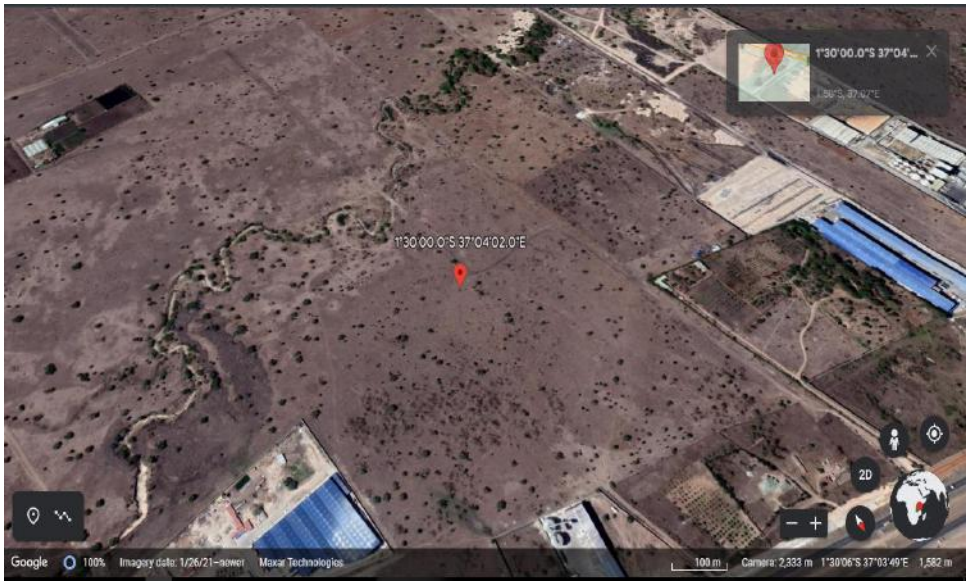
ENVIRONMENTAL IMPACT ASSESSMENT STUDY

FOR THE PROPOSED SET UP OF AN IRON AND STEEL PLANT TO BE LOCATED IN MAVOKO MUNICIPALITY IN MACHAKOS COUNTY ON LR NO. 12648/193

BY

RONGTAI STEEL CO. LIMITED



DECLARATION

We submit the following Environmental Impact Assessment Project Report for the proposed construction and installation of machineries and equipment to be used for the operation of an iron and steel plant to be located in Mavoko Municipality in Machakos County on **LR NO. 12648/193.** To the best of our knowledge, all information contained in this report is an accurate and truthful presentation of all findings as relating to the project proposal.

EIA/EA Experts

Prepaid by: -

Mr. Matthew O. Were (EIA/EA NEMA registered Lead Expert No 1454)

Signature: _____ **Date**: _____

The Proponent

We confirm that this EIA project report has been prepared and forwarded to NEMA with our authority as the project proponent. We also confirm our commitment to implementing the Environmental Management Plan as proposed in this project report, as well as any other conditions that NEMA may prescribe.

Proponent's Management Representative: -

Designation: -

Signature: _____ **Date**: _____

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EXECUTIVE SUMMARY

Rongtai Steel Co. Limited, herein referred to as the proponent, proposes to construct and operate an iron and steel plant. Steel making production technique to be implemented is the use of "Intermediate Frequency Induction Furnace (I.F.F) - Billet Continuous Casting". The plant will be equipped with 3 sets of 5-ton of I.F.F and an R5.25m 2 Strand Billet Caster (C.C.M). Steelmaking is the process of producing steel from iron ore and/or scrap. Steelmaking has existed for millennia, but it was not commercialized on a massive scale until the mid-19th century. Today there are two major commercial processes for making steel, namely basic oxygen steelmaking, which has liquid pig-iron from the blast furnace and scrap steel as the main feed materials, and electric arc furnace (EAF) steelmaking, which uses scrap steel or direct reduced iron (DRI) as the main feed materials.

Project overview

This study was commissioned by Rongtai Steel Co. Limited in accordance with Section 58 of the Environmental Management and Coordination Amendment Act (2015), CAP 387, and Regulation 10 of the Environmental (Impact Assessment Audit) Regulations 2003 amended in 2016, legal notice No 31 of 2019. Other national policies and legislations relevant to the proposed project were reviewed. The purpose of this study is to establish the potential environmental impacts as a result of the set up and operation activities of the proposed development and thereafter propose possible mitigation measures. This report also provides baseline information of the project that may be used in decision-making during the project's evaluation process and is also expected to form the baseline for future environmental audits and monitoring.

Project location, objective and scope

The proposed project involves the construction and installation of an Iron and Steel Processing Plant be located in Mavoko Municipality in Machakos county on **LR NO. 12648/193.** The proposed project area is zoned in an area set for industrial use. The project area will be composed of: Melting Plant Building, Rolling Mill and Other auxiliary facilities. The proposed development project is estimated to cost **Kshs. 319,727,001.55.**

Summary of key findings

The following information was derived from the assessment of the proposed project. The project assessment identified some potential adverse impacts on the physical and socio-economic environment. The impacts that were further investigated and analysed were:

Positive:

- Increased income to the proponent
- Optimal use of land area
- Improved aesthetics
- Increased tax revenue to county and national government
- Creation of employment opportunities and on-job training to locals
- Increased support for development of local community through company CSR programme
- Improvement of local economy
- Increased access to iron and Steel products
- Creation of market for goods and services
- Improved security

Negative:

Various negative impacts are foreseen in the lifecycle of the project and include:

- Generation of dust and air pollution during construction
- Possible accidents amongst workers
- Solid and liquid Waste generation and its disposal or management
- Noise generation and vibrations that may increase ambient noise levels
- Increase in soil erosion and change in soil structure resulting from excavation
- Increase in storm water runoff due to increase in paved areas
- Fire outbreaks
- Increased traffic along the main and feeder roads

Some other potential impacts are short term and of low significance. These will be ameliorated through proposed mitigation measures which includes: -

- Ensuring construction work is undertaken during the day
- Erection of a temporary barrier to condone the area from unauthorized trespassers.
- Collection and appropriate disposal of solid waste from the construction works and materials.
- Provision and enforcement of protective gears to the workers.
- Enhanced monitoring and control of vehicular movement
- Training and awareness of construction workers and staff on safety precautions.
- Transport and storage of materials in bulk.
- Signage to alert general public
- Regular inspection of underground tanks for leakages
- Provide fire extinguishers, alarms and hydrants in areas which are probable source of fires
- Landscaping and replanting of vegetation after all installation and construction is done to form a green belt.
- Excavated soil will be used for levelling of low-lying areas within the plant
- Channelize excess storm runoff efficiently
- Recycle most water used in the plant
- Provision of appropriate stack heights to control air pollution.

Summary of mitigation measures

Mitigation measures have been developed in respect of the significant negative Environmental and Social Impacts. It is also from these impacts that a comprehensive management plan is developed. The mitigation measures are summarized below.

Potential negative impact	**Mitigation measures**
CONSTRUCTION PHASE	
Disruption of existing natural environment and Modification of microclimate.	• Development to be restricted to approved density, building line, land coverage, land ratio and zoning plan. • Careful layout and orientation of structures to respect wind and sun direction • Adequate provision of green and open spaces planted with grass, shrub and tree cover • Minimum use of reflective building material and finishes for roof, walls and pavements • The flow of storm water to be harmonized with neighborhood and directed to well-designed drainage channels

Waste generation	• Contract a NEMA licensed waste handler and dispose offsite at county designated dumpsite. • Develop appropriate and adequate waste collection measures and facilities. • Provide for waste segregation into organics, metals, plastics at source for efficient management. • Maintain waste disposal records. • Manage materials responsibly to recover, reuse, recycle as appropriate. • Develop clean-up plans for wastes and spills.
Biodiversity and Vegetation Loss	• Do not site project in environmentally sensitive area e.g. watershed, wetland and riparian land. • Clear vegetation only when and where necessary. • Comply with land use plans and approved designs. • Resurface and re – vegetate exposed bare areas preferably by using natural indigenous vegetation. Scientific evidence should be put in consideration to avoid introduction of invasive species. • Have a green belt which will provide habitats for birds and small mammals once construction is done. • Use manual labor rather than machinery
Noise pollution	• Maintain regular servicing of machines to produce less noise. • Construction and installation work undertaken during day hours • Workers to wear PPEs. • Use of human labor where appropriate rather than machines. • Switch off machines not in use. • Use of noise mufflers for noise attenuation. • Fence off the construction area from unauthorized persons • Develop and implement a comprehensive noise conservation programme that includes training, equipment maintenance, engineering controls, use of PPEs, noise measurements among others. Ensure the construction site is secured by appropriate noise attenuators
Air emissions	• Service and maintain machinery and vehicles regularly according to schedule.

	• Switch off machines when not in use. • Use standard fuel and lubricants • Ensure water sprinkling on bare surface including access roads to arrest dust emission. • Provide all construction staff with appropriate personal protective equipment (PPEs) such as dust masks, overalls, helmet, dust coats, safety boots and goggles. • Ensure that all construction workers make proper use of the PPEs provided at all the time they are on site. • Clean access routes in surrounding area on a daily basis to prevent dust. • Collect and hold cleaning wastes (e.g. rags) in appropriate containers. • Workers who may unavoidably have to work in dusty workplaces should be provided with nose and ear masks to protect them from excessive dust. • Carry out regular inspection and maintenance of equipment to reduce levels of Green House Gas (GHGs) emissions into the environment.
Health, Safety and Security Concerns	• Provide appropriate PPEs to the construction workers. • Maintain updated firefighting and detecting infrastructure. • Awareness training to construction and installation workers and staff on safety precautions. • Secure the construction area from unauthorized persons by ensuring that access is confined to restricted work sites (including those with operation of mechanical and electric equipment) to persons with permits. • Maintain a first Aid kit on site and train the workers on its use • Implement appropriate traffic plans with the help of local police when (partial) closure of roads is required. • Put up appropriate safety signage.
Occupational health and safety	• Ensure that work sites (especially excavation works), especially have proper protection with clear marking of safety borders and signals and fence off all dangerous areas. • Carry out training of staff in EH&S monitoring and evaluation. • The contractor should recruit H&S person during construction. • All construction workers to first be trained on the appropriate use of the

	provided personal protective equipment. • Project proponent to ensure each construction worker and visitors to the construction site also use the provided personal protective equipment. • The project proponent to ensure that tools and equipment provided for use at the proposed construction site are well serviced and maintained. • Project proponent to ensure that the construction site is free of hazards. • The project proponent to ensure that among the construction workers are trained first aiders. • Project proponent to ensure there is a fully equipped first aid station at the proposed project site. • The contractor will ensure clear human resources policy against sexual harassment that is aligned with national law
Traffic related impacts	• Use reflective signature to direct traffic to designated areas. • Sensitize drivers to observe speed limits • Develop and implement a traffic marshal plan for the construction site • Provide sufficient parking/ holding area for traffic delivering and collecting materials from the construction site.
OPERATION PHASE	
Waste generation	• Manage materials responsibly by applying principle of reuse, recover and recycle. • Segregate the waste at source • Maintain waste disposal records. • Contract a NEMA licensed waste handler. • Dispose waste in designated County government dumpsite by licensed NEMA waste handler • The Proponent should prepare a Solid Waste Management Plan, which should contain an inventory of the types and quantities of waste to be produced. • The most appropriate waste management approach for each type of waste including details on (temporary) storage, transport and final destination of the waste should be adopted.

	• An assessment of any opportunities for reducing solid waste generation, in particular of hazardous and undesirable (persistent and non-reusable) types of wastes. • The Proponent should maintain records of types, quantities, origin, (temporary) storage, transport and elimination/reuse of solid waste, and make these available to the works supervisor upon his request, as proof of proper waste management practices. • Ensure all waste generated during operational phase is managed and disposed as per the provisions of the Environmental Management and Coordination (Waste Management) Regulations, 2006 and The Sustainable Waste Management Act 2022
Increased water and energy demands	• Proponent will ensure that usage avoids wastage • The proponent will purpose to use the most readily available water at the site without compromising availability to other water users in the area • Contaminated water will be treated before discharge to the required standards in line with the water quality regulations. • Minimize water demand by ensuring used water from the cooling circuit is routed through an adequately sized and effective cooling tower and pressure filter to filter the water for recycling purpose. • Explore alternative sources of water that can be used such as roof catchment, rock catchment and collection from rain water pits to minimize drawing water from borehole for industrial use. • Provide adequate water storage tanks on site to store water from roof catchment from the extensive roofs of the go-downs during rainy season that can be used in cooling of plant and equipment. • The proponent will liaise with KPLC to power the plant appropriately. • The plant machinery will be designed to maximize power usage efficiency. • The proponent should consider supplementing electrical supply from the national grid with renewable

	energy such as solar to power the lighting system of plant. • Excavation and construction machines will be in serviceable condition to reduce consumption of fuel • The proponent will ensure installation of generators and ensure they are in good working order to maximize fuel use efficiency.
Noise pollution	• Carry out baseline noise mapping • Adhere to the national standards set out by the EMCA noise and vibration regulations (legal notice No. 61 of 2009 amended 2015) • All noisy plant machinery will be housed in sound proof buildings. • Roller bearing to be used to ensure that the noise levels do not go beyond 70 dB (A) • Insulation against noise should be applied where applicable. • Provide appropriate PPEs • Delivery of raw materials will be limited to day time only
Air Pollution	• Develop and implement Best Manufacturing Practices (BMPs) within the plant to minimize gaseous emissions • Consider to ensure emissions are monitored on a daily basis. • Maintain good housekeeping • Monitor air quality for chimney stacks and ambient air quality • Adopt a combined strategy including a reduction in energy demand, use of cleaner fuels, and application of emissions controls • Develop a green belt around the project site to absorb toxic emissions and carbon dioxide
Traffic related impacts	• Develop and implement a traffic marshal plan for the operational phase • Provide sufficient parking/ holding area for traffic delivering and collecting materials from the plant
Labour Influx	• The Proponent should prepare Labour and Recruitment Plan • The Proponent should prepare a "code of conduct for workers". This code of conduct will be signed and followed by all workers involved in the project.

DECOMMISSIONING PHASE	• Constitute a decommissioning team and inform relevant authorities • A due diligence decommissioning survey (audit) will be undertaken and submitted to NEMA for approval at least three months prior to the exercise. • Dispose of all wastes responsibly • Rehabilitate the degraded soil and natural flora. • Recycle, reuse or recover demolition materials where appropriate

Conclusion

This EIA exercise is intended to inform project planning and implementation processes on issues of significant environmental and social concern. It has determined elements that may not be environmentally compliant and addressed them through the proposed mitigation measures as presented in this Report. After assessing the project impacts, the EIA Expert (s) are of the view that the negative impacts arising out of the proposed project development are manageable and therefore the Proponent should be allowed to proceed with this development as long as the proposed Environmental Management Plan is implemented and complies with all the relevant laws, by-laws and regulations governing the iron and steel industry.

CHAPTER ONE
1.0 INTRODUCTION
1.1 Project Proponent
ZTHY Investment Group Co., Ltd. is an enterprise in Shanghai, focusing on industrial investment domestically and abroad and is with a registered capital of 111 million CNY. The company has registered an iron and steel production and sales enterprise (Rongtai Steel Co., Ltd.) in Kenya with a registered capital of US $30 million to build a production line including steelmaking, continuous casting and continuous rolling. Relying on its good background in the South African steel market, the company aims to exert a wealth of experience in the metallurgical industry, and will provide Kenya with an annual output of 200,000 tons of steel, solving social employment of about 2000 people, to provide economic and social benefits.

1.2 Need of the Project and its Importance to the Country
Steel is a product of large and technologically complex industry having strong forward and backward linkages in terms of material flows and income generation. It is also one of the most important products of the modern world and of strategic importance to any industrial nation. From construction, industrial machinery to consumer products, steel finds its way into a wide variety of applications. It is also an industry with diverse technologies based on the nature and extent of raw materials used. Steel is the backbone of the economic activity of any country.

The per capita steel consumption is an internationally recognized indicator of the level of development of any country. Several initiatives mainly, affordable housing, development of domestic building industry, opening up of defence sector for private participation and the anticipated growth in the automobile sector are expected to create significant demand for steel in the country. Direct and indirect consumption of steel in Kenya is projected to increase as the country embarks on the development activities as envisioned in the Vision 2030. The Iron and Steel industry in Kenya forms about 13 percent of the manufacturing sector, which in turn contributes significantly to the GDP.

The proponent intends to fill the demand-supply gap by producing additional variety of Iron and steel products. The proposed project will have better process efficiency and pollution control having learnt from the existing operations over the years. Further, this project will create additional employment opportunities for the local community at both construction and operation phases. The project will also contribute directly and indirectly to the socio-economic development of the project area as well as nationally. It also contributes to government's agenda through promotion of manufacturing sector.

1.3 Project Location
The project site is located in Mavoko Municipality in Machakos county on **LR NO. 12648/193, GPS Coordinates** (1°30'00"S, 37°04'02"E), (1°29'59"S, 37°04'04"E), (1°30'12"S, 37°04'07"E), (1°30'13"S, 37°04'02"E) and a **Total Acreage of 14.3** acres. No forest land and prime agricultural land will be converted into industrial use for the proposed project.

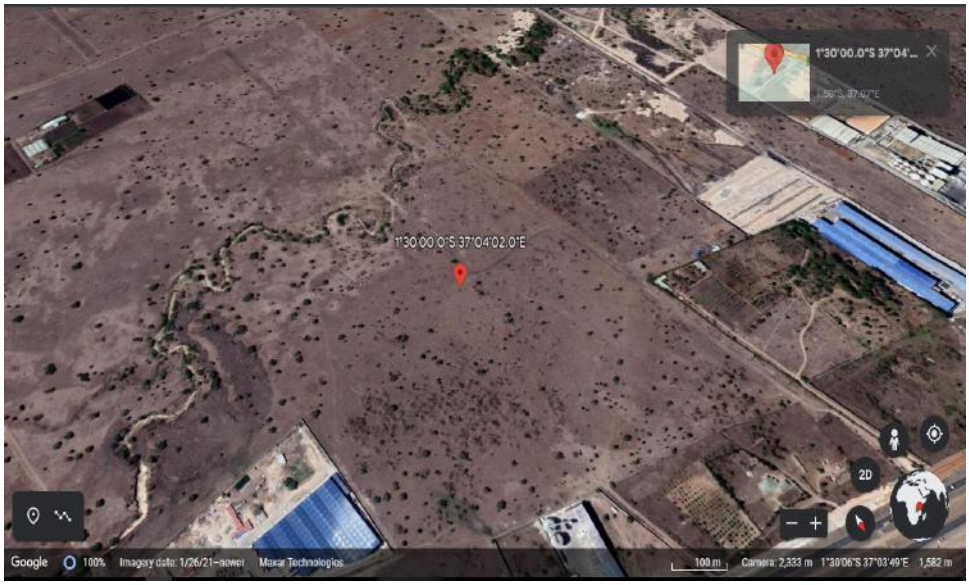


Figure 1: Google earth image of the project site

1.4 Scope of Work

EIA study involves basic components, viz. identification, prediction and evaluation of impacts along with mitigation measures and Environmental Management Plan (EMP). The Terms of Reference (ToR) for the EIA study were prepared and submitted to the National Environment Management Authority (NEMA) for approval. The ToR **(REF: NEMA/TOR/5/2/575)** was approved by NEMA as evidenced by a copy of the ToR approval letter from NEMA (attached in the Annexes). The scope of the EIA study included the following: -

- An intensive reconnaissance and preliminary collection of environmental information to plan field study.
- Field studies to collect preliminary information, particularly on the quality of the physical environment.
- Base line data generation and characterization of air, water, soil, noise and vegetation in the 10 km radius area (impact zone).
- Preparation of Environmental Monitoring Program and to evaluate the effectiveness of mitigation measures.
- Preparation of Environmental Management Plan suggesting suitable methods for mitigating and controlling the pollution levels.
- To suggest the formation of a core group responsible for implementation of environmental control and protective measures and monitoring of such implementation.
- To suggest feedback mechanism enabling to make mid-course corrections.

1.5 Applicable Environmental Regulatory Framework

The proposed project will abide and function under the purview of the following Acts, Rules & Regulations which are formulated by the govt. of Kenya to protect the environment and development in a sustainable way.

- The Constitution of Kenya 2010;
- National Environmental Action Plan (NEAP 2009-2013);
- The National Environment Policy (Sessional Paper 10, 2014);
- The Kenya Vision 2030;
- National Climate Change Response Strategy, 2010;
- The Environment Management and Coordination Act (EMCA), 1999 and Environment Management Coordination (Amendment) Act, 2015;

- Environmental Impact Assessment and Audit Regulations, 2003 and Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2016;
- Environmental Management and Coordination Act (Waste Management) Regulations, 2006;
- Environmental Management and Coordination Act (water quality) Regulation 2006;
- Environmental Management and Coordination Act (Noise and Excessive Vibrations Pollution Control) Regulations, 2009;
- Air Quality Regulation, 2014;
- The Factories Act, 1948;
- The County Government Act 2012;
- Occupational Safety and Health Act OSHA, 2007;
- Work Injury Benefits Act, 2007;
- The Public Health Act (Cap. 242);
- The Physical Planning Act (Cap. 286);
- Building Code By-Laws;
- National Construction Authority Act (No. 41 of 2011, 6 and 16);
- The Energy Act (Amendment) 2015;
- The Water Act (Act No.43 of 2016);
- The Penal Code;
- The Land Registration Act, 2012;
- The Land Act, 2012;
- The Climate Change Act, 2016;
- The Scrap Metal Act, 2015.

1.6 Rationale of the EIA Study

This Environmental Impact Assessment Report has been prepared following a request by the proponent, to the consultant, to develop an Environmental Impact Assessment Report and an Environmental Management Plan (EMP) for the proposed construction and installation of an iron and Steel Plant and other associated facilities. Environmental Impact Assessment (EIA) is a formal process used to predict how development or construction project will affect natural resources such as water, air, land, socioeconomic and biophysical resources. An EIA usually involves a sequence of steps: Screening to decide if a project requires assessment and to what level of detail; Scoping to ensure the EIA focuses on key issues and to determine, where more detailed information is needed; Description of existing environmental baseline conditions; Preliminary assessment to identify key impacts, their magnitude, significance, and importance; Evaluation of Alternatives to the project; and Implementing the main EIA study, which involves detailed investigations to predict impacts, assess their consequences, or both.

1.7 Need for EIA study

The metal products sub-sector, which falls under the manufacturing sector plays a vital role in the country's economy especially with the industrialization strategy, and just like other development activities, it has some adverse impacts to the environment. To ensure sustainable development, it is important to take into consideration the possible environmental impacts associated with this project to ensure a safe and healthy environment at all stages of the project operations. Environmental impact assessment (EIA) is one of the tools used by planners to achieve this goal.

1.8 EIA Scope and Methodology

This study has been carried out within the framework of the guidelines and procedures spelt out in the Environmental (Impact Assessment and Audit) Regulations 2003 and

Environmental Impact Assessment guidelines and Administrative procedures, and as a result of consultations with the project proponent. This was done in line with the requirements of Environmental Management and Coordination (Amendment) Act, 2015 and Environmental (Impact Assessment and Audit) Regulations 2003 among other legal and regulatory frameworks. The study covered the physical extent of the project site and its immediate environs. The study involved a sequence of steps: -

- Screening to decide if a project requires assessment and to what level of detail.
- Scoping to ensure the EIA focuses on key issues and to determine, where more detailed information is needed.
- Evaluate and assess the baseline information (physical, biological and socio-economic environment) within the project area of influence.
- Conduct inclusive and participatory public consultation, engagement and participation during the study.
- Ensure sustainable development and good environmental practice by ensuring that natural resources are used wisely in the project to ensure inter and intra generational equity. This will ensure ecologically sound and sustainable project.
- Identify, prevent, avoid or offset any negative impacts that may emanate from the project thus preventing losses or any disadvantages to any stakeholders.
- Identify potential environmental impacts, both direct and indirect.
- Categorize, measure and propose appropriate mitigation measures for identified adverse impacts of the project.
- Assess the compliance of the project with policy and legal frameworks as stipulated in EMCA 2009 amended in 2015 and any other relevant laws of the republic of Kenya.
- Develop a comprehensive Environmental Management and Monitoring Plan (EMP), indicating the key action items and plans that will be required in order to ensure compliance during construction and operation phases of the project.

1.9 Project Objectives

The objectives of the EIA study are as follows;

- To construct and install an iron and Steel Plant with water reticulation and power connection to mains and auxiliary structures.
- To meet the growing need of iron and Steel products in the County and Country at large.
- To create job opportunities to the society for both skilled and semi-skilled workers
- To increase availability and affordability of iron and steel products particularly for the construction industry.
- To Assist the National Environment Management Authority (NEMA), to decide on the implementation of the project.

1.10 Project Cost

Total estimated cost of the proposed project is **Kshs 319,727,001.55**.

CHAPTER TWO
2.0 PROJECT DESCRIPTION
2.1 Introduction
Besides concrete, steel is produced in greater quantity than any other man-made material today. Steel is dominant in the manufacturing sector as it is among the most widely used materials. It is also the most recycled, making sustainable growth in the steel industry desirable. The 10 major steel producing countries in the world are China, Japan, the USA, Russia, South Korea, Germany, Ukraine, Brazil, India and Italy.

The main sub-sectors of Kenya's metal industry are steel smelting and hot rolling and the manufacture of wire and wire products, galvanized and cold-rolled steel products and pipes. These subsectors are interrelated, as they depend upon each other for the supply of inputs.

The country has 20 steel mills, such as Mabati Rolling Mills, Kaluworks and Doshi, serving a Kenyan market of 1.6 million tons/year. These steel mills have a combined installed capacity of 340,000 tons of liquid steel, a finished production capacity of 555,000 and 245,000 tons of light long and flat products respectively. Demand for steel in the country was projected to rise from 1.6 million tons in 2014 to 7.1 million tons by 2020 and 8.4 million tons by 2030. Of the 1.2 million net imports in 2014, 704,000 tons were HRCs signifying a massive near-term investment opportunity in this area.

2.2 Overview of Project
Rongtai Iron and Steel Development Steel Company Limited, a subsidiary of Shanghai-based ZTHY Investment Group Company Limited, is a private limited company in Kenya with a registered capital of US $30 million. Drawing on its good track record in the South African steel market, the company aims to exert its wealth of experience in the Kenyan metallurgical industry.

The company anticipates building a production line with an annual output of 200,000 tons of steel, and will target both the local and export markets. Production will include processes such as steelmaking, continuous casting and continuous rolling. This is expected to accrue massive socio-economic benefits, among them providing direct and indirect employment to over 2000 people.

The main raw materials to be used in the production process will be scrap metal (sourced both locally and through importation), iron alloy, billets and refractory materials. The finished products will be steel metal bars (D8, D10, D12, D16, D20, D25 and D32), which will be delivered with straight strips in bundles. The scope of construction works will include:

1. Melting Plant Building;
2. Rolling Mill; and
3. Other auxiliary facilities, i.e.
    a. Furnaces,
    b. Water supply and drainage facilities,
    c. Ventilation and dust removal facilities'
    d. Inspection facilities, and
    e. Thermal facilities.
    f. ETP plant

2.2.1 Steel Production
The steel making workshop will adopt the short process production technique "Intermediate Frequency Furnace (I.F.F) - Billet Continuous Casting". According to the scope of production, 3 sets of 5-ton of I.F.F are selected, and the average amount of steel to be produced is 15 T/hr. Transformer capacity is 4,500 kVA for each set. (3 sets in total). This production line has the advantages of high production efficiency, low production cost, small spaces required, as well as economical investment cost. Molten steel

production will be about 180,000 tons per annum. The type of steel produced will be Carbon Structural Steel.

I.F.F Production Calculation

S/N	Item	Unit	Parameter
1	I.F.F Capacity	ton	5
2	I.F.F Average Production Capacity	ton	6-7
3	Sets of I.F.F	set	3
4	I.F.F number of Effective Days in a Year	day / year	≈300
5	I.F.F Smelting Cycle	min	55~65
6	Melting Time	min	55
7	Other Operating Time	min	15
8	I.F.F Batch per Day (MAX)	batch	65
9	I.F.F Molten Steel Capacity per Day (MAX)	ton / day	360
10	I.F.F Molten Steel Capacity per annum (MAX)	ton / year	90000

The process will require approximately 3600 tons of iron alloy per annum of different kinds, including silicon, manganese, chromium, nickel, vanadium, ferrotungsten, ferromolybdenum, titanium iron, etc. It will also need 5000 tons of refractory material per annum. The finished product will be straight bar strips in bundles with the following specifications: 9-12m bar length, 1500-3000kg bundle weight, and 5 section bar bundle way.

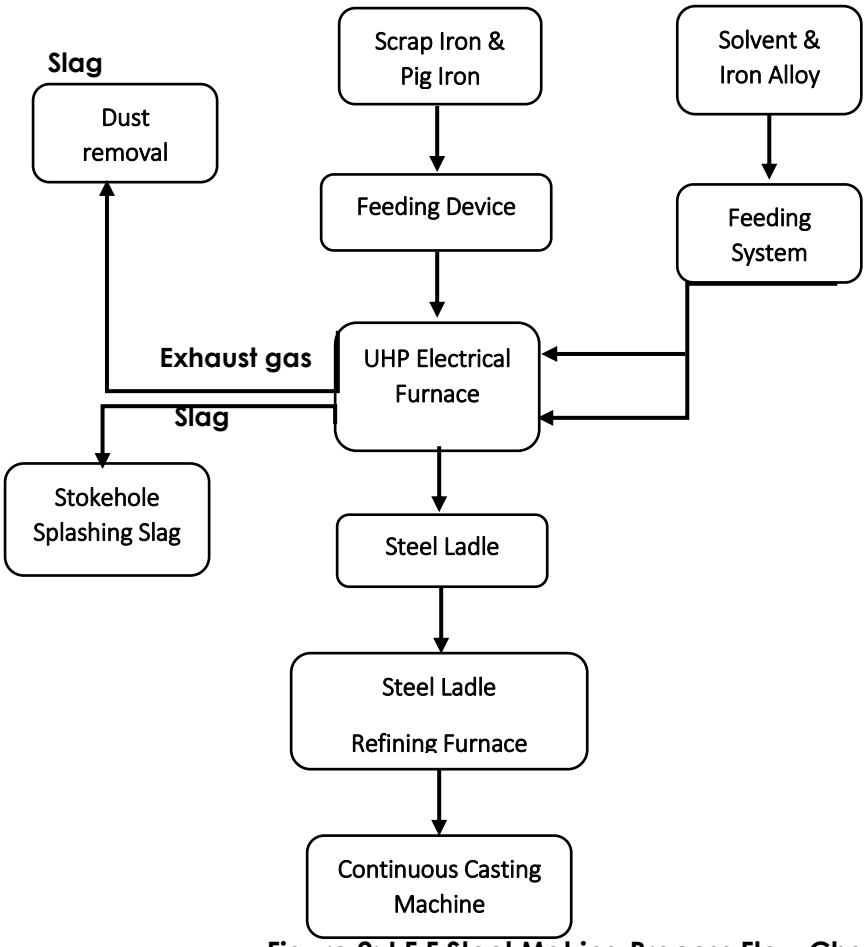


Figure 2: I.F.F Steel Making Process Flow Chart

2.2.2 Continuous Casting (C. Casting) Process

In this process, molten metal from an induction furnace is fed directly into a mold with the required shape. Since continuous casting operates as a true gravity fed bottom-flow casting method, the process minimizes the possible trapping of casual dirt and dross in the casting. Foreign matter in the furnace crucible floats to the top of the melt so it does not become part of the cast product.

Main Technical Parameters of Continuous Casting

S/N	Item	Unit	Parameter
1	Machine Type		Fully Arc Radius Rigid Dummy Bar
2	C.C.M Number of Strands	strand	2
3	C.C.M Radius Arc	meter	R 5.25
4	Billet Section Area	mm^2	100 x 100
5	Billet Length	meter	3-6
6	C.C.M Strand Spacing Gap	mm	1300
7	C.C.M Casting Speed	meter / min	0.5 - 3.2 (Billet: 120/150 mm^2)
8	Length of Crystallizer Mold	mm	≈ 900
9	Crystallizer Mold Oscillation Freq	cycle / min	50 - 320
10	Amplitude	mm	0 - ± 4
11	Dummy Bar Type		Rigid Type
12	Billet Cutting Type		Hydraulic Shearing
13	Billet Output System		Common Billet Table Roller, Chain Type Hydraulic Pusher, Concentrated Cooling Bed

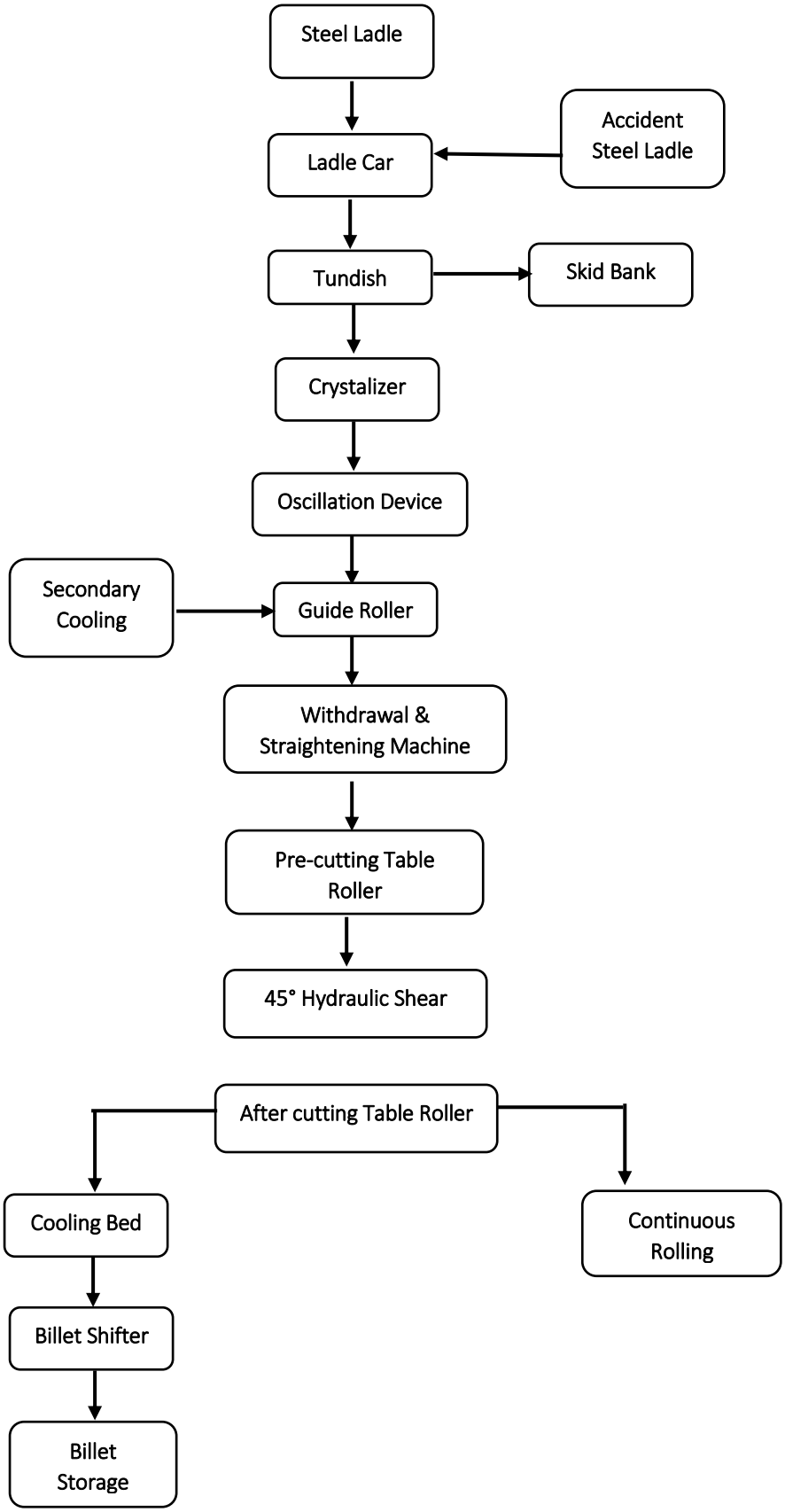


Figure 3: C.C.M Production Process Flow Chart

2.2.3 Roll Mill Process

The whole continuous rolling steel rolling workshop will be built, and it is designed to have the production capacity of 200,000 tons per annum for hot-rolled steel deformed rebar. The finishing speed of the bar is about 13 m/s; the three-roll roughing mills are with AC motor; intermediate mills & finishing mills are with DC motors; continuous casting direct to rolling will be applied.

The whole rolling line adopts continuous twist rolling, and roughing mills and intermediate mills is separated by a set of long table rollers, which realizes off head rolling of rolled pieces between units. The advantages of this arrangement are reducing the cost of roughing transmission part and improving the mill in the rolling speed.

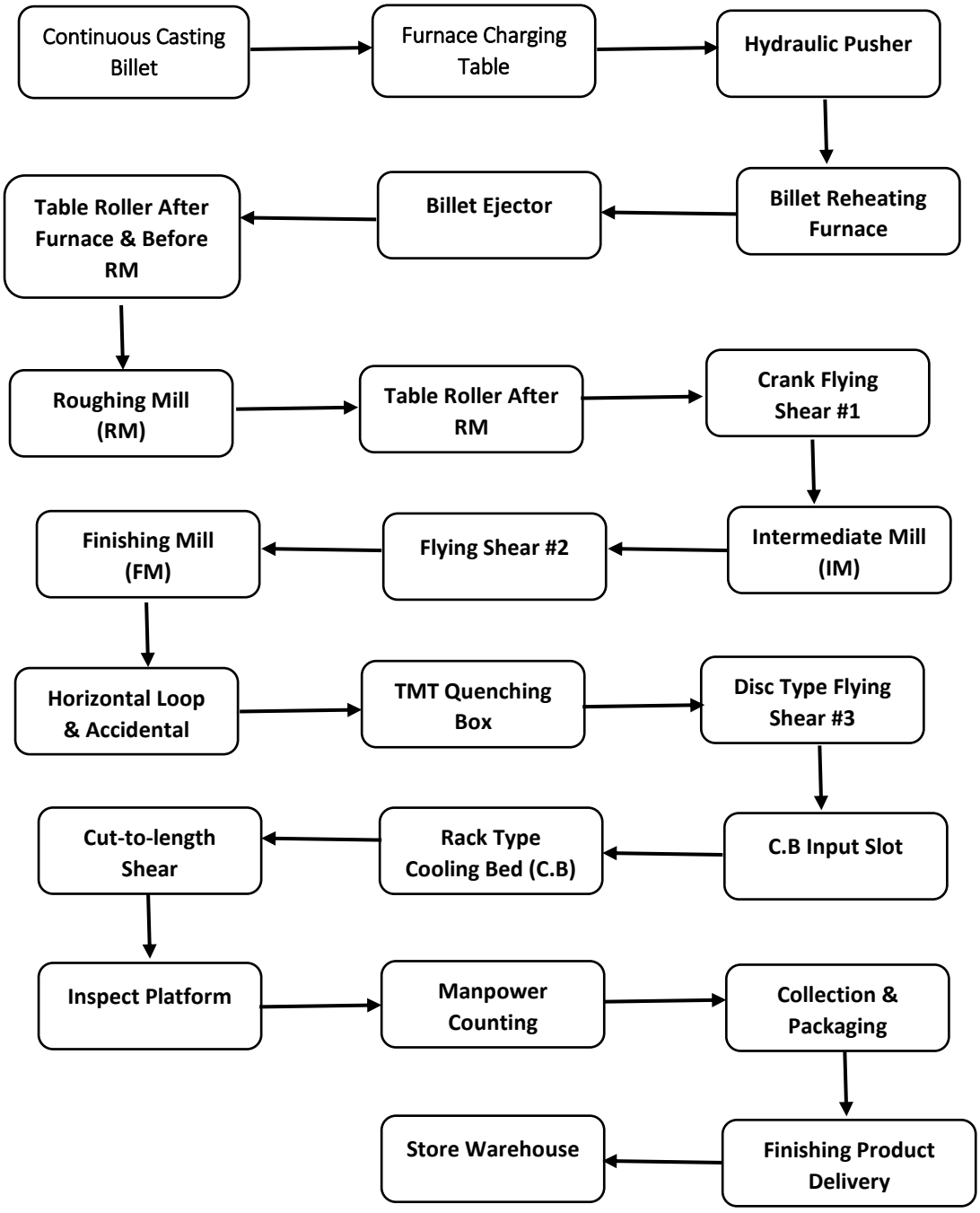


Figure 4: Rolling Process Flow Chart

2.2.4 Working Principle of induction furnace

The principle of induction heating is based on two basic laws of electricity: - One is Faraday's law of electromagnetic induction. The magnitude of the induced electromotive force in a circuit is proportional to the rate of change of the magnetic flux passing through the circuit.

2.2.4.1 Features of Induction Furnace

- Heating method: - According to the design of the induction furnace process flow diagram, the metal charge generates eddy current under the action of the induction magnetic field, and realizes heating, melting, and refining (without direct heating) by resistance heat. The temperature is easy to control, the element volatilization and oxidation loss are small, and the alloy recovery rate is high.
- Slagging conditions: - The slag is melted by the heat of molten metal. The temperature of slag is lower than that of molten steel. It belongs to cold slag, and its fluidity and reaction ability are worse than those of electric arc furnace slag.
- Stirring conditions of molten metal: - Rely on electromagnetic stirring to make the molten steel temperature and composition uniform, with good degassing (N2) ability.
- Metallurgical function: - In general, the raw material conditions are harsh and don't have the function of removing C and P.

2.3 Project Cost

Total estimated cost of the proposed project is **Kshs 319,727,001.55**.

2.4 Manpower Requirement

The manpower requirement in accordance with the targeted production of plant operation has been estimated on the following consideration.

- The estimated production and productivity level which is achievable in various sections of the plant with the proposed plant and machineries.
- The total number of personnel required to perform various duties associated with the different processing steps leading to production of iron and steel products.
- The estimated workforce will be **300.**

2.5 Project Activities

The activities to be carried out during each phase of the project are described below.

2.5.1 Planning / Pre-Construction Phase

Most activities at the planning stage have been undertaken and others are ongoing. It entails project acquisition of land, developing designs for the infrastructure, and seeking approvals from relevant authorities including NEMA. This is also a very a critical phase to involve all the stakeholders including surrounding industries and persons and an opportunity to establish whether land related conflicts exist. In the case of the proposed project, there is no land ownership or property disputes and the proponent has genuine title deed and relevant land permit documents i.e. change of land use document. During this phase, proponent will also mobilize construction machinery, seek out various contractors and required utilities, erect temporary material storage structures and avail all other construction materials in readiness for the next phase of the project. All these activities shall be guided by best 21 practices in environmental protection and safety protocols provided by national environmental and safety legislations.

2.5.2 Construction Phase

The construction activities will include: -

- Excavation – foundation, machine pits excavated to manufacturer's specification, electric cable trenches, drainage for water cooling and waste water, service tanks.
- Concrete foundation for stands, motors and machineries & Concrete Flooring
- Power station to provide power output of the needed capacity
- Furnace Oil, Gear Oil and water connections (plumbing works)
- Installation of loading cranes
- Mechanical works during plant assembly

2.5.3 Final Inspection and occupation

Final inspection will be undertaken to ensure that the project has been done properly and according to the terms of the contract. The inspection team will normally include the project proponent/client, the architect, the engineer and the contractor or their representatives and the County inspection team. The inspection will normally begin at the bottom of the construction to the top and look at and inspect every detail of construction, functioning of mechanical and electrical installations etc. The inspection team shall prepare a punch list indicating the items that need to be corrected. The list will be given to the contractor for necessary action within a specified period. If no new defects are noted, the job will officially be completed. A plant inspection report and certificate of occupation will subsequently be issued. In issuing the certificate of occupation, the inspection will take into account health and safety considerations of intended occupants. Upon certification of the building for occupation, and upon receipt and consideration of necessary legal and other relevant documentation from the contractor, the project proponent will file a formal 'Notice of Completion'. The project will then be handed over to the proponent

2.5.4 Operational Phase

The operational phase will include iron and steel manufacturing and will mainly involve heating, slitting and rolling of iron and steel.

2.5.5 Decommissioning Phase

The activity at this phase would be bringing to a cease all activities and related operations. It may entail removal of stored products to pave way for its rehabilitation. Demolition of activities may result in debris, left over raw materials and waste products from the activities.

2.6: Key design Parameters

1. Project infrastructure has a design life in excess of 50 years.
2. The trenches and pits shall be excavated using conventional methods. Any method which is not in accordance with normally accepted practice must receive prior approval of the Machakos county council. Excavation shall be made to line and grade shown on the approved plans. Electric power will be supplied by Kenya Power and Lightning Company;
3. The plant's design will follow all laid down procedures as per the manufactures instruction to ensure optimal performance and production efficiency. The assembly of machines will be carried out by qualified and certified personnel.
4. The Heavy Fuel Oil Tank will be stored in Furnace Oil Storage Tanks.
5. Best Available Technology (BAT) will be used - the Project will be designed so that all emissions and discharges meet applicable environmental standards. Water cooling system will be designed with a zero liquid discharge concept while integrating periodic water treatment to avoid contamination of air. Air pollution control will involve fitting stacks with wet scrubbers.

6. The Project, and construction activities will be designed in line with the environmental mitigation measures defined in this report.
7. The plant will be assembled and operated within a well-designed and secured area and operations has be carried out as per the manufacturer's instructions and directives.

2.7 The Effluent Treatment Plant

An Effluent Treatment Plants or (ETPs) is a plant in which the treatment of industrial effluents is done. It used by industries to purify water and remove any toxic and nontoxic materials or chemicals from it. These plants are used by industries for the purpose of environmental protection. Industrial waste water treatment is one of the most important components of the ETP, because of the fact that it helps to check the water pollution and helps in purifying it by getting rid of all the harmful chemicals, if any.

Iron and steel industry discharges huge amount of effluent from different sections. It is critical that wastewater treatment technologies advance dramatically in order to reduce fresh water usage and move towards zero effluent discharge. The ETP process steps will include: -

- Screening: - Screening is the first unit operation in ETP plant. The screen is a perforated device that is used to retain the coarser materials found in wastewater. When the solid materials come in contact with the screen they stack and are removed either manually or mechanically.
- Flow Equalization: - Flow equalization is a system which is used to reduce the operational problems created by flow variations, to accelerate the downstream process. In case of any process failure in the treatment process, it is also used as an emergency tank to equalize the effluent. It ensures the constant or nearly constant flow rate of the effluent.
- Coagulation: - It takes place in rapid mix basins which is very rapid. The key function of the rapid mix basin is to disperse the coagulant so that it contacts all of the effluents.
- Flocculation: - It is done to form aggregates from the finely divided matter. The flocculation of effluent is done in two ways. One is mechanical and another is agitation. In both mechanical and air agitation systems, it is common practice to taper the energy input so that the aggregates initially formed will not be broken as they leave the flocculation facilities.
- Neutralization: - Generally, industrial wastewater contains acidic or alkaline components which should be neutralized before discharge or treatment. Especially sulphuric acid, lime, etc. are used to neutralize the wastewater.
- Primary Clarifier: - The primary clarification is a physical treatment process. In this process, solids are removed before the biological process. After the basic screening, it is the most cost-effective way to remove these solids. When the process water enters the clarifier tank, floatable solids are removed from the surface by skimmers while settleable solids are collected at the bottom by a rack and are removed via a sludge removal system.
- Biological Treatment: - There are many biological processes that are used for wastewater treatment. The processes can be divided into five major groups: aerobic process, anoxic process, anaerobic process, combined aerobic anoxic and anaerobic process.

The proponent is to setup an ETP that will be able to receive effluent from the various section of the plant. The proposed sample of the ETP plant to be set by the proponent is attached in the annex and before its setup the proponent is required to carry out an EIA.

2.8 Project Material and Products

2.8.1 Project Material and Inputs

The raw material that will be used in the production of the products will be billets and scrap metals. The billets and scrap metals to be used will be sourced locally and imported.

2.8.2 Inputs

Industrial Diesel and furnace oil, electricity, water, oils and lubricants will be the necessary process inputs. IDO will be the fuel used for hot rolling in the rolling mill; furnace oil will be used for heating the furnace, electricity will power the entire plant, water will be a coolant for the plant, oils and lubricants will lubricate the plant and equipment. In summary, the main material input in the project include –

- The Complete plant components
- oil storage tanks
- Water tanks
- Generator
- Masonry stone
- Sand
- Cement
- Crushed stone
- Gravel
- Soil
- Timber
- Steel (reinforcement, casement, wiring, pipe etc)
- Glass
- PVC material (tiles pipes, conduits and fittings)
- Concrete tiles and paving blocks
- Paint
- Plant material – grass, tree seedlings etc.
- Water

2.8.3 Project Products

The main products that will be generated from iron and steel processing will be iron and steel product. Other products from the project are –

- A fully equipped iron and Steel processing plant
- Administration block
- Security office
- Parking lot
- Septic tank and soak pit
- Washrooms
- Paved driveway, walkway and car parking spaces
- ETP
- Landscaped site planted with grass, shrubs and tree cover
- Increase surface water runoff
- Increased foul water discharge
- Increased solid waste generation
- Increased resident population
- Increased traffic (motor vehicle and pedestrian)

CHAPTER THREE:

3.0 ENVIRONMENTAL AND SOCIO-ECONOMIC BASELINE CONDITIONS

3.1 Introduction

Collection of base line data is an integral aspect of the preparation of environmental impact assessment report. The baseline environmental qualities of various environmental components like air, noise, water, land, flora and fauna and socio-economic form an important and integral part of any environmental study. The baseline data forms the basis for predicting/assessing the environmental impacts of the proposed expansion project. The baseline environmental quality is assessed through field surveys within the impact zone for various components of the environment. The scoping and the extent of data generation were formulated based on interdisciplinary team discussions, and professional judgment keeping in view of the approved TOR by NEMA.

3.2 General Location

The proposed project is situated in Lukenya Location, Mavoko Sub-county in Machakos County. Machakos County borders Nairobi and Kiambu Counties to the West, Embu to the North, Kitui to the East, Makueni to the South, Kajiado to the South West, and Muranga and Kirinyaga to the North West.

3.3 Physical Environment

3.3.1 Climate and Meteorology

Generally, the annual rainfall of the County is unevenly distributed and unreliable. The average rainfall is between 500 mm and 1300 mm. The short rains are expected in October and December while the long rains are expected in March to May. The highland areas within the County such as Mua, Iveti and Kangundo receive an average of 1000mm while the lowland areas receive about 500mm; ideally the rainfall within the County is influence by the latitude. In terms of temperature, July is the coldest month while October and March are the warmest. Temperature varies between 18˚C and 29˚C throughout the year. Since the County does not experience rain throughout the year it then means that there are moths that experience dry spells. These months are mainly February to March and August to September.

3.3.2 Winds

The wind near the ground is very predominantly easterly throughout the year, generally between north-east and east from October to April, and between east and south-east from May to September. The strongest winds occur during the dry season just prior to the "Long Rains" when speeds of 20 to 25 mph are common from mid-morning to early afternoon; at other times of the year winds speeds are usually 10 to 15 mph. During the night the wind is usually light. In the squalls sometimes associated with thunderstorms, short-lived of up to 70 mph have been known to occur.

3.3.3 Physiographic and Natural Conditions

Machakos County has very unique physical and topographical features. Hills and a small plateau rising to 1800-2100m above sea level constitute the Central part of the County. To the West, the County has a large plateau elevated to about 1700m which is Southeast Machakos County Integrated Development Plan, 2015 6 sloping. The County rises from 790 to 1594 m above sea level. In the North West the County has stand-alone hills. The soils are well drained shallow, dark red clay soils particularly in the plains. However, the vegetation across the entire County depends on the altitude of any given area/location. The rainfall distribution in the County depends on the topography of the areas. Since some areas of the County are arid while others have hills and volcanic soils and other areas are plains, the rainfall is widely distributed. For instance, the plains receive less amounts of rainfall as such the dominate vegetation is grasslands and some sparse acacia trees. The areas

within the County are predominately plains include Mutituni, Mwala, Mua, Iveti Hills and Kathiani.

3.4 Ecological Environment

3.4.1 Flora

The forests cover an area of 477.617Km^2 which is 7.6 per cent of the County's total land. The forests are categorized as gazette and un-gazette. The gazette forest covers 606.97 ha while the un-gazette cover 1774 ha. These forests are distributed in various parts of the County. The project location has very few tree species along the stream.

Photo Plate 1:Sample Vegetation in the Project Area

Promotion of Agro-forestry and Green Economy for:
a) Income Generating Activities including farm forestry. Income generating activities in the County in this sector include planting of trees such as eucalyptus, cypress, grevillea and pine for commercial purposes. Other activities include establishment of tree nurseries for seedlings. Fruit trees are also grown and include mangoes, pawpaws, avocadoes, guavas and oranges for both income generation and consumption. This is particularly common in the agricultural areas such as Mwala, Masii, Yatta and Kathiani.

b) Protection of water catchments areas. The main water catchment areas in the County are Iveti hills, Muumandu, Kalimanzalu and Kiima Kimwe. To protect these areas, planting of indigenous trees has been undertaken in the identified water catchment sites. The County has also set aside funds to promote the planting of trees as such a tree planting campaign will be launched in the course of the 1st financial year.

c) Prevention of soil erosions. The hilly areas of the County such as Iveti, Kathiani and Muumandu are prone to soil erosion due to the nature of the landscape. Prior to the coming into force of the County government, the national government through the ministry of Agriculture trained farmers on contour farming and terracing of farm lands to cub soil erosion. Sensitization was also carried to encourage farmers to plant 10 per cent tree cover on their land with fruit trees, fodder trees or any other plantation. The County has also seen the need for the prevention of soil erosion as such the department responsible for agriculture will spear head the prevention of soil erosion under the budgetary provisions.

d) Provision of wood fuel and generation of energy for industries. According to the Kenya Integrated Household Budget Survey Population 81.6 per cent of households use fuel

wood for cooking while 1.2 per cent use the same for lighting. The demand for wood fuel is therefore increasing especially with the frequent increase in fuel and gas prices. To meet this demand, trees have been planted in small portions for provision of wood for home consumption and charcoal burning. The County department in charge of energy and natural resources has prioritized the search for alternative sources of fuel so as to reduce the reliance on wood fuel across the county.

e) Growing of fruit trees for improved nutrition. The proximity of the County to Nairobi and JKIA has stimulated the growing of fruit trees in the County. Grafted fruit trees that produce grapes, straw berry, mangoes, and oranges have been planted. The County produces enough fruits for domestic use and surplus for export to Nairobi. Fruit farming is practiced in all the constituencies in the County expect Mavoko Constituency/Sub County.

3.4.2 Fauna

Urban farming contributes to most of the faunal species in residential areas of Machakos in terms of animals reared as livestock. Some of the animals reared in Machakos include poultry, goats, sheep, cattle, pigs and rabbits (Lee Smith et al, 1994). Most of the faunal species noted from the scoping survey were mainly as a result of urban farming and they included goats, chicken and cattle. According to the 2009 Kenya Population and Housing Census, the number of animals bred in the County was 230,891. These include: 126,608 Sheep, and 629,974 Goats. In addition, there are 862,592 indigenous Poultry, 4,026 Pigs, 21,336 Donkeys, 46,370 beehives and 20 Camels. There is growth in this sub-sector because of various government programmes to develop this sector and the ready market by the Kenya Meat Commission in Athi River. In addition, there are two livestock markets found in Masii and Masinga where farmers can sell their livestock. The County has made provisions within the budget to avail day old chicks to farmers. The department responsible for agriculture has given this priority.

3.5 Socio- Economic Environment

Population and Demography

According to the 2019 Kenya Population and Housing census the total population for Lukenya Location was 81,302. The population is low basically because most of the lands are un-occupied as it is gazetted for light industries.

Land Use

Land has aesthetic, cultural and traditional values and is a vital factor of production in the economy. Land in the County is broadly used for Forest, Government Reserve, Townships, Game Reserves, Agriculture, Ranches, Industrialization, mining and livestock keeping. The absence of the national land use policy has led to the proliferation of informal settlement, inadequate infrastructure services, congestion environmental degradation, unplanned urban centres, pressure on agricultural land and conflicts. The land was an immigration area for animals and also cattle grazing area then changed to light industries.

3.6 Infrastructure and Services

Roads and Accessibility

The transport and communication network in the project area is excellent. The project is off the Nairobi-Mombasa road, which is a national highway. The road leading directly into the site will be connected to this highway. The proponent will liaise with the relevant agency (Kenya National Highways Authority – KeNHA) for connection of the access roads to this national highway.

Water Supply

The main water resource is tap water, which is supplied by the Machakos County supply networks. This will form the main source of water both during construction as well as during

operation. However, it is important to put into consideration the prevalent water shortage in the country. The proponent has proposed to drill boreholes to supplement the public water supply and avoid increasing pressure on the already strained water supply by the county. In case of any shortage, water may be brought to the site using water bowsers. To take care of any shortages during occupation, the proponent will be expected to install water underground reservoirs as well as storage tanks on the upper floors of the buildings. This is well articulated in the architectural drawings.

Sewer System
The proposed project area will be served with a septic tank. Other wastewater generated from the plant will be channeled to the ETP. The proponent will install a waste treatment plant to take care of effluent from the estate through pre-treatment and recycling/reuse of some of the waste water. This will be properly articulated in the operation phase of the proposed project by embracing wastewater treatment and recycling technology.

Surface Drainage
Most of the rainwater will mainly be absorbed into the soil during construction phase. Appropriate drainage systems have been provided for in the designs and will be put in place to handle the run-off/storm water from the site during operation of the project.

Waste Management
The project proponent and the contractor will develop modalities to ensure safe disposal of the generated solid waste. The adoption of integrated Solid Waste Management System will be encouraged during construction and operation phases. In addition, the project's contractor and the proponent will work closely with NEMA for the guidance on the modes and site of the waste disposal. Wastes generated from excavation may be used in back filling of quarry pits. During the operational phase, all wastes will be collected from the site by a licensed contracted waste handler for disposal in the approved dumpsite.

Energy
Construction machinery will require fuel during construction. This will be sourced from legitimate petroleum dealers. Electrical power will come in handy in driving the selected construction machinery. It will also be needed on operation of the completed project. The power (electricity) will be drawn from the power grid lines running at the frontage of the project site. Standby generators and/ or clean energy (solar) will be required to cater for periods when there are supply interruptions.

Communication
The area is well covered by communication facilities by the main telephone service providers including a Telkom, Safaricom, and Airtel among others. All these will facilitate communication during the implementation and on occupation of the project.

Security
There will be a single gate to the site. This will be manned 24 hours by qualified security personnel. The proposed project site will have a masonry perimeter wall served by a single gate. The proponent should also install security lights to beef up security at the site both during construction and the operational phase of the project.

Site Photos

Ditch dug by investor occupying neighboring parcel of land. The ditch passes through part of the project site

The general vegetation of the area comprising grass, shrubs and xerophytic trees

The dried-up channel of the Mulei Kakenyi stream, a seasonal stream passing through a section of the land

Old 'bridge' used to cross a section of the Mulei Kakenyi stream

Poles used to demarcate the boundaries between the project site and neighboring parcels of land

Light industries in the vicinity of the project site

Stakeholder engagement session held on 02.06.2023 between the EIA/EA team and representatives of the local community

CHAPTER FOUR
4.0 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter outlines the policy, legal, regulatory and institutional framework in Kenya particularly for environmental management, protection and assessment applicable to the proposed Project.

Environmental Impact Assessment is a legal tool for ensuring new projects and programmes incorporate appropriate measures to mitigate adverse impacts to the environment and peoples' health and safety as well as enhancing sustainable operations with respect to environmental resources and co-existence with other socio-economic activities in their neighborhood. Necessary policies and legislation that ensure annual environmental audits (EA) are carried out on every running project, activity or programme and a report submitted to National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates.

4.1 National Policies and Regulations

In Kenya there are various sector specific legal instruments that cover environmental and social issues such as public health; soil erosion; protected areas; endangered species; water rights and water quality; air quality, noise and vibration; cultural, historical, scientific and archaeological sites; land use; resettlement; etc.

The main piece of legislation governing environmental management in Kenya is the Environmental Management and Co-ordination Act (EMCA) of 1999, Amended 2015. The main objective of this Act is to provide for the establishment of an appropriate legal and institutional framework for the management of the environment in Kenya. EMCA provided for the establishment of a National Environment Management Authority (NEMA), which became operational in July 2002. NEMA has the statutory mandate to coordinate all environmental activities.

The EMCA has given rise to various regulations that govern Environmental Impact Assessment and Audit and regulations governing Water Quality, Air Quality, Noise and Excessive Vibrations, Waste Management and Conservation of Biological Diversity.

4.2 National Policies

Table 1: The National Policies relevant to the Proposed Project

National Policy	Community development
The National Environment policy, 2013	• The National Environment Policy aims to provide a holistic framework to guide environmental and natural resource management in Kenya. • It also ensures that the link between the environment and poverty reduction is integrated into all government processes and institutions in order to facilitate and realize sustainable development at all levels in the context of a green economy, enhancing social inclusion, improving human welfare, creating employment opportunities and maintaining a healthy functioning of the ecosystem.

The Kenya Health Policy 2012 – 2030	• The policy is based on the Constitution of Kenya 2010, Vision 2030 and global health commitments. • Its broad aim is to ensure equity, people-centeredness and participation, efficiency, multi-sectoral approach and social accountability in delivery of healthcare services. • It sets out the goal, objectives, guiding principles and policy directions aimed at achieving Kenya's health agenda and a comprehensive implementation framework. Also included is the institutional management plan under the evolved system of government taking into account the varied roles of the national and county levels of Government. • The policy also sets out a monitoring and evaluation framework to track progress in achieving the policy objectives.
The National Environmental Sanitation and Hygiene Policy, 2007	• The Environmental Sanitation and Hygiene (ESH) Policy is intended to improve people's health and quality of life. Strategic interventions have been developed to determine the success of the policy implementation. • One of the key purposes of this policy is to clarify the various roles in order to enhance the existing legal and constitutional framework and to encourage the private sector, civil society and community participation in the planning, implementation and ownership of ESH services. • Sanitation and the Environment: One of the key objectives of the policy is to protect the environment from pollution and its negative effect on human health. The government will seek to minimize negative impacts arising from various types of sanitation systems, and maximize positive effects. • Well-functioning sanitation and hygiene systems are a means of protecting the environment. • The health risks associated with poor ESH increase poverty.
National Policy on Water Resources Management and Development (Seasonal Paper No.1 of 1999).	• Recognizes the need to avoid the pollution of water resources and thus proposes development of strict stream effluent discharge standards for controlling the discharge of wastes into water bodies. Also recognizes the need to make water abstraction and disposal permits dynamic and economic instruments for water pollution control • Proposes a process of water quality monitoring of all water bodies and pollution control inspection of potential polluting sources. Proposes that all factories and other waste water generating concerns be required to incorporate in their designs waste water treatment devices

Land Policy (Sessional Paper No. 3 of 2009).	• Envisions the efficient, sustainable and equitable use of land for prosperity and posterity • Seeks to secure rights over land and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. • Seeks to offer a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide inter alia, economically viable, socially equitable and environmentally sustainable allocation and use of land, efficient and effective utilization of land and land-based resources. • Commits the government to restoration of the environmental integrity of land and facilitation of the sustainable management of land-based resources. • Government shall develop a comprehensive and integrated land use policy having regard to fragile areas and the needs of neighboring communities and individuals in such areas • Government shall ensure that environmental impact assessments and audits are carried out on all proposed projects, programmes and activities on land that have a likelihood to degrade the environment.
The Kenya National Biodiversity Strategy and Action Plan, 2000	• The overall objective of the NBSAP is to address the national and international undertakings elaborated in Article 6 of the Convention on Biological Diversity' (CBD). It is a national framework of action for the implementation of the Convention to ensure that the present rate of biodiversity loss is reversed, and that present levels of biological resources are maintained at sustainable levels for Posterity.

4.3 National Legislation

The following legislative provisions and regulations are considered key to management of the environmental, health and safety aspects related to the proposed development.

Table 2: Legal and regulatory framework applicable to the project

	Legislation /Regulation/ Standard Provisions		**Relevance to the Project/ License or Permit Required/ or Activity requiring regulation**
1	The Constitution of Kenya (2010)	• The Constitution has enhanced protection and enforcement of fundamental rights amongst other gains. It provides for a two-tier structure of government, i.e. the National and the County Governments. It distributes the functions and powers between the two levels as detailed in the Fourth Schedule. • In relation to the County Governments, Part 2 of the Fourth Schedule provides that they shall be responsible for county planning and development including setup of industrial areas.	• The project shall be implemented in consultation with both the national government and the county government including the relevant authorities;
2	Environmental Management and Coordination Act 1999, Amended 2015	• Provides for protection and conservation of the environment, environmental impact assessment, and	• Project has initiated this EIA in compliance with regulations

		environmental auditing and monitoring. • Provides that all reasonable measures shall be taken to mitigate any undesirable effects not contemplated in the EIA and an environmental audit report on those measures be prepared and submitted to NEMA	
3	Environmental (Impact Assessment and Audit) Regulations, 2003, Amended 2019	• Provides for the procedure for carrying out the Environmental Impact Assessment (EIA). Provides for the contents of an EIA Study Report.	• The EIA to be carried out in accordance to the regulations.
4	Environmental Management and Co-ordination (Water Quality) Regulations 2006	• Provides for the protection of ground and surface water resources. Provides for the parameters in the quality of wastewater discharged from any facility/activity into the environment or sewer.	• Any discharges to the surface water courses during operation phases to be monitored for conformance with the standards
5	Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution) (Control) Regulations 2009.	• Prohibits the generation of unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. • Provides for the maximum noise levels permissible in various environmental set ups such as	• Sound level limits of 60dB (day) and 35dB(night) to be observed during operations • License to emit noise/vibrations in excess of permissible levels to be acquired if necessary

		residential areas, places of worship, commercial areas and mixed residential. • Provides that where a sound source creates or is likely to emit noise or excessive vibrations, or otherwise fail to comply with the provisions of these Regulations, a license is required	
6	Environmental Management and Co-ordination (Waste Management) Regulations 2006	• Provides for standards for handling, transportation and disposal of various types of wastes including hazardous wastes. • Requirements to ensure waste minimization or cleaner production, waste segregation, recycling or composting. • Provides for licensing of vehicle transporting waste. • Provides for the licensing of waste disposal facilities.	• Disposal of generated waste from operations under the Project; • Proper disposal of generated hazardous wastes such as used oil and oily parts from servicing of equipment and vehicles
7	Environmental Management and Co-ordination (Fossil Fuel)	• Provides for emission standards for internal combustion engines.	• Use of diesel-powered generators and compressors in operations

8	Environmental Management and Coordination (Air Quality) Regulations, 2014	• Provides for ambient air quality tolerance limits. • Prohibits air pollution in a manner that exceed specified levels. • Provides for installation of air pollution control systems where pollutants emitted exceed specified limits. • Provides for the control of fugitive emissions within property boundary. • Provides for the control of vehicular emissions. • Provides for prevention of dispersion of visible particulate matter or dust from any material being transported. • Provides for acquisition of an emission license.	• Exhaust/stack emissions from equipment at the company and vehicles in use by staff
9	The Public Health Act (Cap 242)	• Provides for the prevention of the occurrence of nuisance or conditions dangerous/injurious to humans	• Generation of wastes from operations under the company • Handling, storage and disposal of waste at the company

10	Occupational Safety and Health Act (OSHA), 2007	• Provides that every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace • Provides that before any person occupies or uses any premises as a workplace, he shall apply for the registration of the premises • Provides that workplace shall be of sufficient size for work to be carried out with ease and shall further have the necessary free space and, having regard to the nature of the work, an adequate amount of air for each employee, the minimum permissible being ten cubic meters per person • Provides that an occupier shall ensure that effective and suitable provision is made for securing and maintaining, by the circulation of fresh air in each workroom, the adequate ventilation of the room • Provides that an occupier shall ensure that effective provision is made for securing and maintaining sufficient and suitable lighting, whether natural or artificial, in every part of his workplace in which persons are working or passing	• Site registration as a workplace • Safety measures are required in use of tools and machinery on sites • Protection of the workers and general public with any form of interaction with the sites is necessary

		• Provides that sufficient and suitable sanitary conveniences for the persons employed in the workplace shall be provided, maintained and kept clean, and effective provision shall be made for lighting the conveniences; and, where persons of both sexes are or are intended to be employed (except in the case of workplaces where the only persons employed are members of the same family dwelling there), such conveniences shall afford proper separate accommodation for persons of each sex • Provides that all plant, machinery and equipment whether fixed or mobile for use either at the workplace or as a workplace, shall only be used for work which they are designed for and be operated by a competent person	

11	The Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005	• Rules provide for the maximum noise exposure levels for workers in places of work and for the provision of protective equipment for those exposed to high noise levels. • Provides that an occupier shall also institute noise reduction Measures at the source of noise in the workplace.	• Noise emitted during the operation of the emergency diesel generator require provision of PPE to workers and minimization of noise exposure to the public
12	The Factories and Other Places of Work (Fire Risk Reduction) Rules, 2007	• These rules apply to every workplace, process and operations to which the provisions of the Act apply	• The project may be involved with handling of fire
13	Water Act 2016	• Provides that a permit shall be required for any use of water from a water resource, especially where there is abstraction and use of water with the employment of works.	• Use of water abstracted from the natural spring requires an abstraction permit.
14	Water Resource Management Rules 2007	• Provides for application by all those intending to abstract ground water. • Provides that where any borehole or well is intended to be equipped with a motorized pump the application shall be accompanied by a hydrogeological assessment report.	• Depending on the proposed source of water for construction activities, permits may be required

15	The Energy (Energy Management) Regulations 2012	• Provides for the development of an energy management policy with inter alia, commitment to improve energy efficiency and conservation, and commitment to provide resources necessary to achieve energy efficiency and conservation. • Provides for maintenance of energy consumption records.	• Development and implementation of an Energy Management Policy by organization. • Energy audits should also be carried out on the facilities to identify opportunities for improving efficiency
16	Land Registration Act, 2012 (Act No. 3 of 2012)	• Provides for the registration of titles to land, to give effect to the principles and objects of devolved government in land registration.	• The proposed project site is registered and has a title deed.
17	The Physical and Land Use Planning Act, 2019	• Provides for zoning of areas for the setup of the project and necessary infrastructure.	• The Proposed Project has been approved by the County's Physical Planning Department.
18	Land Act, 2012 (Act No. 6 of 2012)	• Provide for the sustainable administration and management of land and land-based resources, and for connected purposes. The Act also provides for the repeal of the Way leaves Act (Cap. 292) and the Land Acquisition Act (Cap. 295).	• The proposed project site is registered and has a title deed.

19	National Construction Authority Act. (Cap.449A) National Construction Authority Regulations, 2014	• Regulates construction activities and registration of contractors in Kenya.	• The Project shall seek development approval from the Machakos County government and engage approved contractor during construction phase
20	The Standards Act, Chapter 496	• Provides for establishment of minimum quality specifications, mode, materials and apparatus used in the country	• The Project shall comply with this act in measurement.
21	The Traffic Act, Cap 403	• Relating to traffic on all public roads. Key provisions include registration and licensing of vehicles; driving licenses; driving and other offences relating to the use of vehicles on roads; regulation of traffic; accidents; offences by drivers other than motor vehicles and other road users. It prohibits encroachment on and damage to roads including land reserved for roads	• Many types of equipment and materials shall be transported through the roads to the proposed site. Their registration and licensing will be required to follow the stipulated road regulations.
22	Public Roads and Roads of Access Act Cap. 399	• Ensure non-interference with public road when constructing the project.	• The Proponent to apply proposed mitigation measures in the EIA Study Report to minimize impact.
23	Employment Act No 11 of 200	• Prohibition Against Forced Labor • Prohibition of child Labor	• Project proponent undertakes to abide by the requirements of the Act
24	The Climate Change Act, 201	• Provides a framework for promoting climate resilient low carbon economic development. It aims to;	• Project proponent undertakes to abide by the requirements of the Act

		✓ Mainstream, climate change responses into development planning, decision making and implementation; ✓ Build resilience and enhance adaptive capacity to the impacts of climate change; ✓ Integrate climate change into the exercise of power and functions of all levels of governance, ✓ To enhance cooperative climate change governance between national government and county governments ✓ Provide incentives and obligations for private sector contributions to achieving low carbon climate resilient development ✓ Promote low carbon technologies to improve efficiency and reduce emissions intensity by facilitating approaches and uptake of technologies that support low carbon, and climate resilient development • The Act additionally establishes a National Climate Change Council, chaired by the President. That provides an overarching national climate change coordination mechanism. It also establishes the Climate Change Directorate – Secretariat to the Council and the lead agency of the government on national	

		climate change plans and actions; and further sets the targets for the regulation of greenhouse gas emissions. • The Act empowers the National Climate Change Council to assign duties relating to climate change and implementation of the Climate Change Action Plan to both public and private entities. • The Act allows Citizens to apply to the Environment and Land Court "alleging that a person has acted in a manner that has or is likely to adversely affect efforts towards mitigation and adaptation to the effects of climate change" and the court may order a discontinuance or prevention of these actions, and may "provide compensation to a victim of a violation relating to climate change duties." It is stipulated that no proof of loss or injury by the applicant is necessary	
25	The Sustainable Waste Management Act 2022	• The Sustainable Waste Management Act, 2022 No. 31 of 2022 that was assented on 6th July, 2022 and commenced on 26th July, 2022, is one of the legislations to be adhered to by the proponent throughout the life cycle of the project. The Act provides establishes the legal and	• The proponent has no alternative but to strictly adhere to the Act's requirements in totality as elucidated in the objective and the principles in this Act. In addition, shall adhere to all other relevant regulations that enhance compliance to this Act. • Throughout the life cycle of the proposed project, the proponent is fully aware that matters in this Act and all other Acts and regulations regarding Environmental Management that are enforced in Kenya, are monitored

		institutional framework for the Sustainable Management of waste; ensure the realisation of the constitutional provision on the right to a clean and healthy environment and for connected purposes. • The objective of this Act as stipulated in the Act include; ✓ promote sustainable waste management; ✓ improve the health of all Kenyans by ensuring a clean and healthy environment; ✓ reduce air, land, fresh water and marine pollution; ✓ promote and ensure the effective delivery of waste services; ✓ create an enabling environment for employment in the green economy in waste management, recycling and recovery; ✓ establish an environmentally sound infrastructure and system for sustainable waste management; ✓ promote circular economy practices for green growth; ✓ mainstream resource efficiency principles in sustainable consumption and production practices; and ✓ inculcate responsible public behaviour on waste and environment.	and overseen by National Environment Management Authority (NEMA).

		• The general principles of this Act are; ✓ promoting the right to a clean and healthy environment; ✓ the precautionary principle where the lack of scientific certainty shall not be used to postpone measures to prevent environmental degradation where there are threats of damage to the environment; ✓ the polluter pays principle in which the cost of cleaning up any element of the environment that has been damaged by pollution, the cost of the beneficial uses of the environment that have been lost as a result of the pollution, and any other costs associated with or incidental to the pollution shall be paid by the polluter; ✓ payment for ecosystem services or payment for ecological services in which payments are made to farmers or landowners who have agreed to take certain actions to manage land or watersheds in order to provide ecological services as an incentive to conserve natural resources; ✓ zero waste principle in which products and processes are designed and managed to reduce the volume and toxicity of waste and materials, and to	

		conserve and recover all resources, and to prevent the burning or burying of resources, in order to treat waste as a resource that can be harnessed or wealth creation, employment and the reduction of pollution; and achieving sustainable waste management goals.	
World Bank Safeguard Policies			
1.	Environmental Assessment: OP/BP 4.01	• Used to identify, avoid, and mitigate the potential negative environmental impact associated with a project	• Project has potential to impact the environment through pollution of soil and water and social impact to local community
IFC Performance Standards			
1.	Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts	• Establishes the importance of integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects.	• The nature of the project and the existing local regulation since the proposed project falls in the category listed in the Second Schedule of the Environmental Management and Co-ordination Act (EMCA), 1999 Amended 2015.
2.	Performance Standard 2: Labour and Working Conditions	• Recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of	• The proposed project is expected to create job opportunities for both skilled and unskilled Labor during construction, operation and decommissioning phases.

		workers as guided by the ILO Conventions.	
3.	Performance Standard 3: Resource Efficiency and Pollution Prevention	• Recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may	• The proposed project is anticipated to generate negative impacts during its life cycle, however the significance of the impacts can be mitigated.

Table 3: Institutional frame work

Institution	Role in Proposed Project	Project cycle stage Required
NEMA	• Issuance of EIA license • Inspections and monitoring compliance with license and approvals conditions • Protect public interests	Throughout the Project Cycle
Ministry of Industry, Trade and Enterprise Development	• Carryout Quality Control including Industrial Standards development	Throughout the Project Cycle
Directorate of Occupational Health and Safety	• Enforce compliance with OSHA No. 15 of 2007 • Registration of the construction site as a work place	Throughout the Project Cycle
Water Resources Authority (WRA)	• A state corporation mandated through delegated Authority on behalf of the National government to safeguard the right to clean water by ensuring that there is proper regulation of the management and use of water resources, in order to ensure sufficient water for everyone now and in the future.	Throughout the Project Cycle

CHAPTER FIVE
5.0 STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

In order to gain public views, concern and values with regard to the proposed road project, public living in close proximity to the project road will be identified and consulted. Through this, it is anticipated that transparency and accountability in the final project report would be achieved.

Possible conflicts between the key stakeholders, light industries operating in close proximity to the project road, interested parties, mandated government agencies, among others, would be addressed and solved at an earlier stage. Possible delays in project implementation and extra costs will be avoided.

5.1 Stakeholder Identification

The stakeholders to be consulted during the EIA study include the following groups:

- The Landlord;
- Physical Planning Department, Mavoko
- Kenya Power and Lighting Company (KPLC);
- Machakos Water Supply and Sewerage Company;
- Light industries operating in close proximity to the project;
- Neighbours with land parcels.

Once the above stakeholders had been identified on the ground, a further analysis was done to better understand their relevance and the perspective they offer, in understanding their relationship to the project issues and each other, and to prioritize them based on their relative usefulness to this engagement.

5.2 Key Standards and Legislations during the Stakeholder Engagements

According to Kenyan regulations, stakeholder engagement is mandatory as per the following regulations:

1. The Constitution of the Kenya 2010, Article 69, 1(d) empowers the state to encourage public participation in the management, protection and conservation of the environment.
2. Environmental Management and Coordination Act, 1999 (Amendment 2015) emphasizes on public participation in development of policies, plans and processes for the management of the environment.
3. Environment Impact Assessment Guidelines and Administrative Procedures required public participation and disclosure of project information during ESIA procedure in the development of projects, policies, plans and programmes.
4. Climate Change Act, 2016, which guides the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya. The Act is applicable to all sectors of the economy by the national and county governments to facilitate capacity development for public participation in climate change responses through awareness creation, consultation, representation and access to information.
5. Environment and Social Impact Assessment Guidelines and Administrative Procedures requires public participation and disclosure of project information during EIA procedure in the development of projects, policies, plans and programmes.

As compared to the Kenyan law, the World Bank ESF advocates for stakeholder engagement and has dedicated ESS 10 i.e. Stakeholder Engagement and Information Disclosure, which takes into account among others objectives, scope of application and requirements. ESS 10

must be applied in conjunction with ESS1. Requirements regarding engagement with workers are found in ESS2.

Stakeholder Involvement Process

The consultant developed a stakeholder engagement strategy, which will ensure that all stakeholder interfaces are managed based on their needs, interests, and influence during this assignment. The strategy focuses on both formal stakeholder engagement and day-to-day relationship management as outlined in Error! Reference source not found..

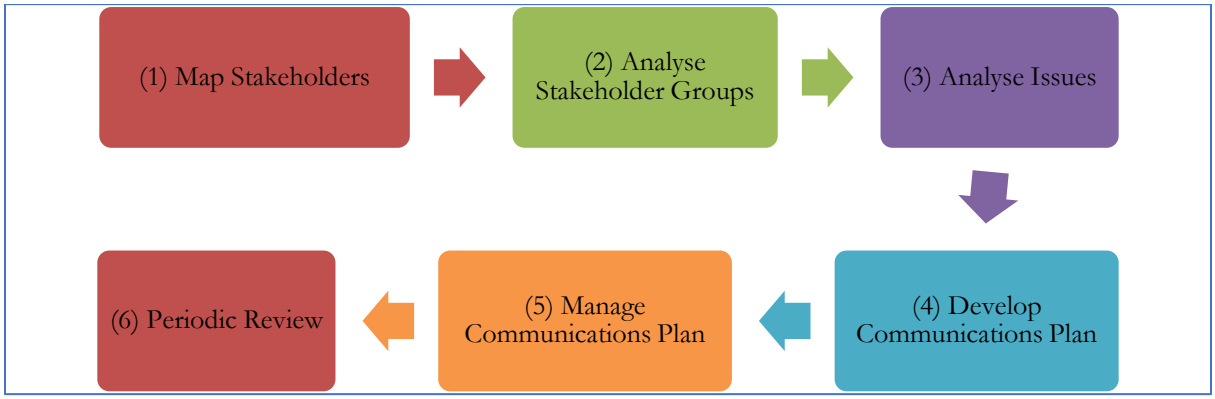


Figure 5: **Stakeholder Management Process**

The benefits of this approach include:

- Gaining a full understanding of all the stakeholders, their needs and appropriate communication channels can increase the likelihood of the project's success.
- Having clear 'owners' and strategies for key stakeholders helps get closer to their needs and ensures that messages are consistent and appropriate.

It provides a structure that can then be reviewed regularly, enabling the approach to be flexed to achieve overall project success.

5.3 Stakeholder Consultation Process

The Consultant will adopt a number of levels and strategies of engagement across this spectrum using a variety of different tools as presented in **Figure 6** below.

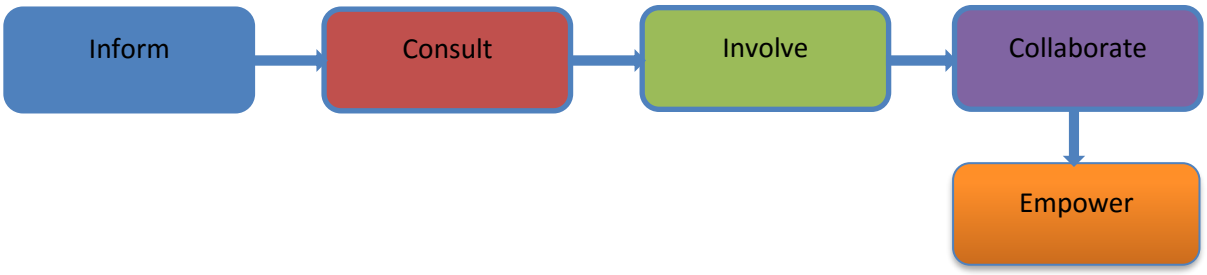


Figure 6: **Stakeholder Consultation Process**

1. ***Inform***: Provide stakeholders with balanced and objective information to help them understand the project, the problem, and the solution alternatives. (There is no opportunity for stakeholder input or decision-making). This is done through Chief's Barazas.

2. ***Consult***: Gather feedback on the information given. Level of input can range from minimal interaction (online surveys, etc.) to extensive. Can be a one-time or ongoing/iterative opportunity to give feedback to be considered in the decision-making process. Questionnaires and KIIs were used here.
3. ***Involve***: Work directly with stakeholders during the process to ensure that their concerns and desired outcomes are fully understood and taken into account at each stage. Final decisions are still made by the consulting organization, but with well-considered input from stakeholders through public participations.
4. ***Collaborate***: Partner with stakeholders at each stage of the decision-making, including developing alternative solution ideas and choosing the preferred solution together. Goal is to achieve consensus regarding decisions by all key stakeholders.
5. ***Empower***: Place final decision-making power in the hands of stakeholders. This level of stakeholder engagement is rare and usually includes a small number of people who represent important stakeholder groups. A final report being submitted to NEMA.

5.4 Public Consultation

Public consultation and participation is a facilitative process of strengthening the organizational and management capacities of people in such a way that they become self-reliant in solving their own problems. It connotes the organized action of the people towards the resolution of issues or acquisition of what they desire and what may benefit them. This, then, requires that people, as a group, must have proper ownership of actions and highly organized course of action.

Objectives of Public Participation

The consultants planned and conducted public consultation meetings with local communities living and working in the project area on 2nd June 2023. A two weeks' notice had been given to the area Chief and all those in close proximity to the project. The purpose of these consultative meetings was to:

- Inform the local people, leaders and other stakeholders about the proposed project and its objectives;
- Initiate public involvement processes, in a bid to induce and cultivate a sense of peoples' belongingness to the project;
- Suggest and facilitate the peoples' roles in the project's sustainability, in terms of management, maintenance and productivity;
- Seek views, concerns and opinions of people in the area concerning the project;
- Establish if the local people foresee any positive or negative environmental effects from the project and if so, how they would wish the perceived impacts to be addressed; and
- Find out if there are issues or places of cultural/or religious importance to the local communities that could be negatively impacted upon by the Project.

Aims of the Consultation Process

Effective public participation requires the availability of adequate information in public inputs. The latter involves various values, critiques, questions, information, suggestions and other inputs, which are expressed by individuals, groups or organizations among the general public in an attempt to influence decision-making. The consultant held public consultations with Interested and Affected Parties (IAPs) with the following aims:

1. Improve project design and thereby minimize conflicts and delays on implementation;
2. Facilitate the development of appropriate and acceptable entitlement options;
3. Increase long term project sustainability and ownership;
4. Reduce problems of institutional coordination;

5. Make the resettlement process transparent; and
6. Increase the effectiveness and sustainability of income restoration strategies and improve coping mechanisms.


Photo Plate 2: Sample photographs of the Public Consultation Meeting held Within the Project Area

Outcome of the Public Consultation Meeting

Key Issues Raised during the Public Consultation meeting are listed below:

S/N	Issue Raised	Response Given
1.	Will the land be enough for the project?	Yes, 14 acres is more than enough
2.	The proponent was requested not to fill up the ditch within the project area that may cause flooding during heavy rains.	
3.	Will the neighbours be given priority during employment and supply of the materials. The Landlord requested to be employed as a Person Living with Disability (PLWD). All casuals employed in the project must be locals.	The proponent proposed that the local administration will aid in the recruitment process of the workers.
4.	What Corporate Social Responsibility Projects is the Client going to venture into.	The proponent requested to be given time to look into as it had not been factored in yet.
5.	What security measures does the Proponent propose for the project.	Fence off the place and have one entry point.
6.	Where will the waste soil from excavations be dumped?	To an approved dumpsite by NEMA.

5.5 Community Perceptions on the Project

From the public consultations undertaken, it was evident that the community embraced the steel factory project and are appealing to the developer to let their youths be involved in the construction activities. A summary of project impacts anticipated by the local community consulted during the meetings is presented below:

Potential Positive Impacts

a) Improve livelihood of the people

b) Enhance business
c) Growth of the area
d) Low cost of construction materials (steel)
e) Improved drainage systems
f) Creation of employment as labour will be sourced from the local community
g) Improved infrastructure that is, water and electricity supply

Potential Negative Impacts

a) Change of land use to industrial.
b) Noise pollution as a result of use of heavy machinery during the construction phase of the project.
c) Air pollution due to the dust from the excavation process and movement of the heavy machinery.
d) Loss of biodiversity especially the flora; vegetation in the project area will have to be cleared
e) Increased soil erosion due to land disturbances from the heavy machines.
f) Accidents during the construction works

Conclusion

The community supports the project since it will bring about numerous social economic benefits in Mavoko Location. However, the community emphasizes the need to be involved in the overall project. Local leaders are an entry point into the community hence the Developer should ensure that they are involved at all stages of the project. In so doing, this will go a long way in ensuring the smooth implementation of the project.

CHAPTER SIX

6.0 TRAFFIC MANAGEMENT, CLIMATE CHANGE ASSESSMENT, CLEANER PRODUCTION AND INDUSTRIAL SYMBIOSIS

6.1 Traffic Management

6.1.1 Overview

Traffic remains the concealed component of the impact analysis of any new development project. Therefore, the impact of certain projects on traffic and transportation is too far reaching to be subsumed under a generalized EIA study. Traffic management can be used to manage predicted impacts associated with transportation activities associated with the project as a result of traffic analysis. Traffic impacts could be direct or cumulative. A direct impact would result solely from the implementation of the proposed project while cumulative impact is based on list of past, present and probable future projects in the area. A traffic impact is an effect, either positive or negative, on the traffic of the adjoining roads and other transportation infrastructures that may be associated with a proposed project activity, thus the importance of traffic management. The implementation and organisation of traffic management along the specified routes to be used by the project is an important component during the construction and operation of the project.

6.1.2 Project Logistics Management Group

The organization will establish a project logistics management group to co-ordinate stakeholders and manage all project related logistic activities. The project logistics management will have defined roles and responsibilities as outlined below:

- Project contractor and schedule interface;
- Approval and Acceptance of contractors;
- External interfaces for statutory, legal, and local issues associated with the project;
- Road infrastructure improvements and monitoring;
- Addressing complaints;
- Managing external affairs.

6.1.3 Main Contractor

- Transport operational planning and resourcing;
- HSE management, documentation compilation, review and update;
- Contractors safety and welfare on site;
- Compliance with project objectives policies and procedures;
- Implementation and maintenance of temporary road signage.
- Management of plant equipment and load securing;
- Compliance with project objectives policies and procedures.

6.1.4 Transport Management Consultant

- Preparation and updating of approved traffic management plan;
- Traffic Management Plan compliance audits and reports;

6.1.5 Personnel Roles and Responsibilities

The Personnel Organisational Structure of the Project Logistics Management during construction of the project. The personnel within project logistics management will have defined roles and responsibilities as outlined below: -

- Accountable for clients and contractors' responsibilities;
- Health Safety & Environment (HSE) leadership;
- Interfaces with transport manager and contractor representatives;
- Provides leadership, guidance and support to contractors;
- Updating and submission of traffic management plan to statutory authorities;

- Support to project monitoring committee or any statutory or legal requests;
- Emergency response management;

6.1.6 Transport Manager

The main responsibilities of the appointed Transport Manager are: -

- Individual responsible for all transport operational activities;
- Health Safety & Environment (HSE) responsibility (Logistics);
- Management of Abnormal loads
- Preparation of specific load plans;
- Attendance at logistic management meetings;
- Coordination of logistics with project schedule requirements;
- Reporting to client representative any issues, local, HSE, incidents.

6.1.7 Contractor Representative

The main responsibilities of the appointed contractor representative are: -

- Appointed individual for contractor logistic activities;
- HSE compliance and responsibility;
- Preparation of contractor requirements;
- Attendance at logistic management meetings;

6.1.8 Individual Drivers

The main responsibilities of each driver are: -

- Their complete vehicle and load;
- Any passenger's safety and welfare;
- Compliance with legal requirements;
- Compliance with company and project policies and procedures;
- Compliance with traffic management plan;
- Emergency response (On Site);
- Comply with Driver Code of Conduct.

6.1.9 Risk Management

The appointed contractor for the construction of the plant will prepare a risk assessment matrix as part of a thorough Health and Safety and Risk review of the operations of the plant, in order to: -

- Identify the risks;
- Identify the appropriate mitigation measures;
- Understand and define how the actions resulting from the identified mitigations are best allocated between the stakeholders according to the responsibilities that each stakeholder takes;
- Monitor implementation of the identified mitigation measures;
- Re-evaluate the risks, the mitigation measures and the effect of completed mitigation measures, including changes due to changes to the operation of the material transfer location, the plant methodology during the construction stage.

Following the preparation of the Risk Assessment Matrix, the traffic management plan will be revised and updated as necessary.

6.1.10 Emergency Response Management

The proponents recognise that their operations and activities have the potential to give rise to emergencies and will seek to conduct its operations in such a way as to prevent harm to its employees, contractors, the community and the environment. Rongtai will manage Emergency Response such that, in the event of an emergency, the harmful effect to people, the environment and assets are minimised.

6.1.11 Access by Emergency Services to Construction sites

With respect to an emergency condition arising from the construction of the plant, priority access to and from these sites will be given to ambulance or fire tenders by a similar general stand down order and by clearance of the access lane to the affected site.

6.1.12 Abnormal Loads

Traffic impacts due to abnormal loads will be subject to permitting by Local Authorities and will be detailed in the applications made for such transports, and will be managed in consultation with the Road Traffic Authorities in Machakos County. Specific abnormal loads will be classified into category and as an example the following control measures will be implemented: -

- Driver vehicle check sheets
- Route Survey
- Trained and Assessed driver
- Vehicle monitoring systems

6.1.13 Review and Updating

The developed traffic management plan will be subject to subsequent revision.

6.1.14 Recommendation

The proposed project's owners will develop a Traffic Management Plan in relation to the proposed development of the iron and steel company.

6.2 Climate Change Assessment

6.2.1 Overview

Climate change is a reality. The effects of climate change are observed in every continent and in all sectors. These changes do not occur in isolation and often reject changes in the global markets that may amplify or dampen the importance of the environmental challenges. Vulnerability refers to the potential of a system to be harmed by an external stress.

Climate risk assessment, also known as climate change risk assessment, is a systematic process to identify potential hazards from climate-related events, trends, forecasts, and projections with the aim of developing plans to avoid or manage these risks. There are significant uncertainties in the magnitude, frequency and spatial occurrence – either as changes to average conditions, or extreme conditions.

Climate change impacts will affect social and ecological systems in complex and broad-ranging ways as technological, economic, social and ecological changes take place across regions, groups and sectors. Many of these impacts, such as impacts on ecological systems, have cascading effects on social, economic and health outcomes. In order to respond to climate change, more vigorous actions are required to be implemented to mitigate negative impacts that may arise such as the emissions of greenhouse gases (GHGs).

The generation of GHG emissions in an iron and steelmaking plant can be generated due to the following process: -

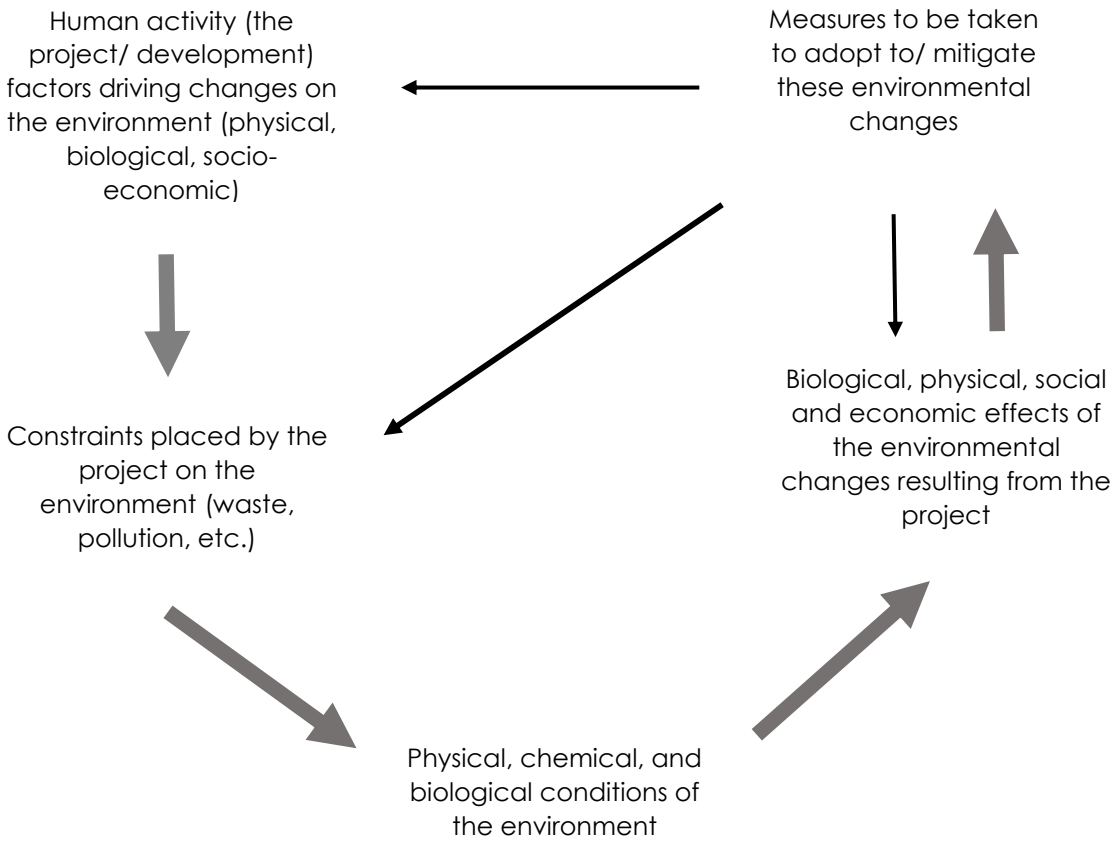
(1) Process emissions, in which raw materials and combustion both may contribute to CO_2 emissions;
(2) Emissions from combustion sources alone; and
(3) Indirect emissions from consumption of electricity (primarily in furnaces and in finishing operations such as rolling mills).

It is expected that the GHG emissions will increase significantly during the project's operation. This is a direct and permanent impact. With regards to this proposed project, climate change considerations have been made during impact assessment at different stages. This assessment is done in accordance to the provisions for the preparation of a study report as laid out by the Legal Notice 31 of 2019 EMCA Amendment to the Second Schedule.

6.2.2 Determining Vulnerability of the project area

Vulnerability is a function of the exposure, sensitivity and the ability to cope with and/or adapt to climatic changes. At the project level, the project activities are not likely to be directly affected by any shifts in climate but the activities could contribute to higher carbon emissions if not well monitored. Using the DPSIR framework, an assessment of the vulnerability of the project area and its larger geographical extent can be determined by identifying the drivers, pressures, State, Impact and Response to climate change. DPSIR (drivers, pressures, state, impact, and response model of intervention) is a causal framework used to describe the interactions between society and the environment. It seeks to analyze and assess environmental problems by bringing together various scientific disciplines, environmental managers, and stakeholders, and solve them by incorporating sustainable development.

The Driver-Pressure-State-Impact-Response (DPSIR) Framework



Based on various historical and statistical studies carried out, the climate change-related drivers in this project area include industrial activities, increased energy demand, changing consumption patterns, increased pressures on natural processes, changes in

agricultural production and increased CO_2 emissions. State factor of the environment increased the occurrence of drought, floods, and changes in physical or biological components of the Earth's system. Impacts include those on the ecosystem, welfare of human beings such as water security and food security which have been witnessed over the recent years. The responses need to be crafted to minimize the impact of the drivers and pressures on ecosystems and maximize the welfare of human beings by adaptation and mitigation phenomenon. In this regard, collection of data for this EIA study was undertaken both for climate and biodiversity in the project site. While it is not solely the responsibility of the project owner to mitigate biodiversity loss if it is not directly affecting this trend, it is part of a larger responsibility to helping maintain the environmental and social integrity within the project area of impact, and the plants and animals therein. The proponent is to setup mitigation measures that will ensure that the proposed project does not adversely affect the environment that could largely contribute to significant climate change in the area.

6.2.3 Considerations for the ecosystem

The project proponent will be committed to ensure that they adhere to the EMP provided herein and recommendations provided for impact mitigation in order to reduce impact on biodiversity through sustainable use of natural resources, responsible waste management and reduction of greenhouse gas emissions. The machines to be installed in the project have to be well maintained at all times, by following manufacturer's guidelines and integrate cleaner production mechanisms during the operation phase. At the same time, the project cycle is expected to include a component for rehabilitating any damaged natural environment at the end of the construction phase. The proponent should also explore technologies for carbon capture and storage within the plant to reduce global warming potential.

6.2.4 Vulnerable populations

While it is a common practice to identify which populations will be adversely affected by project impacts, this assessment goes further to determine what the cumulative effects of both project impacts and climate change will mean for populations within the project area. Mitigation strategies provided in the earlier sections account for cumulative effects. Moreover, public participation was conducted to include any environmental and social concerns that might not be easily identified by the expert through observation. Nevertheless, impact management is required and this can be done together with the annual environmental audits.

6.2.5 Monitoring effectiveness of mitigation measures

Mitigation measures have been outlined in this report. However, monitoring the effectiveness of these measures will go a long way towards ensuring continuous adaption with emerging issues. Monitoring will take into account the following:

- Local climate impacts in the long and short-term; For this reason, the construction of the plant will consider the following: -
    - Development to be restricted to approved density, building line, land coverage, land ratio and zoning plan.
    - Careful layout and orientation of structures to respect wind and sun direction
    - Minimum use of reflective building material and finishes for roof, walls and pavements
    - The flow of storm water to be harmonized with neighborhood and directed to well-designed drainage channels
- Nature of the area in which the adaptation must take place;

- Estimate of the risks;
- During decommissioning ensure that set mitigations are adhered to and the site is restored to acceptable condition.

6.3 Cleaner Production

The project proponent is committed to apply cleaner production principles during the envisaged operation. Cleaner production is the continuous design of improvements that involves the use of cleaner energy and materials, adopting of advanced technology and equipment, improved management and comprehensive utilization of natural resources. The adoption of clean production will be used to ensure that pollution sources are prevented and its generation is avoided to eliminate hazards to human health and the environment within the proposed project area.

To ensure that the organization's operations do not adversely affect the environment the proponent (Rongtai Steel Co. Limited) will do the following interventions: -

- Keep the fuel energy clean by using non-polluting or less polluting energy and materials.
- Use a low consumption, high efficiency, non-polluting or less polluting pollution process and equipment in the iron and steel manufacturing process.
- Maximize the utilization of iron and steel by-products and residual waste to achieve circulation in factory including closed economy and recycling economy.
- Take precautions in each aspect of all running processes, and combine production technology, production processes, management and products with energy, material losses and other factors to achieve sustainable use of resources and economic development.

6.4 Industrial Symbiosis

Rongtai Steel Co. Limited will also put in place the industrial symbiosis mechanism to ensure wastes or by-products of the plant or a production line become raw materials for another. This concept will allow materials to be used in a more sustainable way and contributes to the creation of a circular economy.

This process will serve to reduce the environmental footprint of the Rongtai Steel Co. Limited. It will also add value from materials that would otherwise be discarded and so the materials remain economically valuable for longer than in traditional industrial systems. Some key benefits that will result from the implementation of industrial symbiosis program include: -

- Reduced raw material and waste disposal costs
- Generation of new revenue from residues and by-products
- Diversion of waste from landfill and reduced carbon emissions
- Opening up of new business opportunities
- Strengthening of environmental profiles

CHAPTER SEVEN
7.0 ANALYSIS OF ALTERNATES
7.1 Alternative Technology
The project proposal relates to the construction of godowns and setup of an iron and steel products producing plant. The organization has mastered the art and technology of the operation of such a plant.

7.2 Alternative Site
Relocation option to a different site is an option available for the project implementation. At present the developer does not have an alternative site. This means that they look for the alternative land. The other option available for the project implementation is for the proponent to relocate it to an alternative site either within Athi River or its neighbourhood. At the moment, the proponent does not have an alternative site. This implies that they have to buy another piece of land elsewhere. Looking for land of the similar size and market location and completing official transactions might take over one year, with no guarantee that the land would be available, and if such land is available, its cost might be beyond the proponent's budget. In addition, the proponent will incur loss on the activities they have already undertaken such as approval fees for change of land use, structural and architectural drawings. This option would result to loss of anticipated jobs that would be envisioned by the project.

7.3 No Project Alternative
The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the proponent and the community as a whole. The land will continue to remain idle and underutilized. The proponent will also incur loss on the activities they have already undertaken such as approval fees for change of land use, structural and architectural drawings. This option would result to loss of anticipated jobs that would be envisioned by the project.

7.4 The proposed development alternative
Under the proposed development alternative, the developer of the proposed project would be issued with an EIA License. In issuing the license, NEMA would approve the proposed project, provided all environmental measures are complied with during the construction period and occupation phases.

7.5 Analysis of Alternative Construction Materials and Technology
The proposed project will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Equipment that saves energy and water will be given first priority without compromising on cost or availability factors. The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements.

7.6 Alternative power source
- Main Electricity grid: - The site is already supplied with power from the main Kenya power grid. This is the preferred option by the proponent since it will require only internal working and approvals from Kenya Power Company. The option is cheap on the short term but expensive in the long run due to the recurrent electricity bills during operation phase.

- Solar Power: - The project area has a high potential for solar energy since the location has about 6 to 7 sunshine hours in a day. Solar power is therefore recommended for green energy but initial cost of installation of solar panels, batteries and other accessories is prohibitive. This study recommends that the proponent can consider the combination of both mains and solar power in their operations. Solar energy will minimize expenditure on electricity bills. The structures should be built to enhance use of natural lighting during the day.

7.7 Solid waste management alternatives

A lot of solid wastes will be generated from the proposed development. An integrated solid waste management system is recommendable. First, the proponent will give priority to Reduction at Source of the waste materials. This option will demand a solid waste management awareness programme in the management and the workers. Notices for proper waste management/handling may be posted at strategic places for the sake of visitors. Secondly, Recycling, Reuse and compositing of the waste will be the second alternative in priority. The recyclables will be sold to waste buyers within Machakos County. The third priority in the hierarchy of options is combustion of the waste that is not recyclable. Finally, sanitary land filling will be the last option for the proponent to consider.

CHAPTER EIGHT
8.0 OCCUPATIONAL HEALTH, SAFETY AND ACCIDENT PREVENTION PLAN
8.1 Site Organization
To ensure health and safety conditions and prevent accidents on site, efforts will be made to have a clear site organization plan. These include:

- Developing a clear site organization plan and construction schedule
- Delivery and storage of material at appropriate locations and times
- Right size of staff/workers with clear work schedule and appropriate dress gear
- Control staff and vehicle movement on site and keep out unwanted persons
- Site office with safety kit i.e. first aid and fire extinguisher
- Site toilet, could be a mobile toilet
- Adequate water supply for both construction work, operation and worker use.

8.2 Project Team
In order to ensure proper and appropriate organization of activities during plan, design and construction of the project, there must be appropriate project team. These include

- Plant installation experts / Mechanical engineers
- Town / physical planner
- Environmental Impact Assessment Expert
- Project Architect - Structural / Civil Engineer
- Service Engineers
- Quantity Surveyor
- Land Surveyor

8.3 Enforcement of Standards and Legal Requirement
The project must ensure that appropriate standards and legal requirements are met. These include:

- That building work is in accordance to county government approved drawings and plans
- That building operations to meet the building code specifications
- That requirements of the Factory Workers Act are followed
- That requirements of the Public Health Act are followed
- That requirements as outlined in the Environmental Action Plan are observed.

8.4 Activities of Workers
The following activities by workers are clearly identified and must be closely monitored and organized to ensure health, safety and accident standards on site:

- Excavation using pick axes and shovels
- Fitting of the plant system and equipment
- Pushing of wheel barrows
- Watering of roads and walk surfaces
- Hand packing of stones on road surface
- Lifting and laying of building material, stone, concrete etc.
- Plastering of walls and ceiling
- Bending, cutting and laying of reinforcement steel
- Other general building work activities.

8.5 Activities by Machinery and Light Equipment
The activities of machinery and plant must also be properly organized and monitored in order to ensure health and safety conditions and prevent accidents. The machinery and plant to be used on site include –

- Compacting machine
- Vibrators

- Concrete mixer
- Small size hoist machine
- Goods truck
- Tipper
- Machinery or equipment installed for operation

8.6 Insurance

The project proponent and building contractor will take appropriate insurance cover for the various project activities and personnel and/or workers.

CHAPTER NINE
9.0 ANTICIPATED IMPACTS AND MITIGATION MEASURES
9.1 Introduction
This chapter focuses on the anticipated positive and negative impacts of the proposed project on the natural and human environment during its construction, operation and decommissioning phases. These impacts can be categorized in various ways according to their nature such as, positive or negative impacts; random or predictable impacts; cumulative, local or widespread impacts; temporary or permanent impacts; short- or long-term impacts. They can also be categorized based on their level of significance.

Some impact mitigation has already been proactively addressed in the project design while others will be undertaken through considered incorporation in the implementation of the project and guided by the Environmental Management and Monitoring Plan (EMMP) developed in this report. The prediction and analysis of the environmental impacts of the proposed project is based on:

- Compliance with relevant Kenyan legislations and standards on environment, health and safety and the World Bank Safeguards as well as World Bank's Environment, Health and Safety guidelines.
- Professional judgment - the proposed site is within an area zoned as an Industrial Zone and the environmental impacts will mostly result from construction activities that will include excavation of the ground, site preparation, construction, commissioning and operation phases.

9.2 Potential Positive Impacts
Based on information gathered during the study, the following are the potential positive social and environmental impacts identified with respect to the project.

Table 4: Positive Social and Environmental Impacts

Impact	Construction phase	Operation phase	Decommissioning phase	Description
Employment creation	Major positive impact Temporary Short-term	Major positive impact Permanent Long-term	Major positive impact Permanent Long-term	• Employment of temporary and permanent employees during construction and operation • Suppliers and contractors required throughout project
Increased revenue for government	Major positive impact Temporary Short-term	Major positive impact Permanent Long-term	Major positive impact Permanent Long-term	• Revenue obtained through taxes and fees • Additional revenue if exported (foreign currencies gained)
Optimal land Use	Major positive impact Specialized/ localized Temporary Long-term	Major positive impact Permanent Long-term	Negligible/zero impact	• The area is zoned as an Industrial Zone. The proposed project site is bordered by both existing and upcoming light industries/ factories
Increased product variety	Negligible/zero impact	Major positive impact Permanent Long-term	Negligible/zero impact	• Increased availability and accessibility of steel products to meet local demand
Skills and Technology transfer	Major positive impact Permanent	Major positive impact Permanent	Minor positive impact Specialized/ localized	• Construction and manufacturing skills transferred during the project cycle

	Short-term	Long-term	Short-term	
Waste Recycling	Minor positive impact Temporary Short-term	Major positive impact Permanent Long-term Widespread	Negligible/zero impact	• Scrap metal that would be accumulating in landfills turned into useful steel products
Improved Infrastructure	Major positive impact Permanent Long-term Specialized/ localized	Major positive impact Permanent Long-term Specialized/ localized	Negligible/zero impact	• Proponent to repair any damages to roads during construction. • To also collaborate with other players to improve drainage systems and access roads through CSR projects
Boost to local economics	Minor positive impact Temporary Short-term	Major positive impact Permanent Long-term Widespread	Minor positive impact Short-term Specialized/ localized	• New business opportunities for suppliers • Increased business opportunities for retail traders like food kiosks • Accessibility of steel products for local hardware shops giving them comparative advantage

9.3 Potential Negative Impacts

The project's potential negative environmental impacts are shown in the table below.

Table: Negative Social and Environmental Impacts

Impact	Construction phase	Operation phase	Decommissioning phase	Description
Biodiversity loss	Long term Specific/localized Reversible	Long term Specific/localized Reversible	Short term Specific/localized Reversible	Significant biodiversity loss from clearing of existing vegetation
Soil disruption	Long term Specific/localized Reversible	Long term Specific/localized Reversible	Short term Specific/localized Reversible	• Excavation will disrupt soil structure and associated microorganisms • Concrete paving could increase runoff or flooding due to reduced soil permeability • Construction works and material delivery trucks during construction shall have significant negative impact on topsoil
Air quality	Short term Specific/localized Reversible	Permanent Long term Widespread Reversible	Short term Specific/localized Reversible	• During excavation and construction works air, dust and noise pollution and vibrations could increase significantly as a result of construction activities • Noise generated during operation, is anticipated to be localized. • Dust and noise pollution will also increase significantly

				during decommissioning and operational phases
Water Quality	Major negative impact/ Negligible/zero impact	Minor negative impact Permanent Long term	Major negative impact Short term	• During construction and decommissioning phases, potential water and soil contamination could arise from disturbance of soil, spillage of fuels, lubricants and other toxic materials at the construction site and discharge of silt-laden run-off from sites. • Contamination will not be anticipated during the operation phase as the site around the building shall be connected to the existing drainage i.e. both open drainage channel for storm water and to the ETP that will be constructed.
Solid waste generation	Major negative impact Short term Reversible Widespread	Major negative impact Negligible/zero impact Widespread	Major negative impact Widespread Reversible	• Increased solid waste generation will be significant during site preparation and demolition during construction and operation phases; it will be used in levelling the uneven grounds onsite. • During the operational phase, increased waste mainly off cuts, carbon powder and mill scale will be generated. Proper and guided disposal of wastes is necessary.

Public health and amenities	Major negative impact Temporary Reversible Specific/localized	Major negative impact Permanent Reversible Widespread	Major negative impact Reversible Temporary	• Increased pressure on roads, water and energy • Increased dust, noise and general air pollution levels could impact on public health, particularly in the direct impact zone. • Any waste stockpiles at the facility could be potential breeding grounds for disease vectors such as mosquitoes and vermin
Occupational Health and Safety	Major negative impact Long term Reversible/ Irreversible Specific/localized	Minor positive impact Reversible/ Irreversible Specific/localized	Major negative impact Temporary Reversible/ Irreversible Specific/localized	• Workers will be exposed to risks of accidental falls, burns and injuries during construction, operational and decommissioning activities.

9.4 Specific Impacts and Mitigation Measures

9.4.1 Noise and vibration pollution

Noise and vibrations are expected to occur mainly during the construction phase with the major receptors being the immediate residents. Sources of noise would include materials delivery trucks, concrete mixers, steel bars as well as noise generated by the work force. Upon commissioning, the primary noise sources at the site are expected to be generated from the rolling machines which will, however, be a concern to the in-house environment. During decommissioning phase, sources of noise will include; demolition works and vehicles carting away materials.

Construction and decommissioning phase mitigation measures

- Comply with the legal requirements for the management of noise impact specified in the noise quality regulations;
- Use of modern construction equipment, which produce the least noise;
- Maintain construction equipment properly as per manufacturer's instructions;
- Construction activities to be restricted to daytime hours only to ensure minimal disturbances to neighboring land users;
- The operation of machinery to be restricted to when it is actually required;
- Workers to wear ear plugs/ muffs as part of the personal protective gear where necessary

Operation phase mitigation measures

- Comply with the legal requirements specified in the noise quality regulations;

9.4.2 Air pollution

Air pollution from dust particles and combustion emissions from the vehicle exhausts such as sulphur dioxide, carbon monoxides and hydrocarbons is a potential environmental impact from the construction and decommissioning of the project. Dust from materials delivery, particulate matter from dry materials (sand, cement, gravel, murram, etc.) and emissions (smoke, hydrocarbons and nitrogenous gases – NOx among others from machinery exhaust emissions) will be expected to increase significantly. These will, however, be a much-localized effect anticipated to be felt mainly within the site.
Dust emission is not envisaged during operation phase because the surfaces will be concreted and hence limited or no generation of dust is anticipated. The impact from these sources will be minor and be limited to the project site.

Construction phase mitigation measures

- Maintain construction machinery at all times as per manufacturer's instructions;
- Impose speed restrictions for trucks and construction vehicles around the site at 10Kph. Post speed limit notice at the entrance to the construction site;
- Keep the loose soils and stockpile at the construction site moist at all times or cover with a membrane to prevent them from being blown away;
- Haulage trucks entering or leaving the site to be covered;
- The project area to be cordoned off to minimize dust migration to nearby facilities by wind;
- Provision of PPE in accordance with the risk of the various work places e.g. masks; goggles; coveralls; etc.;
- Prohibit idling of vehicles and create awareness on the same;
- Prohibit open burning of solid wastes;
- Securely cover skips and minimize drop heights;

Decommissioning phase mitigation measures

- Use manual methods during demolitions to minimize generation of dust;

- Cover areas to be demolished.

9.4.3 Solid waste generation

Different types of solid wastes will be generated during construction as well as decommissioning phases. It is anticipated that effects of these wastes would be felt away from the site, most likely the disposal sites. The construction phase will generate wastes such as glasses, solvent containers, wrappers and papers. Some of the waste materials contain hazardous substances, are not biodegradable, and can have long-term and cumulative effects on the environment.
Major solid waste from this project during operational phase is expected to be mill scale and offcuts from the generation of rods, reinforcement bars and angles. The latter will be recycled back into the production process. Other wastes include office wastes which are expected to be handled as per the Waste Management Regulations of 2006.

Construction phase mitigation measures

- Practice waste minimization, segregation and proper disposal according to EMCA (Waste Management) Regulations, 2006;
- Contractor to establish a solid waste management plan for disposal of debris/ garbage at the construction site which will include levelling the uneven grounds on site;

Operation phase mitigation measures

- Recycling where applicable;
- The waste will be collected for offsite disposal by NEMA registered waste handlers and disposed at designated landfills.

9.4.4 Soil and water pollution

During construction phase, potential soil and water contamination could arise from disturbance of soil, spillage of fuels, lubricants and other toxic materials at the construction site, discharge of silt-laden run-off from sites during rainy seasons, and disposal of waste and wastewater from sanitary conveniences. Construction activities such as excavation and operation of large equipment can also lead to significant soil disturbance at construction sites, resulting in soil erosion and/or compaction, degradation of affected areas and pollution of the rivers.

Storage and handling of construction materials such as concrete additives, oil, fuel and solvent at the construction site could lead to spills on site, along roads and in surrounding areas. Contaminated run-off from spill sites could adversely affect soils, vegetation and water quality of the nearby seasonal stream. The extent of impact will depend on the size, frequency and timing of spills in relation to flow conditions in the receiving waters. The extent will also depend on the nature of the materials involved including their toxicity and possible for bio-magnification or bioaccumulation. To minimize the impact on surface water and groundwater quality, the following mitigation should be adopted.

During operational phase, outdoor operations will involve mainly transport of raw materials and goods onsite and offsite. Potential negative impacts on soils could arise from spills of raw materials or products and thus get carried into the environment through wind and rain. Unpaved areas of the site could potentially lead to minor surface erosion. Surface water on such surfaces could also carry any accidental spillage into the storm drains. Groundwater is not expected to be affected by daily activities of the project.

Construction and decommissioning phase mitigation measures

- Adopt protective measures to prevent spills of construction materials and put in place a suitable spill response plan;
- Prevent the washing away of construction materials, soil, silt or debris into any drainage system;
- All applicable regulation for the safe use, handling, storage and disposal of hazardous waste to be followed;
- No repair or servicing of vehicles will be allowed on site;
- Construction waste to be disposed offsite by NEMA approved waste handlers.

Operational phase mitigation measures

- Waste water from processes will be passed through an effective waste water treatment system to remove any contaminants from cooling process. Biocides will be used to prevent the growth of microorganisms;
- The treated water quality will meet standards as set by the Water Quality Regulations 2006. Regular water analysis will be undertaken to ensure compliance. Any sludge produced will be disposed via relevant licensed hazardous waste handlers;
- Avoid contamination of ground water by use of impervious liner in the storage yard;
- Oil storage equipment should ensure that spill controls and measures are in place and staff trained for such emergencies. Oil transfer should be automated to prevent spillages;
- Ensure proper and timely maintenance of vehicles and machines to avoid spillage;
- Train workers regularly on proper use of chemicals

9.4.5 Occupational health and safety issues

Construction workers will be exposed to risks of accidents and injuries during construction activities. Such injuries can result from accidental falls from high elevations if safety harness is not used while working at height; injuries from hand tools and construction equipment; back injury could occur if workers lift heavy materials and inappropriate body posture; cuts from sharp edges of objects and risk of vehicular accidents. Burns may occur at many points in the steel-making process: at the front of the furnace during tapping from molten metal or slag; from spills, spatters or eruptions of hot metal from ladles or vessels during processing, teeming (pouring) or transporting; and from contact with hot metal as it is being formed into the final product. Other injuries or fatalities may result from workers operating equipment without adequate training or with lack of PPE, or extended exposure to outdoor weather resulting in heat-related lethargy or exposure to hazardous materials e.g. cement, adhesives, solvents and paints without appropriate PPEs. This is considered a short-term impact that has potential for long-term implications. Risks of injuries and accidents may also happen to employees if the site is not well secured through falls at excavated areas and by construction vehicles. Potential risks during operation phase include fire and electrical hazards and noise.

Mitigation measures for entire project cycle

- Appoint a Health and Safety officer with knowledge to guide and implement Health, Safety issues during construction;
- Develop a site safety action plan detailing emergency procedure, restriction on site and personnel responsible for safety inspections and control;
- Suppress dust generation;

- Workers hired during any phase to first be trained on the appropriate use of the provided personal protective equipment;
- Project proponent to ensure all workers and visitors to the project site also use the provided personal protective equipment appropriately;
- The project proponent to ensure that tools and equipment provided for use during all phases are well-serviced and maintained;
- The project proponent to ensure that among the workers are trained first aiders with a fully equipped first aid station;
- Provide a General Register for recording injuries that occur on site and preventive corrective actions implemented as appropriate;
- Install safety signs and posters throughout the project area for enhanced safety awareness especially fire-fighting equipment, evacuation procedures and informative signage to inform of safety hazards and controls; etc.;
- Comply with all requirements outlined under the Occupational Health and Safety Act, Public Health Act as well the Local Government Act.

9.4.6 Public Health and Amenities

Inhalation of emissions from processes and dust could lead to a wide variety of health problems.

Any waste stockpiles at the facility could be potential breeding grounds for disease vectors such as mosquitoes and vermin. This, therefore, could affect the community's health and have negative socio-economic impacts. Adequate measures to control pests should be put in place.

Increased vehicular traffic especially raw material and finished goods traffic is expected to increase in the area. This will put pressure on the Nairobi-Mombasa Highway and the murram access. Heavy truck traffic on this road will further damage the road leading to poor access for both neighbors and the proposed project. This will also lead to increased damage of vehicles that use the roads.

The increased production capacity will be energy and water heavy. This will put pressure on national supply of water and energy to the area. During times of drought, it is expected that increased use of borehole water will be implemented thereby putting pressure on the aquifer.

Increased fuel usage will require more imports of Heavy Fuel oil which cause loss of foreign exchange.

Mitigation measures for entire project cycle

- The proponent should adopt energy and water conservation good practices.
- The proponent will put in measures in the project design to ensure water conservation;
- Give ample notice for interruptions in shared amenities and provide alternative options;
- Adhere to industrial safety best practices;
- Proponent should liaise with Kenya Power to find best way to meet energy demands without interfering with existing grid output;
- Practice good waste management;
- Provide traffic control measures during peak traffic periods;
- Conduct regular water and energy audits

9.4.7 Increased Traffic

Mitigation measures for construction phase

- Use reflective signature to direct traffic to designated areas.
- Sensitize drivers to observe speed limits
- Develop and implement a traffic marshal plan for the construction site
- Provide sufficient parking/ holding area for traffic delivering and collecting materials from the construction site.

Mitigation measures for operation phase

- Develop and implement a traffic marshal plan for the for the operational phase
- Provide sufficient parking/ holding area for traffic delivering and collecting materials from the plant

9.4.8 Population influx

Mitigation measures for entire project cycle

- The Proponent should prepare Labour and Recruitment Plan
- The Proponent should prepare a "code of conduct for workers". This code of conduct will be signed and followed by all workers involved in the project.

CHAPTER TEN
10.0 ENVIRONMENTAL MANAGEMENT PLAN
10.1 Introduction
Integrating environmental issues into construction management, such as those related to development of Iron and Steel processing plant is that it increases efficiency while enhancing the company's financial and environmental management. These issues, which are normally of financial concern at company level, are costs, product quality, investments, level of productivity and planning.

Environmental planning and management as a concept seek to improve and protect environmental quality through segregating activities, which are environmentally incompatible. Environmental planning and management integrate social systems, regulatory law, environmental awareness and ethics. Environmental Management Plan (EMP) for development projects such as the proposed Iron and Steel processing plant development is aimed at providing a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, EMP assigns responsibilities for action to various actors, and provides time frame within which mitigation measures can be done and the cost.

EMP is a vital output for an environmental impact assessment as it provides a checklist for project monitoring and evaluation and as a basis for environmental audit. A number of mitigation measures have already been incorporated into the project design. The EMP is outlined in the table below to addressed the identified potential negative impacts and mitigation measures of the proposed Iron and Steel processing plant development on plot LR NO. 12648/193. Mavoko sub-county, Machakos County.

10.2 Environmental Monitoring and Evaluation
Environmental monitoring and evaluation are essential in project's lifespan as they are conducted to establish if the project implementation has complied with the set environmental management standards as articulated in the Environmental Management and Coordination Act (EMCA) CAP 387, and its attendant Environmental (Impact Assessment and Audit) Regulations, 2003 amended 2015.

In the context of the proposed project, design has made provisions for an elaborate operational monitoring framework for the following among others:

- Disruption of natural environment and modification of microclimate
- Air and noise pollution
- Increased heat generation
- Oil spills and leaks
- Workers accidents safety and health infections during construction process
- Increased uncollected wastes both solid and liquid
- Aesthetics degradation
- Fire out-breaks

Environmental Management Plan for The Project

Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Kshs)
Construction phase				
1. Curb project associated conflicts e.g. Disputes with neighbourhood				
Project Implementation Disputes	Land ownership documentation should be formalized before the project starts as per the laws of the land	Proponent/ land owner	Project Planning Phase	Planning cost
	Sufficient planning for adequate resources required i.e. financial, personnel and equipment	Proponent & Contractor	Project Planning Phase	
2. Minimize extraction site impacts and ensure efficient use of raw materials in construction				
High Demand of construction raw materials	Source building materials from local suppliers who use environmentally friendly processes in their operations	Project Manager & Contractor	Throughout construction period	**0**
	Ensure accurate budgeting and estimation of actual construction material requirements to ensure that the least amount of material necessary is ordered	Project Manager & Contractor	Throughout construction period	30,000
	Ensure that damage or loss of materials at the construction site is kept minimal through proper storage.	Project Manager & Contractor	Throughout construction period	15,000
	Use at least 5%-10% recycled, refurbished or salvaged materials to reduce the use of raw materials and divert material from landfills	Project Manager & Contractor	Throughout construction period	**0**
3. Minimize vegetation and landscaped gardens disturbance at and/ or around construction site				

Vegetation/biodiversity disturbance	Ensure proper demarcation and delineation of the project area to be affected by construction works.	Contractor, Civil engineer & Project Manager	1 month	200,000
	Specify locations for trailers and equipment, and areas of the site which should be kept free of traffic, equipment, and storage	Civil Engineer, Architect and Project Manager	1 month	20,000
	Designate access routes and parking within the site	Civil Engineer, Architect and Project Manager	1 month	10,000
	Introduction of vegetation (trees, shrubs and grass) on open spaces and their maintenance	Architect & Landscape specialist	Monthly to Annually	15,000
	Design and implement an appropriate landscaping programme to help in re-vegetation of part of the project area after construction	Architect & Landscape specialist	2 months	15,000
4. Reduce storm-water, runoff and soil erosion				
Increased storm water, runoff and soil erosion	A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be designed.	The Civil Engineer, Mechanical Engineer and Project Manager	1 month	10,000
	Apply soil erosion control measures such as levelling of the project site to reduce runoff velocity and increase infiltration of storm water into the soil.	The Civil Engineer, Mechanical Engineer and Project Manager	1 months	
	Ensure that construction vehicles are restricted to existing graded roads to avoid soil compaction within the project site.	The Civil Engineer, Mechanical Engineer and Project Manager	Throughout construction period	
	Ensure that any compacted areas are ripped to reduce run off.	The Civil Engineer, Mechanical Engineer and Project Manager	2 months	

	Open drains all interconnected will be provided on site.	Civil Engineer	Throughout construction period	7,000 per unit
5. Minimize solid waste generation and ensure efficient solid waste management during construction				
Increased solid waste generation	Use of an integrated solid waste management system i.e. through a hierarchy of options: o Source reduction o Recycling o Composting and reuse o Combustion o Sanitary land filling	Project Manager & Contractor	Throughout construction period	5,000
	Through accurate estimation of the sizes and quantities of materials required, order materials in the sizes and quantities they will be needed rather than cutting them to size, or having large quantities of residual materials.	Project Manager & Contractor	One-off	0
	Ensure that construction materials left over at the end of construction will be used in other projects rather than being disposed of.	Project Manager & Contractor	One-off	0
	Ensure that damaged or wasted construction materials including doors, plumbing and lighting fixtures and glass will be recovered for refurbishing and use in other projects.	Project Manager & Contractor	One-off	0
	Donate recyclable/reusable or residual materials to local community groups, institutions and individual local residents or homeowners.	Project Manager & Contractor	One-off	0
	Use of durable, long-lasting materials that will not need to be replaced as often,	Project Manager & Contractor	Throughout construction period	-

	thereby reducing the amount of construction waste generated over time.			
	Provide facilities for proper handling and storage of construction materials to reduce the amount of waste caused by damage or exposure to the elements.	Project Manager & Contractor	One-off	6,000
	Purchase of perishable construction materials such as paints should be done incrementally to ensure reduced spoilage of unused materials.	Project Manager & Contractor	Throughout construction period	0
	Use building materials that have minimal or no packaging to avoid the generation of excessive packaging waste.	Project Manager & Contractor	Throughout construction period	0
	Use construction materials containing recycled content when possible and in accordance with accepted standards.	Project Manager & Contractor	Throughout construction period	0
	Reuse packaging materials such as cartons, cement bags, empty metal and plastic containers to reduce waste at the site.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	0
	Dispose waste more responsibly by dumping at designated dumping sites or landfills only.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	2,000/ month
	Waste collection bins to be provided at designated points on site.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	8,000
	Private waste disposal company to be contracted to transport and dispose the solid waste from site.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	

	Running an educational campaign amongst employees, e.g. through use of posters, to encourage reuse or recycling of the solid waste.	Project Manager, Mechanical Engineer & Contractor	Throughout construction period	
6. Reduce dust emissions				
Dust emission	Ensure strict enforcement of onsite speed limit regulations.	Project Manager & Contractor	Throughout construction period	7,800
	Avoid excavation works in extremely dry weathers.	Project Manager & Contractor	Throughout construction period	
	Careful screening of construction site to contain and arrest construction related dust.	Project Manager & Contractor	Throughout construction period	
	Sprinkle water on graded access routes when necessary to reduce dust generation by construction vehicles.	Project Manager & Contractor	Throughout construction period	
	Personal Protective equipment to be worn.	Project Manager	Throughout construction period	
	Vegetation will be replanted in disturbed areas as soon as possible to create green space and stabilize soils.	Project Manager	Once construction is done	
7. Minimization of exhaust emissions and Traffic congestion				
Exhaust emission	Vehicle idling time shall be minimized.	Project Manager & Contractor	Throughout construction period	0
	Alternatively, fuelled construction equipment shall be used where feasible equipment shall be properly tuned and maintained.	Project Manager & Contractor	Throughout construction period	0
	Sensitize truck drivers to avoid unnecessary racing of vehicle engines at	Project Manager & Contractor	Throughout construction period	0

	loading/offloading points and parking areas, and to switch off or keep vehicle engines at these points.			
Traffic Congestion	Transport of materials during the traffic off peak hours to avoid possible traffic congestion, purchasing of material according to the demand, ensuring minimal residence period for trucks mobilizing material on site, Proper planning during construction period.	Project Manager & Contractor	Throughout construction period	0
8. Minimization of noise and vibration				
Noise and vibration	Sensitize construction vehicle drivers and machinery operators to switch off engines of vehicles or machinery not being used.	Project Manager & Contractor	Throughout construction period	5,000
	Sensitize construction drivers to avoid gunning of vehicle engines or hooting especially when passing through sensitive areas such as churches, residential areas and hospitals.	Project Manager & Contractor	Throughout construction period	5,000
	Ensure that construction machineries are kept in good condition to reduce noise generation Project.	Manager & Contractor	Throughout construction period	7,000
	Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels.	Project Manager & Contractor	Throughout construction period	15,000
	The noisy construction works will entirely be planned to be during daytime when most of the neighbours will be at work.	Project Manager & all site foremen	Throughout construction period	0

	Comply with the provisions of Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 regarding noise limits at the workplace.	Project Manager & all site foremen	Throughout construction period	0
9. Minimization of energy consumption				
Increased energy consumption	Ensure electrical equipment, appliances and lights are switched off when not being used.	Project Manager & Contractor	Throughout construction period	0
	Install energy saving fluorescent tubes at all lighting points instead of bulbs which consume higher electric energy.	Project Manager & Contractor	Throughout construction period	3,800
	Ensure planning of transportation of materials to ensure that fossil fuels (diesel, petrol) are not consumed in excessive amounts.	Project Manager & Contractor	Throughout construction period	10,000
	Monitor energy use during construction and set targets for reduction of energy use.	Project Manager & Contractor	Throughout construction period	2,400
10. Minimize water consumption and ensure more efficient and safe water use				
High water demand	Install water conserving taps that turn-off automatically when water is not being used.	Project Manager & Contractor	One-off	10-40 % higher
	Promote recycling and reuse of water as much as possible.	Project Manager & Contractor	Throughout construction period	5,500
	Install a discharge meter at water outlets to determine and monitor total water usage.	Project Manager & Contractor	One-off	3,000
	Promptly detect and repair of water pipe and tank leaks.	Project Manager & Contractor	Throughout construction period	3,500 per month
	Sensitize staff to conserve water by avoiding unnecessary water use.	Project Manager & Contractor	Throughout construction period	2,500

	Ensure taps are not running when not in use.	Project Manager & Contractor	Throughout construction period	2,500
11. Minimize release of liquid effluent				
Generation of wastewater	Provide means for handling sewage generated by construction workers.	Mechanical Engineer & Project Manager	One-off	5,000 per Month
	Conduct regular checks for pipe blockages or damages since such vices can lead to release of the effluent into the land and water bodies.	Mechanical Engineer & Project Manager	Throughout construction period	4,000/month
	Monitor effluent quality regularly to ensure that the stipulated discharge rules and standards are not violated.	Mechanical Engineer & Project Manager	Throughout construction period	4,000/month
12. Minimize occupational health and safety risks				
Approval of building plans	Ensure that all building plans are approved by the Local Authority and the local Occupational Health and Safety Office.	Developer	One-off	5,000
Registration of the premises	Registration of the premises under the Occupational Safety and Health Act, 2007 Laws of Kenya is mandatory.	Developer	One-off	5,000
General register	A general register should be kept within the facility as stipulated in Sec 122&123 of the Occupational Safety and Health Act, 2007.	Project Manager & Contractor	One-off	1,500
Posting of abstract of OSHA 2007 Act,	There shall be displayed at prominent places within the site the prescribed abstract of the OSHA and the relevant notices as stipulated in section 121 of the OSHA, 2007.	Project Manager & Contractor	One-off	2,500

Incidents, accidents and dangerous occurrences.	Ensure that provisions for reporting incidents, accidents and dangerous occurrences during construction using prescribed forms obtainable from the local Occupational Health and Safety Office (OHSO) are in place.	Project Manager, Developer & Contractor	Continuous	2000/month
	Enforcing adherence to safety procedures and preparing contingency plan for accident response in addition safety education and training shall be emphasized.	The Contractor, Project Manager& Site Safety Officer	Continuous	14,400
Insurance	Ensure that the premises are insured as per statutory requirements (third party and workman's compensation).	Developer	Annually	-
Safety, health and environment (SHE) policy	Develop, document and display prominently an appropriate SHE policy for construction works.	Project Manager, Developer & Contractor	One-off	2,500
Health and safety committee	Provisions must be put in place for the formation of a Health and Safety Committee, in which the employer and the workers are represented. Statutory training to be offered.	Project Manager Environmental Impact Study Report	Annually	100,000
Sanitary conveniences	Suitable, efficient, clean, well-lit and adequate sanitary conveniences should be provided for construction workers.	Project Manager	One-off	50,000
Medical examination	Arrangements must be in place for the medical examination of all construction employees before, during and after termination of employment.	Project Manager, Developer & Contractor	Continuous	2000 per examination

Machinery/equipment safety	Ensure that machinery, equipment, personal protective equipment, appliances and hand tools used in construction do comply with the prescribed safety and health standards and be appropriately installed maintained and safeguarded.	Project Manager, Developer & Contractor	One-off	-
	Ensure that equipment and work tasks are adapted to fit workers and their ability including protection against mental strain.	Project Manager, Developer & Contractor	Continuous	-
	All machines and other moving parts of equipment must be enclosed or guarded to protect all workers from injury.	Project Manager	One-off	-
	Arrangements must be in place to train and supervise inexperienced workers regarding construction machinery use and other procedures/ operations.	Project Manager	Continuous	100,000 per training
	Equipment such as fire extinguishers must be examined by a government authorized person. The equipment may only be used if a certificate of examination has been issued.	Project Manager	Continuous	
	Reports of such examinations must be presented in prescribed forms, signed by the examiner and attached to the general register.	Project Manager	Continuous	20,000 per examination
Storage of materials	Ensure that materials are stored or stacked in such manner as to ensure their stability and prevent any fall or collapse.	Project Manager	Continuous	8,000
	Ensure that items are not stored/stacked against weak walls and partitions.	Project Manager	Continuous	-

Safe means of access and safe place of employment	All floors, steps, stairs and passages of the premises must be of sound construction and properly maintained.	Project Manager & Contractor	Continuous	-
	Securely fence or cover all openings in floors.	Project Manager & Contractor	One-off	-
	Ensure that construction workers are not locked up such that they would not escape in case of an emergency.	Project Manager & Contractor	Continuous	-
	All ladders used in construction works must be of good construction and sound material of adequate strength and be properly maintained.	Project Manager & Contractor	One-off	-
Emergency preparedness and evacuation procedures	Design suitable documented emergency preparedness and evacuation procedures to be used during any emergency.	Project Manager & Contractor	One-off	5,000
	Such procedures must be tested at regular intervals.	Project Manager & Contractor	Every 3 months	5,000
	Ensure that adequate provisions are in place to immediately stop any operations where there in an imminent and serious danger to health and safety and to evacuate workers.	Project Manager & Contractor	One-off	8,000
	Ensure that the most current emergency telephone numbers posters are prominently and strategically displayed within the construction site.	Project Manager & Contractor	One-off	3,000
	Provide measures to deal with emergencies and accidents including adequate first aid arrangements.	Project Manager & Contractor	Continuous	

First Aid	Well stocked first aid box which is easily available and accessible should be provided within the premises.	Project Manager & Contractor	Annually	50,000
	Provision must be made for persons to be trained in first aid, with a certificate issued by a recognized body.	Project Manager & Contractor	Annually	50,000
13. Ensure the general safety and security of the site and surrounding areas				
Increased Pressure on Infrastructure	Coordinate with other planning goals and objectives for the region Architect.	Project Manager, Contactor and the Developer	Continuous	5,000
	Upgrade existing infrastructure and services, if and where feasible.	Architect, Project Manager,	Contactor and the Developer	Continuous
Insecurity	Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site.	Security Officer, Project Manager & Police Continuous	Continuous	150,000 monthly
	Body-search the workers on entry, to avoid getting weapons on site, and leaving site to ensure nothing is stolen.	Security Officer	Continuous	
	Ensure only authorized personnel get to the site.	Security Officer	Continuous	
	Security alarms will be installed.	Security Officer	Continuous	
Operational phase				
Air Environment	• Leak detection and repair (LDAR) program shall be implemented in the facility • Ambient air quality with respect to SPM, RPM, SO2, NOx, H2S, CO	Project's management	Monitored daily and air quality to be measures once in six months	Operational budget

	and HC monitoring shall be continued in the impact zone as per regulations • To minimise occupational exposure or hazards, the present practice of using personal protective equipment e.g. helmets, safety (gas) mask/safety dress, safety harness for working at heights, safety shoes, safety goggles, low temperature hand gloves & shock resistant hand gloves etc. be ensured for workers engaged in operation of process units within the facility complex • Waste Lube oil will not be incinerated and will be sold to NEMA authorised waste oil recyclers • All access roads (internal as well as external) to be used by the project authorities will be paved to suppress the dust generation along the roads			
Noise Environment	• The major areas of concern for noise generation will be adequately addressed by considering it during procurement of the machinery from vendors, project implementation stage. Further feedback from the monitored noise levels at sensitive locations will be taken to ensure that the	Project's management	Monitored daily and noise quality to be measures once in six months	operational budget

	impact due to high noise levels is practically minimized • Monitoring job and location specific noise levels for compliance with Health Safety Environment regulations by verifying acceptability of noise levels caused by the project activities and comparison with noise criteria • Conducting periodic audiometric tests for employees working close to high noise levels, such as compressors, etc. • Provision of PPE"s will be done and their proper usage will be ensured for eardrum protection of the workers as well as visitors • Acoustic barriers and silencers shall be used in equipment wherever necessary • Sound proofing/ glass panelling shall be provided at critical operating stations/ control rooms, etc. • Monitoring of ambient noise levels shall also be carried out regularly both inside the facility area as well as outside the peripheral greenbelt.			
Water Environment	• There will be industrial effluent generated in this plant. This will be treated in the ETP to be set on site. The proponent is also encouraged to Collect and treat all wastewater and	Project's management	Monitored daily (inspection) and water quality to be measures once in three months (operational budget)	operational budget

	practise water recycling in their operations. • Rain Water Harvesting: The rain water harvesting program shall be implemented in the plant. • Routinely undertake surface water quality monitoring • Ensure all sanitary liquid is discharged into the septic • Where applicable ensure a sewer discharge license is obtained • Capture and contain runoff water from the storage area for treatment before release to the environment • Install oil traps at storm drain exit points • Pass any sludge produced through a filter press and dry in impermeable sludge drying beds prior to disposal. • Dispose Sludge thorough licensed hazardous waste handlers • Undertake regular (waste) water analysis to ensure efficacy of the treatment plant. • Put in place a monitoring program to ensure liquid waste from the plant is managed accordingly • Ensure treated waste water meets relevant standards in Water Quality Regulations. • Undertake regular effluent analysis			

Energy resource	• Undertake energy audits every 3 years • Implement 50% recommendations of audit before next audit • Consider capture of heat and gas from processes to supplement energy requirements of the project. • Use energy efficient equipment on site	Project's management	Monitored daily (inspection) and Energy audits carried out every three years	operational budget
Land Environment	• Greenbelt in and around the facility will be set and maintained	Project's management	Inspection to be throughout operational phase	operational budget
	• Solid/Hazardous Waste Management • No solid hazardous waste will be generated in the operation of the Plant.	Project's management	Inspection to be throughout operational phase	operational budget
Biological Environment	• The green belt will be developed by carefully selected plant species as help in the reduction of noise and air pollution	Project's management	Inspection of the green belt established to be done throughout operational phase	operational budget
Climate Change	• Undertake an intensive greenhouse gas inventory to monitor GHG emissions • Develop and implement a GHG data management system • Consider converting waste heat into electricity • Include and maintain plant greenbelts and participate in tree planting activities to act as carbon sink • Include climate change prevention measures in environmental policy and sensitize workers on	Project's management	Air Quality Reports Environmental Audits	operational budget

	importance of adherence to the measures			
Socio-economic Environment	• In order to mitigate the impacts likely to arise out of the proposed project and also to maintain good will of local people, steps will be taken for improving the social environment. • Necessary social welfare measures by the industry shall be undertaken in gaining public confidence and to meet local area development requirement. The following measures are suggested: • The organization shall undertake social welfare programs for the betterment of the Quality of Life of Athi River people in collaboration with the local bodies i.e. focus shall be on to educate the community regarding safety measures provided in the plant.	Project's management	Inspection to be throughout operational phase	Operational budget

Insecurity	• Ensure the general safety and security at all times by providing day and night security guards and adequate lighting within and around the construction site. • Body-search the workers on entry, to avoid getting weapons on site, and leaving site to ensure nothing is stolen. • Ensure only authority personnel get to the site. • Security alarms will be installed.	Security officer, project's management &Police	Inspection Continuous	Operational budget
Decommissioning				
Demolition of the factory and the installations	• The installation done in the godown will be removed under the following conditions: - • Before the start of demolition, the building will be inspected to ensure that materials left in for demolition do not adversely affect the environment during the demolition process. • Air Quality will be maintained by taking all reasonable precautions to prevent particulate material from becoming airborne, including but not limited to the use of water for the control of dust in the demolition of existing buildings or structures. • Noise pollution will be reduced by: - scheduling noisy operations to be	Proponent	Inspection done once	TBD

	carried out at the same time, switching off of machines not in use, demolition workers will be provided with appropriate PPEs and the demolition will be carried out during the day.			
Solid Waste generation	• Collect, segregate and dispose waste responsibly • Contract a licensed waste handler to dispose the wastes	Proponent	Inspection done daily	TBD
General	• Inform stakeholders/ • Inform the relevant authorities • Rehabilitate/ restore the site to its original state as much as is practical	Proponent	Communication memos To be done once Approval letters To be done once Site observation To be done daily	TBD

CONCLUSION AND RECOMMENDATION

This EIA exercise is intended to inform project planning and implementation processes on issues of significant environmental and social concern. Evaluation of alternatives has already shown that options are limited and costly. Already the proponent has incurred a substantial amount of money in the project up to design stage. Adequate mitigation measures have been proposed to address any of the negative impacts arising from the project and the proponent has committed to adhere to them. The project will create employment and improve income earnings in the area. The project will also boost the demand for iron and Steel products and associated services in Kenya and reduce reliance on imports.

After assessing the project impacts, the EIA Expert (s) are of the view that the negative impacts arising out of the proposed project development are manageable and therefore the Proponent should be allowed to proceed with this development as long as the proposed Environmental Management Plan is implemented and complies with all the relevant laws, by-laws and regulations governing the iron and steel industry.

The Proponent is also required to carry out EIAs for the set up of the ETP and drilling of the borehole.