractors' HSE performance. (vii) The project implementation team to carry out regular audits of the HSE Management system implementation by EPC Contractors. (viii) The project Health and Safety Management Policy which covers no tolerance to drugs and alcohol, AIDS prevention leaflets, etc. (ix) Stakeholder Engagement Plan (SEP) implementation with regards to keeping a regular dialogue with local communities. 	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility for Implementation	Timeframe / Due Date	Cost Estimates	Monitoring	Applicable Safeguards / Documents
			(x) One “umbrella” Project Grievance Mechanism, extended and accessible to all workers, those who directly work directly for the IAIP project and also employed by contractors.					
	SE5	Environmental Emissions	Refer to Air Quality and Noise sections of the ESMP.					
	SE6	Community Infrastructure and Services	(i) The Workers Camp will provide in-house laundry, first-aid, cooking, recreational, religious and common area facilities/rooms which will help to reduce the need for non-local workers to use local infrastructure and services; (ii) The planned Workers Camp will follow best practice guidance on workers’ accommodation. (iii) Implement a community health management plan in consultation with relevant stakeholders (e.g. local doctors and the local authorities). This plan will ensure that appropriate and adequate health care services are provided on site and at the accommodation camp to address/ manage worker illnesses and injuries.	IPDC / Contractor	Throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Cultural Heritage	CH1	Loss of cultural resources (graves) at the RTC	The following mitigation measures are to be implemented during the Project development. (i) Prior to the construction of the RTC at the Shashemene site the graves / tombs have to be exhumed and removed from the site and the bodies from these graves / tombs have to be buried outside of the RTC on a site agreed to by the community and in line with relevant legislation. (ii) If there are any accidental or “chance findings” during the project implementation the contractor shall immediately inform the project developer which in this case is the Oromia IPDC. The IPDC will then report to the Authority for Research and Conservation of Cultural Heritage (ARCCH) for further investigation and appropriate follow up action	IPDC / Contractor	Prior to construction and throughout construction	Covered in Project Budget	See Monitoring Plan Ref. 11.4.3(4)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Table 11-3: Operation Phase Environmental and Social Management Plan

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
Soils	S1	Erosion Eroded areas will continue to spread, unless stopped, resulting in a cumulative effect on the site's identified soils	(i) Regular inspection will be undertaken of all discharge points from site for early detection of erosion areas; remedial works will be undertaken accordingly; (ii) Soil erosion control measures shall conform to the best management practices highlighted in the appropriate code.	IPDC	Throughout Operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(1)	World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	S2	Sedimentation Eroded soil particles may end up in a nearby watercourse, which runs through the IAIP site, as sedimentation	Sedimentation control management measures: (i) Reduce and prevent off-site sediment transport by using measures such as settlement ponds and silt fences. (ii) The implementation of soil erosion mitigation measures will also mitigate against enhanced sedimentation.	IPDC / Contractor	During site clearing and throughout construction	Covered in Project Budget	See Monitoring Plan Ref.11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	S3	Compaction Soil compaction results in the change of the original structure	(i) No mitigation possible	-	-	-	-	-
	S4	Dust creation If bare surfaces and soil stockpiles are not watered and vegetated, there will be high amounts of dust creation	(i) Bare surfaces, including stockpiles: - Long-term solution is to vegetate the soil as plant roots bind soil and protect the soil against the wind. Good vegetation coverage is necessary for this to be successful. - Short-term solution – for the period between stockpiling and plant growth – keep the stockpiles damp during high wind periods.	IPDC / Contractor	During site clearing and throughout construction	-	See Monitoring Plan Ref.11.4.3(1)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	S5	Soil contamination	(i) On-site pollutants should be contained in a bunded area and on an impermeable surface. (ii) One should maintain control of substances entering the site. (iii) Provide adequate disposal facilities. (iv) Enforce a non-polluting environment.	IPDC	Throughout Operation	Covered in Project Budget	See Monitoring Plan Ref.11.4.3(1)	AFDB OS1, OS4 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Surface Water	SW1	Altering the hydrological regime- change in runoff volume	(i) Keep the hard standing areas as minimal as possible; (ii) Introduce pervious paving in areas such as parking bays.	IPDC / Enterprises	Throughout Operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(2)	World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	SW2	Altering the hydrological regime-change in runoff velocity	(i) Energy dissipaters should be implemented and maintained at each discharge point.	IPDC	During construction and throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(2)	World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
Groundwater	GW1	Lowering of groundwater levels through abstraction of groundwater for use at the IAIP and RTC sites	<ul style="list-style-type: none"> (i) Monitor groundwater levels in the vicinity of the site. (ii) Monitoring boreholes should be placed both up gradient and down gradient of the operations, and take preferential groundwater flow paths into consideration. Groundwater monitoring should be conducted on a quarterly basis. 	IPDC	Throughout operation	TBD	See Monitoring Plan Ref. 11.4.4(3)	AFDB OS1 World Bank Group EHS Guidelines
	GW2	Contamination of groundwater resources from contaminated surface water runoff or subsurface leakages from underground chemical storage and/or effluent systems	<ul style="list-style-type: none"> (i) Monitor groundwater quality in the vicinity of the site. (ii) Contain and treat surface water runoff in order to prevent it entering the groundwater environment 	IPDC	Throughout operation	TBD	See Monitoring Plan Ref. 11.4.4(3)	AFDB OS1 World Bank Group EHS Guidelines
	GW3	Groundwater quality unfit for human consumption due to naturally high levels of fluoride and sodium. This impact will only be relevant if groundwater is selected as a source of water supply for the Operation	<ul style="list-style-type: none"> (i) Set up a treatment plant for the groundwater to reduce the concentrations of fluoride and sodium to acceptable levels 	IPDC	Throughout operation	TBD	See Monitoring Plan Ref. 11.4.4(3)	AFDB OS1 World Bank Group EHS Guidelines
Air Quality	AQ1 AQ2	<p>Air quality impacts</p> <p>Increased particulate and gaseous concentrations affecting residential receptors within immediate vicinity of site boundary and receptors beyond site boundary</p>	<p>General recommendations for air quality management have been provided in the draft Development Control Regulations for Oromia (2017) and include:</p> <ul style="list-style-type: none"> (i) Water the roads immediately before compacting to strengthen the road surface, otherwise traffic will soon beat back the road surface to pre-bladed condition; (ii) When possible, delay compacting until the beginning of the wet season or when water becomes more available; (iii) Ensure that vehicles and other equipment are regularly inspected according to schedule maintenance for proper exhaust emission; (iv) Truck drivers to minimise speed limits on earthen roads, especially in dry periods; (v) Avoid burning of biomass as much as possible and use fire only in situations where this is least possible environmental damage; (vi) Speed control using speed bumps; with permanent speed bumps to be installed in villages and bazaars to reduce traffic speeds in inhabited areas; (vii) If water is available, the road surface can be sprayed on a frequent schedule; (viii) Bitumen surface roads to be constructed in bazaars, with speed controls implemented; (ix) Dense vegetation planted on the roadside; and (x) Schedule work activities to minimise disturbance. 	IPDC / Enterprises	Throughout Operation	<p>Covered in Project Budget</p> <p>See Monitoring Plan Ref. 11.4.4(4)</p> <p>Design costs to be determined by each enterprise at design stage</p>	See Monitoring Plan Ref. 11.4.4(4)	AFDB OS1, OS4 World Bank Group EHS Guidelines USEPA, 1995 Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
			<p>Preparation of an Environmental Management Plan is also required for formulation, implementation and monitoring of environmental protection measures during and after commissioning of the project. As part of this this, the following is applicable to air quality:</p> <p>(xi) Regular monitoring of fugitive emissions shall be conducted and any abnormalities reported for immediate corrective measures;</p> <p>(xii) Regular monitoring of ambient air quality in and around the site shall be conducted;</p> <p>(xiii) Unauthorised clearing and removal of vegetation should be prohibited;</p> <p>(xiv) Normal means of dust suppression, including watering of roads, will be employed to minimise dust generation.</p> <p>(xv) Occupational dust levels are to be monitored and managed as required.</p> <p>(xvi) The size and area of stockpiles of soil will be minimised. Stockpiles that may be susceptible to erosion must be terraced, covered or have suitable erosion control measures such as silt fences;</p> <p>(xvii) Access routes will use established roads where possible;</p> <p>(xviii) The moisture content of access road surface layers will be maintained through routine directional spraying or the use of an appropriate dust suppressant as agreed with the Concerned Authority; and</p> <p>(xix) Off-road driving and the creation of new roads/tracks will be avoided wherever possible.</p> <p>(xx) Recommendations provided in the IFC EHS Guidelines for Air Emissions and Ambient Air Quality are to be considered during design of facilities to be established within the IAIP and RTC. Sectoral specific EHS guidelines have also been developed for the following:</p> <ul style="list-style-type: none"> - Breweries; - Meat processing; - Dairy processing; and - Food and beverage processing. <p>Refer to Annexure 11.2 for Sector Specific Guidelines</p> <p>(xxi) Mitigation measures detailed in Table 15 of the Air Quality Report are to be implemented.</p>					
Noise	N1	Acoustic impacts Degradation of noise climate / annoyance on residential receptors within and beyond 200m of the site boundary	<p>(i) Units with significant noise generating potential are to be housed within closed-wall buildings to limit the transmission of noise to surrounding receptors.</p> <p>(ii) As per the IFC EHS Guidelines for Noise Management, the following noise reduction options should also be considered:</p> <ul style="list-style-type: none"> - Selecting equipment with lower sound power levels; - Installing silencers for fans; - Installing suitable mufflers on engine exhausts and compressor components; 	IPDC / Enterprises	Throughout Operation	Covered in Project Budget See Monitoring Plan Ref. 11.4.4(5)	See Monitoring Plan Ref. 11.4.4(5)	AFDB OS1, OS4 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
			<ul style="list-style-type: none"> - Installing acoustic enclosures for equipment casing radiating noise; - Improving the acoustic performance of constructed buildings by applying sound insulation; - Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m² in order to minimize the transmission of sound through the barrier. Barriers should be located as close to the source or to the receptor location to be effective; - Installing vibration isolation for mechanical equipment; - Re-locating noise sources to less sensitive areas to take advantage of distance and shielding; - Siting permanent high noise generating 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; and - Developing a mechanism to record and respond to complaints. <p>As per the Development Control Regulation document for the Oromia site (MACE, 2017), the following site designs will be followed:</p> <p>(iii) Windows and openings to all building spaces intended for human occupancy shall be orientated away from sources of distractive noise or shall be provided with protections acceptable to the building official;</p> <p>(iv) Regular monitoring of ambient noise in and around the site shall be conducted; and</p> <p>(v) Alert public when loud noise will be generated.</p>					
Transport and Access	T1	Traffic impacts	<p>(i) The mitigation measures (intersection upgrades, etc.) are to be in place from the Construction phase.</p> <p>(ii) The required road signs, road markings and street lighting should also be implemented at the accesses to ensure good intersection operation and safety.</p> <p>(iii) It is recommended that the trip generation of the IAIP be monitored annually to ensure that the access intersections operate safely and with sufficient capacity and acceptable levels of service.</p> <p>(iv) If the intersection performance deteriorates to unacceptable levels in future, additional intersection upgrades should be implemented.</p>	IPDC / FDRE	During construction and throughout Operation	Covered in Project Budget See Monitoring Plan Ref. 11.4.4(7)	See Monitoring Plan Ref. 11.4.4(7)	AFDB OS1 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Waste Management	WM1 WM2 WM3 WM4	Waste Impacts	<p>(i) Provide segregated waste receptacles to each Enterprise operating within the IAIP or RTC.</p> <p>(ii) Encourage Enterprises to operate a clean site policy and ensure waste receptacles are easily available and ensure all their staff are properly trained on the contents of the overarching Waste Management Plan (WMP).</p>	IPDC / Enterprises	Throughout Operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(6)	AFDB OS1, OS4 World Bank Group EHS Guidelines Development Corporation

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
			<ul style="list-style-type: none"> (iii) IPDC must ensure that waste is collected at least once a week for all Enterprises and where there is greater waste being generated by an Enterprise, waste collection must increase to twice a week for those specific Enterprises. (iv) Provide dedicated bins for hazardous waste, located on hardstanding within the designated Waste Management Area. (v) All Enterprises that generate hazardous waste must be required to deliver this to the waste management area every third day. (vi) Apply the waste hierarchy and prevent waste from being generated. The site will operate on a zero waste discharge basis and therefore, no waste, with the exception of small quantities of hazardous waste will be permitted to be disposed of outside of the IAIP and RTC. (vii) Operate a 'Zero Waste Discharge' facility. (viii) Enforce the implementation of the Waste Hierarchy. (ix) Ensure all Enterprises are contractually committed to implementing the WMP. (x) No waste from the IAIP and RTC sites may be permitted to be disposed of within a landfill with the exception of small quantities of industrial hazardous Waste and bio-medical waste. Since there are no sanitary landfills within Bulbulla and Shashemene which are the closest urban areas to the site, these wastes must be transported to the nearest sanitary landfill. (xi) Limit the volumes of residual wastes, industrial hazardous waste and bio-medical wastes streams. (xii) Encourage Enterprises to use alternative products to reduce hazardous rating. (xiii) Investigate and support the development of a Sanitary Landfill within the vicinity of the sites. 					Regulations (Oromia), 2017 Waste Management Plan
Biodiversity (Bulbulla IAIP)	B1 B2 B3 B4	Re-vegetation of indigenous plant species in greenery areas; Disturbance and Electrocutions of avian species; Deterioration of water resources/quality; and Attraction of wild animals by food wastes.	<p>The following mitigation measures are to be implemented.</p> <ul style="list-style-type: none"> (i) Appropriate selection of natural vegetation; (ii) Undertake monitoring of the birds & their flyway on regular basis; (iii) Use of birds friendly power lines and associated infrastructures; (iv) Developing effective watershed management plan for the area; (v) Support watershed conservation efforts in and around the project area; (vi) Avoiding any uncontrolled drainage towards the surrounding water features; (vii) Developing effective management of waste and hazardous materials as per the WMP; (viii) Launching awareness creation programs for the whole staff; (ix) Avoiding feeding and any contact with wild animals; and (x) Adoption of conventional sewage treatment facilities and solid waste management. 	IPDC Oromia Regional EPLAUA and its associated Woreda level office	Prior to operation and throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(8)	AFDB OS1, OS3 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
Biodiversity (Shashemene RTC)	B1 B2 B3 B4	Re-vegetation of indigenous plant species in greenery areas; Attraction of scavenger wild animals by wastes	The following mitigation measures are to be implemented. (i) Appropriate selection of natural vegetation; (ii) Launching awareness creation programs for the whole staff; and (iii) Adoption of conventional sewage treatment facilities and solid waste management.	IPDC Oromia Regional EPLAUA and its associated Woreda level office	Prior to operation and throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(8)	AFDB OS1, OS3 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
Socio-Economic	SE1	Employment and Economy	(i) Maintain and regularly update a separate web page on the developer website dedicated to local tenders for the provision of goods and services. Such webpage should be widely publicised by the developer. (ii) A Worker Influx Management Plan will need to be prepared to define labour practices in line with international standards that will need to be applied by EPC Contractors and their subcontractors, as well as in the Project's supply chain. The Worker Influx Management Plan will need to be aligned with the developer's Grievance Procedure to ensure that the procedure is consistently implemented across all Project activities.	IPDC	Throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	SE2	Livelihood/Sources of Income	(i) Land acquisition and any displacement impacts on the project will be carried out in compliance with Ethiopian law and AfDB Operational Safeguard 2- Involuntary Resettlement (OS2). (ii) The Mol and the IAIP Developer will seek to avoid physical displacement where possible, and to minimise economic displacement. (iii) Impacts on land and livelihoods shall be compensated. (iv) Any affected standing crops will be compensated at current market value to make sure farmers do not lose harvest. (v) The affected Orphan land, i.e. the remaining portion of the land plot that remains with the farmer but made uneconomic and/or too small to use, will be compensated in full; (vi) Affected people will have access to a grievance mechanism, including a first tier of internal grievance review by the IAIP Developers, with the possibility for aggrieved individuals to resort to a second tier of independent review of the grievance. (vii) Vulnerable people will be identified and specifically assisted as needed. (viii) Stakeholder Engagement Plan (SEP) implementation with regards to keeping a regular dialogue with local communities, and in particular, with affected people. (ix) The IPDC/PIU need to follow the Resettlement Action Plan and monitor internally and externally to ensure compliance the AfDB OS2 and National policies and measure if the PAPs' livelihood has at least stayed the same or ideally, improved as a result of land acquisition.	IPDC	Throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	SE3	Community Health	(i) Implementation of a Health and Safety Management Policy and Worker Influx Management Plan.	IPDC	Throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(9)	AFDB OS1, OS5 World Bank Group EHS Guidelines

Environment	No.	Potential Impacts	Proposed Mitigation and Benefit Enhancement Measures	Institutional Responsibility For Implementation	Timeframe / Due Date	Cost Estimates	Comments / Further Action & Monitoring	Applicable Safeguards / Documents
			<ul style="list-style-type: none"> (ii) Provide the project HSE and Worker Influx Management Policies to all subcontractors during formal induction, including the security firms. (iii) One “umbrella” Project Grievance Mechanism, extended and accessible to all workers, those who directly work for the IAIPs development and also employed by contractors. (iv) The developer will ensure that EPC Contractors will provide onsite first-aid tents (one tent per site) to ensure that basic medical attention and first aid treatment can be provided by a trained first-aider during the hours that the work is being undertaken at the Project site. For all medical incidents that require medical attention, the EPC contractors will quickly provide transportation to the Workers’ Camp clinic which will also help reduce the potential pressure on local healthcare facilities 					Development Corporation Regulations (Oromia), 2017
	SE3	Community Safety and Security	<ul style="list-style-type: none"> (i) Ensure that a Project Code of Conduct and appropriate training for security personnel are implemented to ensure best practice in running a secure site and implementing the Code of Conduct that fosters behaviours that help to avoid, eliminate or minimise the use of excessive force in potential conflict situation. (ii) Provide project HSE Management Plans to all staff during formal induction. (iii) The project implementation team to carry out regular internal audits of the HSE Management system implementation. (iv) The project Health and Safety Management Policy is discussed with all staff and new employees, and imposes no tolerance to drugs and alcohol, AIDS prevention leaflets, etc. (v) Stakeholder Engagement Plan (SEP) implementation with regards to keeping a regular dialogue with local communities. (vi) One “umbrella” Project Grievance Mechanism, extended and accessible to all employees and staff, those who directly work directly for the IAIP project and also employed by contractors. 	IPDC	Throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(9)	AFDB OS1, OS5World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017
	SE4	Environmental Emissions	Refer to Air Quality and Noise sections of the ESMP.				See Monitoring Plan Ref. 11.4.4(4)	
	SE5	Community Infrastructure and Services	<ul style="list-style-type: none"> (i) Continue regular dialogue with local authorities whose job is to ensure adequate infrastructure for the developing areas/settlements. Continue to implement a community health management plan in consultation with relevant stakeholders (e.g. local doctors and the local authorities). This plan will ensure that appropriate and adequate health care services are provided on site to address/ manage staff/personnel illnesses and injuries during the IAIP operations. 	IPDC	Throughout operation	Covered in Project Budget	See Monitoring Plan Ref. 11.4.4(9)	AFDB OS1, OS5World Bank Group EHS Guidelines Development Corporation Regulations (Oromia), 2017

11.4 ENVIRONMENTAL AND SOCIAL MONITORING PROGRAMME

11.4.1 OVERVIEW

Environmental monitoring is an essential tool in relation to environmental management as it provides the basis for rational management decisions regarding impact control. Monitoring should be performed during all stages of the project to verify the impact predictions and to ensure that the impacts are no greater than predicted.

By using the information collected through monitoring, environmental management plans can be improved when necessary (e.g. adapting mitigation measures to changing situations throughout the project construction and operation) to ensure that the anticipated impacts are mitigated. Should the environmental monitoring determine construction works or operations pose an environmental concern; the works or operation will be modified or halted.

The objectives of the environmental monitoring programme include the following:

- To monitor the changes in the environmental conditions by the construction and operation of the proposed Project;
- To check on whether mitigation and benefit enhancement measures have actually been adopted, and are proving effective 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 mitigation measures; and
- 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.

There are two basic forms of monitoring:

- Compliance monitoring, which checks whether prescribed actions have been carried out, usually by means of inspection or enquiries, and
- Effects monitoring which records the consequences of activities on one or more environmental components, and usually involves physical measurement of selected parameters or the execution of surveys to establish the nature and extent of induced changes.

For this project, it is recommended to carry out both compliance and effects monitoring. However, during construction compliance monitoring will play a major role in checking whether recommended impact mitigation and management plans have been carried out or not. This is because most impact control takes the form of measures incorporated in project designs and contract documents. The extent to which recommendations on these matters, as set out in the ESIA and ESMP, are complied with plays a major part in determining the overall environmental performance of the project.

The environmental monitoring plan outlined below and summarised in **Table 11-4** and **Table 11-7** describes the particular resources that will be monitored through the construction and operation phases of the project respectively. The types of data that will be collected to describe each resource are also included in these tables.

11.4.2 MONITORING TO ESTABLISH BASELINE

The quality of environmental assessment is usually, to a large extent, constrained by limitation of baseline information and data time series. The environmental baseline conditions, which will form a basis for some of the monitoring activities, were determined by the ESIA studies during the pre-construction Phase. However, there is a need for additional information about present status and development trends for good predication of impacts of the project environment.

A monitoring regime is to begin at the earliest convenience to be established against which changes during construction, and on into operation, can be assessed.

Therefore, it is recommended for the IPDC to set-up an environmental and social monitoring system and establish a databases as well as support system for data storage and dissemination. Such system might be established for general state of the environment reporting.

11.4.3 MONITORING PLAN: CONSTRUCTION PHASE

(1) GENERAL

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 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 of all site activities and the contractor's offsite facilities including stockpile 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.

Most of the monitoring will comprise visual observations during site inspection and will be 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. All sites where construction is taking place will be formally inspected from an environmental viewpoint on a regular basis.

These activities will also be integrated with other construction supervision and monitoring activities to be carried out by the IPDC. The IPDC will decide on the appropriate course of action to be taken in cases where unsatisfactory reports are received from field staff regarding environmental matters. In the case of relatively minor matters, advice to the contractor on the need for remedial action may suffice, but in all serious cases, the IPDC should issue a formal instruction to the EPC Contractor to take remedial action, depending on the extent of his delegated powers.

The IPDC, as an implementing agency of this project, has the responsibility to be involved with the construction supervision team to see the implementation of this environmental monitoring plan. The IPDC will establish an Environmental Management Unit (EMU) at site office level and is responsible to coordinate the environmental management and monitoring activities on a day-to-day basis.

The EPC contractor will assign an Environmental Inspector and to undertake check monitoring on an intermittent basis.

Furthermore, condition 24(2) of the Industrial Park Proclamation No. 886/2015 states that, "*The Ministry of Environment and Forest shall establish an office within industrial parks for the application, supervision, protection and enforcement of environmental norms, standards, safeguards, management and mitigation plans within the Industrial Parks*".

In addition to visual observation, it is particularly important that monitoring should also include limited informal questioning of members of the local community and their leaders who live near to the project since they may be aware of matters which are unsatisfactory, but which may not be readily apparent or recognised during normal site inspection visits.

In the following sections, monitoring activities are presented for various impact components during the construction phase. **Table 11-4** below outlines the overall package of environmental monitoring that will be carried out in relation to the Project. The table also assigns responsibilities for each monitoring activity, and proposes parties capable of carrying out the monitoring on behalf of the IPDC.

(2) SOIL EROSION

The EMU is to ensure the effectiveness of erosion and sedimentation control measures to be implemented during the construction stage.

(3) SURFACE WATER QUALITY

Monitoring of water quality will ensure proper implementation of the identified mitigation measures for the construction phase and complying with the Water Pollution Control Regulation.

The water quality monitoring program should also include the potable water supplied to the construction work camps and work sites. Periodical water analysis of the drinking water provided to the workers and an awareness program on safe water shall be performed in order to limit waterborne diseases.

(4) AIR QUALITY

Particulate matter (PM) at the constructions sites and roads used by trucks for haulage of materials, will be visually monitored. Monitoring will be carried out throughout the construction activities on a daily basis. If nuisance dust is generated around the site during the construction period, it will be the responsibility of EMU to ensure that appropriate control measure are taken.

Inspection of stock piled material sites is to be undertaken on a regular basis to ensure suitable mitigation measures are in place. In addition, trucks and machinery shall occasionally be inspected unannounced regarding engine emissions (i.e., when black clouds of soot are visible). Engine maintenance shall be requested in case of any deficiency noticed.

(5) NOISE

The implementation of the identified mitigation measures will be monitored during construction activities. The noise level at construction sites will be monitored with portable sound level meters once a week, during normal construction activities, and upon receipt of complaints. Thus compliance with the Regulation on the Assessment and Management of the Environmental Noise and Regulation of Worker's Health and Work Safety will be ensured.

If nuisance noise is generated around settlement areas during the construction period, it will be the responsibility of the EMU to ensure that appropriate control measure are taken.

(6) WASTE MANAGEMENT

Wastes will be handled to ensure compliance with related Ethiopian Legislation, and internationally accepted standards. To handle all types of wastes properly during construction, a waste management plan has been prepared and implementation of the measures proposed in the plan will be monitored regularly to comply with all relevant legislation and standards.

All the records for storage, transportation and treatment of these wastes will be kept as required by the management plans. The EMU shall check on regular basis the activity in the waste management areas.

(7) NATURAL VEGETATION

It is the responsibility of the EMU together with the Woreda office of Agriculture and Rural Development to ensure that the recommended mitigation measures for natural vegetation are implemented. Parameters to be monitored include areas of woodland in the vicinity of the project sites to ensure deforestation does not take place. The monitoring would allow EMU to assess that the cutting and removal of trees and bush is carried out in accordance with proper forest conservation practices.

Additionally monitoring of:

- The rehabilitation and re-vegetation of the areas affected during construction process;
- Habitat change/prevalence of invasive species;
- Of locally sensitive areas that require consideration;
- Identification of approved disposal site and a system for supervision and monitoring;

- Prevalence of human-wildlife conflict / behavioural change.

(8) EQUIPMENT, FUEL STORAGE AND MAINTENANCE

It will be the responsibility of the EMU to check on the proper storage and operations of equipment, fuel storage and handling facilities and maintenance areas to ensure these facilities are safe and secure.

(9) SOCIO-ECONOMIC

SAFETY

Occupational health and safety issues of the IAIP and RTC operation will be monitored to ensure compliance with legislation related to occupational health and safety management.

COMPENSATION AND RESETTLEMENT

Monitoring of the following aspects are to be undertaken:

- Changes in economic and social status of compensated and resettled population including livelihood improvement, effectiveness and timing of public information/participation and consultation activities;
- Implementation and effectiveness of social development plans;
- Effectiveness of resettlement planning, complaints or grievances regarding resettlement and effectiveness of corrective/preventive activities performed for them.

The main type of monitoring to be adopted for the purpose of this project will be both internal and external performance monitoring. Accordingly, the IPDC will undertake continuous and systematic performance monitoring of the resettlement process.

Table 11-4: Monitoring Plan - Construction Phase

No.	Parameter to be monitored	Location	Measurement	Frequency	Institutional Responsibility	Cost (Birr)
1	Erosion and Sedimentation	Construction sites, stockpile areas, access roads	Observation and reporting regarding the provisions in Erosion and Sediment Control Plan	Continuous controls and monthly reporting	EPC Contractor, EMU	Covered in Project Budget
2	Air Quality	Construction sites, stockpile areas, access roads	Observation and inspection	Continuous throughout the construction period	EPC Contractor, EMU	Covered in Project Budget
3	Air Quality	Trucks and machinery exhausts	Observation and inspection	Occasionally throughout construction period	EPC Contractor, EMU	Covered in Project Budget
4	Noise	Near settlements and construction sites	Portable sound level meters for measuring noise levels	Once a week and upon complaints	EPC Contractor, EMU	200,000 for equipment
5	Waste Management	At construction sites and camp facilities	Observation and record keeping	Monthly	EPC Contractor, EMU	Covered in project budget
6	Natural Vegetation	IAIP site	Observation and record keeping	Monthly	EMU / ARD	Covered in project budget
6	Equipment, fuel storage and handling and maintenance	Construction camp and workshop	Visual inspection	Monthly	EPC Contractor, EMU	Covered in project budget

No.	Parameter to be monitored	Location	Measurement	Frequency	Institutional Responsibility	Cost (Birr)
7	Health and Safety	All work places	Observation inspection and reporting	Daily / Monthly	EPC Contractor, EMU	Covered in Project budget
8	Environmental Monitoring Coordination	-	Monitoring of the implementation and success of the mitigation measures (including the relevant environmental and health and safety plans) Reporting on monitoring results, and compliance with relevant legislation, contract and technical requirements	Monitoring continuously Reporting bi-annually	EMU / EPC Contractor	100,000 per year
9	Resettlement and Socioeconomic	Monitoring of the Resettlement Action Plan (for details see RAP Report)				

11.4.4 MONITORING PLAN: OPERATION PHASE

Monitoring will be an integrated part of operation of the project to comply with the standards and improve management practices.

The principal fields of interest requiring monitoring during operation phase are discussed below and summarized in **Table 11-7**.

(1) SOIL EROSION

The EMU is to ensure the effectiveness of erosion control measures to be implemented during the operation phase.

(2) SURFACE WATER QUALITY

Monitoring of water quality will ensure proper implementation of the identified mitigation measures for the construction phase and complying with the Water Pollution control Regulation.

The surrounding water courses must be monitored upstream and downstream of the IAIP site. Details of the monitoring protocols are defined below.

SAMPLING LOCATION AND FREQUENCY

BULBULLA IAIP

The Bulbulla River must be monitored on a monthly basis upstream and downstream of the IAIP site. Three surface water sampling locations have been identified and are summarised in **Table 11-5**.

Table 11-5: IAIP Surface Water Sampling Locations

Sample name	Sampling Point	Easting	Northing
OMASW01	Downstream of site	461037.02 m E	853275.96 m N
OMASW02	Perpendicular to site	461661.76 m E	856150.25 m N
OMASW03	Upstream of site	463230.45 m E	857572.35 m N

SHASHEMENE RTC

The stormwater discharge leaving the RTC site must be monitored on a monthly basis at each of the discharge points as identified in **Table 11-6**.

Table 11-6: RTC Surface Water Sampling Locations

Sample name	Sampling Point	Latitude	Longitude
RTC SW01	Discharge Point 1	Identify on completion of construction phase	Identify on completion of construction phase

SAMPLING METHODOLOGY

The surface water samples must be collected directly into laboratory supplied sample containers. Surface water samples must be obtained from at least 10cm below the water surface (wherever possible), with the bottle opening facing upstream. Sample containers must be kept closed and in a clean condition up to the point of sampling.

Monitoring must be undertaken according to internationally accepted protocols, ensuring that the potential for cross contamination is minimised (i.e. during sampling, new disposable latex gloves must be worn at each sampling point).

For each sampling point, the temperature, pH and electrical conductivity must be measured in-situ using a calibrated multi-parameter and recorded. This information, as well as the physical and environmental

information of each sampling point (e.g. visual, olfactory observations and flow conditions) must be recorded on designated field data sheet.

On each sample, the following must be recorded to ensure proper identification:

- Site Name (e.g. Oromia IAIP);
- Sample Location and Sample Type (e.g. Oromia SW01); and
- Sample Date and Time.

Sample containers must be kept closed and in a clean condition up to the point of sampling. Post sampling, all samples must be stored in a temperature controlled cooler box (below 4°C), which is kept sealed and dust-free, until samples are dispatched to the laboratory for analysis. Any glass sample vessels must be wrapped in bubble wrap to prevent breakages.

ANALYTICAL PROGRAMME

The analytical schedule for the surface water samples is included in the below:

- Metals and metalloids: aluminium, arsenic, barium, beryllium, boron, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, potassium, selenium, vanadium and zinc;
- Anions: chloride, cyanide, phosphate, sulphate fluoride, ammoniacal nitrogen as N and NH₃, TON, nitrate as N and nitrite as N;
- Chemical Oxygen Demand (COD);
- Biological Oxygen Demand (BOD);
- General: TOC, pH, electrical conductivity, DO, TDS and Total Suspended Solids (TSS).

The pH and electrical conductivity measured in-situ must be validated through laboratory testing.

DATA QUALITY

A factual and interpretive report should be drafted in accordance with the monitoring reporting requirements stipulated in the IFC guidelines. The report should include a description of the methodologies followed, the analytical results obtained and associated interpretation in line with the defined water quality guidelines.

The precision of the sampling and analysis must be assessed through a comparison of the original and duplicate sample analytical results. This must be done through a quality assurance/quality control programme (i.e. obtain the percentage variance of the duplicated sample).

Should negative surface water related impacts be identified at root cause investigation should be undertaken and corrective actions identified and implemented.

(3) GROUNDWATER MONITORING

A water quality monitoring program with adequate resources and management oversight should be developed in accordance with the IFC World Bank Group Guidelines (IFC, 2007) and implemented to meet the objective(s) of the monitoring program. The monitoring program should be initiated once the IAIP and RTC Sites become operational.

Groundwater monitoring should be conducted on a quarterly basis.

As there are currently a limited number of accessible groundwater abstraction points in the areas surrounding both Sites, additional monitoring borehole may be required. This should be assessed once the proposed water supply programme for the IAIP and RTC Sites has been finalised, as the location of the water supply boreholes will be the main driving factor behind the design of the monitoring programme.

The programme should ensure that monitoring wells are positioned both up gradient and down gradient of the operations, and be positioned to provide adequate information on water quality between the site and potential down gradient receptors. Monitoring boreholes should take preferential groundwater flow paths into consideration.

The water monitoring program should consider the following elements:

- *Monitoring parameters:* The parameters selected for monitoring should be indicative of the pollutants of concern from the process, and should include parameters that are regulated under compliance requirements;
- *Monitoring type and frequency:* Wastewater monitoring should take into consideration the discharge characteristics from the process over time. Monitoring of discharges from processes with batch manufacturing or seasonal process variations should take into consideration of time-dependent variations in discharges and, therefore, is more complex than monitoring of continuous discharges. Effluents from highly variable processes may need to be sampled more frequently or through composite methods. Grab samples or, if automated equipment permits, composite samples may offer more insight on average concentrations of pollutants over a 24-hour period. Composite samplers may not be appropriate where analytes of concern are short-lived (e.g., quickly degraded or volatile).
- *Monitoring locations:* The monitoring location should be selected with the objective of providing representative monitoring data. Effluent sampling stations may be located at the final discharge, as well as at strategic upstream points prior to merging of different discharges. Process discharges should not be diluted prior or after treatment with the objective of meeting the discharge or ambient water quality standards. Monitoring boreholes should be placed both up gradient and down gradient of the operations, and take preferential groundwater flow paths into consideration
- *Data quality:* Monitoring programs should apply internationally approved methods for sample collection, preservation and analysis. Sampling should be conducted by or under the supervision of trained individuals. Analysis should be conducted by entities permitted or certified for this purpose. Sampling and Analysis Quality Assurance/Quality Control (QA/QC) plans should be prepared and, implemented. QA/QC documentation should be included in monitoring reports.

(4) AIR QUALITY MONITORING

Regular monitoring of ambient air quality, and fugitive emissions, in and around the site shall be conducted during the operation phase, following commencement of the park.

(5) NOISE MONITORING

Regular monitoring of ambient noise in and around the site is to be conducted during the operation phase, following commencement of the park. Should complaints be received at any point noise monitoring is to be undertaken to determine the source of the noise and corrective actions are to be identified and implemented.

(6) WASTE MONITORING

Regular monitoring of waste management areas in and around the site is to be conducted during the operation phase, following commencement of the park.

(7) TRAFFIC MONITORING

The trip generation of the IAIP is to be monitored annually, during the operational phase, to ensure that the access intersections operate safely and with sufficient capacity and acceptable levels of service.

(8) BIODIVERSITY

Undertake monitoring of the birds & their flyway on regular basis with regards to high tension transmission lines.

(9) SOCIO-ECONOMIC

SAFETY

Occupational health and safety issues of the IAIP and RTC operation will be monitored to ensure compliance with legislation related to occupational health and safety management.

COMPENSATION AND RESETTLEMENT

Monitoring of the following aspects are to be undertaken:

- Changes in economic and social status of compensated and resettled population including livelihood improvement, effectiveness and timing of public information/participation and consultation activities;
- Implementation and effectiveness of social development plans;
- Effectiveness of resettlement planning, complaints or grievances regarding resettlement and effectiveness of corrective/preventive activities performed for them.

The main type of monitoring to be adopted for the purpose of this project will be both internal and external performance monitoring. Accordingly, the IPDC will undertake continuous and systematic performance monitoring of the resettlement process.

(10) CONSTRUCTION SITE RESTORATION

This programme will be maintained for only a short duration during the construction period and the clean-up of the construction site. The programme will have the responsibility of ensuring that the EPC contractor implement environmental precautions and that the required landscaping and re-vegetation programme are implemented as part of the construction demobilisation process.

11.4.5 CHECKING AND CORRECTIVE ACTION

INSPECTION OF ENVIRONMENTAL PERFORMANCE AND MONITORING

Environmental monitoring of site activities is undertaken through a set of inspection reports and incidents forms. An Environmental Inspection Reports (EIR) is to be issued to Site Management when the Environmental Inspector identifies negative impacts, poor environmental practices and/or breach of the standards and its procedures. This is normally supported by photographic evidence.

NON-CONFORMANCE, CORRECTIVE AND PREVENTIVE ACTION

When procedures are not followed, action is taken to prevent the occurrence of environmental problems.

Non-conformances include breach of environmental legislation and failure to follow ESMP procedures. The Environmental Inspectors and EMU are to investigate the cause of non-conformance in order to determine appropriate corrective actions. Once and corrective actions are complete, the non-conformance is closed and no further action is required.

RECORDS

The Environmental Inspectors and EMU keep records of the documentation of the environmental inspection and monitoring. These records include:

- Environmental Inspection Reports;
- Monthly Environmental Summary;
- Environmental Incidents and any no-conformance reports;
- Corrective and preventive actions;
- Complaints;
- Permits and approvals;
- Employer/Consultant and EPC Contractor internal minutes of meeting; and
- Environment audit findings.

Records shall be kept to demonstrate the environmental performance at the site. This serves as a basis for interested parties to evaluate the site's performance. The records shall be legible, identifiable and accessible.

11.4.6 MONITORING FRAMEWORK

Effective monitoring of all stages of the project could be managed through an environmental management team. The principal aim of the environmental management team would be advising the project authorities and local administration about the best practicable means for protecting the environment during all stages of the project's life span.

It would provide the IPDC with proposals for monitoring the environment, and indicate operational procedures for protecting the environment.

The primary responsibility of this monitoring plan is of the IPDC who is the Project Developer. The Environmental monitoring plan will be administered within the IPDC project coordination office. The EMU will begin the implementation of the programme by forming a team of specialists to assist in monitoring the environmental effects during the construction period.

Independent external environmental monitoring may also be considered by MEFCC for the activities that are not under the responsibility of the IPDC.

In addition, there are other agencies that have the responsibility and authority to monitor some of the measures. It is also recommended that the IPDC involves other Agencies (including MEFCC) and subcontractors as required to form the environmental management team.

During the construction phase, the EPC contractor will designate an Environmental Inspector who will be responsible for environmental monitoring issues regarding the Project.

It is recommended that a formal annual audit of environmental and social performance is undertaken by an independent body.

Table 11-7: Monitoring Plan - Operation Phase

No.	Parameter to be monitored	Location	Measurement	Frequency	Institutional Responsibility	Cost (Birr)
1	Surface Water Quality	IAIP – Bulbulla River - Upstream and downstream of the IAIP at 3 identified locations	Sampling and analysis Physical, chemical parameters	Monthly	IPDC/EMU	100,000 per year
		RTC – At the 2 surface water discharge points	Sampling and analysis Physical, chemical parameters	Monthly	IPDC/EMU	50,000 per year
2	Groundwater	Both up gradient and down gradient of the operations	Sampling and analysis	Quarterly	Groundwater	Both up gradient and down gradient of the operations
3	Air Quality	Sensitive receptors around the IAIP site	Observation and inspection / sampling and analysis	Quarterly	IPDC/EMU	200,000 per year
4	Noise	Sensitive receptors around the IAIP site	Portable sound level meter for measuring noise levels	Once a week and upon complaints	EPC Contractor, EMU	Equipment cost included in construction budget
5	Traffic	Access intersection at IAIP site	Observation and reporting	Annual	IPDC/EMU	Covered in operation cost
6	Health and Safety	All work places	Visual inspection and reporting / Health and safety survey	Monthly	EMU	Covered in operation cost

No.	Parameter to be monitored	Location	Measurement	Frequency	Institutional Responsibility	Cost (Birr)
7	Environmental Monitoring Coordination	-	Monitoring of the implementation and success of the mitigation measures Reporting on monitoring results, and compliance with relevant legislation, contract and technical requirements	Monitoring continuously and Reporting bi-annually	EMU	Covered in operation cost
8	Resettlement and Socioeconomic	Monitoring of the Resettlement Action Plan (for details see RAP Report)				

11.5 PUBLIC CONSULTATION AND DISSEMINATION OF INFORMATION

Public Consultation was initiated in 2015 by the IPDC during the initial phase of the Project and continued in 2016 and 2017. The public consultation has been conducted to ensure that the project has taken full account of the priority concerns of PAPs and other relevant stakeholders in order to make the IPDC (the project developer) aware about the potential adverse impacts of the project and concerns raised by the stakeholders.

The FDRE Constitution, Article 92, states that; *“People have the right to full consultation and to the expression of their views in the planning and implementation of environmental policies and projects that affect them directly”*.

Public consultations were held as part of the ESIA process with Federal, Regional, Zonal, Woreda and local officials and institutions, PAPs, community elders, etc. with the following key objectives among others:

- To develop and maintain avenues of communication between the project and stakeholders in order to ensure that their views and concerns are incorporated into the ESIA and associated management plans, with the objectives of reducing or offsetting negative impacts and enhancing benefits from the project;
- To inform and discuss about the nature and scale of adverse impacts and to identify and prioritise the remedial measures for the impacts in a more transparent and direct manner;
- Include the attitudes of the community and officials who will be affected by the project so that their views and proposals are mainstreamed to formulate mitigation and benefit enhancement measures;
- Increase public awareness and understanding of the project, and ensure its acceptance; and
- To inform local authorities of the impacts and solicit their views on the project and discuss their share of the responsibility

The stakeholder consultation process undertaken as part of the ESIA is discussed in Chapter 7.

A Stakeholder Engagement Plan (SEP) has been attached in **Appendix B** of the ESIA.

11.6 ORGANISATIONS AND INSTITUTIONS RESPONSIBLE FOR IMPLEMENTATION OF THE ESMP

11.6.1 INTER-ORGANISATIONAL COORDINATION

It is recognised that effective environmental management will only be achieved only if it is undertaken as a fully integrated part of the overall project management. In order to effectively implement a comprehensive environmental management plan, the coordination of efforts of the various Federal and Regional Agencies is necessary with a concept comprising three sub-components, namely:

- A clear framework of inter-organisational coordination measures;
- A specific information strategy; and
- A tailored capacity building program.

The key organisations for the implementation of the ESMP during the construction phase are the IPDC and EPC contractor. During the operation phase the IPDC is the major responsible agency. There are other government agencies which will have the responsibility for implementation of certain mitigation and monitoring activities and their activities will be coordinated by the IPDC.

The main responsible institutions for implementation, coordination and administration of the Environmental management plan set out in this ESMP is summarised in **Table 11-8**.

Table 11-8: Main responsible institutions for implementation of the ESMP

Organisation	Role	Construction	Operation	Responsibility in ESMP
IPDC	Project Developer and Agency responsible for operating the IAIP and RTC	✓	✓	Implementation of RAP Coordination with other agencies Monitoring During operation phase responsible for the IAIP and RTC
EPC Contractor	Construction activities	✓		Implementation of mitigation measures Monitoring (For the construction phases)
MEFCC	Agency responsible for monitoring / auditing of environmental pollution	✓	✓	Monitoring/ auditing for compliance with Federal and Regional Environmental Regulations
Ministry of Health and Regional Health Bureau	Agency responsible for public health	✓	✓	Monitoring public health
Ministry of Labour and Social Security	Agency responsible for occupational health	✓	✓	Monitoring / auditing
IPDC and Federal Government	Agency responsible for resettlement and construction of relocation sites	✓	✓	Implementation of RAP Monitoring of compensated families

11.6.2 IPDC ENVIRONMENTAL MONITORING UNIT

The main responsibilities of the Environmental Monitoring Unit (EMU) include:

- Review and approve of the environmental components of the EPC contractor's project plan.
- Ensure that mitigation measures, conditions and specifications are fully implemented during construction and resolving problems as encountered.
- Supervise restoration of construction area that was affected during construction period of the project to its natural state.
- Conducting periodic environmental monitoring during construction and operation phases.
- Monitoring proper implementation during resettlement and post resettlement of communities.

- Liaise with members of the public, local organizations, government and non-governmental organizations; and,
- Report results of mitigation and monitoring activities to the MEFCC, Regional Environmental offices and other relevant parties.

11.6.3 MINISTRY OF ENVIRONMENT FORESTRY AND CLIMATE CHANGE

As per Proclamation 803/2013 (amendment), the Ministry of Environment, Forestry and Climate Change (MEFCC) has the powers and duties to:

- Coordinate measures to ensure that the environmental objectives provided under the Constitution and the basic principles set out in the Environmental Policy of Ethiopia are realised.
- Establish a system for environmental impact assessment of public and private projects, as well as social and economic development policies, strategies, laws and programmes.
- Establish a system for the evaluation of the environmental impact assessment of investment projects submitted by their respective proponents by the concerned sectorial licensing organ prior to granting a permission for their implementation in accordance with the Environmental Impact Assessment Proclamation.

Article 24(2) of the Industrial Park Proclamation No. 886/2014 requires the MEFCC to establish offices within the industrial parks for the application, supervision, protection and enforcement of environmental norms and standards, safeguards, management and mitigation plans within the industrial parks.

11.6.4 EPC CONTRACTOR

The EPC contractor will assign an Environmental Inspector during the construction phase. The Environmental Inspector is responsible to:

- Check compliance with recommended conditions in the contract, ESIA and ESMP;
- Review the effectiveness of mitigation measures for proper management of construction risks and uncertainties;
- Review the effectiveness of environmental management plan for the construction activities.
- Recommend modifying or halting construction activities, or developing appropriate mitigation measures in case of unpredicted adverse effects on the environment or if environmental monitoring determine construction works pose environmental concern;
- Identify and liaise to promote social integration and the development of mutually satisfactory solutions to problems affecting local communities; and
- Provide advice and assistance, as and when required, on aspects of environmental management.

11.7 REPORTING AND REVIEWING

11.7.1 GENERAL

The management measures identified in the ESMP concern actions to be taken in order to prevent, or mitigate, environmental or social impacts, or to enhance positive impacts. A system of reporting and auditing of the ESMP commitments is required to assess the degree of success in terms of implementation of the ESMP. This will apply to IPDC and the EPC Contractor.

The expected reports include:

- Site Environmental Management Plan,
- Site Inspection and
- Progress Reports.

Each of these organisations will provide monthly reports on the actions taken in the previous month to fulfil the ESMP. The IPDC will be able to draw on the reports it receives from the contractor and augments these reports with a report of its own performance.

A complete set up to handle and manage data and information generated from the management plan and other monitoring activities will be established. Therefore, the EMU shall maintain all necessary records related to environmental management and monitoring.

The MEFCC will be required to randomly verify the actual performance of the EPC Contractor and the EMU Team.

It is recommended that a formal annual audit of environmental and social performance be carried out by an independent entity.

11.7.2 RECORD KEEPING AND REPORTING

Records of significant environmental matters, including monitoring data, accidents and occupational illness, and spills, fires and other emergencies shall be maintained.

Recorded information shall be reviewed and evaluated to improve the effectiveness of the ESMP. An annual summary of the above information shall be provided to statutory authorities, if required.

11.8 PROJECT FEEDBACK ADJUSTMENT

11.8.1 PROJECT FEEDBACK

The monitoring programme will establish effective feedback mechanisms so that the performance and effectiveness of the various elements of the ESMP can be evaluated, and if necessary corrective actions can be implemented.

The monitoring results as well as the report on environmental performance and the occurrences of unforeseen circumstance may also be used to modify and reshape the project's construction methods and/or operation.

The ESMP is to be available at the project offices for all employees of the project.

11.8.2 AMENDING THE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESMP has been developed with project knowledge and information available to-date. As project scheduling plans are developed and changed, and construction techniques determined, components of the ESMP might require amending.

The IPDC may periodically revise the ESMP in consultation with the EPC Contractor, and subject to approval from the MEFCC, to accommodate changes in work and site conditions.

11.8.3 CHANGE MANAGEMENT

The ESMP is a working document that changes during the life of the project. Therefore, in the event that compliance regarding environmental requirements is determined to be inadequate, or to address unforeseen or unexpected conditions, changes to project design, procedures, process or activities can be proposed at any time during the project. Should the environmental monitoring also determine construction works or operation pose an environmental concern, the works or operation will be modified or changed to adopt mitigation measures to changing situations throughout the project construction and operation phases.

The EMU is responsible to ensure operations are conducted as recommended in the ESMP and in accordance with statutory requirements and recommends any necessary changes to the plan. The change management processes include the following:

- Identification of item/situations potentially requiring change;
- List and document the reason for making changes to ESMP;
- Preparation of change request document that:
 - outlines the nature of the item/situation requiring change,
 - outlines impacts of the change (cost, schedule, safety, operability, etc.), and
 - identifies potential biophysical, socio-economic or health concerns.
- Review of the proposed changes to ensure that environmental protection measures will be adopted and the proposal provides an acceptable level of impact control;
- Documentation of the approval or rejection of the change request;
- Implementation of the approved change, including communication to appropriate parties concerning the nature, scope and timing of the change; and
- Summary of project changes and status to be included in the monthly reports and the annual environmental status report.

When a procedure is amended to suit a particular type of environment, both the IPDC and the EPC contractor are responsible for managing changes within their respective areas of responsibility. The EPC contractor is responsible for ensuring that construction staff are aware of any changes to the ESMP and revised procedures.

11.9 CONTINGENCY PLANS

The IPDC is to develop a contingency plan which is designed to take account of a possible future events or circumstance including accidents, fires, hazardous spills, natural disasters that may affect the IAIP and RTC facilities.

The IPDC are to ensure that each facility develops a site specific contingency plan for each development with the parks.

These plans are to be reviewed and updated on an annual basis.

11.10 PROJECT GRIEVANCE AND REDRESS MECHANISM

11.10.1 OS REQUIREMENT

In OS 1, the AfDB requires the establishment of a “*credible, independent and empowered local grievance and redress mechanism to receive, facilitate and follow up on the resolution of the affected people’s grievances and concerns regarding the environmental and social performance of the project. The local grievance mechanism needs to be sufficiently independent, empowered and accessible to the stakeholders at all times during project cycle and all responses to grievances shall be recorded and included in project supervision formats and reports.*”

The aim of a project Grievance and Redress Mechanism (GRM) is therefore to enable people fearing or suffering adverse impacts to be able to be heard and assisted.

11.10.2 OBJECTIVES AND SCOPE

A project GRM is a systematic process for receiving, evaluating and facilitating resolution of affected people’s project-related concerns, complaints and grievances about the borrower’s/client’s social and environmental performance on a project.

The GRM provides a structured and managed way of allowing the concerns of affected people to be heard and addressed.

11.10.3 DEVELOPING AND IMPLEMENTING

DEVELOPING A GRIEVANCE AND REDRESS MECHANISM

The process by which a complaint will be accepted or rejected needs to be carefully designed, and should maximise interactivity and cultural sensitivity. The acceptance/rejection of a complaint should go through a discussion stage where the plaintiff and the GRM staff interact on the grounds and motives of the complaint, after which the plaintiff should clearly and transparently be told whether or not the complaint is eligible and will be processed. It is best if the acceptance/rejection of the complaint is based on objective criteria that are posted by the GRM, including a written copy displayed in the public access area of the GRM in an appropriate language.

The processing of the complaint, if accepted should go through various phases:

- Filing of the complaint and labelling with an identification code, communicated immediately to the plaintiff.
- Assessment of the complaint (including severity of the risk/impact).
- Formulation of the response.
- Selection of the grievance resolution approach is key. There are four general approaches to choose from:
 - The project's management proposes a solution.
 - The community and the project's management decide together.
 - The project's management and the community defer to a third party to decide.
 - The project's management and the community utilise traditional or customary practices to reach a solution.

“*Decide together*” approaches are usually the most accessible, natural and unthreatening ways for communities and a project's management to resolve differences. With the potential to resolve perhaps the majority of all grievances, “*decide together*” should be the centrepiece of any grievance mechanism's resolution options.

The relevant GRM is to be developed in line with Section 7 of the Industrial Parks Council of Ministers Regulations No. 417/2017.

IMPLEMENTING A GRIEVANCE AND REDRESS MECHANISM

During project implementation, five steps may be required:

- Establish human resources and logistics.
- Introduce the GRM to project staff.
- Communicate with the local communities to build awareness.
- Train and support participants.
- Develop a monitoring programme.

An internal communication campaign among the key project staff should highlight that the function of the GRM is not to put blame on individuals or to identify mistakes and other errors, but rather that it identifies the risk of unintended negative impacts so as to avoid them altogether or, at worst, to compensate for them if intervention/warning comes too late.

Effective communication also needs to be established with the community itself to explain that the GRM, what the goals and roles of the GRM are and how GRM intervention can or should be triggered.

This effort should follow these key principles:

- Develop simple, visually engaging marketing materials;
- Provide materials in an understandable format and language; and
- Use face-to-face, informal meetings in local communities.

Finally an important element of implementation is monitoring and reporting, including evaluating success and identifying need for improvement.

Refer to **Appendix B** (Stakeholder Engagement Plan) of the ESIA for Grievance Mechanism Process.

11.10.4 LOCAL COMMUNITIES

The IPDC and the EPC contractor should be prepared to respond to the communities, concerns related Project. A grievance mechanism is proposed to be established to receive and facilitate resolution of the affected communities concerns. Liaison groups significantly reduce the aggravation and hostility of locals to the IPDC and the EPC contractor and their staff.

During construction phase, it is recommended that a community Liaison group be established. Therefore, both the IPDC and the EPC contractor should assign the responsibility of liaising with local communities and local authorities to their respective Community Development and Liaison (CDL) Officer. The CDL will be permanently on site and will provide effective liaison to promote social integration, and the development of mutually satisfactory solutions to problems affecting local communities.

Regular interaction with local communities by the CDL will ensure that many problems are dealt with at an early stage and effectively. Both the IPDC and the EPC contractor's PRs will be available to deal with issues arising out of construction sites. Therefore, it is recommended that the CDL be allocated an office at both sites.

Any aggrieved local residents can bring their grievance to the IPDC or the EPC contractor at any reasonable time and the matter will be discussed and dealt with in appropriate manner. The grievances shall be addressed promptly, using an understandable and transparent process, which shall be readily accessible to all segments of the neighbouring communities.

Complaints shall be resolved through negotiations with the community. In the negotiation it is recommended to involve existing community institutions like the Kebeles and others community leaders.

Appropriate public addressing systems shall be used as well as other means to announce certain events, such as programmed hours of explosions (if applicable) during construction, hazardous activities for the people to be aware of, closure of roads for certain hours due to construction activities, etc.

This office will deal with the day-to-day information needs of the local people. Furthermore, provision of information regarding the project shall circulate to the local population through their leaders.

11.10.5 CONSTRUCTION WORKERS

The EPC contractor shall develop a grievance mechanism for workers and their organizations to raise reasonable workplace concerns. The mechanism will involve an appropriate level of management and address concerns promptly, using a transparent process.

11.11 TRAINING AND CAPACITY BUILDING

If the environmental management and monitoring programme is to be successfully implemented it is recommended that a various training be provided. In general, training should be composed of workshops, in-service training, and in-service formal courses.

11.11.1 IPDC

IN-SERVICE TRAINING AND TECHNICAL ASSISTANCE

The technical assistance will facilitate adequate on-the-job training and technology transfer, enabling the EMU staff to undertake their monitoring activities during the Construction and Operation Phases of the Project.

The Technical Assistance Project will have the following overall aims:

- To help the EMU to implement the core obligations with respect to the Environmental Measures, including the continuous review of the ESMP;
- To help the EMU to monitor all obligations with respect to the environmental measures;
- To provide on-the-job training to EMU staff as well as the employees of the consultants involved in various activities. They shall participate in environmental awareness training seminars and workshops This will help to build technical expertise in the environmental and social aspects of the Project;
- To assist the EMU to coordinate its work with other government authorities and non-government agencies concerned with the Environmental Objectives; and
- To instruct EMU staffs in the proper techniques of Project inspection, monitoring, use of field monitoring equipment, data analysis and reporting.

It is proposed that the training should be aimed at IPDC personnel and in particular, the staff members of the EMU. Training arrangements would need to be discussed in detail with the IPDC to establish precise objectives and requirements, so that the course content can be specifically targeted at real needs.

11.11.2 OTHER FEDERAL AND REGIONAL LEVEL AGENCIES

In an effort to strengthen institutional capacity and environmental awareness, seminars and workshops to be organised under this project should also be open for individuals from concerned ministries and agencies such as the MEFCC, Oromia's office of Environmental Protection, the Regional Bureau of Agriculture and Rural Development, Regional and Woreda level Environment departments, etc. The objectives of the seminar-workshops are to ensure environmental awareness, knowledge and skill for the implementation of this ESMP.

11.11.3 TRAINING CONSTRUCTION WORKERS

The foremen, operators, and work crews (including any subcontractors) will be trained so that they understand the specific environmental issues on the work site and their responsibilities. All personnel are to receive a brief environmental and safety training course.

LOCAL RECRUITMENT PLAN

Condition 28(1) of the Industrial Park Proclamation No. 886/2015 states that the Labour Proclamation No. 377/2003 (as amended) is applicable in any Industrial Park. Additional condition 28(4) indicates that the Ministry of Industry shall organise technical and vocational training programs in collaboration with the concern government entities and IPDC whenever necessary.

A Local Recruitment Plan is to be prepared for both the construction and operations phases, aimed at maximising employment opportunities for the PAPs and local communities and to manage expectations and the potential for influx into the area during the construction and operation phase of the Project. The Plan is to take into account vulnerable groups such as women, youth and Project PAPs.

The Plan is to include details for job training and capacity building prior to and during the construction and operation activities. The Plan is to also include procedural guidelines and a code of conduct concerning employment and workforce in order to encourage appropriate work ethics and behaviour.

This is particularly important where employment opportunities will be realised by individuals outside of the Project area.

Finally, this Plan is to include an on-going communication strategy to clearly and consistently disclose information regarding employment opportunities and contracting procedures, with the idea of managing expectations of job opportunities, and therefore influx of workers. Key messages may include the number of positions available, the timeframe for employment availability, and an explanation of the contracting process.

Influx management will also involve a coordinated approach which key stakeholders with responsibility for issues related to influx, including governmental offices and agencies, NGOs, and local communities, where relevant.

HEALTH AND SAFETY PLAN

To address both occupational and community health and safety risks, a Health and Safety (H&S) Plan is to be prepared for both the construction and operations phases. It is to include a company policy, and measures included within are to comply with national laws and the AFDB ISS. Aspects to be covered in this Plan include:

- Health and safety training for all employees;
- Health and safety training on the use of chemical and hazardous materials;
- Provision of the appropriate Personal Protective Equipment (PPE);
- Traffic management plan and driver training;
- Accident prevention monitoring;
- Training in the use of all equipment;
- Safeguards of environmental pollution of water resources;
- Safeguards in hazardous materials handling and transportation;
- First Aid access and communications; and
- Emergency Response Procedures.

In addition, health education with regard to communicable diseases is to be undertaken as part of the induction training for workforce members. This is to include health education on sexually transmitted diseases (STDs) as well as diseases such as malaria.

Provision is to be made for education awareness of communicable diseases within the wider community. If possible, this is to be undertaken in collaboration with NGOs relevant to health care, and the local administration.

COMMITMENT TO WORKERS' RIGHTS

The Project needs to ensure its policy and procedural consistency with international standards related to workers' rights. This includes:

- Observing statutory requirements relating to minimum age for employment of children and meeting international standards of not employing any persons under the age of 14 for general work and no persons under the age of 18 for work involving hazardous activity.
- Ensuring acceptable conditions of work including observing national statutory requirements related to minimum wages and hours of work.
- Meeting international standards related to paying all wages, including bonuses and premium pay for overtime work, to all employees in a timely fashion and in a manner consistent with ILO Convention 95.
- There should be clearly benchmarked payment schedules in the Contractors' contracts.
- Having Contractors commit that they will not take any action to prevent employees from exercising their right of association and their right to organise and bargain collectively.
- Ensuring no workers are charged fees to gain employment on the Project.
- Ensuring rigorous standards for occupational health and safety are in place.

- Having Contractors base employment decisions on principles of non-discrimination and equal opportunity, in particular fair and equal pay, especially for women carrying out the same work as men.
- Having Contractors establish a labour grievance mechanism and documenting its use for complaints about unfair treatment or unsafe living or working conditions without reprisal. Access to labour grievance mechanisms needs to stress its relevance for both genders.

As emphasised above, these commitments need to be passed on to Contractors and Sub-contractors via main and subcontract clauses, and requirements to address them in management systems and work procedures.

PROJECT CODE OF CONDUCT

It is recommended that the Project establish a Code of Conduct for the labour force. The Code of Conduct recognises the provision of resources by the employer and shares responsibilities among the workers for the use of equipment, procedures and training. It aims to contribute to a harmonious relationship with local communities, to reduce behaviours that could lead to social conflict, and to prevent further environmental degradation.

Typical issues to be addressed would include:

- Proper use of PPE and other work equipment that has been provided;
- Discreet sexual behaviour that takes into consideration messages about HIV/AIDs sexually transmitted diseases;
- Restrictions related to consumption of alcohol and drugs;
- Respect for the local community and its cultural norms in which labourers are working; and
- Professional behaviour and integrity when dealing with the public.

11.12 ANNEXURES

ANNEXURE 11.1

Air Quality - Recommended mitigation measures for general construction (USEPA, 1995).

Recommended Air Quality mitigation measures for general construction (USEPA, 1995).

Emission Source	Recommended Control Method
Debris handling	Wind speed reduction
	Wet suppression ⁽¹⁾
Truck transport ⁽²⁾	Wet suppression
	Paving
	Chemical stabilisation ⁽³⁾
Bulldozers	Wet suppression ⁽⁴⁾
Pan scrapers	Wet suppression
Cut/fill material handling	Wind speed reduction
	Wet suppression
Cut/fill haulage	Wet suppression
	Paving
	Chemical stabilisation
General construction	Wind speed reduction

Emission Source	Recommended Control Method
	Wet suppression
	Early paving of permanent roads
Notes: <ol style="list-style-type: none"> (1) Dust control plans should contain precautions against watering programs that confound trackout problems. (2) Loads could be covered to avoid loss of material in transport, especially if material is transported offsite. (3) Chemical stabilisation usually cost-effective for relatively long-term or semi-permanent unpaved roads (4) Excavated materials may already be moist and may not require additional wetting. 	

ANNEXURE 11.2

Air Quality - Recommendations to reduce emissions from identified sources during the operational phase.

Recommended Air Quality mitigation measures for the operational phase.

Source	Recommendations for Mitigation
Boiler	<ul style="list-style-type: none"> Emissions from the boiler should be compliant with the IFC EHS emission guidelines for small combustion processes (defined as systems designed to delivery electrical or mechanical power, steam, heat or any combination of these, regardless of the fuel type, with a total, rated heat input capacity of between three MW and 50 MW). These emission guidelines are applicable to small combustion process installations operating more than 500 hours per year, and those with an annual capacity utilisation of more than 30%; Annual stack testing is also recommended to be undertaken for SO₂, NO_x and PM. If the annual stack emission testing results show constantly (3 consecutive years) and significantly (less than 75%) better than the required levels, the frequency of the annual stack emission testing can be reduced from annual to every two to three years.
Brewery	<ul style="list-style-type: none"> To reduce emissions from wort boiling, a heat recovery system should be used to collect and condense the vapours and the recovered energy used in process or utility systems; Cyclones and bag filters should be used to collect and recover dust in the following manner: <ul style="list-style-type: none"> Dust generated from the unloading of raw materials and transport of malt and adjuncts should be conveyed to the mash or adjunct kettle and the extract recovered; Dust arising from malt and adjuncts may be used as animal feed.
Dairy Processing	<ul style="list-style-type: none"> Installation of exhaust ventilation equipment equipped with dry powder retention systems (e.g. cyclones or bag filters) to reduce dust emissions; Ensure wastewater treatment facilities are properly designed and maintained for the anticipated wastewater load; Keep all working and storage areas clean; Empty and clean the fat trap frequently;

Source	Recommendations for Mitigation
	<ul style="list-style-type: none"> Minimise stock of waste and by-products and store for short periods in cold, closed and well ventilated rooms; Enclose production activities that cause odour and operate under vacuum.
Food and Beverage Processing	<ul style="list-style-type: none"> Cover skips, vessels and stockpiles; Enclose silos and containers used for bulk storage of powders and fine materials Where enclosure is not feasible, use sprays, windbreaks, sweeping, sprinkling and other stockpile management techniques; Use closed conveyers equipped with filters to clean transport air prior to release; Use cyclones, venture scrubbers, ESPs to remove particulate matter from the gas stream (where feasible); Recirculate exhaust gas from frying and other cooking operations to the burner; Minimise storage duration for solid waste to avoid putrefaction; Operate facilities under partial vacuum to prevent fugitive odour emissions; Regular inspection of chilling and freezing equipment to monitor loss of refrigerants.
Meat Processing	<ul style="list-style-type: none"> Pasteurize organic matter before processing it to halt biological processes that generate odour; Install rendering equipment in closed spaces and operate under negative pressure compared to ambient air conditions; Minimize the inventory of raw carcasses, waste and by-products and stored it for short periods of time in a cold, closed, well ventilated place; Seal off animal by-products during transport, loading, unloading and storage activities; Clean pens and livestock yards on a timeously basis; Empty and clean fat traps frequently; Add oxidants such as nitrates to stored waste and effluent; Unload contains containing animal by-products within an enclosed building that is equipped with extraction ventilation connected to odour abatement devices; Clean and maintain a sufficient level of humidity in pens and livestock yards to reduce dust/particulates; Reduce fugitive dust by minimising surface areas with exposed soil surfaces, and by planting hedges or erecting fences to minimise wind turbulence; Use liquefied petroleum gas or natural gas instead of fuel oil in the singeing process.
Sewage Treatment Works	<p>Basic means of odour control that should be undertaken at sewage treatment works include (DEFRA, 2006):</p> <ul style="list-style-type: none"> Good housekeeping and raw materials handling practices; Control and minimisation of odours from residual materials and waste;

Source	Recommendations for Mitigation
	<ul style="list-style-type: none"> • Maintaining the effluent aeration other than in processes which are specifically anaerobic; • Avoiding anaerobic conditions; • Minimising septicity; • Selecting process steps that present least risk of odour.
Vehicle entrainment on paved roads	<ul style="list-style-type: none"> • Dust emissions from paved roads vary with the silt loading present on the road surface, as well as the average weight and speed of vehicles travelling on the road. • As the silt loading of the road is a significant determinant of dust emissions, control techniques attempt to either prevent material from being deposited onto the surface (preventive controls) or to remove from the travel lanes any material that has been deposited (mitigative controls). • Preventative measures include the covering of loads in trucks and the paving of access areas while mitigative measures include vacuum sweeping, water flushing, and broom sweeping and flushing (USEPA, 2011).
Vehicle entrainment on unpaved roads	<ul style="list-style-type: none"> • Vehicle restrictions that limit the speed, weight or number of vehicles on the road; • Surface improvement by measures such as paving or adding gravel or slag to a dirt road; • Surface treatment such as watering or treatment with chemical dust suppressants.

12 CONCLUSION

This ESIA has been undertaken in accordance with Ethiopian Legislation and the African Development Bank (AfDB) Operating Safeguards. Chapter 1 of this ESIA includes a summary of the contents of each chapter that is required in order for the ESIA to meet the AfDB requirements.

The scoping stage of the ESIA identified the need to consider potential impacts during the construction and operational phases of the Project on: soils, surface water, ground water, air quality, climate change, noise, transport and access, waste management, biodiversity and socio-economic environments on the functionality of the Project.

The majority of impacts were assessed to be of minor negative significance with implementation of the recommended mitigation measures. During the construction phase, six moderate residual negative effects of the project have been identified resulting from the proposed project. The physical environmental impacts include soil erosion, soil compaction and degradation of noise climate. Implementation of mitigation measures as contained in the ESMP as well as ongoing environmental noise monitoring will prevent these impacts from occurring and when identified can be dealt with in a timely manner. Therefore these impacts are deemed appropriate for the size and extend of the project proposed and are acceptable impacts of construction which if managed well can be minimised.

The remaining moderate impacts relate to loss of access to agricultural land plots and in some cases, loss of residential buildings, other assets (crops), the potential for the workforce to introduce and/or increase the rate of spread of communicable diseases in the project area and additional pressures on the existing community infrastructure and services such as strain, congestion, and wear and tear for roads and strain on medical facilities in the local area. These impacts have occurred as a result of the proposed site supporting existing agricultural practices, as well as the potential for large numbers of workers being attracted to the development for employment or business opportunities. These impacts are being mitigated through payment of compensation, access to training and reallocation of land as well as provision of additional infrastructure and services. The Oromia Resettlement Action Plan (RAP) deals with these issues and others and will be a live document that will be implemented post authorisation. In addition the Stakeholder Engagement Plan (Appendix B1) contains a summary of consultation completed to date as well as the consultation that should occur into the Project Execution phase.

The major negative impacts identified relate to change in surface profile, compaction, land use and land capability, and direct loss/degradation of natural wetland habitat and biota. These impacts are expected and irreversible following development but are considered acceptable consequences of a transformation project such as this. In addition, the anticipated significant negative impact identified in relation to the potential lack of jobs in the event that the IAIP is decommissioned, highlights the value the employment opportunities being offered by this project are to the economy and the local communities. There will be a negative impact on the livelihoods of the local community that do gain employment from the facility should the facility be decommissioned.

Three major negative impacts were identified during the construction phase. These impacts relate to the change in surface profile, land use and land capability of the sites. These are deemed major impacts as they will lead to permanent changes resulting in the loss of valuable agricultural land. These impacts are anticipated to take place during the construction phase, however once operational the proposed facilities are anticipated to result in a number of moderate positive impacts that outweigh the loss of the agricultural land in terms of biodiversity and socio-economic benefits.

The majority of the impact identified during the construction phase do not continue into the operational phase which is identified to result in one moderate negative residual impact associated with resettlement and livelihood restoration; one major negative impact associated with soil compaction and three moderate residual positive impacts. The moderate residual positive effects of the project arise from the re-vegetation the greenery areas with indigenous plant species as well as an increase in employment opportunities and demand for goods and services.

Furthermore, the presence of the IAIP and RTC sites within the context of the surroundings is considered to present a positive visual enhancement to the area as the IAIP and RTC is seen as representing progression and advancement in the agricultural sector through industrialisation. Overall

the community consultation process undertaken as part of this ESIA has shown an overwhelming support of the Oromia project even by the project affected people. The community believe that a development of this scale and magnitude, offering large employment opportunities will uplift the whole community.

A number of measures have been identified as necessary to minimise and control the risk of erosion and subsequent water pollution / sedimentation of the Bulbulla River. Water use and pollution would need to be monitored in the future to limit residual effects on other water users and ecosystems in the Project area. Furthermore, groundwater use in the region is very limited due to the naturally high fluoride concentrations making it an unsuitable source of potable water without significant treatment. The Oromia IAIP and RTC sites are noted to pose a low risk to the groundwater environment.

Based on the census data collected by the IPDC, the proposed Oromia Project (including the IAIP and RTC facilities) will result in 287 PAPs (i.e. 252 and 35 PAPs affected by the IAIP and RTC respectively) being affected by a combination of economic and physical displacement, including 68 PAPs who will be physically displaced from the IAIP site. A Resettlement Action Plan has been developed as part of the Project, which focuses on displacement issues in more detail.

The project also has a number of broader benefits that have been identified, mainly associated with economic well-being of the local communities. The industrialisation of the agricultural sector provides employment transition opportunities for farmers and their children. The Bulbulla IAIP and Shashemene RTC are anticipated to increase incomes, provide greater food security and more employment opportunities.

The Stakeholder Engagement process as part of the Project has been summarised in Chapter 7 of this ESIA and the Stakeholder Engagement Plan (SEP) is included as **Appendix B-1**. The Stakeholder Engagement built on the existing work done by the local authority and has further established links with representatives for stakeholder groups; facilitated data collection; identified concerns and opportunities.

An Environment and Social Management Plan (ESMP) has been developed (Chapter 11). The ESMP represents the Oromia IPDCs commitment to address and manage the potential negative and positive impacts associated with the Bulbulla IAIP and Shashemene RTC projects. The key intent of the ESMP is to ensure that the environmental and social objectives of the project are met and it is based on the various components of the Project throughout design, construction and operational phases.

The ESIA has not identified any fatal flaws which would restrict the development of the proposed Oromia IAIP and RTC.

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APPENDIX

A MEFCC CERTIFICATES FOR ETWRDEC

APPENDIX

B

STAKEHOLDER
CONSULTATION



APPENDIX

B-1 *STAKEHOLDER ENGAGEMENT PLAN*

APPENDIX

B-2 *STAKEHOLDER MATERIAL*

APPENDIX

B-3 *STAKEHOLDER ENGAGEMENT MINUTES – INITIATION MEETINGS*

APPENDIX

B-4 *STAKEHOLDER ENGAGEMENT MINUTES – SCOPING PHASE*

APPENDIX

B-5 *STAKEHOLDER ENGAGEMENT MINUTES – ESIA PHASE*

APPENDIX

C

SPECIALIST REPORTS



APPENDIX

C-1 SOILS

APPENDIX

C-2 *SURFACE WATER*

APPENDIX

C-3 *GROUNDWATER*

APPENDIX

C-4 *WETLANDS*

APPENDIX

C-5 *AIR QUALITY*

C-6 *CLIMATE CHANGE*

APPENDIX

C-7 *NOISE*

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C-8 *TRANSPORT AND ACCESS*

APPENDIX

C-9 *WASTE MANAGEMENT PLAN*

APPENDIX

C-10 *BIODIVERSITY*

APPENDIX

C-11 *SOCIO-ECONOMIC*

APPENDIX

C-12 *CULTURAL HERITAGE*

APPENDIX

D

ESIA CONSOLIDATED IMPACT
SIGNIFICANT MATRIX



