Environmental Impact Assessment Report

For Proposed Expansion of Blending Fertilizer Plant at Athi River, Mavoko Sub County ,Machakos County

May 2021

Project Proponent

MAISHA MINERAL FERTILIZER LIMITED

Mavuno FERTILIZER

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ACRONYMS

ALARP	As low as reasonably practicable
AOB	Ammonia-oxidizing bacteria
CDF	Constituency Development Fund
DAP	Di-ammonium phosphate
Db	Decibels
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESP	Economic Stimulus Programme
GIIP	Good International Industry Practice
HAG	Hot Air Gas
ILO	International Labour Organization
MMFL	Maisha Mineral Fertilizer Limited
MOP	Muriate of Potash
NEMA	National Environmental Management Authority
NPK	Nitrogen, Phosphorous and Potassium
PPE	Personal Protective Equipment
PUC	Pollution Under Control Certificate
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
VFD	Variable frequency drives
WHO	World Health Organization
PM	Particulate Matter
EIA	Environmental Impact Assessment
EHS	Environmental Health and Safety

EXECUTIVE SUMMARY

This Environmental and Social Impact Assessment (ESIA) report has been prepared for the Maisha Mineral Fertilizer Limited (MMFL) plant expansion project, which proposes to triple the capacity of the existing NPK (nitrogen, phosphorous and potassium) fertilizer blending facility from the current 100,000 mtpa to 300,000 mtpa to meet market demands. Maisha Mineral Fertilizer Limited (MMFL) is a processor and supplier of a wide range of fertilizers of optimum quality; these are namely: Mavuno Planting, Mavuno vegetables and Mavuno Top dressing. The granulated fertilizers are of various grade of blended NPK fertilizers depending on the crop requirements under the brand name Mavuno fertilizer.

Proponent

Mavuno Fertilizer division was initially set up in 2003 for the manufacture of a range of quality nutrient fertilizers. In 2020, National Cement Company Limited (NCCL) acquired the plant and renamed it Maisha Mineral Fertilizer Limited (MMFL), while maintaining the quality of the granulated Fertilizers that are various grades of blended NPK fertilizers depending on the crop requirements under the brand name Mavuno fertilizer.

MMFL has proposed to expand its blended NPK fertilizer plant at Plot LR No. 337/664, 337/52, 337/3253 and 337/667 in Athi River Mavoko Sub county. At present MMFL processing plant is already operating in this plot processing albeit at a 100,000MTPA. Considering the market demands MMFL, intend to expand its existing unit to 300,000 MTPA to allow for more efficient activities.

Project Location

The proposed project will be setup at Plot on LR No. 337/664, 337/52, 337/3253 and 337/667 in Athi River Mavoko Sub County, with GPS coordinates latitudes 01^0.27' 4.96" S and longitudes 36^0 58' 33.27" E; the site is located in a notified industrial area. The site is well connected to Mombasa road through Namanga road which is passing at about 1.0 km south of the proposed plant site. Brief information about project site is given in **Table 0-1** below

Table 1-1: Salient Project Features

No.	Particulars	Details
1	Project Location	Plot no. 337/664, 337/52, 337/3253 and 337/667,Athi River, Mavoko Sub County, Machakos County
2	Coordinates	010 27' 4.96" S 360 58' 33.27" E Elev. 1511m
3	Present land use of site	Industrial Plot, Blending of fertilizer
4	Nearby Features	Nearest Town: Athi River Town Nearest Railway Station: Nearest railway station is Athi River station about 500m Nearest Highway: Mombasa-Namanga road approx. 2km away from the site

No.	Particulars	Details
		Nearest surface water body: The Athi River, at a distance of 1km from the site Water source for project: Two boreholes at the site Power Source for Project: Coal to provide heat for granulation and Kenya Power and Lighting Company energy for other uses.
5	Proposed Plant Capacity	300,000 mtpa
6	Total Area	11 acres
7	Hills/valleys	None within 10 km area
8	Topography	Plain
9	Archaeologically important places	None within 10 km area
10	Protected areas	None within 10 km radius.

Process Description

The plant requires five different raw materials Limestone, Gypsum, Urea, DAP and MOP for production process. Limestone will be obtained from the plant quarry site in Kajiado while Gypsum will be obtained from Garissa quarry site. Urea, DAP and MOP are imported in granules form and added to the grounded limestone and gypsum in varying quantities dependence on plant requirement. Coal will be the source of energy providing hot air gas in the milling process to sustain the production. The proposed process is based on granulation technology which has following major benefits: manufacture of different grades of fertilizer according to the crop type, reduced air pollution, zero effluent discharge process and no water requirement in the process. Granulation technology is proven technology and all recent fertilizer plant worldwide are based on this technology. This technology offers following distinct advantages.

a. Flexibility of turndown.
b. Flexibility in using different raw materials.
c. Better yield thus reduced emissions.
d. Zero effluent discharge as all liquids are received into reactor section.

The processing plant involves crushing of limestone and gypsum to form granules then blending them with imported fertilizers i.e., Urea, Di-ammonium phosphate (DAP) and Muriate of Potash (MOP) forming a final product (fertilizer) branded as Mavuno fertilizer to prospective customers (farmers). The step wise processing involves.

- Coal grounding
- Raw material unloading
- Grinding and crushing
- Raw material storage
- Raw material feeding
- Feeding macro and micronutrients at pre-set proportions
- Blending/mixing
- Product bagging
- Bags loading

- Final product storage

ESIA Methodology

The study has also been guided by the requirements of the EIA Regulations set out in terms of the Environment Management and Coordination Act, 1999 and (amendment) 2015. The approach taken in this study is guided by the principles of integrated environmental management. The approach is therefore guided by the principles of transparency which is aimed at encouraging decision making. The underpinning principles of integrated environmental management are:

- Informed decision making.
- Accountability for information on which decisions are made.
- Consultation with stakeholders.
- Due consideration of feasible alternatives.
- An attempt to mitigate negative impacts and enhance positive impacts associated with the proposed project.
- An attempt to ensure that social costs of the development proposals are outweighed by the social benefits.
- Regard to individual rights and obligations.
- Compliance with these principles during all stages of planning, implementation and decommissioning of the proposed development; and
- Opportunities for public and specialist input in the decision-making process.

a) Literature Review

Numerous literatures were reviewed as part of the ESIA study and included policy and legal related secondary data as well as non-statutory literature. The principal national legislation governing issues of environmental concern in Kenya is the Environmental Management and Coordination 1999 and Environmental Management and Coordination (Amended) Act of 2015 typically referred to as EMCA. EMCA calls for Environmental Impact assessment (EIA) (under Section 58) to guide the implementation of environmentally sound decisions and empowers stakeholders to participate in sustainable management of the natural resources. Projects likely to cause environmental impacts require that an environmental impact assessment study to be carried out. It is under this provision that the current study has been undertaken. Other legislation adhered to during this study are the Environmental Impact Assessment and Audit Regulations 2003; Waste Management Regulations 2006; Water Quality Regulations 2006; Noise and Excessive Vibration Pollution Control Regulations 2009 (Legal Notice 61), Air quality Regulations 2009, Water Act (2016), Constitution of Kenya (2010), Public Health Act (CAP. 242), Employment Act (2007), Children's Act (2012), Sexual Offences Act (2006), Traffic Act (Chapter 403) among others.

b) Field Site Surveys and Stakeholder Consultations

Field site surveys formed part of the preparation of the ESIA report. The main objective of this activity was to carry out on-site field assessments of the expected effects of the project on the physical, biological and socio-economic environment. During these site surveys, consultations with key informants and the project affected persons and other

interested stakeholders were conducted using a variety of appropriate tools. Direct observation was also used as a technique.

Baseline Conditions

Climate

The County receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and unreliable. The altitude mainly influences rainfall distribution in the county. The high areas such as Muia, Iveti and Kangundo receive an average rainfall of 1000mm while the lowland areas receive about 500mm. Temperatures vary between 18˚C and 29˚C throughout the year. The dry spells mainly occur from January to March and August to October. Athi River Town and the greater Machakos County fall under the agro-climatic zone IV. This zone is characterized as semi-arid with average rainfall amounting to 450- 900mm annually. A small portion of the County has potential for agriculture.

Physical and topographical features

The physical and topographical features in Machakos County include amongst others hills rising between 1800 – 2100m above sea level and Yatta plateau, which is elevated to about 1700m above sea level, slopes to the South East and isolated hills in the North West. In the plains, the soils are well-drained, shallow, dark and red clay soils. In addition, the vegetation across the entire County varies according to the altitude. The plains receive less rainfall and are characterized by open grassland with scattered trees as compared to high altitude areas, which receive high rainfall and have dense vegetation. 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 receives 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.

Soil

There is a close relationship between the geological formation, topography and soils. Athi River lies in an area of predominantly black cotton soil. The thickness of these soils varies with the geological sequences of the area. The weathering process of the Kapiti Phonolite results to the formation of the orange-brown lateritic soil below the dark grey black cotton soil. The black cotton soil or vertisol has a high content of expansive clay (60%) known as montmorillonite that forms deep cracks during drier seasons. Alternate shrinking and swelling causes self-mulching, where the soil material consistently mixes itself. Vertisols typically form from highly basic rocks such as basalt and phonolites in climates that are seasonally humid or subject to erratic droughts and floods, or to impeded drainage. The shrinking and swelling of vertisols can damage buildings and roads, leading to extensive subsidence.

The lateritic soil is the reddish soil developed from weathering which is also known as latosol. They are soils of humid tropical or equatorial zones characterized by a deep

weathered layer from which silica has been leached, a lack of humus, and an accumulation or layer of aluminium. The reddish-brown colour of these soils is derived from a wide variety of rocks weathering under strongly oxidizing and leaching conditions. Lateritic soils may contain clay minerals; but they tend to be silica-poor, for silica is leached out by waters passing through the soil.

Social baseline

Machakos County is sub-divided into eight sub-counties/constituencies, namely Mavoko, Kathiani, Machakos, Matungulu, Yatta, Masinga, Mwala, and Kangundo. The eight subcounties are further sub-divided into twenty-two divisions, seventy-five locations and two hundred and thirty-nine sub-locations.

Project Alternatives

No Project Alternative

It is essential that the 'no project option' be considered as a first step in mitigation. This alternative implies that the proposed fertilizer production will not go on and this implies the proponent will make no further investments in the area of fertilizer blending/production. This means that the identified benefits presented in the succeeding section will not come into fruition. This alternative is against the desires of the government to boost competitiveness, facilitate manufacturing, industrialization and agricultural self-reliance, which will in turn lead to improved access to social services and improved quality of life.

Project Execution as proposed

Taking this option means that the proposed blending plant will be constructed. Current challenges facing farmers in the country which include higher fertilizer cost in the country as well as longer delivery time. These problems will be minimized as soon as the proposed project is implemented according to the design. The implication of taking this project alternative, in contrast to the "No Project Alternative", is that cheaper, effective and a less environmentally damaging fertilizer blending plant will be delivered at the end of the construction period. Other implications include enhanced socio-economic impacts to be brought about on the project communities by the execution of the project. Significant positive environmental impacts will also be made if the project is carried out as proposed due to the numerous benefits accruable to the inhabitants of the project area and those in the extended project's area of influence. For instance, socio-economic, educational and health status of the immediate and extended host communities will improve as a result of the execution of the project. The proposed project thus has a high tendency for discouraging rural-urban drift in its area of influence.

Alternative Project Location

The proposed site for expansion will be part of 11acre property owned by the proponent hence no new land acquisition for the proposed expansion project. Athi River is a good location for the proposed project considering the fact that the area is a designated industrial zone that already hosts several industries hosting the current plant as well. The location of an industry is an important factor in its success. For example, its location to some extent determines access to markets, ease of transportation of raw materials among other things.

The option of using other locations would not be more sustainable than the chosen location in Athi River as a result of the location illustrations and was therefore rejected.

Alternative fertilizer grades

This entails planning and constructing a blending plant that will produce different grades and blends of fertilizer from the proposed ones. The proposed production process is a result of an optimized cost-effective engineering design against which several alternative products were considered during the initial design. Producing different blends of fertilizers is not a feasible option as doing so may result in greater negative environmental impacts than going ahead with the proposed project. Alternative fertilizer production options i.e., using phosphoric acids may be prohibitively more expensive because the raw materials may have to be imported, whereas the micronutrients to be used for the proposed project are locally available in the country.

Alternative Energy Source

Coal will be used as the source of fuel in drying the granules. coal is energy-efficient and provides hot aired flue gas efficient for granulation exercise in the production process.

Heavy Fuel Oil (HFO) are products based on the residues from various refinery distillation and cracking processes. It has a high calorific value with low consumption rate and produces heat that have particularly high viscosity and density which is suitable for the production small amount of light fuel oil in the form of heating oil, gas oil or diesel grades to fire kiln "lighting up" burners, and to heat auxiliary furnaces for raw material drying. This alternative was however not feasible since it would be costly, and design already had a recommendation of another fuel.

Power for normal operations (lighting) will be supplied from the national electrical grid (33Kv). The only other alternative is the use of a generator, which is less favorable due to the cost involved.

Alternative Water Source

Ground water

Water supply supporting current operations at the plant is abstracted from the two permitted existing boreholes owned by NCCL- Athi river. The boreholes yield approximately 15m^3 /hr and 20 m^3/hr which is considered sufficient enough to support and meet the water requirements of the expansion project. Use of the boreholes during construction and operations will not exceed the abstraction levels detailed in the Water Resources Authority (WRA) permit. Since the water from the boreholes is considered hard water, it shall be used during the construction phase in making concretes and in operation phase for cleaning purposes.

Piped water

The site is connected to a piped water supply from Mavoko Water and Sewerage Company (MAVWASCO). The supply is however erratic and unreliable only pumped once per week and only considered for domestic use (drinking) during the construction and operation since it's a fresh water supply.

Beneficial Impacts

The major beneficial long-term impact of the project will be during the construction and operational phase and will include: -

Table 1-2: Summary Beneficial Impacts

Beneficial Impacts	
Expected impact on poverty alleviation	With the implementation of the project will provide the community with job opportunities directly and also will boost businesses around the project area.
Local material supplies	It is expected that the project will generate new income revenues for the local population engaged in the supply of building and construction materials.
Improved standard of living	Access to stable and reliable income will change the standard of living of the people.

Environmental Impact and Mitigation Measures

Air Quality: The operation of the plant will lead the air emissions from the process stack. Crushing of limestone and gypsum, handling and transportation of raw material and vehicles shall also lead air and fugitive emissions.

Mitigation Measures: There will be a complete combustion of fuel. Ash collection system shall be provided to control PM emission. The limestone and gypsum are proposed to be transported under cover truck only. All precaution and provision are made for arresting the dust particle during crushing of rock and handling of materials which will include covered conveyer system with dust collection system at transfer points and water spraying shall be done for dust suppression in dust generating areas/roads by sprinkling of water to control fugitive dust emission. Greenbelt will be maintained to attenuate the air pollution

Water Quality: The plant will generate domestic waste as a result of the proposed expansion project. There are no other effluent generation sources in plant.

Mitigation Measures: The domestic wastewater generated from the toilets, washrooms and canteen of the plant shall be disposed in septic tank. No process effluent will be discharged outside the plant premises under normal operating conditions.

Noise Quality: The main source of noise generated during operation stages are mainly crushing, grinding and vehicles used for transportation of raw materials, finished goods etc.

Mitigation Measures: Equipment will be maintained so that noise level does not increase due to improper maintenance. Mufflers, silencers, acoustics treatment of room will be done wherever required. To avoid occupational health hazard, workers will be provided PPE's like ear plug/earmuffs, wherever required. Greenbelt developed within the plant premises will also act as a barrier to the propagation of noise from the factory premises. This shall further reduce the noise levels appreciably. Hence, no significant impact is envisaged. It is, therefore, expected that noise level at the plant boundary will be within the prescribed

norms due to operation of the proposed project and hence no significant adverse impact on noise environment is expected.

Solid Wastes: Solid and hazardous waste is the main concern if not managed properly. Domestic waste like used paper, label, cartoons will be generated from work area during operation phase. Domestic waste (organic waste) from canteen shall be generated. Hazardous waste like discarded container and used oil shall also generated during the process

Mitigation measure: Organic and domestic waste like used paper, label, and cartons will be disposed to the municipal dump. Discarded container and used oil shall be sold to authorized recycler.

Impact on Biological Environment: The attributes that are identified to describe ecology are animals, birds, fish, field crops, threatened species, natural vegetation etc. The study area does not have any identified endangered species, forest, national park, sanctuaries and hence there is no question of any adverse impact on the same. The impact on the surrounding ecology during the operation of the project will mainly occur from the deposition of air pollutants. Air pollution affects the biotic and abiotic components of the ecosystem individually and synergistically with other pollutants. Chronic and acute effects on plants and animals may be induced when the concentration of air pollutants exceeds threshold limits. Particulate emission and other gaseous emissions from the proposed plant are the major pollutant that may affect the ecology of the area.

Mitigation Measures: The incremental emission of air pollutants is not likely to induce any significant changes in the ecology because the national ambient air quality standards will remain within the limits. Proposed plant is zero liquid discharge based so no wastewater will be discharged. All solid waste and hazardous waste shall be disposed as per norm. Therefore, impact of emission on the surrounding vegetation will be insignificant. Greenbelt development along the plant boundary, further development of gardens and lawns near building will mitigate the residual impact on natural resources**.**

Occupational Health and Safety: Construction activities involve risks to health and safety of construction workers as it involves handling of heavy construction machinery/vehicle/components and lifting equipment and working on heights. This will involve risks of working on height and lifting of heavy materials. Occupational risks involved during implementation phase are fall, slip, accidents, failure of crane, fire, electric shock, unconsciousness due to working in sun at heights etc. Safety measures are required to be taken up to prevent any injury or accident during the construction phase. Measures are proposed to ensure occupational, health and safety of the workers and staff during project implementation phase and are listed below.

Mitigation Measures

- Contractor shall prepare a construction safety plan detailing action to be taken in case of emergency.
- Construction/excavation activity area shall be hoarded for safety reasons.

- The contractor will make sure that during the construction work all relevant provisions of the Building and Other Construction Workers (regulation of employment and conditions of services) Act are adhered to.
- The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the country labour regulations and International Labour Organization (ILO) Convention as far as those are applicable to this contract.
- All work forces shall be subjected to an orientation program to familiarize them with work requirements, safety practices at work, safe distances to keep from earth moving equipment, emergency response etc. to be adopted to ensure their own safety and that of other workers and public around operational areas.
- Visitors/officials to worksite are to be provided with PPEs (such as helmets and safety boots and safety jackets) and shall be briefed ongoing operations on that specific time and related safety requirement at work site including safe distances to keep, while at site visit.

Traffic Impacts: As the site is already developed limited quantity of construction material shall be required for the project. Though transportation of construction material may generate dust and other vehicular emissions (SO_2, NO_2 and CO) leading to air pollution. There will be increased vehicular movement on roads due to transportation of construction material which may lead to traffic congestion and increased risk of accidents. These impacts are short term but are manageable if suitable mitigation measures are taken up.

Mitigation Measures

- Construction material like sand, stone etc shall be bought from authorized suppliers
- Transportation of loose materials shall be done in covered conditions only
- No overloading of vehicle shall be allowed
- Material shall preferably be sourced from local market or nearby areas
- Arrangement for need based water spray system for dust suppression during loading and unloading

Environmental Monitoring plan

The project already has an EHS officer manning the current operation that will also take over in the proposed plant. The officer will undertake routine environmental monitoring to evaluate performance of pollution control measures and to ensure compliance with the prescribed standards. Among his responsibilities will be:

- Implement the ESMP and guideline as per project requirement
- Regular training to employees on health, safety and environment topics.
- Regular monitoring of wastewater, stacks, ambient air, noise etc appointing external agency and data analysis.
- Hazardous wastes management and handling.

Environmental and Social Management Plan

ESMP for effective management of environmental impacts and ensuring overall protection of the environment through appropriate management procedures has been recommended in the ESIA report.

Table 1-3: Summary of the results of the Impact Assessment

Environmental /social variable	Project activities/impacts	Phase	Predicted significance	
			Before mitigation	With mitigation
Air quality	Plant emissions	Construction/operation	Moderate	Negligible
	Road traffic exhaust emissions	Construction/operation	Negligible	Negligible
	Dust and PM_{10} from unpaved roads	Construction/operation	Moderate	Negligible
Noise emissions	Noise from construction and decommissioning activities	Construction/Decommissioning	Negligible	Negligible
	Noise from plant operations	Construction/Decommissioning	Minor	Negligible
Soil erosion	Loss of soil resources due to erosion	Construction/Decommissioning	Minor	Negligible to minor
Surface and subsurface water	Availability and quality of water	Construction/Decommissioning	Minor	Negligible to minor
Flora and vegetation	Disturbance to vegetation	Construction/Decommissioning	Minor	Negligible
Fauna	Disturbance to fauna species and degradation to environment during construction	Construction/Decommissioning	Minor	Negligible
Solid and liquid waste	Release to environment	Construction/Decommissioning	Moderate	Minor
Access to infrastructure	Disruption to traffic and transportation	Construction/Decommissioning	Moderate	Minor
Landscape and visual amenity	Deterioration of visual amenity	Construction/Decommissioning	Negligible	Negligible
Workers health and safety management	Effects of workers health and safety and	Construction/Decommissioning	Moderate	Minor
Community health and safety	Community safety (road accidents, trespass,)	Construction/Decommissioning	Moderate	Minor
	Environmental health (noise and air)	Construction/Decommissioning	Moderate	Minor
Unplanned events	Reduction in local soil/ground water	Construction/Decommissioning	Minor	Negligible
Economy and employment	Local employment opportunities, capacity building and economic development	Construction/Decommissioning	Moderate	Positive

1 INTRODUCTION

Maisha Mineral Fertilizer Limited (MMFL) is a processor and supplier of a wide range of fertilizers of optimum quality; these are namely: Mavuno Planting (10%N, 26%P2O5, 10%K2O, S and traces of B, Zn, Mn, Mo and Cu) and Mavuno Top dressing (30%N, 10%CaO and 5%S). The granulated Fertilizers are of various grade of blended NPK fertilizers depending on the crop requirements under the brand name Mavuno fertilizer. This Environmental and Social Impact Assessment (ESIA) report has been prepared for the plant expansion project, which proposes to triple the capacity of the existing NPK fertilizer blending plant from the current 100,000mtpa to 300,000 mtpa to meet market demands. The project involves the demolition of the current go-down and construction of a bulk-blending unit, storage halls, weighing station, parking areas and other ancillary facilities (roofing, walkways) etc.

1.0. Project Location

The fertilizer blending plant is located at the junction of Mzee Paurana road and KMC road in Athi River town about 1.5km from the Nairobi-Namanga road (A104) and 2km from the turn on the main Nairobi-Mombasa highway (A109) in the precincts of Mavoko Sub County in Machakos County, Kenya. The plant is on Plot No. LR No. 337/664, 337/52, 337/3253 and 337/667 at GPS location 01^0 27' 4.96" S, 36^0 58' 33.27" E and elevation of 1511m ASL. It occupies an area of about 11 acres and is in a designated industrial area. The additional 200,000 mtpa blending plant will be located at the same site. No further land will be required for the project.

Figure 1-1: Project Site

1.1. Project Salient Features

The salient features of the details about the proposed project are in **Table 1-1** below:

Table 1-1: Salient Features of the Project

Particulars	Details
Project Location	Plot no. 337/664, 337/52, 337/3253 and 337/667, Athi River, Mavoko Sub County, Machakos County
Coordinates	01^0 27' 4.96" S 36^0 58' 33.27" E Elev. 1511m
Present land use of site	Industrial Plot, Blending of fertilizer
Nearby Features	**Nearest Town:** Athi River Town **Nearest Railway Station:** Nearest railway station is Athi River station about 500m **Nearest Highway:** Mombasa-Namanga road approx. 2km away from the site **Nearest surface water body:** The Athi River, at a distance of 1km from the site **Water source for project:** Two boreholes at the site **Power Source for Project:** Coal to provide heat for granulation and Kenya Power and Lighting Company energy for other uses, lighting, sockets etc
Proposed Plant Capacity	300,000 mtpa

Total Area	11 acres
Hills/valleys	None within 10 km area
Topography	Plain
Archaeologically important places	None within 10 km area
Protected areas	None within 10 km radius.

1.2. Project Justification

A healthy soil would ensure proper retention and release of water and nutrients promote root growth and resist degradation. Due to increased food grain production because of excessive and skewed fertilizer use, it has resulted in poor soil health. In an effort to boost food security status, Kenya targets to increase fertilizer consumption per unit of arable land to 50kg/ha from the current 31kg/ha. This will increase crop productivity, food security and income at farm level for the small-scale farmers (who make over 80% of the farming community in the country).

The increase in use of fertilizer is a key factor and in line with the Abuja Declaration of 2006, which acknowledges that; "Fertilizer is crucial for achieving an African Green Revolution in the face of a rapidly rising population and declining soil fertility". There is gap in demand and supply for fertilizer in Kenya. The government is encouraging indigenous production to reduce the gap and dependence on imports. To optimize the overuse of fertilizer, government is promoting customized fertilizer. NPK is in demand to meet the nutrient requirement of the soil and as part of customized fertilizer. As a prudent organization, to promote the balance fertilization, MMFL decided to increase the capacity of its Fertilizer Blending Unit in the existing fertilizer complex at Athi River to utilize the benefit of available land, infrastructure and utilities. The proposed project aims to contribute to meeting the objective of the government, fulfil demand of the farmers and provide jobs for people in the project area boosting socio-economic activities in the country.

1.3. Project Objectives

The main objectives of this project are to:

- Make fertilizer available to farmers at the right time and price;
- Stimulate and contribute to the agricultural development of the country; and
- Create both direct and in-direct employment opportunities for substantial number of workers.

1.4. Fertilizer Blending Process

The customized fertilizer will be produced by bulk blending of various raw materials and it is the simplest, the most economical and versatile method of producing customized fertilizers (Nitrogen, Phosphorous, Potassium, Sulphur etc.) along with micronutrients (Zinc, Boron, Manganese, Molybdenum, Copper). The process involves weigh feeding, size reduction, mixing, pan granulation, drying, cooling, coating and bagging. The plant will be designed to produce different grades of customized NPK fertilizers both crop and farming site specific. The process is as follows:

- Based on the product grade, batched solid fertilizer raw materials from the individual hoppers feed into the system. Feed material also contains the recycled undersize product material.
- A special crusher crushes the feed mixture to uniform size. The crushed material passes through screens.
- The rotary drum pan granulator mixes the feed material thoroughly forming granules by the agglomeration process.
- The low-pressure steam is fed to the granulator, which comes in contact with the material.
- From the granulator the material fed to the rotary dryer which is a co-current dryer. The hot air generator provides the hot air for drying.
- From the dryer the material feeds to the vibrating feeder, separating the lumps as it feeds to the first screen.
- The dust generated from the dryer passes through cyclone separators and bag filters to remove the dust materials and through the scrubbers before venting through the chimney.
- The desired product material from the first screen feeds to the rotary cooler which uses the ambient air for cooling the product material. It is a counter current cooler. The air from the cooler pass through the cyclone separators, bag filters and wet scrubbers to chimney through ID Fan.
- After the cooler, the material feeds through a series of screens where the fines are separated from the product mixture and recycled back to the granulator. The recycle ratio is approximately 50%.
- The product material of desired size goes to the coating drum, a rotary drum where the final product material is mixed with colouring agents and other additives.
- The final product from the coating drum goes to product storage hoppers by use of conveyors before bagging.

1.5. Equipment at the plant

The major equipment at the fertilizer blending plant:

- Pan Granulator drum
- Rotary Dryer
- Rotary Cooler
- Belt/Screw Conveyors
- Crushers
- Screens
- Weigh feeders
- Cyclone Separators
- Bag filters &Scrubbers
- Bucket elevators
- Screw conveyors
- Coating drum
- Blowers
- Compressors
- Centrifugal Pumps

1.6. ESIA Scope and Objective

The purpose of this study was to undertake an Environmental and Social Impact Assessment study for the expansion of the fertilizer blending plant capacity from 100–300mtpa. The ESIA study has been developed in compliance with the Environmental Impact Assessment/Audit Regulation, 2003. The purpose of an ESIA is to provide information to regulators, the public and other stakeholders to aid the decision-making process. The objectives of an ESIA are to:

- Define the scope of the project and the potential interactions of project activities with the environment (natural and social).
- Identify relevant legislation, standards and guidelines and to ensure their consideration at all stages of project development.
- Provide a description of the proposed project activities and the existing environmental and social conditions that the project activities may interact with.
- Predict, describe and assess impacts that may result from project activities and identify mitigation measures and management actions to avoid, reduce, remedy or compensate for significant adverse effects and, where practicable, to maximize potential positive impacts and opportunities.
- Provide a plan for implementation of mitigation measures and management of residual impacts as well as methods for monitoring the effectiveness of the plan.

1.7. Report Structure

In order to provide clear presentation of the ESIA procedures including their results, conclusions and recommendations, the report structure is as follows:

1. **Chapter 1. Project Overview** (this chapter). The chapter introduces the Project by providing details of its location, scope, owner and developer.
2. **Chapter 2. ESIA Methodology**. This chapter provides an overview of the overall process of environmental and social impact assessment and applicability of the international methodology for the ESIA procedure. The chapter further addresses: definitions of key terms; identification of potential environmental and social impacts (through consultation and scoping process); description of the criteria used to determine the significance of impacts for various environmental and social topics; and how mitigation measures are considered within the assessment process.
3. **Chapter 3. Project Description.** This chapter describes the background and phasing of the Project, including descriptions of the main and auxiliary facilities, infrastructure, associated facilities, as well as definition of the Project boundaries in the form of the Project area of influence. A tentative project implementation timeline is provided.
4. **Chapter 4. Policy Legal and Institutional Framework.** This chapter provides an overview of the national and international legal framework, within which the Project is to be developed and implemented. Environmental and social legal requirements of the Republic of Kenya is considered.
5. **Chapter 5. Baseline Environmental and Socio-Economic Conditions.** The existing environmental and socio-economic baseline is described and characterized in this chapter.

6. **Chapter 6. Stakeholder Engagement**. This chapter describes the stakeholder engagement process adopted by the Project. It describes the results of consultation activities undertaken earlier and as part of the ESIA process. It also provides stakeholder identification.
7. **Chapter 7. Analysis of Project Alternatives.** The key process solutions are presented as they are seen at the current stage of planning, alongside with considered alternatives and justification of the preferred alternative.
8. **Chapter 8. Assessment of Potential Risks and Impacts**. This chapter presents the assessment of potential environmental and socio-economic impacts, including identification of mitigation measures and monitoring requirements. Impacts of the Project are assessed for each component of the environment. Impacts during the Project implementation are assessed on a topic-by-topic basis. This chapter addresses potential cumulative impacts of the Project and other third-party economic activities in the region.
9. **Chapter 9. Environmental and Social Management.** This chapter describes the approaches to environmental and social management across all Project activities and recommends the management procedures and plans to be adopted to ensure compliance with the applicable international requirements throughout the life of the Project.
10. **Chapter 10. Conclusion** provides summary of the key significant impacts, mitigations and monitoring, as well as recommendations for further studies to remove uncertainties.

2 ESIA METHODOLOGY

This ESIA intends to provide an accurate and comprehensive assessment of adverse impacts, benefits and potential risks of the planned operations, and develop prevention, mitigation and remediation measures for the identified environmental and social impacts, as well as the approaches to monitor and control them. This chapter provides a structured description of the ESIA methodology including:

- Main stages of ESIA process;
- ESIA scoping;
- Baseline studies;
- Impact identification and evaluation of significance; and
- Mitigation measures.

The ESIA study is informed by the relevant survey reports, environmental impact assessments, design and other documentation which have been prepared so far for the Project components and associated activities, as well as scientific publications, statutory reports, etc. listed in more detail in the reference chapter of this report. Specific recommendations are to be prepared as part of the ESIA process for implementation of management, mitigation and remediation measures, additional studies, as well as approaches to monitoring and control, in order to make sure that Project activities are fully compliant with the applicable requirements (refer to chapter 3) at all stages of its life cycle.

2.1. ESIA Process

To ensure a robust and comprehensive impact assessment, the ESIA process is structured around a series of progressive and iterative stages (Figure 2-1). Stakeholders, entities and individuals responsible for development/implementation of the Project design, the ESIA team provide inputs to these stages. Public engagement is maintained at all stages of the ESIA process. This ESIA shall cover all required stages: from scoping, stakeholder identification and consultations, review of alternatives, identification and assessment of benefits and adverse impacts of the Project, to development of mitigation and remediation measures, and proposals for the control and monitoring to be undertaken.

2.2. ESIA Scoping

Scoping of studies to be conducted for assessment of the Project impacts is a vital element of ESIA preparation. Scoping is the process of determining the content and extent of the matters that should be covered in the ESIA and associated documentation as well as identifies methods for assessment of impacts. The scoping process is intended to identify the types of the environmental and social impacts to be examined and documented by the ESIA, considering the most significant potential aspects and risks. The main objectives at the scoping stage are:

- Preliminary review (screening) of documents provided by the client regarding proposed operations and potential alternatives;
- Collection and high-level analysis of the available information of the environmental and social conditions at the Project site and wider area, and identification of the most sensitive (vulnerable) receptors;
- Identification of the applicable local and international requirements and standards;

- Identification of similar projects for benchmarking of the proposed operations;
- Preliminary identification of stakeholders and initial consultations with them; and
- Initial identification of the Project impacts.

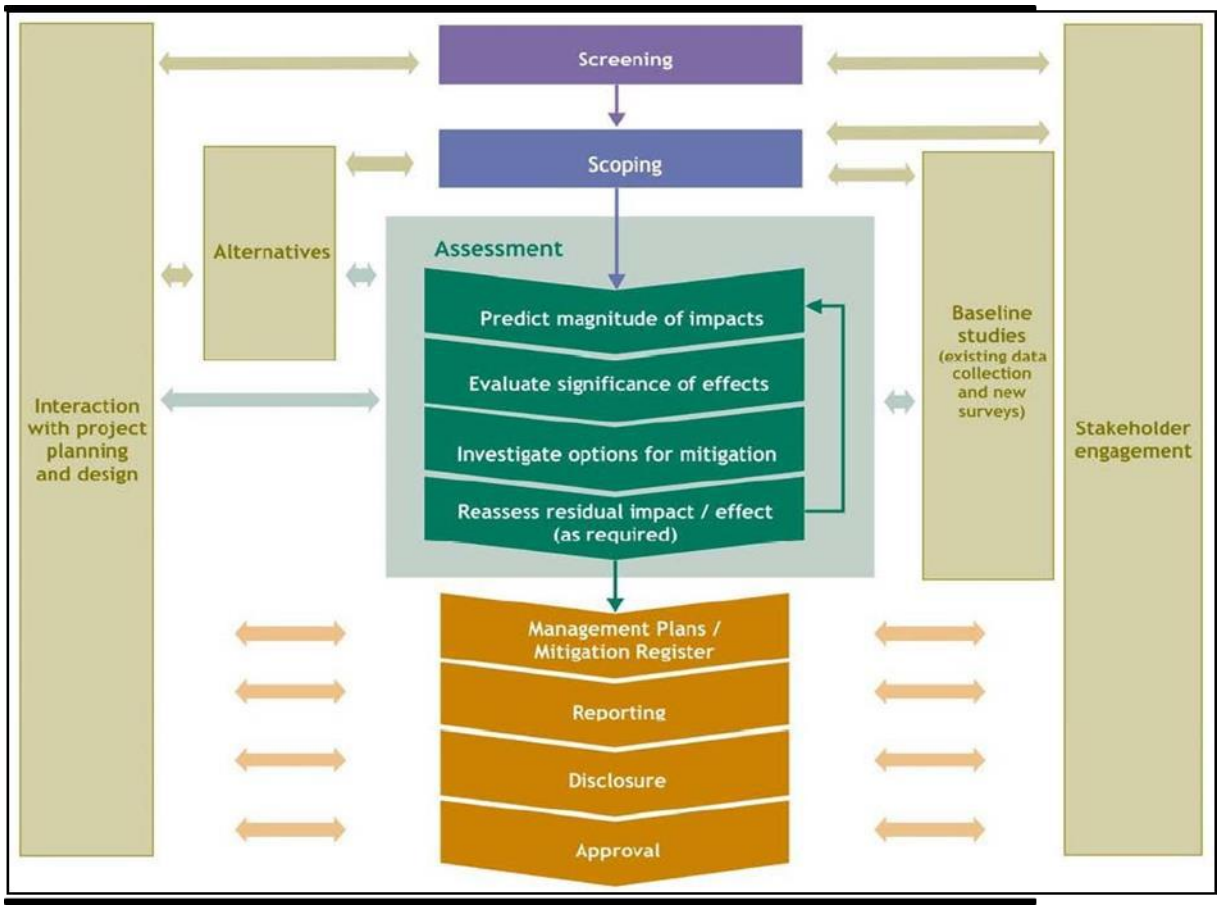

Figure 2-1: ESIA Process

2.3. Baseline Studies

Baseline studies are primarily undertaken at two key stages, i.e., scoping and impact assessment. However, as shown in Figure 2-1, they are an ongoing activity throughout the ESIA Process. During scoping work, relatively 'high-level' baseline data are required to assist identification of likely gaps and key impacts. Identified gaps between available baseline data and data required for the ESIA at the scoping stage, require additional surveys or studies to collect the required data. The work included desk-based studies and the site visit conducted by EMC Consultants environmental and social assessment teams. It is important to ensure that identification and analysis of receptors and their sensitivity is determined during scoping and baseline studies. Receptors are environmental and social components that could potentially adversely or beneficially affected by the proposed operations.

2.4. Impact Identification and Evaluation of Significance

2.4.1. Identification of Impacts

The following approach supports identification of environmental, social and cumulative impacts:

- Review of previous studies, surveys, impact assessments, environmental monitoring data in the proposed location area (existing plant) and associated facilities within the scope of the Project;
- Review of the design documentation, including potential alternatives, as well as characteristics of the proposed increase in operations (separately for construction, operation, decommissioning) and associated activities which may cause environmental, social and human health impacts;
- Consideration of the local area development plans and strategic development programmes for the region;
- Review of applicable national requirements and standards;
- Stakeholder consultation, including their input to identification, mitigation and control of Project impacts.
- "Source-Path-Receptor" Analysis. Potentially significant social and environmental impacts are also identified by structured analysis of potential sources of impacts, ways they can impact the environment and human health (e.g. direct impact or transport of pollution emissions/discharges in the environment), and sensitivity of potentially affected receptors.

Potential impacts on individual components of the environment are identified for all phases of the planned operations, and their magnitude is assessed.

2.4.2. Impact Assessment and Analysis

This structure of the exercise enabled coverage of all the requirements under the Kenya EIA/EA Regulations as stipulated under the Gazette Notice No. 56 of 13 June 2003. It involved an understanding of the project background, the preliminary designs and the implementation plan as well as commissioning. In addition, baseline information obtained through physical investigation of the site areas, public consultations with members of the community in the project areas, survey, photography, and discussions with the staff of MMFL was used. The impact significance was ranked using the matrix in **Table 2-1** below.

Table 2-1: Impact Significance Matrix

		Receptor Sensitivity			
		Negligible	**Low**	**Moderate**	**High**
Impact Magnitude	Negligible	Not Significant	Not Significant	Not Significant	Not Significant
	Minor	Not Significant	Low	Low / Moderate	Moderate
	Moderate	Not Significant	Low / Moderate	Moderate	High
	Major	Low	Moderate	High	High

Definitions of the above significance ranks adopted in international ESIA practice are in table 2-2 below.

Table 2-2: Project impacts ranking by significance

Impact Significance	Description
Negligible	Impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

Low	Impacts with a "Low" significance are expected to be noticeable changes to baseline conditions, beyond natural variation, however well below the applicable standards (e.g. environmental quality standards, and are not expected to cause hardship, degradation, or impair the function and value of receptor. These impacts warrant the attention of decision-makers and should be avoided or mitigated where practicable.
Moderate	Impacts with a "Moderate" significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of a receptor, although the overall function and value of a receptor is not disrupted. These impacts must be mitigated to avoid or reduce the impact.
High	Impacts with a "High" significance are likely to disrupt the function and value of a receptor and may have broader systemic consequences (e.g. ecosystem or social well-being). They may also result in a failure to maintain adverse effects within the permissible regulatory levels. These impacts are a priority for mandatory mitigation to avoid or reduce the significance of the impact.

2.4.3. Impact Mitigation

The development of mitigation measures is to minimize the risk intensity and/or impact probability, and therefore reduce the significance of the impact. Assessment of significance of potential impact/risk has been assessed during the ESIA process based on potential and residual impacts, using the criteria mentioned in **Section 2.5.** As part of the ESIA process, when adverse impacts are identified, measures for mitigation, minimization and control of risks, and monitoring of residual impacts are developed (as necessary or appropriate). A residual impact is the impact that remains following the application of mitigation measures. The process of identifying design controls and mitigation measures must follow the sequence of the mitigation hierarchy (Figure 2-3) which is widely regarded as the best practice approach to managing impacts.

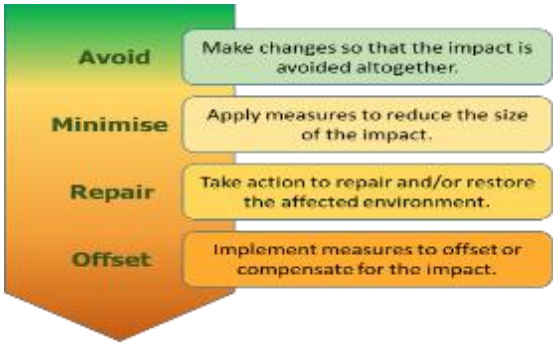

Figure 2-1: Mitigation Hierarchy

First, efforts are made to avoid or prevent, then minimize or reduce adverse impacts. If the impact cannot be fully avoided by application of design controls, they are supplemented by further engineering measures for minimization and mitigation of the adverse impacts. These measures are supplemented by additional mitigation measures to be applied through the effective management of project-related activities during construction, operation and de-commissioning. Any remaining residual impacts are then addressed via mitigation measures such as restoration and remediation (e.g. at the end of construction) and/or offsetting and compensation. The measures are developed and implemented in the same order as they are listed above.

2.5. Public Consultation

Questionnaires were administered to the public/stakeholders' in consultations undertaken through from 6th-8th December 2020. The consultation gave the immediate perceptions that the affected parties associate with it. The public consultation addressed the following: -

- Information to the Athi River residents on the proposed expansion of MMFL production unit
- Establish if the residents foresee any positive or negative environmental effects from it; and
- Seek views, concerns and opinions of the stakeholders likely to be affected by the Project.

3 LEGAL FRAMEWORK

This chapter sets out the standards to which the legal, policy and administrative framework within which the Project will be developed. It identifies the applicable lender requirements and national standards. The proponent through this ESIA will conform to the Kenyan legislative and regulatory framework.

Table 3-1: Summary of National Policies

Policy	Description
The National Environment Policy, 2013	The goal of the policy is to ensure a better quality of life for present and future generations through sustainable management and use of the environment and natural resources. The objectives of the Policy are *inter alia* to: • Provide a framework for an integrated approach to planning and sustainable management of Kenya's environment and natural resources; • Strengthen the legal and institutional framework for good governance, effective coordination and management of the environment and natural resources; and • Ensure sustainable management of the environment and natural resources, such as unique terrestrial and aquatic ecosystems, for national economic growth and improved livelihoods. Some of the guiding principles in the implementation of the policy include: • **Environmental Right**: Every person in Kenya has a right to a clean and healthy environment and a duty to safeguard and enhance the environment; • **Right to Development**: The right to development will be exercised taking into consideration sustainability, resource efficiency and economic, social and environmental needs; • **Sustainable Resource Use**: Environmental resources will be utilized in a manner that does not compromise the quality and value of the resource or decrease the carrying capacity of supporting ecosystems; and • **Public Participation**: A coordinated and participatory approach to environmental protection and management will be enhanced to ensure that the relevant government agencies, county governments, private sector, civil society and communities are involved in planning, implementation and decision-making processes. **Relevance** The contractor must conform to the requirements of the policy in terms of sustainability, resource efficiency and striking a balance between economic, social and environmental needs while undertaking this project.
Economic Recovery for Wealth and Employment Creation Strategy, 2006	The overall goal of the strategy is to ensure clear improvement in the social and economic wellbeing of all Kenyans; thereby giving Kenyans a better deal in their lives, and in their struggle to build a modern and prosperous nation. The key areas covered in the strategy are: • Expanding and improving infrastructure; • Reforms in trade and industry; • Reforms in forestry; • Affordable shelter and housing;

	• Developing arid and semi-arid lands; and • Safeguarding environment and natural resources. **Relevance** The project contractor is obligated to put in place appropriate measures to ensure that poverty alleviation interventions such as the creation of employment do not result in discrimination

Table 3-2: Summary of National Laws

Legislation	Provisions	Relevance to the Project
The Constitution of Kenya (2010)	Provides for protection and conservation of the environment and ensuring ecologically sustainable development and use of natural resources; Mandates the State to: -Establish systems of environmental impact assessment, environmental audit and monitoring of the environment; - Eliminate processes and activities that are likely to endanger the environment; - utilize the environment and natural resources for the benefit of the people of Kenya; -Encourage public participation in the management, protection and conservation of the environment; and -Accords every person the right to a clean and healthy environment and where this is being or is likely to be, denied, violated, infringed or threatened, the person may apply to a court for redress in addition to any other legal remedies that are available in respect to the same matter.	Constitutional requirements on consultation, public participation and access to information must be complied with throughout the implementation of this project.
Environmental Management and Coordination Act, 1999	Provides for protection and conservation of the environment, environmental impact assessment, and environmental auditing and monitoring.	An EIA of the potential interventions should be carried out and EIA License to be acquired before commencement of development.
Environmental (Impact Assessment and	-Provides for the procedure for carrying out	-The EIA to be carried out on the potential interventions

Audit) Regulations, 2003	Environmental Impact Assessment (EIA) and Environmental Audit (EA). -Provides for the carrying out of an environmental audit study following commencement of project operations. -Provides for the contents of an ESIA and an EA Report.	should be carried out in accordance to the regulations. -An initial environmental audit should also be carried out in the first year of operation
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 residential areas, places of worship, commercial areas and mixed residential.	-License to emit noise/vibrations in excess of permissible levels to be acquired if necessary. -Sound level limits of 55dB (day) and 35dB (night) to be observed during construction and operations.
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.	Project will generate wastes and will have to manage and dispose all these wastes in accordance with the Waste Management) Regulations, 2006.
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.	Exhaust emissions from construction machinery will lead to air quality impacts and project will have to abide by the air quality regulations.

	-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.	
The Public Health Act (Cap 242)	-Provides for the prevention of the occurrence of nuisance or conditions dangerous/injurious to humans. -Provides that the relevant local authority shall take all lawful, necessary and reasonably practicable measures -: - For preventing any pollution dangerous to health of any supply of water which the public within its jurisdiction has a right to use and does use for drinking or domestic purposes (whether such supply is derived from sources within or beyond its jurisdiction); and - For purifying any such supply which has become so polluted, and to take measures (including, if necessary, proceedings at law) against any person so polluting any such supply or polluting any stream so as to be a nuisance or danger to health.	Project activities during construction could lead to public health impacts and project must comply with the requirements of the Public Health Act.
Occupational Safety and Health Act (OSHA), 2007	-Provides for the safety, health and welfare of workers and all persons lawfully present at work places. -Provides for the registration of workplaces. -Outlines safety requirements in use of machinery to prevent accidents and injuries.	-Construction sites require registration as a workplace;

Factories and other Places of Work Act (Chapter 514 of the Laws of Kenya)	-provide for the health, safety and welfare of persons employed in factories and other places of work and for matters incidental thereto and connected therewith. It also provides for the formation of Health and Safety Committees in the work place.	
Water Act 2016	-The ministry of water is vested with duty to conserve and regulate the use of natural water resource. A section of the act related to the environment prohibits the abstraction of water without permit and also spells out penalties for pollution of water	Project proponent has an abstraction permit from its two boreholes
Sexual Offences Act, 2006	This Act of Parliament makes provision about sexual offences and aims at prevention and the protection of all persons from harm from unlawful sexual acts. Section 15, 17 and 18 focuses mainly on sexual offenses on minors (children).	The contractor is obligated to put in place mechanisms which are necessary or expedient in order to achieve or promote the objects of this Act, including for instance, a sexual harassment policy.
Children Act, 2001	This Act of Parliament provides safeguards for the rights and welfare of the child including the right to parental care, non-discrimination, education, religion, health care and protection from child labour and armed conflict, among others. The Act requires that in all actions concerning children, the best interests of the child shall be a primary consideration.	The contractor under this Project will be required to comply with provisions of the Act during Project implementation by ensuring that measures are in place to prevent violation of children's rights particularly protection from child labour.
National Gender and Equality Commission Act, 2011	The over-arching goal for NGEC is to contribute to the reduction of gender inequalities and the discrimination against all women, men, persons with disabilities, the youth, children, the elderly, minorities and marginalized communities.	The provisions of the Act become relevant during hiring of workforce on site in a fair and non-discriminative manner. It may also apply in grievance redress if an aggrieved person escalates a complaint to the commission.
Employment Act, 2007	This Act of Parliament prohibits discrimination in labour relations, sexual	The contractor will be guided by the provisions of this Act on matters touching on equality of opportunities in

	harassment, forced labour and child labour. It obligates all employers with twenty or more employees to issue a policy statement on sexual harassment.	employment, terms of service, age limit and prevention of sexual harassment in the workplace.

3.1.1 Kenya Air Quality Emission Standards

In undertaking the construction and operation activities described above, the Contractor will comply with the following national regulatory air quality standards. The supervision consultant will conduct regular monitoring to determine compliance and corrective/ mitigation measures applied where necessary

Table 3-3: Ambient Air Quality Tolerance Limits

Pollutant	**Time Weighted Average**			
		Industrial Area	**Residential, Rural & Other Area**	**Controlled Areas**
Sulphur oxides (SOX);	Annual Average	80 µg/m^3	60 µg/m^3	15 µg/m^3
	24 hours	125 µg/m3	80 µg/m3	30 µg/m3
	Annual Average		0.019 ppm/50µg/m3	
	24 Hours		0.048ppm /125µg/m3	
	Instant Peak		500 µg/m3	
	Instant Peak (10 min)		0.191 ppm	
Oxides of Nitrogen (NOX);	Annual Average	80 µg/m3	60 µg/m3	15 µg/m3
	24 hours	150 µg/m3	80 µg/m3	30 µg/m3
	Annual Average		0.2 ppm	
	Month Average		0.3 ppm	
	24 Hours		0.4 ppm	
	One Hour		0.8 ppm	
	Instant Peak		1.4 ppm	
Nitrogen Dioxide	Annual Average	150 µg/m3	0.05 ppm	
	Month Average		0.08 ppm	
	24 Hours	100 µg/m3	0.1 ppm	
	One Hour		0.2 ppm	

Pollutant	Time Weighted Average			
		Industrial Area	Residential, Rural & Other Area	Controlled Areas
	Instant Peak		0.5 ppm	
Suspended Particulate Matter	Annual Average	360 µg/m3	140 µg/m3	70 µg/m3
	24 hours	500 µg/m3	200 µg/m3	100 µg/m3
	Annual Average		100 µg/m3	
	24 hours		180 µg/m3	
Respirable Particulate Matter (<10m) (RPM)	Annual Average	70 µg/m3	50 µg/m3	50 µg/m3
	24 hours	150 ug/Nm^3	100 ug/Nm^3	75 ug/Nm^3
PM2.5	Annual Average	35 µg/m3		
	24 hours	75 µg/m3		
Lead (Pb)	Annual Average	1.0 ug/Nm^3	0.75 ug/Nm^3	0.50 µg/m3
	24 hours	1.5 µg/m3	1.00 µg/m3	0.75 µg/m3
	Month Average		2.5	
Carbon monoxide (CO)/carbon dioxide (CO_2)	8 hours	5.0 mg/m^3	2.0 mg/m^3	1.0 mg/m^3
	1 hour	10.0 mg/m^3	4.0 mg/m^3	2.0 mg/m^3
Hydrogen sulphide	24 hours	150µg/m3		
	instant Peak	700ppb		
Total VOC	24 hours	600 µg/m3		

Source-Environmental Management and Coordination, Air Quality Regulations, 2014

Table 3-4: National Air Quality Standards for General Pollutants

Pollutant	Time Weighted Average	Property Boundary
Particulate matter (PM)	Annual Average	50 µg/m3
	24 hours	70 µg/m3
Oxides of Nitrogen (NOX);	Annual Average	80 µg/m3
	24 hours	150 µg/m3
Sulphur oxides (SOX);	Annual Average	50 µg/m3
	24 hours	125 µg/m3
Hydrogen Sulphide	24 hours	50 µg/m3
Lead (Pb)	Annual/24 hours	0.5 – 2.0µg/m3
Ammonia	24 hours	100 µg/m3

Source-Environmental Management and Coordination, Air Quality Regulations, 2014

3.1.2 National Noise Emission Guidelines

Use of equipment is bound to generate some level of noise, which are bound to have a negative impact on the surrounding environment. These impacts will be felt during the crushing and grinding and operation phase of the project, and if minimal mechanization is employed the impacts can be reduced further. The guidelines also provide the maximum noise levels which the Contractor should strive to adhere to. The guidelines also call for baseline and annual monitoring of noise generation within the Contractor's site to establish compliance to the guidelines and local regulation.

In undertaking the activities described above, the proponent/Contractor will comply with the following national regulatory air quality standards. Regular monitoring to determine compliance will be done by the Supervision Consultant and corrective/mitigation measures applied where necessary.

Table 3-5: Maximum Permissible Noise Levels

Zone	Maximum Noise level limits dB (A)		Time Frame
	Day	Night	
Silent Zones	40	35	Day time: 6.01a.m – 8.00p.m Night time: 8.01p.m – 6.00p.m
Places of worship	40	35	
Residential: 1. Indoors 2. Outdoors	 45 50	 35 35	
Mixed Residential (with some commercial and places of Entertainment)	55	35	
Commercial	60	35	

Source-Environmental Management and Coordination, (Noise and Excessive Vibration Pollution) Control Regulations, 2009

Table 3-6: Maximum permissible noise Levels for construction sites (within facility)

Facility	Maximum Noise level limits dB (A)		Time Frame
	Day	Night	
Health facilities, Educational Centres and homes of disabled	60	35	Day time: 6.01am- 10.00pm Night time: 10.01pm – 6.00am
Residential	60	35	
Other areas other than those prescribed above	75	65	

Source-Environmental Management and Coordination, (Noise and Excessive Vibration Pollution) Control Regulations, 2009

3.1.3 Solid Waste Management

Construction, preparation and operation works will produce waste. The Contractor will prepare a waste management plan using these guidelines that conform, at a minimum, to the Waste Management regulations, 2006.

3.1.4 International Conventions

Relevant international agreements, treaties and conventions that have a social and/or environmental aspect, to which Kenya is a signatory or has acceded to/ratified and which will guide project implementation, are detailed in **Table 3-7** below:

Table 3-7: International Conventions

Convention	
Convention on Biological Diversity (1992)	The objectives of the CBD have been considered in this ESIA.
Convention on Wetlands of International Importance especially Waterfowl Habitat (Ramsar Convention, 1971)	This EIA has taken into account any potential wetlands.
Minimum Age Convention, 1973 (No. 138)	Ensure that employment policies include prohibitions on the employment of children and that such polices are adhered to.
Worst Forms of Child Labour Convention, 1999(No. 182)	Ensure that employment policies include prohibitions on the employment of children and that such polices are adhered to.
Freedom of Association and Protection of the Right to Organize Convention, 1948 (No. 87)	Ensure that the Project recognize workers freedom of association and protection of the right to organise.
Discrimination (Employment and Occupation)Convention, 1958 (No. 111)	Discrimination in the field of employment and occupation should be expressly forbidden.
International Convention on the Elimination of All Forms of Racial Discrimination: 1969.	All workplace racial discrimination should be expressly forbidden.
Convention on the Rights of the Child, 1990	Ensure that employment policies include prohibitions on the employment of children.
Convention against Torture and Other Cruel, In human or Degrading Treatment or Punishment:1987	Torture in all workplace should be expressly forbidden.
International Covenant on Economic, Social and Cultural Rights, 1976	Ensure that economic, social and cultural rights are respected in the proposed Project.
Convention on the Rights of Persons with Disabilities	All workplace discrimination should be expressly forbidden.
The African Charter on Human and Peoples' Rights (African Charter)	Ensure civil and political rights are observed in the proposed Project.
Worst Forms of Child Labour	Ensure that employment policies include prohibitions on the employment of children.

4 PROJECT DESCRIPTION

4.1 Project Overview

The Project is the expansion of fertiliser blending process for making multiple grades of fertilizer within the existing Fertilizer plant at Athi River, Mavoko Sub County. The proposed process is on granulation technology, which has following major benefits: manufacture of different grades of fertilizer according to the crop type, reduced air pollution and zero effluent discharge process (no additional water requirement in the process). Granulation is a state of the art technology. All new fertilizer-blending plants use this technology as it offers following distinct advantages:

a) Flexibility of turndown.
b) Flexibility in using different raw materials.
c) Better yield thus reduced emissions.
d) Zero effluent discharge (as all liquid discharges go to the reactor section).

The processing plant involves crushing of limestone and gypsum to form granules then blending them with imported granulated fertilizers i.e., Urea, Di-ammonium phosphate (DAP) and Muriate of Potash (MOP) forming a final product (fertilizer) branded as Mavuno fertilizer to prospective customers (farmers). The expansion project will not cause any change in the land use, land cover or topography as the project is an expansion of an existing facility. The layout map of the proposed expansion unit is in the **figure 4-1 below.** Existing off sites and utilities shall be augmented for the proposed units. The broad provision of plants and facilities to be made for expansion project together are given in **table 4-1** below**:**

Table 4-1: Details of the Proposed Site

Items	**Details**
Location	Athi River, Mavoko Sub County, Machakos County
Type of Project	Expansion
Total MMFL Plant Area	11 Acres
Area allotted for expansion	8000m^2 Plant shall be built on land presently occupied by go down.
Existing capacity	100,000 MTPA
Proposed expansion capacity	300,000 MTPA
Processing process	Granulation with reactor system
Air pollution control facility	Location: 2 dust collectors at the crusher mills, 5 cyclones at the granulation area
Effluent management facility	The process used for the fertilizer production is a zero effluent discharge process.
Solid waste management facility	No solid waste will be generated from the process during operation.
Hazardous waste management facility	From the process operation, No Hazardous waste will be generated. Machine lube oil is expected which is already consented. However, no increase in consented quantity envisaged. Used machine lube oil is disposed to approve recyclers.

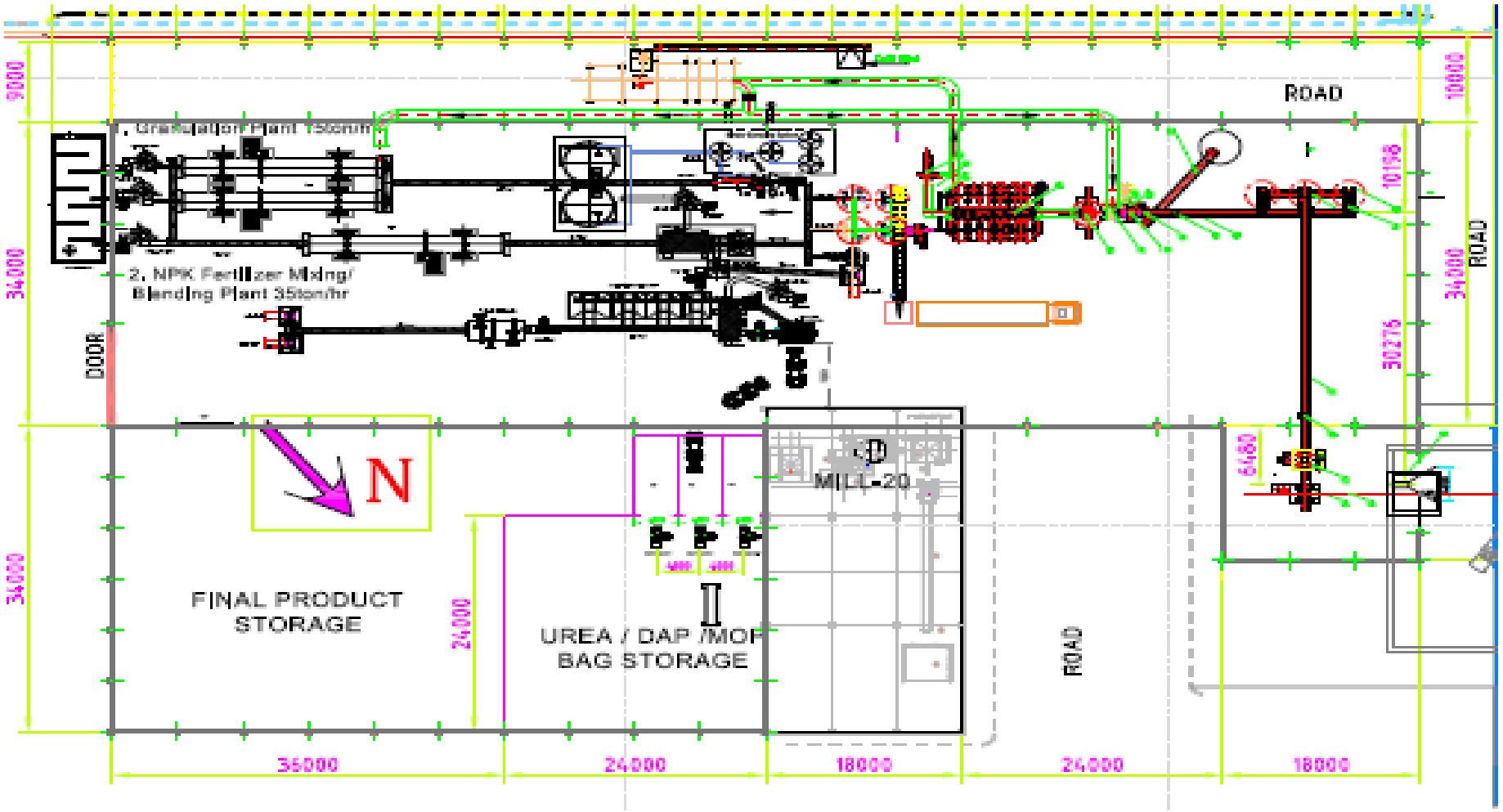

Figure 4-1: Layout Plan of the Proposed Site

4.2 Activities within Project Phases

4.2.1 Pre-Construction Activities

Preconstruction activities for this project include feasibility/technical design and environmental planning. Others are recruitment of semi-skilled and non-skilled workforce and establishment of construction yard.

4.3 Construction Phase

4.3.1.1 Site Preparation

The construction phase of this project will begin with clearing of the go down at the proposed project site. This involves demolition of the existing structure, metal scrap material from the demolition dispatched to Devki Group of companies for recycling and reuse.

4.3.1.2 Civil Works and Steel Structures

The civil and steel structure necessary for the realization of the proposed project in particular includes the following works:

- Foundations of the bulk blending unit
- Storage halls
- Walkways and roofing
- Access platforms and support for equipment / conveyors
- Weighing station and lorry park

Bulk Blending Unit

Equipment and facilities will be based on massive down to the ground with good supply installation of release for standard ground networks.

Weighing station

A foundation in the form of a general raft will be provided at the truck weighing station. Entering and exiting trucks will have to go through weighing bridge before joining the unloading raw material area.

Roads and Parkings

A road network is required for the movement of trucks and vehicles. The pavement structure will have to be constituted at least by a bilayer pavement structure.

Metal framework

Transport, unloading, on-site storage, assembly, installation and fixing and anticorrosion protection with paint supply for possible finishing touches on site, including:

- Supply of commercial and/or welded profiles and workshop fabrications
- Supply and installation of all sealing parts (plates, bolts and other inserts);
- Supply, installation and fixing of the cover and cladding in sheets with translucent plates;
- Painting and corrosion protection of metal structures;
- Cladding and roofing.

4.3.2 Operational Activities

Operational phase of the project will succeed the construction phase and involve raw materials processing and fertilizer blending activities, followed by packaging in variety of bags with different sizes and branding and then distributing to the domestic market or storage. In this phase of the proposed project, installed equipment would also require routine maintenance. The plant is designed to produce different grades of customized NPK fertilizers both crop and farming site specific.

4.4 Raw Materials Used

The plant requires five different raw materials Limestone, Gypsum, Urea, DAP and MOP for production process. Limestone will be obtained from the plant quarry site in Kajiado while Gypsum will be obtained from Garissa quarry site. Urea, DAP and MOP are imported as finished products are added to the granulated blend of limestone and gypsum in varying quantities dependence on plant requirement. Limestone and gypsum will be stored in a specific demarcated region prior to their crushing while the granulated fertilizers (Urea, DAP and MOP) once imported will be stored differently under the existing warehouse where they shall be manned by a security personnel to enhance on the material safety purposes.

4.4.1 Limestone

Limestone is a sedimentary rock consisting of more than 50% calcium carbonate (calcite - CaCO3). There are many different types of limestone formed through a variety of processes. Limestone can be precipitated from water (non-clastic, chemical or inorganic limestone), secreted by marine organisms such as algae and coral (biochemical limestone), or can form from the shells of dead sea creatures (bio-clastic limestone). Some limestone form from the cementation of sand and/or mud by calcite (clastic limestone), and these often have the appearance of sandstone or mudstone. Limestone obtained from Kajiado quarry will be transported to the site via road for crushing and plant processing.

4.4.2 Gypsum

Gypsum is very soft mineral composed of calcium sulphate dehydrate, with the chemical formula $CaSO_4.2H_2O$. This material provides the Sulphur dioxide and will be obtained from Garissa County. Heating gypsum to between 100^oC and 150^oC, (423F) partially dehydrates the mineral by driving off exactly 75% of the water contained in its chemical structure. The temperature and time needed depends on ambient partial pressure of H_2O. Temperature as high as 170^oC are used in industrial calcinations, but at these temperatures the anhydrite begins to be formed. The reaction of the partial dehydration is at these temperatures the anhydrite begins to be formed. The reaction of the partial dehydration is $CaSO_4.2H_2O$ + Heat CaSo4. $½H_2O$ +$1½H_2O$ (Steam).

4.4.3 Muriate of Potash

Muriate of Potash or MOP (also known as Potassium Chloride) is the most common potassium source used in agriculture, accounting for about 95% of all potash fertilizers used worldwide. Potassium helps regulate plant metabolism and affects water pressure regulation inside and outside of plant cells. It is important for good root development. For these reasons, potassium is critical to plant stress tolerance. The chloride content of Potassium Chloride can also be beneficial where soil chloride is low. Potassium Chloride is an excellent source of

potassium, potassium aids healthy plant growth, disease resistance, increase plant vigour, stiffen stems and aid in fruit formation. Muriate of Potash is good for root and tuber crops like carrots, beets, and potatoes as it promotes healthy root growth.

4.4.4 Di-ammonium Phosphate

Di-ammonium Phosphate (DAP) is a fertilizer. When applied as plant food, it temporarily increases the soil pH, but over a long term, the treated ground becomes more acidic than before upon nitrification of the ammonium. It is incompatible with alkaline chemicals because its ammonium ion is more likely to convert to ammonia in a high-pH environment. The average pH in solution is 7.5–8. The typical formulation is 18-46-0 (18% N, 46% P2O5, 0% K2O).

4.4.5 Urea

Urea, also known as carbamide, is an organic compound with chemical formula CO (NH2)2. It is a colourless, odourless solid, highly soluble in water, and practically non-toxic (LD50 is 15 g/kg for rats). When dissolved in water, it is neither acidic nor alkaline. More than 90% of world industrial production of urea is used as a nitrogen-release fertilizer. Urea has the highest nitrogen content of all solid nitrogenous fertilizers in common use. Therefore, it has the lowest transportation costs per unit of nitrogen nutrient. Many soil bacteria possess the enzyme urease, which catalyses conversion of urea to ammonia (NH3) or ammonium ion (NH4+) and bicarbonate ion (HCO3 −). Thus, urea fertilizers rapidly transform to the ammonium form in soils. Among the soil bacteria known to carry urease, some ammonia-oxidizing bacteria (AOB), such as species of Nitrosomonas, can also assimilate the carbon dioxide the reaction releases to make biomass via the Calvin cycle, and harvest energy by oxidizing ammonia (the other product of urease) to nitrite, a process termed nitrification. Nitrite-oxidizing bacteria, especially Nitrobacter, oxidize nitrite to nitrate, which is extremely mobile in soils and is a major cause of water pollution from agriculture. Ammonium and nitrate are readily absorbed by plants and are the dominant sources of nitrogen for plant growth. Urea is also used in many multi-component solid fertilizer formulations. Urea is highly soluble in water and is therefore also very suitable for use in fertilizer solutions (in combination with ammonium nitrate: UAN), e.g., in 'foliar feed' fertilizers.

4.5 Process Description

MMFL processing is a simple process, it involves crushing and blending limestone and gypsum and mixing the granules under different composition of Urea, DAP and MOP, resulting in production of fertilizer under different crop requirements. The step wise processing involves: -

- Coal grounding
- Raw material unloading
- Grinding and crushing
- Raw material storage
- Raw material feeding
- Feeding macro and micronutrients at pre-set proportions
- Blending/mixing
- Product bagging
- Bags loading

- Final product storage

Plant Equipment
The major equipment at the fertilizer blending plant:

- Pan granulator drum
- Rotary dryer
- Rotary cooler
- Belt /screw conveyors
- Crushers
- Screens
- Weigh feeders
- Cyclone separators
- Bag filters and scrubbers
- Bucket elevators and screw conveyors
- Coating drum
- Blowers and compressors
- Centrifugal pumps

4.5.1 Coal grounding

Coal will be imported and grounded onsite using a 5 mil/kg/calorie furnace, 800kg/hr of coal will be fed within the furnace. The hot air gas (HAG) produced will be discharged to the drier for provision of heat used for granulating of the raw materials. A continuous emissions monitoring system (stack) will be installed on the drier section after pan granulator.

4.5.2 Grinding of Raw Material

Limestone and gypsum is unloaded in the covered material sheds. The same is fed into feed hopper by means of either an overhead crane or loaders. These material chips are then conveyed through belt conveyors to the grinding mill where, it is brought to the desired mesh size. The powdered material is collected in the storage hopper by air swept grinding mill through dust collecting cyclones and dust collector bags.

4.5.3 Micro Nutrients Feeding

Micronutrients will be fed into hoppers. The hopper would be equipped with a screen mesh that has (30 X 30) mm opening size in order to isolate big lumps coming with the materials. From the hopper, each raw material will go through a belt conveyor then is elevated by a belt elevator and stored in bulk in its appropriate area by the mean of a tripper. From the storage area, each raw material would be fed to its hoppers by a front-end loader (for bulk materials). There shall be a hoist at the micronutrient hopper level in order to lift the micronutrient big bag and place it using forklift so the operator can safely empty the bags into the hopper (s).

4.5.4 Blend Grade Preparation

The blend grade with the right ratios will be prepared by withdrawing a measured quantity of each raw material from the dedicated hopper. Each hopper will sit on four (4) weighing cells accurately measuring withdrawn quantity as per the pre-set formula. Raw materials withdrawal and grades preparation with accurate ratios and quantities shall be automatic and continuous by a pre-set program in the PLC. The system shall be PLC-controlled, come with

a digital control panel and managing software allowing simple equipment configuration, blend formulations, automatic dosing control and adjustment, in addition of operations monitoring and control. The control system shall be interfaced with a computer installed in a control room.

Metering device for raw materials to be belt conveyors and screw conveyors for micronutrients with variable frequency drives (VFD) to control feed rates. Feeding monitoring and control system shall have the capability to switch into volumetric metering in case of emergency and/or unstable weight measurement in the hopper. Each hopper shall be equipped with the appropriate isolation valve at outlet nozzle in order to do the necessary maintenance for metering device and discharging equipment without dumping the hopper contents, the powdered materials will be mixed with water resulting in formation of granules. The granules will be fed into a drier drum where the moisture is removed by heating it through a hot fired flue gas from coal fired hot air gas (HAG) and maintaining it at a temperature. This is cooled and sent through a mesh of required size and blended with different varieties of fertilizer (DAP, MOP and Urea) according to the crop requirement and branded accordance of the quality of the product.

4.5.5 Blending and Production

Raw materials (base fertilizers and granules) will be fed continuously to blender by means of a belt conveyor. The urea hopper shall be equipped with a dedicated impregnation system, that will allow a pre-treatment of the urea before mixing the overall raw materials, mixing will be ensured via a continuous screw conveyor. Raw materials, together with measured quantities of coating agent and liquid micronutrient, fed by dosing pumps, will be mixed inside the blender. A good mixing and guarantee consistent properties of the final product shall be assured. Dust suppression agents shall be used instead of water-based agents in order to avoid caking due to higher moisture content in final product. No drying equipment is included in bulk blending plant. The maximum liquid content in the final product that the blender can take will be specified. After the mixing, the product will be fed to a delumper before being sent to the bagging system in order to avoid any lumps going to the bagging system.

4.5.6 Bagging

The blended materials will be discharged continuously into product hoppers through the product bucket elevator. Product hopper will sit on four (4) load cells. Each hopper will feed a bagging machine where the product is bagged in different bag size. Bags will be sewed, and either sent to truck by belt conveyor, or alternatively sent to storage by forklift. The bagging machine will produce different bags size from 25 kg to 50 kg (mainly 50 kg). As per market demand, it is possible to use small bags (5 kg to 15 kg).

Figure 4-3: Limestone for Current Processing

Figure 4-2: Imported granulated DAP in a warehouse

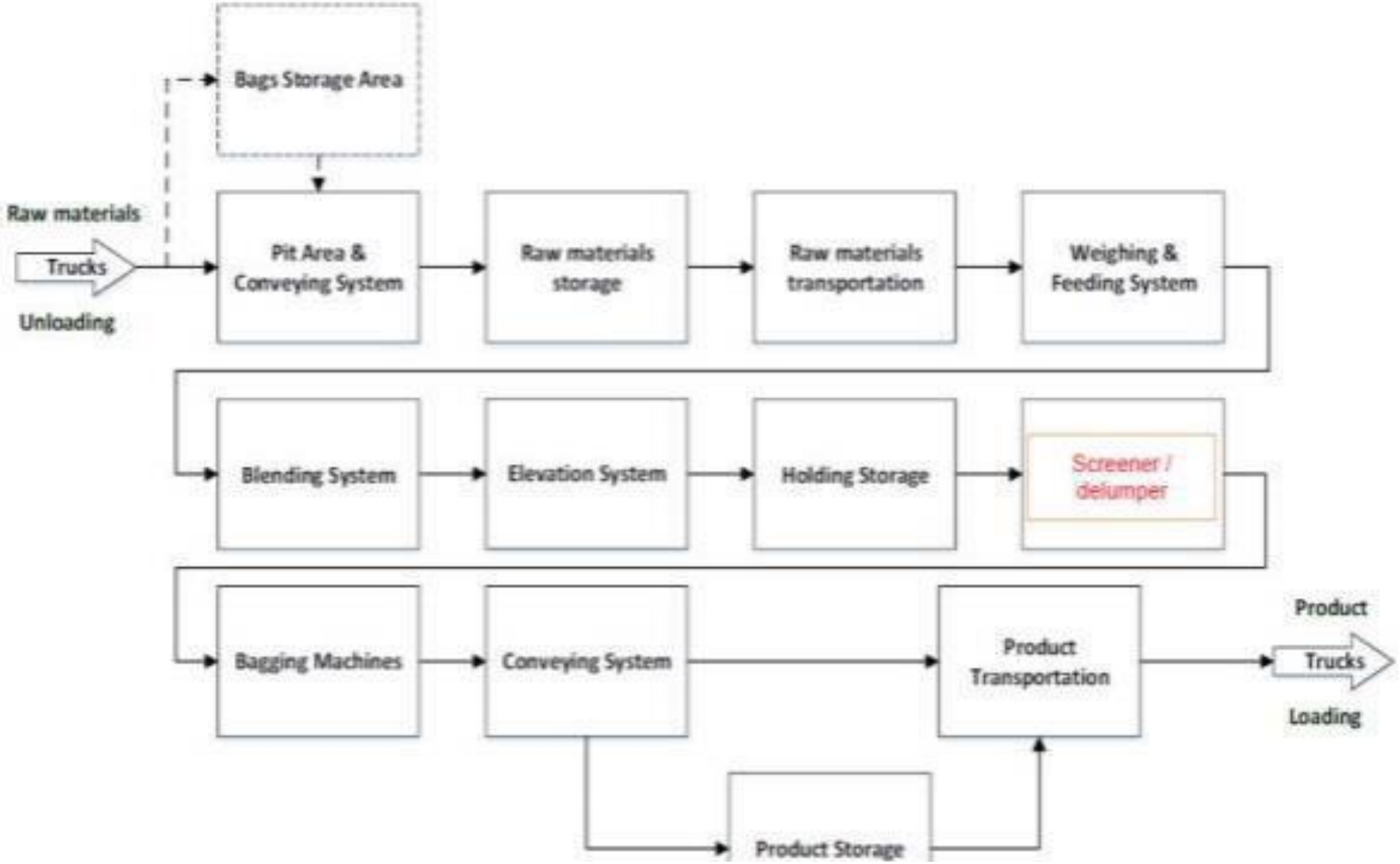

Figure 4-4: Block flow diagram of the fertilizer blending process

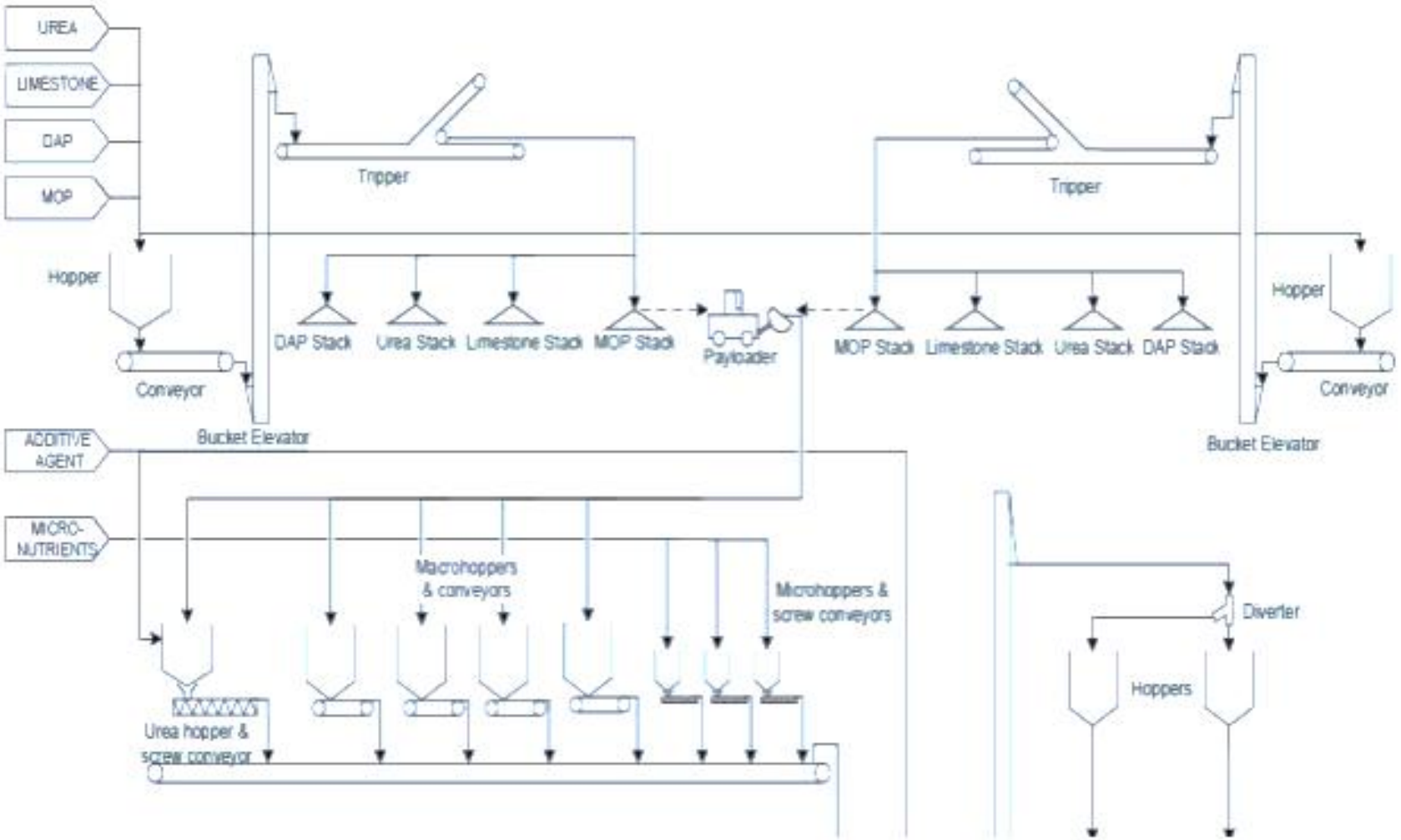

Figure 4-5: Flow diagram of the proposed fertilizer blending process

4.6 Pollution Control Measures

The considerations have been given to optimal use of resources by adopting best available production process and plants with focus on least waste generation. By the nature of the processes project will have key area as air, solid and hazardous waste. Details of these aspects and provision made in the project design are given in the following sections.

4.6.1 Air pollution and its management

The major air emission in the plant is majorly from coal milling to provide energy and production of granules.

Crushing and milling Section: limestone and gypsum are fed separately into the hopper by using crane with grab bucket. From hopper, a fixed quantity of rock is drawn with the help of a Pin Gate and through belt conveyor and fed to mill in which grinding takes place and the ground rock (fineness 90 to 93% passing through mesh), will be mechanically conveyed to storage. It will emit pollutants, principally PM and shall be discharged through bag type dust collector. If rock is wet, then it will be dried and dust-laden hot air from this unit will be passed through cyclone separator and dust chamber to remove dust

Stack emissions: The main sources of air pollution due to the operation of the plant are the coal stacks. PM and flue gases are the main air pollutants generated from the plant. The stack details are provided in table **4-2 below**:

Table 4-2: Stack Dimension

Stack height (m)	20
Stack diameter (m)	0.4
Stack exit velocity (m/s)	20
Stack temperature (^{0}K)	300
Type of emission	Particulate Matter

Table 4-3: Details of major Pollution Control Equipment's

Detail	**Specification**
Cyclone Separator	5No.
Size:	1.5m X 4m height (approx.)
Type of entry:	Tangential
Pressure drop:	100 mm WG
Inlet velocity:	15 m/s
Material of Construction:	MS Rubber lined/ brick lined
Pump Horse Power:	7.5 HP / 2900 RPM
Scrubbing Efficiency:	~ 80 %

4.7 Resource Requirements for the Project

4.7.1 Fuel Type and Source

Coal is the process fuel. Low sulphur (low volatile) bitumen coal will be delivered from a third party by road, then stored and milled onsite.

4.7.2 Water Use, Demand and Supply

The water demand for the plant includes drinking, sanitation, firefighting and plantation is estimated to be around 20–30 m^3 per day. Water requirement for the plant including drinking and sanitation will be from the two boreholes MMFL has on its project site; these will supply water for use during construction and operation of the plant. The available yield of the boreholes is approximately15m^3/hr and 20 m^3/hr respectively and is adequate to meet the water demand. The main water demand during the construction phase is for domestic (75%) and construction (25%) purposes. Low water volume will be required in the construction as it's shall only be needed in making ground concrete thereafter the structure will be made with iron sheets.

4.8 Wastes

Waste Materials	Sources	Collection Method	Disposal Method
Construction Phase			
Excavated material	Land excavation	Stored as piles in the project site	To be used as backfill material
Metal scrap	Steel use	Stored in designated area in the project site	To be recycled by NCCL's Devki Steel Mills Athi River
Used oil and grease	Lubricants	Stored in designated area in the project site for hazardous wastes	To be sold for local oil recycling industry
Garbage	Domestic use	Collected in bins and containers	Disposed in the licensed dumpsite for collection by a NEMA approved waste handler
Domestic waste water	Administration facilities	Underground pipeline to lined septic system	Emptied regularly by a NEMA licensed waste handler and disposed in licensed sewer network
Operation Phase			
Metal scrap	Steel use	Stored in designated area in the project site	To be recycled by NCCL's Devki Steel Mills Athi River
Used oil and grease	Lubricants	Stored in designated area in the project site for hazardous wastes	To be sold for local oil recycling industry
Garbage	Domestic use	Collected in bins and containers	Disposed in the licensed dumpsite for collection by a NEMA approved waste handler
Domestic waste water	Administration facilities	Underground pipeline to lined septic system	Emptied regularly by a NEMA licensed waste handler and disposed in licensed sewer network
Decommissioning phase			

Waste Materials	Sources	Collection Method	Disposal Method
Construction Phase			
Metal scrap	Steel use	Stored in designated area in the project site	To be recycled by NCCL's Devki Steel Mills Athi River
Garbage	Domestic use	Collected in bins and containers	Disposed in the licensed dumpsite for collection by a NEMA approved waste handler

4.9 Fugitive Emissions

There is no source of fugitive emission as such except during transportation of raw materials and in dump hopper. Only covered trucks will transport the raw materials. The dump hopping/collection happen under shed and in moist conditions. As such all products, remain confined to the shed area even when air borne. All precaution and provision for arresting the dust particles during crushing of rock and milling have been considered. This includes covered conveyer system with dust collection system at transfer points and water spraying for dust suppression on heavy vehicles movement areas/ roads.

4.10 Noise

The plant will have material crushing area and granulation unit as the noise source. Acoustic enclosure or noise reduction measures are proposed for all such areas to maintain the noise levels within national standards.

4.11 Effluent Generation

The wastewater generated from the proposed unit all of which shall be from domestic waste, this will be disposed in septic tank and soak pit. The Effluent generation from the proposed process unit will be nil as the unit will operate on a principal of "Zero Liquid Discharge" and no wastewater shall be discharge outside the plant premises. MMFL plant area has an existing storm-water drainage system. It consists of partially covered drains with masonry work. There are total six storm-water drainage outlets.

4.12 Solid Waste Management

Solid waste generated in the processing and other administrative area is segregated into organic and inorganic waste. Organic waste is converted in fertilizer. Other solid wastes are disposed of through NEMA licensed waste handlers. Proposed MMFL process shall not generate any new type of solid waste.

4.13 Hazardous Waste Management System

The hazardous waste management system at the plant is divided in to three major activities, viz. Collection, segregation and disposal. The hazardous waste generated is mainly used oil, oil filters, oil drums and electrical waste. Proposed plant expansion process will not generate any new type hazardous waste.

Legal Requirement: MMFL has identified all the obligations under the legal requirement of "Hazardous Waste (Management Handling and Trans-boundary

movement) Rules-2008". The hazardous waste management plan is evaluated every six months for compliance. Environmental department is responsible for the disposal of hazardous waste to NEMA licensed waste recycler. Disposal period is strictly 90 days from date of generation.

Collection of Hazardous Waste: Segregation of the hazardous waste is done based on the categories given in the Hazardous Rule 2008. Pre-printed labels are placed on the container. It is ensured that the compatibility of the materials is maintained between two hazardous materials.

Personal Protective Equipment (PPE): - PPE such as hand gloves, safety goggles and safety shoes are used while handling the hazardous waste.

4.14 Occupational Health and Safety for Workers

The existing system of Occupational Health and Safety is capable of catering to the needs, arising from the proposed expansion. The MMFL has a Health and Safety Policy.

4.15 Decommissioning Phase

The design life of the proposed factory will be 20 years, which is dependent on proper maintenance. It would more likely be upgraded or rehabilitated if this is found to be necessary in the future. However, should decommissioning be required in the long run, the general good practice guidelines for decommissioning of infrastructure as well as the existing environmental legislation of the time would guide appropriate decommissioning of the fertilizer blending plant.

5 BASELINE ENVIRONMENT

This Chapter describes the baseline environmental conditions around the proposed MMFL project site for various environmental attributes, i.e. physical, biological and socio-economic conditions, within the 10-km radial zone of the proposed project site, which is termed as the study area. Topography, drainage, meteorology, air, noise, water, soil and land constitute the physical environment, whereas flora and fauna constitute the biological environment. Demographic details and occupational pattern in the study area constitute socio-economic environment.

5.1 Definition of the Study Area

The fertilizer blending plant is located at the junction of Mzee Paurana road and KMC road in Athi River town about 1.5km from the Nairobi-Namanga road (A104) and 2km from the turn on the main Nairobi-Mombasa highway (A109) in the precincts of Mavoko Sub County in Machakos County, Kenya. The plant is on Plot No. LR No. 337/664, 337/52, 337/3253 and 337/667 at GPS location 01^0 27' 4.96" S, 36^0 58' 33.27" E and elevation of 1511m ASL. It occupies an area of about 11 acres and is in a designated industrial area. The immediate project neighbours are business premises and Industrial plants situated in the Northern and Southern areas of the project site. National Cement Company Limited a sister company for MMFL owns the parcels of land which is currently housing the 100mtpa fertilizer blending plant.

Figure 5-1: Enhance Google Map showing project site

5.1.1 Political Units

Machakos County is divided into eight constituencies which are further broken down into forty (40) County Assembly Wards as illustrated in table below.

Table 5-1: Machakos County Assembly Wards

Constituency	County Assembly Wards
Masinga	Kivaa
	Masinga Central
	Ekalakala
	Muthesya
	Ndithini
Yatta	Ndalani
	Matuu
	Kithimani
	Ikombe
	Katangi
Kangundo	Kangundo North
	Kangundo Central
	Kangundo East
	Kangundo West
Matungulu	Tala
	Matungulu North
	Matungulu East
	Matungulu West
	Kyeleni
Kathiani	Mitaboni
	Kathiani Central
	Upper Kaewa/Iveti
	Lower Kaewa/Kaani
Mavoko	Athi River
	Kinanie
	Muthwani
	Syokimau/Mulolongo
Machakos Town	Kalama
	Mua
	Mutituni
	Machakos Central
	Mumbuni North
	Muvuti/Kiima Kimwe
	Kola
Mwala	Mbiuni
	Makutano/Mwala
	Masii

5.1.2 Administrative Units

Administratively, the County is sub-divided into eight sub-counties/constituencies, namely Mavoko, Kathiani, Machakos, Matungulu, Yatta, Masinga, Mwala, and Kangundo. The eight sub-counties are further sub-divided into twenty-two divisions,

seventy-five locations and two hundred and thirty-nine sub-locations as shown in **table 5-2** below.

Table 5-2: Area and Administrative Units by Sub-County

Sub-county/ Constituency	Area (km^2)	Divisions	No. of Locations	No. of Sub-locations
Machakos	925.2	2	13	39
Kangundo	177.2	3	9	25
Kathiani	207.1	1	4	21
Mavoko	843.2	4	7	14
Yatta	1,057.3	3	8	23
Masinga	1,402.8	2	9	29
Matungulu	577.5	3	10	30
Mwala	1,017.9	4	15	58
TOTAL	6,208.2	22	75	239

Source: Machakos County CIDP 2018 – 2022

The table indicates that Mwala Sub-county has the highest number of administrative units with 15 locations and 58 sub-locations. Mavoko Sub-county has the lowest number of sub-locations at 14. Though Kathiani has lowest number of locations i.e., 4, it has more sub-locations compared to Mavoko Sub-county.

5.2 Climate

The County receives bimodal rainfall with short rains in October and December while the long rains from March to May. The rainfall range is between 500mm and 1250mm, which is unevenly distributed and unreliable. The altitude mainly influences rainfall distribution in the county. The high areas such as Mua, Iveti and Kangundo receive an average rainfall of 1000mm while the lowland areas receive about 500mm. Temperatures vary between 18˚C and 29˚C throughout the year. The dry spells mainly occur from January to March and August to October. Athi River Town and the greater Machakos County fall under the agro-climatic zone IV, characterized as semi-arid with average rainfall amounting to 450-900mm annually. A small portion of the County has potential for agriculture. 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.

5.3 Geology

The lithology of the area comprises several geological sequences. The volcanic rocks in the area are represented by Upper Athi Series consisting of sediments and Lake Beds, Athi Tuffs and Kapiti phonolite. The thickness of these volcanics varies but generally decreases towards the South and South-East as they reach the limit of the lava flows. The geological succession

underlying the project area consists of the Cenozoic volcanics, which, in geo- chronological order, consists of the following formations:

- Upper Athi Series
- Kapiti Phonolites
- Basement System

The Upper Athi Series forms part of the extensive Athi tuffs and lake beds. Its occurrence is as a result of consolidation of fragmental volcanic material, which was deposited shallowly into water after eruption. Geaverts, 1964, classify the series as all the sediments and tuffs lying between the Nairobi and the Kapiti phonolite. They are taken to include beds of the Kerichwa Valley series where the phonolite and trachytes are absent. Wherever the contacts of the Kapiti Phonolite are present, the unit underlies associated volcanic rocks and is consequently the oldest lava of the succession. The basement system comprises crystalline rocks of Precambrian age. They are predominantly biotite gneises, frequently migmatitic and rich in hornblende.

5.3.1 Soils

There is a close relationship between the geological formation, topography and soils. Athi River lies in an area of predominantly black cotton soil. The thickness of these soils varies with the geological sequences of the area. The weathering process of the Kapiti Phonolite results to the formation of the orange-brown lateritic soil below the dark grey black cotton soil. The black cotton soil or vertisol has a high content of expansive clay (60%) known as montmorillonite that forms deep cracks during drier seasons. Alternate shrinking and swelling causes self-mulching, where the soil material consistently mixes itself. Vertisols typically form from highly basic rocks such as basalt and phonolites in climates that are seasonally humid or subject to erratic droughts and floods, or to impede drainage. The shrinking and swelling of vertisols can damage buildings and roads, leading to extensive subsidence.

The lateritic soil is the reddish soil developed from weathering which is also known as latosol. They are soils of humid tropical or equatorial zones characterized by a deep weathered layer from which silica has been leached, a lack of humus, and an accumulation or layer of aluminium. The reddish-brown colour of these soils is derived from a wide variety of rocks weathering under strongly oxidizing and leaching conditions. Lateritic soils may contain clay minerals; but they tend to be silica-poor, for silica is leached out by waters passing through the soil.

5.4 Surface Hydrology and Drainage

The regional hydrogeology indicates that the most significant aquifer system is located in the Upper Athi Series. This is the main aquifer for boreholes in Nairobi and Kiambu areas and is composed of tuffs, lakebeds and sediments. Other aquifers in this area are found in the weathered inter-lava layers and in fractured zones. Basement System rocks where aquifers are predominantly found in fractured or deeply weathered zones. Water quality in the Athi River is impacted by industrial and commercial activities predominantly in Nairobi and Athi River areas where a variety of toxic pollutants are discharged.

5.4.1 Water Resources

Machakos County is a water scarce County with its water situation levels below the national natural endowment of 647m per capita per year. Its arid and semi-arid areas are critically limited in water endowment. This serious water stress adversely affects food production and often disrupts economic development. To address the water scarcity situation, more investment in water storage infrastructure should be done to increase water storage per capita.

Water resources in the County are mainly seasonal rivers, dams and springs. Furthermore, the County has two perennial rivers. One of them traverses the County namely Athi River and the other namely Tana River forms the County boundary with Embu and Tharaka Nithi counties. The dams include Maruba, which is the main source of the water consumed in Machakos town whereas Masinga dam on Tana River is shared between Machakos and Embu counties. In addition, several earth dams and springs across the County serve as water resources. Underground water sources (boreholes and wells) supplement surface water sources. Most of these water sources are under threat of pollution from agricultural chemicals, urban and industrial wastes especially Athi River, which is under threat of pollution from the Nairobi city and adjacent towns. The water resources are also under pressure for use in agricultural irrigation, domestic, industrial and use for hydroelectric power generation.

Figure 5-2: Drainage System Erected by the Plant

5.5 Ecological Conditions

The County has several hills namely Iveti, Lukenya, Komarock, Ithanga, Mavoloni, Kangonde, Kamuthamba, Nzii, Ekalakala, Kyanzavi, Mua, Kiima kimwe, among others. In addition, the County is home to Yatta plateau and has two main permanent rivers, that is, Tana and Athi.

Table 5-3: Major Agro – Ecological Zones across the County

Major AEZ	Ward (s)	Precipitation amounts & adequacy	Score
Lower Highlands (LH) 2-3	Upper Kaewa, Kathiani Central, Mua,	Moderate (1000 - 1250mm)	3

Upper midland (UM) 2-3	Machakos Central, Upper Kaewa, Kathiani Central, Kangundo Central, Kangundo East, Kangundo West, Kangundo North, Tala, Matungulu East, Mutituni, Mumbuni North	Moderate (1000 - 1250mm)	3
Upper midland (UM) 4	Kalama, Kola, Muvuti-Kiima kimwe, Lower Kaewa, Mitaboni, Kangundo East, Matungulu West,Matungulu East, Matungulu North, Kyeleni,	Low (500-750mm)	4
Upper midland (UM) 5-6	Athi river North, Kinanie, Muthwani, Syokimau- Mlolongo	Low (500-750mm)	4
Lower Midland (LM) 3	Kangundo East, Masii	Very low (<500mm)	5
Lower Midland (LM) 4	Kangundo East, Masii, Mbiuni, Muthetheni, Mwala- Makutani	Very low (<500mm)	5
Lower midland (LM) 5	Wamunyu, Kibauni, Ikombe, Katangi, Matuu, Ndalani, Kithimani, Kivaa, Ekalakala, Masinga central, Muthesyia, Ndithini	Very low (<500mm)	5

5.5.1 Physical and Topographical Features

The physical and topographical features in Machakos County include amongst others hills rising between 1800 – 2100m above sea level and Yatta plateau, which is elevated to about 1700m above sea level, slopes to the South East and isolated hills in the North West. In the plains, the soils are well-drained, shallow, dark and red clay soils. In addition, the vegetation across the entire County varies according to the altitude. The plains receive less rainfall and are characterized by open grassland with scattered trees as compared to high altitude areas, which receive high rainfall and have dense vegetation. 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 receives 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.

5.5.2 Land-Use

Land use in Machakos County urban centres is generally mixed development. There are no clear-cut zones for specific land uses in the county. This is because all the existing physical development plans except Machakos New Town Local Physical Development Plan are outdated hence not in force. There is no well-defined zoning policy in the county that guides land use development in all its urban centres sometimes leading to overlaps and mixing of incompatible land uses. There are two basic land use structures, which are rural and urban. Rural: Agriculture (arable), Urban: residential, commercial, industrial, recreational, wildlife, rangeland. Most of the heavy industries in Machakos County are concentrated in Mavoko Sub County. The other towns mainly have light industrial establishments. The project site is off the old Mombasa Road and has largely commercial and industrial land uses. The project area is also compatible with the recent land use within the County.

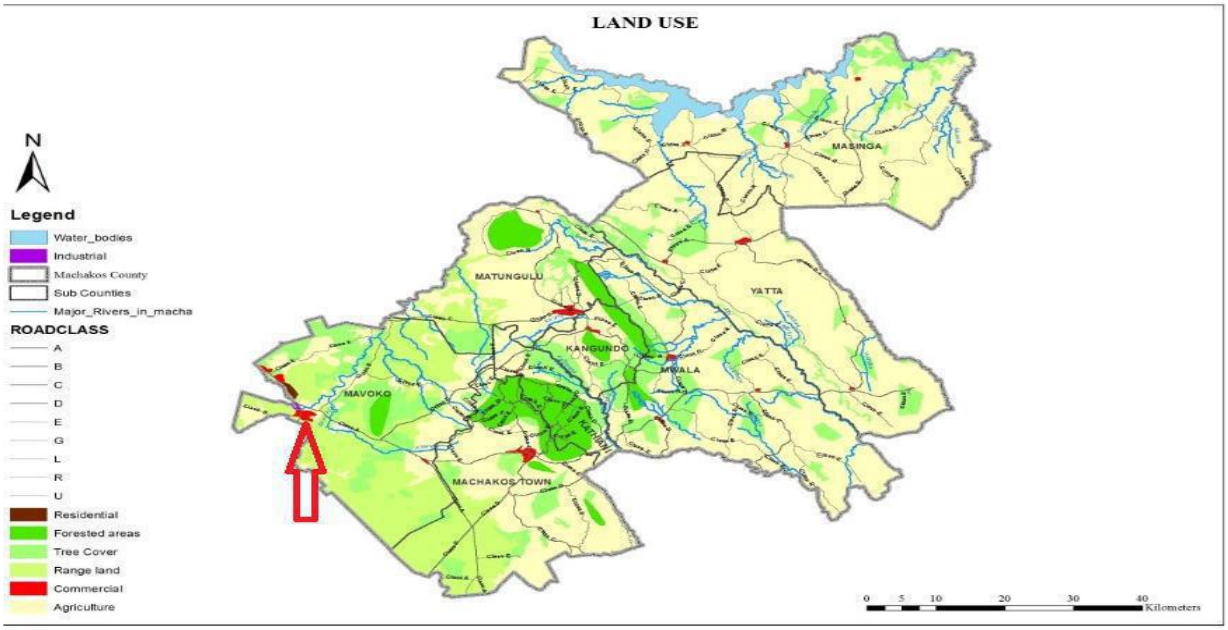

Figure 5-3: Project site in relation to land use within the County

5.6 Biological Environment

5.6.1 Flora

The vegetation around the site is scanty as the entire site is in a built-up environment. The vegetation cover in the project site is a bushland with the potential plant growth being medium to low. The main habitats within the Athi River ecosystem are the grass plains dominated by *Cynodon, Themeda, Cypress, and Digitaria species; Dry forest, Olea africana, Croton dichogamus, Brachylaena hutchinsii, and Calodendrum; Riverine forest/valley forest, Acacia xanthophloea, Euphorbia candelabrum, Apodytes dimidiata, Canthium schimperiana, Elaeodendron buchananii, Ficus eriocarpa, Aspilia mossambicensis, Rhus natalensis, and Newtonia* species.

Figure 5-4: Flora within the project site

5.6.2 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 because 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. There are two livestock markets one in Masii and another in Masinga, where farmers can sell their livestock. The County has made provisions within the budget to avail day old chicks to farmers.

5.7 Socio– Economic Environment

5.7.1 Population

Machakos County is at the beginning of a transition from a child rich population structure where those aged between 0-14 at 39%, are at the onset of a decline while those aged between 15-34 years old who constitute 34% of the total population are beginning to increase. This is also evidenced by the fact that the percentage household size of 0-3 members is 42.3% and 4-6 household size members is 42.6%.

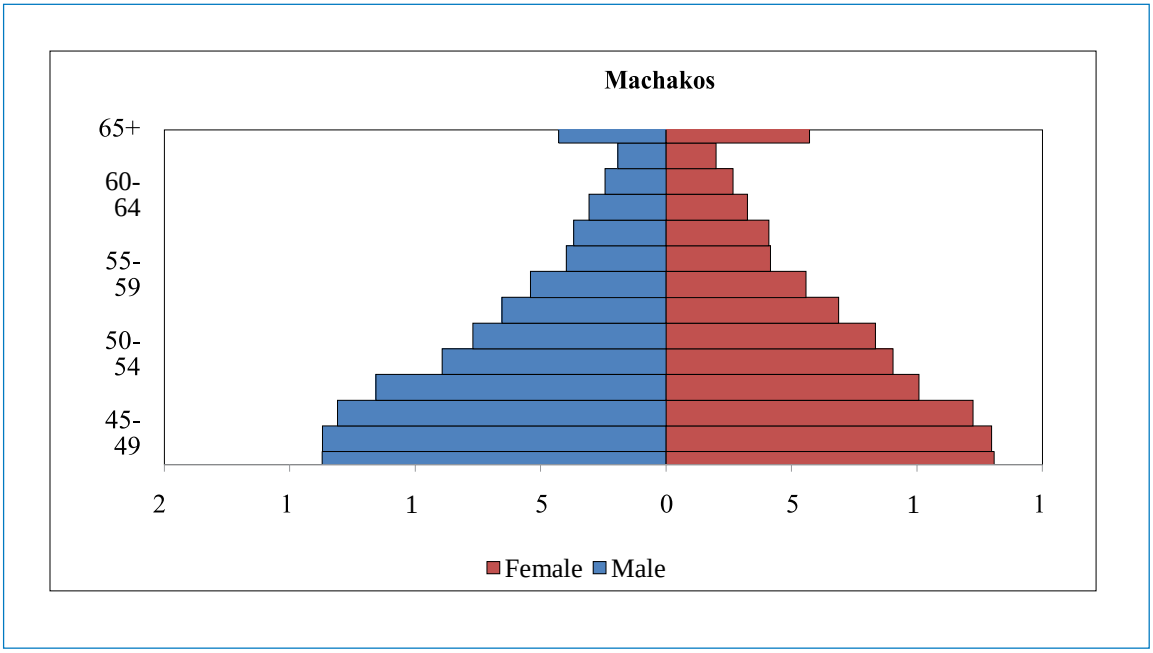

Figure 5-5: Machakos County population pyramid

5.7.2 Road Network

The current road network in the County is not adequate in terms of coverage to meet current and future demands as envisaged in the Vision 2030. There is heavy congestion on most of the city roads especially during the morning and evening peak hours. The current poor state of road network is a great impediment to socio-economic growth leading to high production costs and low productivity.

5.7.3 Energy Access

The main source of energy for cooking and lighting is wood and electricity respectively. Other sources of energy across the County are solar, wind, biogas, gas, charcoal and paraffin. Masinga dam is one of the Seven Folks dams, which produce hydroelectric power for the national electricity grid. There is increasing connectivity to the national grid across the County because of the implementation of "last mile" power project by the national government.

5.7.3.1 Cooking Fuel

Only 3% of residents in Machakos County use liquefied petroleum gas (LPG), and 11% use paraffin. 69% use firewood and 16% use charcoal. Firewood is the most common cooking fuel by either gender with 64% of male-headed households and 76% in female-headed

households. Mavoko constituency has the highest level of charcoal use in Machakos County at 31%.This is five times Masinga constituency, which has the lowest share at 6%. Mavoko constituency is 15 percentage points above the county average. Athi River ward has the highest level of charcoal use in Machakos County at 41%. This is 39 % points more than Muthesya ward, which has the lowest share. Athi River ward is 25 % points above the county average. Mavoko constituency has the highest level of paraffin use in Machakos County at 42%. This is 40 percentage points above Masinga constituency. Mavoko constituency is 31% points higher than the county average. Syokimau ward has the highest level of paraffin use in Machakos County at 58%. This is 58 % points above Kangundo East ward, which has the lowest share. Syokimau ward is 47 % points above the county average.

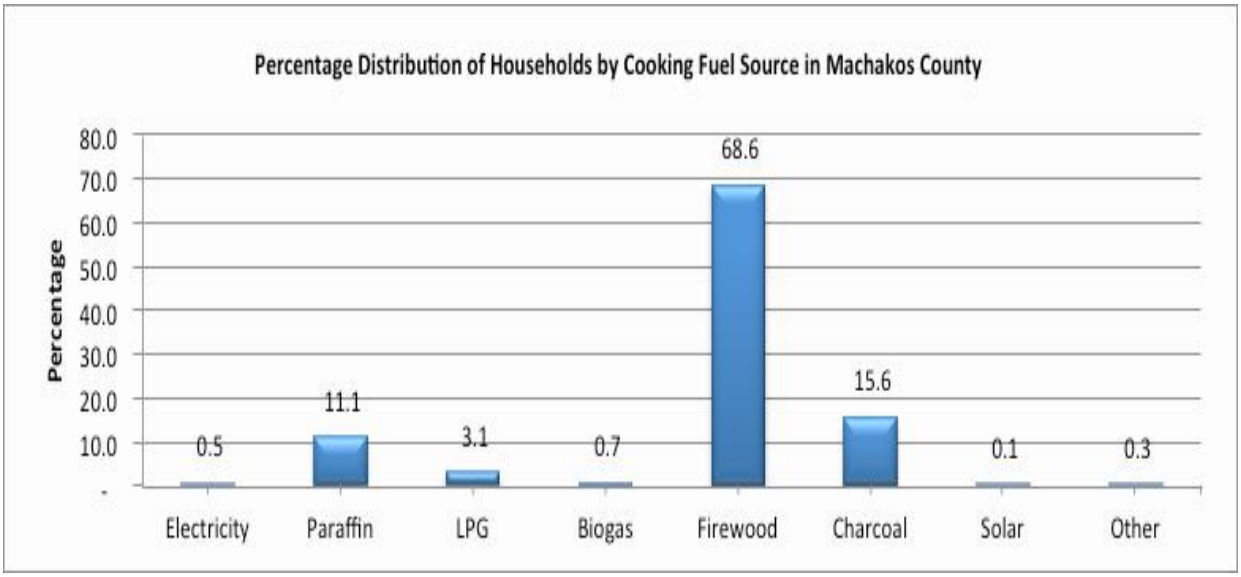

Figure 5-6: Percentage Distribution of Households by Source of Cooking Fuel in Machakos County

5.7.3.2 Lighting

A total of 17% of residents in Machakos County use electricity as their main source of lighting. A further 54% use lanterns, and 24% use tin lamps. Less than 1% use fuel wood. Electricity use is mostly common in male headed households at 19% as compared with female headed households at 13%. Mavoko constituency has the highest level of electricity use at 46%. That is 12 times Masinga constituency, which has the lowest level of electricity use. Mavoko constituency is 29 percentage points above the county average. Syokimau ward has the highest level of electricity use at 62%. That is 62 percentage points above Ikombe ward, which has the lowest level of electricity use. Syokimau ward is 45 percentage points above the county average.

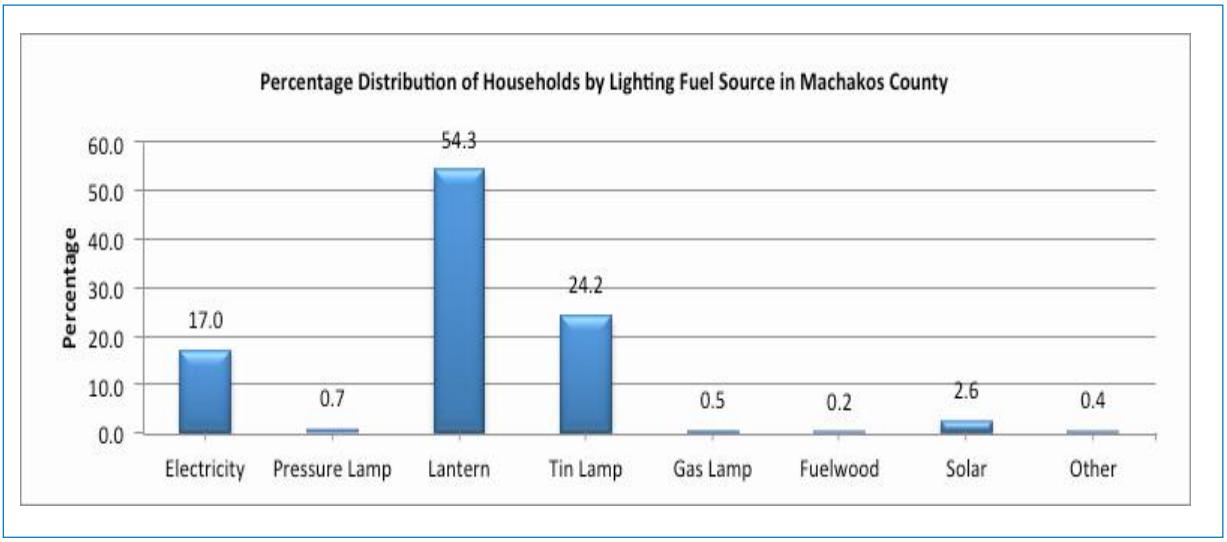

Figure 5-7: Percentage Distribution of Households by Source of Lighting Fuel in Machakos County

5.7.4 Housing

5.7.4.1 Flooring

In Machakos County, 58% of residents have homes with cement floors, while 40% have earth floors. Less than less than 1% has wood and just 2% have tile floors. Mavoko constituency has the highest share of cement floors at 83%. That is twice Masinga constituency, which has the lowest share of cement floors. Mavoko constituency is 25 percentage points above the county average. Athi River ward has the highest share of cement floors at 92%. That is four times Kyeleni ward, which has the lowest share of cement floors. Athi River ward is 34 percentage points above the county average.

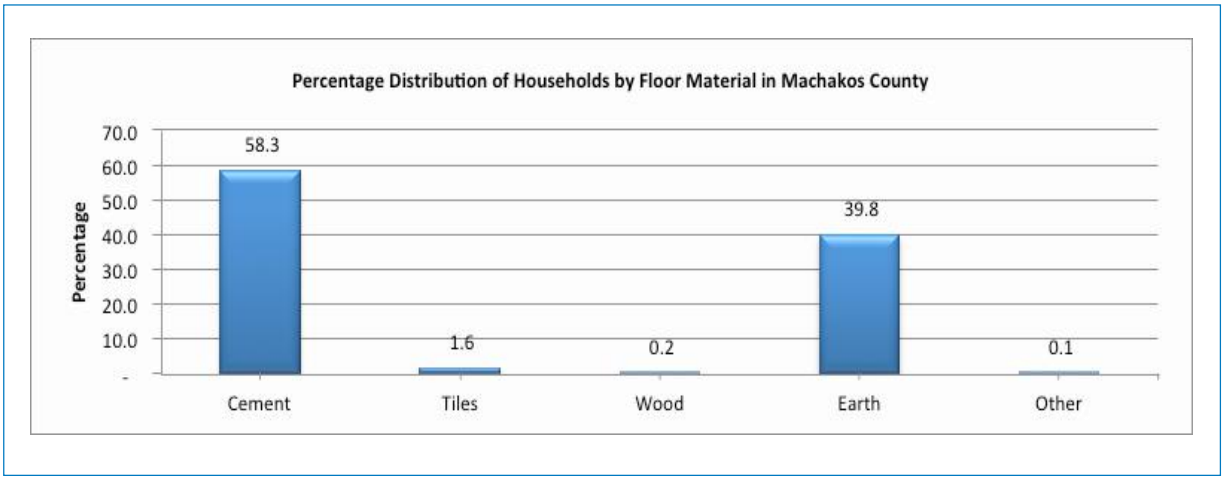

Figure 5-8: Percentage Distribution of Households by Floor Material in Machakos County

5.7.4.2 Roofing

In Machakos County, 3% of residents have homes with concrete roofs, while 89% have corrugated iron sheet roofs. Grass and makuti roofs constitute 5% of homes, and none have mud/dung roofs. Kathiani and Kangundo constituencies have the highest share of corrugated

iron sheet roofs at 96% each. That is 21 percentage points above Mavoko constituency, which has the lowest share of corrugated iron sheet roofs. Kathiani and Kangundo constituencies are 7 percentage points above the county average. Kangundo North ward has the highest share of corrugated iron sheet roofs at 99%. That is 37 percentage points above Syokimau ward, which has the lowest share of corrugated iron sheet roofs. Kangundo North ward is 10 percentage points above the county average.

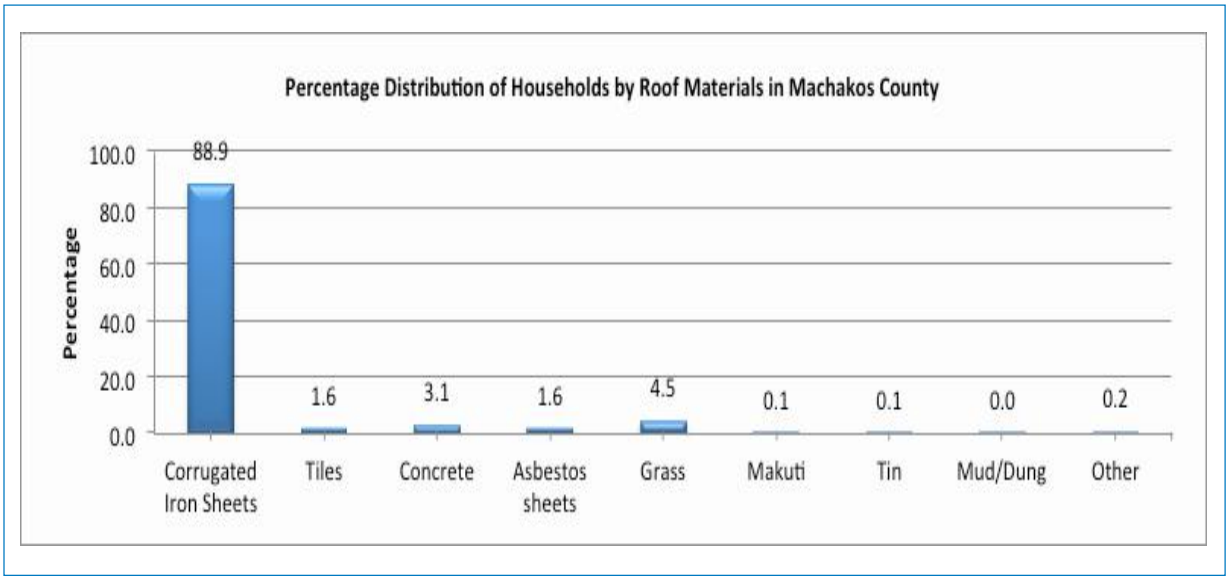

Figure 5-9: Percentage Distribution of Households by Roof Material in Machakos County

5.7.5 Health Access

The construction of health facilities programme through Economic Stimulus Programme (ESP) and Constituency Development Fund (CDF) led to increase in health facilities in all sub counties. The County Government has greatly improved the health facilities with one Level 5 hospital located at Machakos town and four Level 4 hospitals in Kathiani, Mwala, Matuu and Kangundo. Other health facilities by ownership include 193 under the County Government, 32 owned by Faith Based Organizations (FBOs), 9 owned by Non-Governmental Organizations (NGOs) and 128 privately owned. The total health facilities in the County are 367. Most of the health facilities are in the urban areas. Patients/clients in rural areas travel longer distances to access health services. In response, the County Government has instituted measures to ensure access to well-equipped health centres within the wards.

5.7.6 Education, Skills, Literacy and Infrastructure

Education provides individuals with technical or professional skills and increases their chances and capacity to obtain a higher income and standard of living. Literacy levels in the county stand at 92.4% of which male and female literacy levels is 95.4% and 89.4% respectively. Education status in the county is as in the **table 5-4** below.

Table 5-4: Education Status

Population with KCPE certificate	Population with KCSE certificate	Population with College certificate	Population with diploma certificate	Population with degree certificate	Population with no qualification
32.4%	19.9%	1.8%	2.6%	1.5%	40.1

Source: *Machakos County Integrated Development Plan, 2018-2022*

5.7.7 Mining

The major mineral deposits within the County are limestone, granite and sand. Most of the major cement factories in Kenya are located in Mavoko Sub-county namely Bamburi Cement, East Africa Portland, Mombasa Cement, Ndovu Cement, Simba Cement, Athi River Mining and Savanna Cement. Sand is mostly harvested along the riverbeds by private individuals. In addition, there are quarries for stone mining.

5.7.8 Industry and Trade

Industries in the County are mostly located in Athi River, Mavoko Sub-county. Some of these include cement industries, agro-chemicals industries, steel plants and textile industries in EPZ, among others. Trade across the County is mainly on small-scale basis. However, there are large-scale businesses like go downs, business parks, industrial parks, malls and supermarkets. These are bound to increase drastically because of development of modern infrastructure across the County. In Katumani, a model plant for production of aflasafe in the country has been established.

5.7.9 Water

Improved sources of water comprise protected spring, protected well, borehole, piped into dwelling, piped and rainwater collection while unimproved sources include pond, dam, lake, stream/river, unprotected spring, unprotected well, jabia, water vendor and others. In Machakos County, 37% of residents use improved sources of water, with the rest relying on unimproved sources. Use of improved sources of water is common in male-headed households (39%) as compared with female-headed households (33%). Mavoko constituency has the highest share of residents using improved sources of water (65%). That is about three times Mwala constituency, which has the lowest share using improved sources of water. Mavoko constituency is 28 percentage points above the county average. Syokimau ward has the highest share of residents using improved sources of water (77%). That is 15 times the coverage in Muthetheni ward, which has the lowest share using improved sources of water. Syokimau ward is 40 percentage points above the county average.

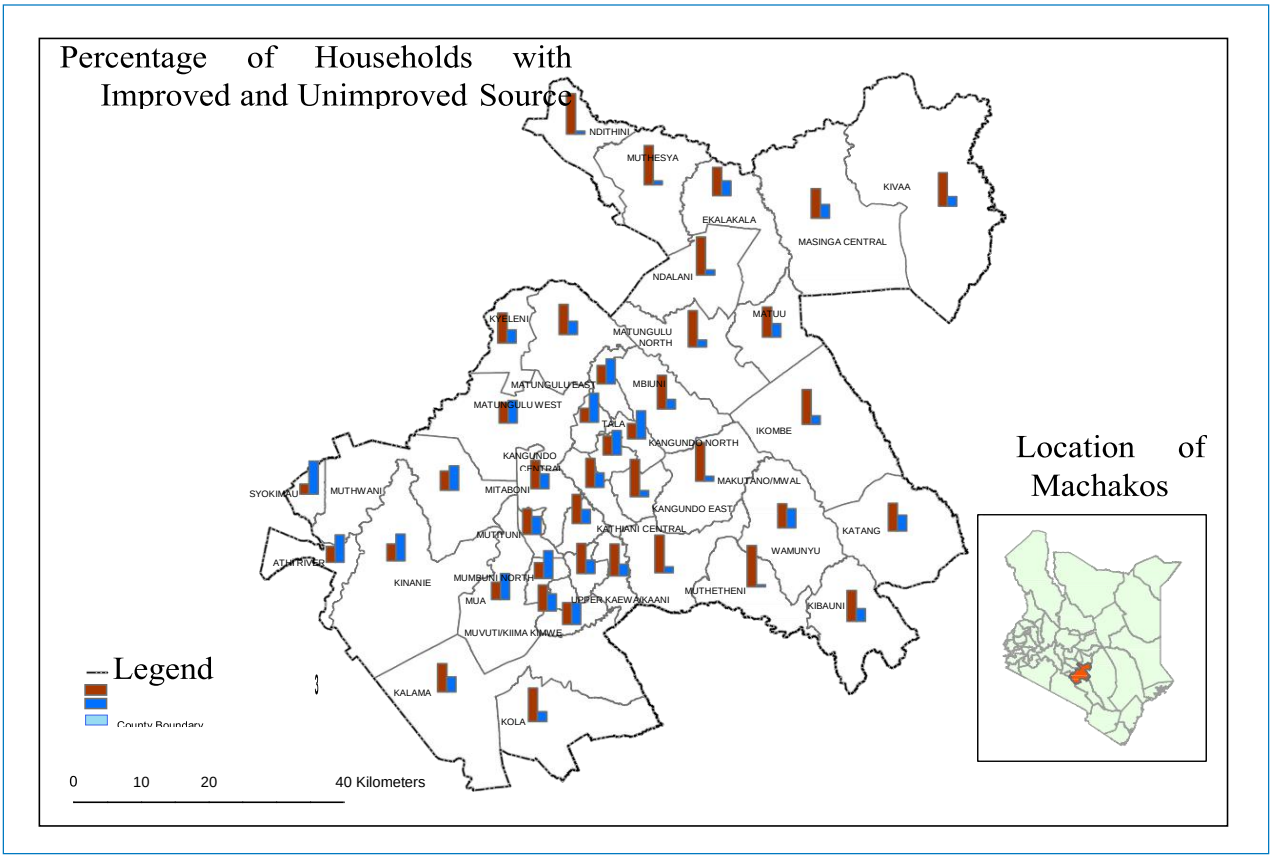

Figure 5-10: Machakos County-Percentage of Households with Improved and Unimproved Sources of Water by Ward

5.7.10 Sanitation

There are two sewer lines in Machakos and Athi River towns. However, the Machakos line is partially connected to sewer lines-this includes parts of Kariobangi and Mjini where more than 50% use pit latrines. The County Government, private firms and individual households do garbage disposal. The site has septic tanks, NEMA licensed waste handlers exhaust the sceptic tanks. The project does not include construction of any additional sanitation facilities to cater for staff and visitors as the available facilities are adequate.

5.7.11 Employment

5.7.11.1 Wage Earners

There are few formal employment opportunities within the County. Majority of employees in the County are casual labourers working in the farms, construction, manufacturing and textile industries.

5.7.11.2 Self Employed

Most residents in the County are self-employed. Those living in the rural areas engage in agricultural activities while those in the urban areas engage in small-scale businesses as their sources of livelihood. The national government has set up various funds such as Youth Fund, Uwezo Fund and Women Fund to provide affordable credit to small businesses and/or self-help groups to start or improve their businesses and agricultural activities. On the other hand,

the County Government has set up a fund to support women commonly referred to as table banking.

5.7.11.3 Labour Force

The County has a high number of skilled and unskilled labourers that is steadily increasing. This poses a major challenge in matching employment opportunities with the surplus labour.

5.7.11.4 Unemployment Levels

The unemployment rate in the County is high due to increasing level of labour force with unmatched slowly growing commercial sectors. In addition, land use change from agricultural to real estate development and other uses has shrunk employment opportunities in agriculture sector. Mostly, the youth are unemployed due to their preference for white-collar jobs, shying

6 ANALYSIS OF ALTERNATIVES

This section presents a discussion on the various alternatives considered during project planning and design, as well as reasons for the selection of the preferred alternative. Alternatives, in relation to a proposed project, mean different ways of meeting the general purpose and requirements of the project and may include the following types of alternatives:

- Location alternatives;
- Type of project development to be undertaken;
- Design or layout of the project development;
- Technology to be used for the development; and
- Operational aspects of the development.

It therefore follows that projects such as fertilizer production that may have impacts on the environment may raise issues of concern and alternative causes of actions are always considered. The reason is to assess the effects of these alternatives on the environment against expected benefits. For this project, four main alternatives were considered in all, three of them against the proposed project that was the fourth alternative. The four alternatives considered were therefore as follows:

- The 'No project' option
- Using other locations
- Using a different technology for the proposed production process
- Project execution as proposed

6.1 Project Execution as Proposed

Taking this option means that the proposed blending plant will be constructed. Current challenges facing farmers in the country which include higher fertilizer cost in the country as well as longer delivery time. These problems will be minimized as soon as the proposed project is implemented according to the design. The implication of taking this project alternative, in contrast to the "No Project Alternative", is that cheaper, effective and a less environmentally damaging fertilizer blending plant will be delivered at the end of the construction period. Other implications include enhanced socio-economic impacts to be brought about on the project communities by the execution of the project. Significant positive environmental impacts will also be made if the project is carried out as proposed due to the numerous benefits accruable to the inhabitants of the project area and those in the extended project's area of influence. For instance, socio-economic, educational and health status of the immediate and extended host communities will improve as a result of the execution of the project. The proposed project thus has a high tendency for discouraging rural-urban drift in its area of influence.

6.2 No Project Option

It is essential that the 'no project option' be considered as a first step in mitigation. This alternative implies that the proposed fertilizer production will not go on and this implies the proponent will make no further investments in the area of fertilizer blending/production. This means that the identified benefits presented in the succeeding section will not come into fruition. This alternative is against the desires of the government to boost competitiveness,

facilitate manufacturing, industrialization and agricultural self-reliance, which will in turn lead to improved access to social services and improved quality of life.

6.3 Alternative Location

Approximately 11 Acres land is already under the possession of MMFL and expansion project is coming in same premises of MMFL within 8000m^2. There is no additional land required for the proposed Project. The location of an industry is an important factor in its success. For example, its location to some extent determines access to markets, ease of transportation of raw materials among other things. Athi River is a good location for the proposed expansion project considering the fact that the area is a designated industrial zone that already hosts several industries and the current plant as well. The option of using other locations would not be as beneficial as the current location in Athi River, as the plant is currently in the region. This option was therefore rejected.

6.4 Alternative Fertilizer Grades

This alternative entails planning and constructing a blending plant that will produce different grades and blends of fertilizer from the proposed ones. The proposed production process is a result of an optimized cost-effective engineering design against which several alternative products were considered during the initial design. Alternative fertilizer production options may be prohibitively more expensive because the raw materials may have to be imported, whereas the raw materials to be used for the proposed project are locally available in the country.

6.5 Alternative Energy

Coal will be used as the source of fuel in drying the granules. coal is energy-efficient and provides hot aired flue gas efficient for granulation exercise in the production process.

Heavy Fuel Oil (HFO) are products based on the residues from various refinery distillation and cracking processes. It has a high calorific value with low consumption rate and produces heat that have particularly high viscosity and density which is suitable for the production small amount of light fuel oil in the form of heating oil, gas oil or diesel grades to fire kiln "lighting up" burners, and to heat auxiliary furnaces for raw material drying. This alternative was however not feasible since it would be costly, and design already had a recommendation of another fuel.

Power will be supplied from the national electrical grid (33Kv). The only other alternative is the use of a generator, which is less favorable due to the cost involved.

Solar panel is a feasible alternative for power generation but was not considered since it's an expensive exercise.

6.6 Alternative Water Source

Piped Water

The site is connected to a piped water supply from Mavoko Water and Sewerage Company (MAVWASCO). The supply is however erratic and unreliable only pumped once per week

and only considered for domestic use (drinking) during the construction and operation since it's a fresh water supply.

Ground Water

Water supply supporting current operations at the plant is abstracted from the two permitted existing boreholes owned by NCCL- Athi river. The boreholes yield approximately 15m ^{3} /hr and 20 m ^{3} /hr which is considered sufficient enough to support and meet the water requirements of the expansion project. Use of the boreholes during construction and operations will not exceed the abstraction levels detailed in the WRA permit. Since the water from the boreholes is considered hard water, it shall be used during the construction phase in making concretes and in operation phase for cleaning purposes.

Surface Water

The nearest water source to the site is Athi River which could provide water supply all year round. Majority of the residents along the river course downstream to Indian ocean depends on its supply for domestic and agricultural purposes. Abstracting water from the river would therefore partially infringe on the downstream residents from obtaining sufficient water supply especially during erratic weather conditions. Moreover, obtaining a permit for abstractions would require for longer duration of time and processes. This method was therefore expunged from consideration as the design process already envisioned ground water and pipeline as the alternative sources.

7 PUBLIC PARTICIPATION

7.1 Overview

The need for public involvement in development projects is in the Constitution. This is further set out in EMCA 1999 (Amended 2015), and the Integrated Environmental (Impact and Audit) Regulations of 2018. Community consultation and participation ensures that project stakeholders are part and parcel of the proposed development and in so doing ensures the sustainable management of resources. Evidence shows that projects that are subjected to a consultative and public participation process acquire higher level of acceptance and accrue benefits to a wider section of the society.

7.2 Aim of the Stakeholder Consultations

The aim of the public consultation process was to:

- Share project information with stakeholders;
- Collect the views and concerns of the stakeholders regarding the project;
- Gather stakeholder perceptions on the positive and negative project impacts and how these can be enhanced or overcome, respectively; and
- Build stakeholder consensus of the project

7.3 Consultation Methodology

Questionnaires were prepared and administered to the public identified during mapping of stakeholders. Stakeholder consultations were carried out between 6th-8th December 2020. Sample copies of the filled questionnaires is annexed to this report under Appendix 1. The study employed three main methods of consultations to get the data presented in this report. These are:

- Meetings and discussions with key stakeholders.
- Questionnaire administration and interviews;
- Public consultation meeting within the project area

7.4 Feedback from Stakeholder Interviews

7.4.1 Consulted Parties

The respondents were identified through simple random sampling technique. Some of those interviewed had prior knowledge of the proposed project, particularly those living in the vicinity of the proposed site. The public survey focused around economic, social, safety, health, environmental and welfare issues. Those interviewed were welcoming of the project since in their opinion, the project will create employment for skilled and unskilled labourers especially bearing in mind that the area relies heavily on casual employment from a number of factories and processing facilities in the area.

7.4.2 Summary of Responses

This section presents a brief compilation of the responses obtained from those interviewed.

7.4.2.1 Perceived Positive Impacts

Respondents acknowledged that the project would have some positive impacts which they enumerated as below:

- Create more job opportunities to the local community

- More revenue to the national and the county government
- Land lords will benefit because there will be more people to rent houses
- Increased economic status of the town

7.4.2.2 Perceived Negative Impacts

Majority of the people whose opinion was obtained during the ESIA consultations had no objection to the implementation of the project but agreed that the project has potential gains and costs. The negative impacts perceived by respondents have been highlighted in the subsequent section.

- Noise pollution during construction
- Air pollution because of the trucks coming in and out of the facility and from operation
- Increased traffic during and after construction
- Injuries from bulk handling
- Population will increase due to available employment opportunities that overcrowding
- Insecurity is likely to increase because of the newcomers

8 IMPACTS & MITIGATION MEASURES

8.1 Introduction

The construction and operation of the proposed project involves various activities which may have impact on the environment. Impact analysis has been carried out for all the activities for different phases of the proposed project for physical, biological and socio-economic environment. The anticipated qualitative potential impacts related to the proposed project activities and risk interaction based on the environmental sensitivities/ resources available in the project area and surroundings has been provided in interactive matrices in this chapter. The impact analysis performed is intended to cover the impacts of construction and operational activities associated with the proposed expansion plant. Based on the proposed project activities and the baseline information provided in Chapter 5, the activities have potential to impact the following environmental resources in **Table 8-1** below:

Table 8-1: Identification of Potential Impacts

		Environmental Sensitivities								
		Physical				Biological		Socio-economic		
Impacts/ Risks / **Activities**	Air Quality	Noise	Surface Water Quality	Ground Water Quality	Land	Flora	Fauna	Conditions of Living Local People	Occupational Exposure & General Safety	Economy
Site preparation and construction by demolishing existing AN bagged storage area	◆	◆	◆		◆			◆	◆	◆
Installation and operation of process plant and bagging machines	◆	◆	◆		◆			◆	◆	◆
Transportation of personnel and material	◆	◆						◆		◆
Atmospheric emissions	◆					◆	◆	◆	◆	
Noise levels		◆						◆	◆	
Wastewater generation			◆		◆					
Solid/Demolition waste generation	◆				◆				◆	
Socio-economic								◆		◆

Denotes likely adverse impact ◆ **Denotes positive impact** ◆

8.2 Impact Assessment and Evaluation

Identification of project activities (project construction and operation phases) and environmental components which may be impacted due to different project activities is carried out and is given in **Table 8-1 above.** Significance of impact on each of the identified environmental components for all the activities is assessed and evaluated using qualitative and quantitative techniques. Thereafter, cost-effective but appropriate mitigation measures are proposed to eliminate or minimise the identified impacts. An ESMP has been designed to ensure the effective implementation of proposed mitigation measures.

8.3 Impacts during Implementation/Construction Phase

8.3.1 Site Clearance Impacts

Proposed land is located in Athi River dominated by a good number of industries. At present the plant is already operating in this plot. Considering the market demands, intend to expand existing unit. Since the infrastructure and machineries are identically same for the plant, hence the existing infrastructure and machineries plant shall be used for proposed plant. Hence limited construction is associated with the project. Further noise fugitive dust emission is anticipated from machineries like trucks/dumpers etc. No tree/shrubs cutting is required in the proposed project. These impacts can be managed with the mitigation measures which are proposed below.

Mitigation Measures

- To control the fugitive emission during construction phase adequate water sprinkling system will be developed in dust generating area.
- All trucks/machineries used for construction should have PUC.
- All the loose construction material will be transported in covered trucks/dumpers.
- Regular maintenance of all the construction equipment including dumpers/trucks to prevent leakage and other emissions.

8.3.2 Material Sourcing and Transportation Impacts

As the site is already developed limited quantity of construction material shall be required for the project. Though transportation of construction material may generate dust and other vehicular emissions (SO_2, NO_2 and CO) leading to air pollution. There will be increased vehicular movement on roads due to transportation of construction material which may lead to traffic congestion and increased risk of accidents. These impacts are short term but are manageable if suitable mitigation measures are taken up.

Mitigation Measures

- Construction material like sand, stone etc shall be bought from authorized suppliers
- Transportation of loose materials shall be done in covered conditions only
- No overloading of vehicle shall be allowed
- Material shall preferably be sourced from local market or nearby areas
- Arrangement for need based water spray system for dust suppression during loading and unloading

8.3.3 Occupational Health and Safety Impacts

Construction activities involve risks to health and safety of construction workers as it involves handling of heavy construction machinery/vehicle/components and lifting equipment and working on heights. This will involve risks of working on height and lifting of heavy materials. Occupational risks involved during implementation phase are fall, slip, accidents, failure of crane, fire, electric shock, unconsciousness due to working in sun at heights etc. Safety measures are required to be taken up to prevent any injury or accident during the construction phase. Measures are proposed to ensure occupational, health and safety of the workers and staff during project implementation phase and are listed below.

Mitigation Measures

- Contractor shall prepare a construction safety plan detailing action to be taken in case of emergency.
- Construction/excavation activity area shall be hoarded for safety reasons.
- The contractor will make sure that during the construction work all relevant provisions of the Building and Other Construction Workers (regulation of employment and conditions of services) Act are adhered to.
- The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the country labour regulations and International Labour Organization (ILO) Convention as far as those are applicable to this contract.
- All work forces shall be subjected to an orientation program to familiarize them with work requirements, safety practices at work, safe distances to keep from earth moving equipment, emergency response etc. to be adopted to ensure their own safety and that of other workers and public around operational areas.
- Visitors/officials to worksite are to be provided with PPEs (such as helmets and safety boots and safety jackets) and shall be briefed ongoing operations on that specific time and related safety requirement at work site including safe distances to keep, while at site visit.

8.3.4 Air Quality Impacts

Being an existing unit very limited construction activities are is associated with the project. Though dust will be the main pollutant affecting the ambient air quality of the area during the construction phase. Dust will be generated during construction activities. Vehicular movement of trucks, dumpers and construction machinery will also generate dust. Stockpiles are the other sources of air emission during construction period. Short term, localised and reversible impact is expected due to dust emissions generated during the construction stage. Mitigation measures proposed are given below:

Mitigation Measures

- Hoarding of construction site.
- Water sprinkling shall be done at regular interval in dust generating areas.
- Providing suitable surface treatment to ease the traffic flow and regular sprinkling of water will reduce the dust generation.
- Aggregates and sand will be stockpiled at suitable places (after stabilizing the surface), near the boundary wall so that the wall acts as windshield.
- Necessary water sprinkling arrangement will be provided around the stockpiles and used whenever necessary to make them moist.
- Cement and steel will be stocked inside covered sheds.
- Construction equipment having “Pollution Under Control Certificate” will be deployed during the activity to restrict the exhaust emissions

8.3.5 Noise and Vibration Impacts

Because very limited construction activities are associated with project hence the chances of noise generation from construction machineries is anticipated for short term duration.

Construction equipment are likely to produce maximum noise levels, between 60-70 dB(A). However, the noise impacts during construction period will be localised and for a short period. Measures are proposed to ensure the noise level remains within the norms are listed below.

Mitigation Measures

- The construction activity will be carried out mostly during daytime.
- The construction equipment will undergo preventive maintenance test at routine intervals.
- Any machinery or equipment generating excessive noise levels (above 90 dB(A) will be taken out of service and replaced by new ones.
- The noise generation will be confined within the surrounding areas of construction site.
- Workers exposed to noise will be given personnel protective equipment like nose masks, face shields and ear plugs. Job rotation schemes will be practiced for over-exposed persons

8.3.6 Water Quality Impacts

Water will be required during construction stage for civil works. Water requirement will be made available through two boreholes. Water will be needed mainly for construction and domestic purpose i.e., for drinking and sanitation. Drinking and sanitation facilities shall be provided to workers and staff during construction. Water will also be needed for sprinkling to reduce dust emission. Storm water drains will be made immediately after starting construction activity. Wastewater will arise from site offices, canteens and other washing facilities which may impact the ground water if not managed properly.

Mitigation Measures

- Wastewater arising from site offices, canteens and other washing facilities shall be disposed in septic tank and soak pit.
- Oil separator/interceptor will be provided near vehicle parking site, workshop and canteen to prevent the release of oil and grease into drainage system.
- The oil and grease separators will be cleaned on regular basis.

8.3.7 Land Use Impacts

The site is in an industrial area hence impact on land use is negligible. At present another line is already operating in this plot. Storm water drains internal roads etc. are already developed hence impact on land use negligible.

8.3.8 Soil Quality Impacts

Soil quality of the area may get affected due to the contamination of soil with the construction material, domestic waste, spillage of oil/fuel/paints, spillage of waste/debris, etc. However, being an existing unit limited construction activity are associated and impacts are short term and site specific and can be minimized with the mitigation measures.

Mitigation Measures

- Drip pans shall be provided with vehicles and machinery to prevent soil

contamination.

- Construction material, construction waste shall be stored on designated areas, preferably on paved surface.
- Debris, scraps, excavated soil, used bags and steel waste shall be generated and disposed as per Construction and Demolition Waste Management Rules
- Domestic sewage shall be disposed in septic tank.
- Hazardous wastes will be stored at earmarked area with impervious flooring, shed and spillage/leakage collection system to eliminate rainwater contamination, chances of overflow/spillages going on to the land and thus land/ soil contamination. Hazardous wastes will be disposed as per the Hazardous Waste Rules.

8.3.9 Impact on Ecology

The land identified for the proposed project is Industrial plot. No trees are present on the identified land. Fugitive dust emission is anticipated due to site clearance, levelling work operation of construction machineries which may deposit on surrounding flora and fauna.

Mitigation Measures

- Water sprinkling shall be done at regular interval in dust generating areas.
- Providing suitable surface treatment to ease the traffic flow and regular sprinkling of water will reduce the dust generation.
- Greenbelt development shall started in and around the plant wherever possible

8.3.10 Socio-Economic Environment

The current land use of the site is industrial set up. Being an existing unit very limited construction activities shall associate with the project. Though people residing in close vicinity of the project will get subjected to dust emission, noise from heavy vehicles, etc. Solid Waste generation during construction phase are vehicular emissions like CO and HC's and dust generation due to use of construction machinery and vehicles. Increase in Noise level is expected to be generated during construction phase mainly from application of heavy machinery, and traffic activities. Dust and other emissions are expected during construction phase and local people may be affected. However, some positive impacts are also associated with the project. This project will provide employment opportunities for the local people. Also, other indirect employment opportunities will generate due commissioning of proposed project.

Mitigation Measures

- To control the fugitive emission during construction phase adequate water sprinkling system will be developed in dust generating area.
- All trucks/machineries used for construction should have PUC.
- All the loose construction material will be transported in covered trucks/dumpers.
- Regular maintenance of all the construction equipment including dumpers/trucks to prevent leakage and Noise and dust emissions.
- Barricade the area for safety and minimization of dust spread.
- However, the project will create employment opportunity for regular and contractual persons.
- MMFL is also committed to employ local people, depending upon their skill and

experience.

8.4 Impacts during Operation Phase

8.4.1 Impacts on Air Quality

Particulate and fugitive emissions might arise from raw material stock piling, process activities like coal milling, crushing, grinding, granulation and vehicular movement

Mitigation Measures

- Cyclone separator, the entire hot air system shall be fluidized. There will be a complete combustion of fuel. Ash collection system shall be provided to control PM emission.
- The limestone and gypsum are proposed to be transported under cover truck only.
- The process happens under shed and in moist conditions. All products remain confined to shed area only even if become air borne. All precaution and provision are made for arresting the dust particle during crushing of rock and handling of which will include covered conveyer system with dust collection system at transfer points and water spraying shall be done for dust suppression in dust generating areas/ roads.
- Sprinkling of water to control fugitive dust emission.
- Speed of vehicles inside the factory premises will be controlled to 15km/hr
- Greenbelt will be maintained to attenuate the air pollution.
- Proper personal protective equipment will be provided to the workers.
- All the trucks being used for transportation of raw material and final product shall be checked for "Pollution under Control" certificate prior to their entry to the plant premises.

8.4.2 Impacts on Water Quality

No ground or surface water shall be used for the project. Water requirement shall be made available from the two boreholes. The freshwater requirement for the proposed project will be used for granulation, domestic and for plantation purpose.

- Only domestic wastes shall be generated from proposed plant.
- Strom water discharge from the plant area may also contaminate the surrounding ground water quality

Mitigation Measures

- The domestic wastewater generated from the toilets, washrooms and canteen of the plant shall be disposed in septic tank and soak pit.
- No process effluent will be discharged outside the plant premises under normal operating conditions.
- Domestic sewage generated from the sanitary blocks shall be disposed in septic tank

8.4.3 Impacts on Land Use

Following impacts are anticipated on land:

- Disposal of solid waste or liquid effluents on the land can pollute land environment
- There will be generation of hazardous waste
- Generation of sewage sludge or other sludge

Mitigation Measures

- Commercial waste like empty iron scrap etc. will be sold to taken by the sister company (Devki) for re-use. Organic and domestic waste like used paper, label, cartons will be disposed to the licensed municipal dump site

8.4.4 Noise and Vibration Impacts

Noise shall be produced due to crushing, machineries, pumps, D.G. set, vehicles etc. With increasing distance from the any noise source, the noise level decreases due to wave divergence. Additional decrease also occurs due to certain atmospheric interventions like noise barriers and interaction with objects in the transmission paths.

Mitigation Measures

- The standards for occupational exposures - tolerable level is 75 dB (A) for 8 hour exposure. This level will be achieved inside work area through use of properly maintained machines, pumps and vehicles.
- In case of overexposure found inside working area, workers will be provided with ear plugs/ earmuffs for use so that the exposure is minimized/brought to acceptable level.
- Equipment will be maintained so that noise level does not increase due to improper maintenance.
- Mufflers, silencers, acoustics treatment of room will be done wherever required.
- It is expected that noise level at the plant boundary will be within the prescribed norms due to operation of the proposed project and no significant impact on noise environment is expected.
- Greenbelt developed within the plant premises will also act as a barrier to the propagation of noise from the factory premises. This shall further reduce the noise levels appreciably. Hence, no significant impact is envisaged.

8.4.5 Impact due to Solid and Hazardous Waste Generation

Solid and hazardous waste is the main concern if not managed properly. Domestic waste like used paper, label, cartons will be generated from work area during operation phase. Domestic waste (organic waste) from canteen shall be generated. Hazardous waste like discarded container and spent oil shall be generated during the process.

Mitigation Measures

- Solid waste consisting of recyclable waste and non-recyclable generated from construction activities, shall be segregated in appropriate bins and shall be disposed of.
- Solid waste including domestic waste (from kitchen, gallery etc), combustible and recyclable waste generated shall be collected, segregated and stored in specified containers and shall be transferred for its proper disposal

8.4.6 Impact of Road Transportation

Following transportation impacts are associated with the project.

- Transportation of raw material and finished product.

- Accident and traffic congestion

Mitigation Measures

- Being an industrial area there is well developed road network exist. Further the quantity of raw material and finished to be transported is less and 20-30 trucks shall be required to transport the raw material and finished product.
- The roads used for transportation are well capable to bear additional increase in the traffic due to this plant.
- Transportation vehicle movement shall be scheduled during non-peak hours, i.e. late evening or early morning hours to prevent traffic congestion
- Proper parking shall be established for vehicles.
- Comply speed limits of the specific road while transportation of material
- All drivers shall carry the valid license

8.4.7 Impact on Biological Environment

The attributes that are identified to describe ecology are animals, birds, fish, field crops, threatened species, natural vegetation etc. The project area does not have any identified endangered species, forest, national park, sanctuaries and hence there is no question of any adverse impact on the same. The impact on the surrounding ecology during the operation of the project will mainly occur from the deposition of air pollutants. Air pollution affects the biotic and abiotic components of the ecosystem individually and synergistically with other pollutants. Chronic and acute effects on plants and animals may be induced when the concentration of air pollutants exceeds threshold limits. Particulate emission and other gaseous emissions from the proposed plant are the major pollutant that may affect the ecology of the area.

Mitigation Measures

- Proposed plant is zero liquid discharge based so no wastewater will be discharged.
- All solid waste and hazardous waste shall be disposed as per norm. Therefore, impact of emission on the surrounding vegetation will be insignificant.
- Greenbelt development along the plant boundary, further development of gardens and lawns will mitigate the residual impact on natural resources.

8.4.8 Socio–Economic Environment

Due to proposed project operation air emission, wastewater generation and solid waste generation, will affect the surrounding aesthetic and environment if not managed properly. Due to noise generation during the operation phase of the proposed project, local people may be adversely affected. There may be chances of accident and road congestion due to additional traffic load on the surrounding roads.

Mitigation Measures

- Proposed plant is zero liquid discharge based so no wastewater will be discharged.
- All solid waste and hazardous waste shall be disposed as per norm. Therefore, impact of emission on the surrounding vegetation will be insignificant.
- However, the project will create employment opportunity to people of the area. It is

anticipated that this project will improve the socio-economic status in the project area by creating better paying job opportunities. MMFL is also committed to employ local people, and depending upon their skill and experience

- Company shall be giving preference to local people from economically weaker sections for employment in various semi- skilled/unskilled jobs.

8.5 Impact Significance

Evaluation of impacts signifies the potential impacts in terms of its likelihood nature as per the following criteria:

- The impacts are further classified based on their spatial distribution, i.e., local, when impacting an area of approximately 1 km radius from the project area, moderate spread, when impacting an area of 1 to 2 km radius and regional beyond 2 km
- The impacts are classified as short term, moderate term and long term in terms of their existence in temporal scale. Impacts less than 1 year existence as short term, while those with 1 to 3 years as moderate term and more than 3 years as long term
- The negative impacts are termed as adverse impacts while positive impacts as beneficial

The significance of environmental impacts of various involved activities has been evaluated based on the criteria outlined in table below:

Table 8-2: Impact Significance Criteria

Impact Significance	Criteria
Long term Adverse	When the impact is of high intensity with high spread and high duration or of high intensity with medium spread and medium duration
Moderate term Adverse	When the impact is of moderate intensity with high spread and high duration or of high intensity with low/ moderate spread and low duration
Short term Adverse	When the impact is of low intensity but with moderate spread and moderate duration or of moderate intensity
Insignificant Adverse	When the impact is of low intensity, low spread and low duration
Beneficial	When the impacts are positive

Based on the above-specified criteria, matrix method has been used to describe potential environmental impacts due to proposed expansion project. It is important to note that one activity may have varying impacts on different receptors i.e., different components of the environment. To avoid repetitions, this section describes various activities, which may have wide impacts on many receptors. For example, waste generation and disposal will have impacts on land, water bodies, odour nuisance etc, therefore, the impacts of waste generation and disposal have been considered as one of the key areas of impacts. Similarly, gaseous emissions may affect air quality, which on exposure may impact upon health of individuals and ecology in the surroundings.

Table 8-3: Potential Environmental Impacts of Proposed Project activity (Without mitigation measures)

Environmental Sensitivities	Nature of Likely Impacts	Impact Significance

	Low Intensity	Moderate Intensity	High Intensity	Local	Moderate Spread	Regional	Short Term	Moderate Term	Long Term	Adverse	Beneficial	Insignificance	Short Term	Moderate	Long Term
Air Quality		√				√			√	√					
Noise		√			√				√	√					
Water Quality		√			√			√		√					
Land Environment		√			√			√		√					
Flora	√			√			√			√					
Fauna	√			√			√			√					
Local Economy		√			√				√						

Note: for colour coding refer Table 8.2

Table 8-4: Potential Environmental Impacts of Proposed Project activity (With Mitigation Measures)

Environmental Sensitivities	Nature of Likely Impacts											Impact Significance			
	Low Intensity	Moderate Intensity	High	Local	Moderate Spread	Regional	Short term	Moderate Term	Long	Adverse	Beneficial	Insignificant	Short term	Moderate	Long
Air Quality	√				√			√		√					
Noise	√				√			√		√					
Water Quality	√			√			√			√					
Land Environment	√			√			√			√					
Flora	√			√			√			√					
Fauna	√			√			√			√					
Local fish population	√			√			√			√					
Local Economy		√			√			√	√						

Note: for colour coding refer Table 8.2

From the above analysis, it is found that the impacts anticipated vary from low to moderate significance but most of the anticipated impacts envisaged are spread over large spatial extent, i.e., project area but are manageable and mitigatable if the suggested mitigation measures and environment management plan (chapter 9) are implemented at each project stage

8.6 Decommissioning Phase

Over time, it has been discovered that the lifespan of any industrial production project is primarily hinged on a number of factors, including the design parameters and construction materials; availability of raw materials and feedstock; acceptability of the end-product; maintenance and technological development. The design life of the proposed fertilizer blending plant, depending on proper maintenance, is at least 20 years. This, in effect, means that the plant will be expected to be fully operational for at least 20 years, and may be more, if it is still in good shape. In fact, the plant may more likely be upgraded or at least rehabilitated for an extended life span. Therefore, should the project require decommissioning, it would be distant enough to assume that the existing legislative context and receiving environment would have changed. Decommissioning would then need to comply with the relevant legislation of the time and guidance may be required from the relevant environmental authority of the time and the most feasible option for the end use of the various components of the production plant would then be determined.

Since the proposed project is not expected to be decommissioned in the near future and given the known fact that projects always have both positive and negative impacts on their physical and social environments, especially in the construction phase; it is important to put in place plans to recover and/or restore the project site to its original state at the end of the construction phase. This requires a good understanding of all the environmental components of the project

in the ecosystem during the construction phase. A decommissioning ESMP would therefore need to be developed and approved by the relevant authority of the time, so as to effectively manage these impacts. The plan must include management measures in order to mitigate unavoidable negative impacts to acceptable levels. Similarly, any potential positive impacts, e.g., job creation must also be managed in order to maximize the benefits.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

The Environmental Management Plan (ESMP) is synthesis of all proposed mitigation and monitoring actions, set to a time frame with specific responsibility assigned and follow-up actions defined. EMP is a plan of actions for avoidance, mitigation and management of the impacts associated with construction and operation stages of the project. A detailed set of mitigation measures have been compiled in view of the likely impacts associated with the proposed project.

9.2 Objective of Environmental and Social Management Plan

The EMP consists of a set of mitigation, monitoring and institutional measures to be taken up during the design, construction and operation stages of the project. The ESMP has been designed keeping in view of the regulatory and other requirements to ensure the following:

- Minimum disturbance to the environment and social components
- Compliance with the environmental acts, rules and maintaining the quality of air, water, soil and noise as per the prescribed norms by regulatory bodies.
- Conservation of natural resources to the extent possible
- Enhancement of Project benefits for Society and Environment
- Sustainable development and operation of project

9.3 Environmental and Social Management Plan

At present fertilizer plant is already operating in this plot. Considering the market demands MMFL, intend to expand a second line in the proposed plant. The infrastructure and machineries are identically same for existing plant; hence the existing infrastructure and machineries shall be used for proposed expansion. Hence very limited construction is associated with the project. Though major activities associated with the proposed project are construction and operation of the project. A detailed environmental management plan for each activity of Pre-construction, construction and operation phases are prepared. ESMP lists the activities involved along with environmental impacts associated with each activity, suggestive impact mitigation measures, and implementation plan covering monitoring and supervisory responsibilities. The environmental management plan is included as Table 9.1. In order to effectively manage the environmental management (including social management) of the project, CSR plan, greenbelt development plan, Solid Waste Management Plan; Occupational Health Management Plan, Budget for Environmental Management Plan has-been prepared separately and integrated with ESMP. These shall be followed for effective implementation of the ESMP.

Table 9-1: Environmental and Social Management Plan

NO.	Project Activity/Component	Environmental Issue/ concern	Remedial Measure	Institutional Responsibility	
				Implementation	Supervision
	Construction Stage				
1.	Site Clearance and Levelling of site	• Dust and debris generation. • Air emission and fugitive dust emission due to demolition of existing structure and operation of construction machineries • Disturbance to public • Traffic congestion & diversion	• The debris shall be stacked at safe places and disposed as per the norm. • Usable material shall be used in project construction. • To control the fugitive emission during demolition of existing structure and construction phase adequate water sprinkling system will be developed in dust generating area. • All trucks/machineries used for construction should have PUC. • All the loose construction material will be transported in covered trucks/dumpers. • Regular maintenance of all the construction equipment including dumpers/trucks to prevent leakage and other emissions. • Barricade the area for safety and minimization of dust spread. • No excavated area shall be left open without barricading	MMFL	EHS
2.	Occupational Health & Safety of workers due to project activities	• Occupational Health and Safety of pedestrian and traffic • High noise • Dust generation	• Contractor shall depute environmental and safety officer to ensure compliance to EMP and health and safety measures • Construction/demolition/excavation activity area shall be barricaded for safety reasons. • The contractor will make sure that during the construction work all relevant provisions of the Building and Other Construction Workers (regulation of employment and conditions of services) Act, are adhered to. • The Contractor shall comply with all the precautions as required for ensuring the safety of the workmen as per the country' labour regulations and International Labour Organization (ILO) • All work force shall be subjected to an orientation program to familiarize them with work requirements, safety practices at work, safe distances to keep from earth moving equipment, emergency response etc. • Contractor will ensure that each worker use the safety equipment's like helmets, Safety shoes, goggles, Protective eye gear, helmets, gum	Contractor	MMFL

			boots and vests when on construction site.		
3.	Impact on Air Environment	• Dust generation due to Construction activities • Dust generation due to vehicle movement • Air emission due to machineries	• Hoarding of construction site. • Water sprinkling shall be done at regular interval in dust generating areas. • Providing suitable surface treatment to ease the traffic flow and regular sprinkling of water will reduce the dust generation. • Necessary water sprinkling arrangement will be provided around the stockpiles and used whenever necessary to make them moist. • Cement and steel will be stocked inside covered sheds. • Construction equipment having "Pollution Under Control Certificate" will be deployed during the activity to restrict the exhaust emissions.	Contractor	**MMFL**
4.	Impact on Noise Environment	• Noise generation from earth moving equipment and material handling traffic • High noise exposure to workers	• The construction activity will be carried out mostly during daytime. • The construction equipment will undergo preventive maintenance test at routine intervals. • Any machinery or equipment generating excessive noise levels (above 90 dBA) will be taken out of service and replaced by new ones. • The noise generation will be confined within the plant premises. • Workers exposed to noise will be given personnel protective equipment like nose masks, face shields and ear plugs. Job rotation schemes will be practiced for over-exposed persons	Contractor	**MMFL**
5.	Impact on Water Quality	• Wastewater generation • Change in drainage	• Wastewater arising from site offices, canteens and other washing facilities shall be disposed in septic tank • Oil separator/interceptor will be provided near vehicle parking site, workshop and canteen to prevent the release of oil and grease into drainage system. • The oil and grease separators will be cleaned on regular basis. • Storm water drains will be made immediately after starting construction activity. • The drains will be properly aligned in conformity with the site drainage pattern so that the alteration is kept to the minimum and flooding or soil	Contractor	**MMFL**

			erosion does not occur.		
6.	Impact on land use	• Being an industrial area no change in land use is anticipated.	--	-	-
7.	Impact on Ecology	• Fugitive dust emission is anticipated due to site construction activities • Traffic dust which may deposit on surrounding flora and fauna.	• Water sprinkling shall be done at regular interval in dust generating areas. • Providing suitable surface treatment to ease the traffic flow and regular sprinkling of water will reduce the dust generation. • Greenbelt development shall be started in and around the plant wherever possible	Contractor	**MMFL**
8.	Social Impacts	• Dust and noise emission due construction activities • Employment Generation	• To control the fugitive emission during construction phase adequate water sprinkling system will be developed in dust generating area. • All trucks/machineries used for construction should have PUC. • All the loose construction material will be transported in covered trucks/dumpers. • Regular maintenance of all the construction equipment including dumpers/trucks to prevent leakage and Noise and dust emissions. • Hoarding the area for safety and minimization of dust spread. • However, the project will create employment opportunity for regular and contractual persons. • MMFL is also committed to employ local people, depending upon their skill and experience.	Contractor	**MMFL**
OPERATION PHASE					
1.	Impact on Air Quality	• Fugitive emission is expected during transportation and handling limestone and gypsum • Coal used as the energy source is a source of emissions	• Cyclone shall be installed to control dust. • Ash collection system shall be provided to control PM emission. Furnace Ash shall be used in the sister cement company • The limestone and gypsum is proposed to be transported under cover truck only. • Covered conveyer system with dust collection system at transfer points • Water spraying shall be done for dust suppression in dust generating areas/ roads.	MMFL	MMFL

			• Adequate stack height shall be provided • Greenbelt will be maintained to attenuate the air pollution. • Proper personal protective equipment will be provided to workers • All the trucks being used for transportation of raw materials and final product shall be checked for pollution under control certificate to their entry into the plant		
2	Impact on Noise Quality	• Noise generation from crushing, grinding, DG sets, and vehicles.	• The standards for occupational exposures - tolerable level is 90 dB(A) for 8-hour exposure. This level will be achieved inside work area through use of properly maintained machines, pumps, compressors and vehicles. • In case of overexposure found inside working area, workers will be provided with ear plugs/ earmuffs for use so that the exposure is minimized/brought to acceptable level. • Equipment will be maintained so that noise level does not increase due to improper maintenance. • DG sets will be provided with acoustics enclosures. • Mufflers, silencers, acoustics treatment of room will be done wherever required. • Greenbelt developed within the plant premises will also act as a barrier to the propagation of noise from the factory premises. This shall further reduce the noise levels appreciably. Hence, no significant impact is envisaged.	MMFL	MMFL
3	Impact on Water Quality	• Impact due to Industrial and domestic wastewater generation. • Impact due to discharge of untreated waste • Strom water discharge from the plant area	• No ground water shall be used • Domestic waste shall be generated from proposed plant. • The domestic wastewater generated from the toilets, washrooms and canteen of the plant shall be disposed in septic tank and soak pit. • No process effluent will be discharged outside the plant premises during non- monsoon and under normal operating conditions. • The network of storm water drains, and wastewater drains inside the plant will be made separate.	MMFL	MMFL
4.	Impact due to solid waste generation	• Impact due to generation of Hazardous waste like discarded container spent oil	• Domestic waste like used paper, label, cartoons will be disposed to the scrap buyers. Organic waste from canteen to the municipal dumpsite	MMFL	MMFL

		• Domestic waste shall be generated from office, canteen etc.			
5.	Impact on Biological environment	• Particulate emission and other gaseous emissions from the proposed plants are the major pollutant that may affect the ecology of the project area. • Air pollution affects the biotic and abiotic components of the ecosystem individually and synergistically with other pollutants Chronic and acute effects on plants and animals may be induced when the concentration of air pollutants exceeds threshold limits.	• Proposed plant is zero liquid discharge based so no wastewater will be discharged. • All solid waste and hazardous waste shall be disposed as per norm. Therefore, impact of emission on the surrounding vegetation will be insignificant. • Greenbelt development along the plant boundary, further development of gardens and lawns near admin building will mitigate the residual impact on natural resources.	MMFL	MMFL(Management)
6.	Impact of Road Transportation	• Transportation of raw material and finished product. • Accident and traffic congestion	• Most of the raw materials and finished product shall be transported through road. • Being an industrial area there is well developed road network exist. Further the quantity of raw material and finished to be transported is very less and 25-30 trucks shall be required to transport the raw material and finished product. • The roads used for transportation are well capable to bear additional increase in the traffic due to this plant. • Transportation vehicle movement shall be scheduled during non-peak hours, i.e., late evening or early morning hours to prevent traffic congestion • Proper parking shall be established for vehicles. • Comply speed limits of the specific road while transportation of material • All drivers shall carry the valid license	MMFL	MMFL
7.	Impact on Socio-economic	• Employment generation	• The project will create employment opportunity to people	MMFL	MMFL(Managem

		• People will get subjected to increase in criminal cases etc	of the area. • MMFL will recruit regular and contractual persons in proposed project. • It is anticipated that this project will improve the socio-economic status in the study area by creating better paying job opportunities. • MMFL is also committed to employ local people and depending upon their skill and experience they will be trained and allotted suitable jobs. • Proposed plant is zero liquid discharge based so no wastewater will be discharged. • All solid waste and hazardous waste shall be disposed as per norm. Therefore, the impact of emission on social environment will be insignificant.		ent)

10 ENVIRONMENTAL MONITORING PLAN

10.1 Introduction

This chapter provides the proposed environmental monitoring programme for the proposed project to access the environmental attributes for both the construction and operation stages.

10.2 Identification of the Key Monitoring Indicators

Key monitoring indicators are defined as the environmental parameters which may get impacted during different project stages. Key monitoring indicators for project implementation phase with monitoring plan is given at **Table 10-1 and 10-2** respectively

Table 10-1: Environment Monitoring Indicators

Key Monitoring Indicators	Rational for Selection During Project Construction Phase
Air Quality	Dust generation and generation of other emissions
Noise Levels	High noise generation from construction vehicle and equipment
Soil Quality	Soil pollution may happen due to spillage of chemicals, hazardous substances and construction material
Occupational Health & Safety	Usage of heavy machinery, equipment, work at height and interface with electrical system
Solid Waste	Demolition/Construction waste, municipal waste and hazardous waste
Construction Vehicle	Dust generation, vehicular emission and safety issues
Drinking Water	Contaminated water consumption may lead to health issue and there are chances of water contamination
Sanitation	If proper sanitation facility not provided, it may lead to generation of unhygienic conditions and may become health hazard
Construction site	Mandatory to provide comfort and clean-living environment to labour
Heavy Lifting equipment	Safety issues
Fuel storage area	Chance of contamination of soil, ground water and surface run-off

Table 10-2: Environmental Monitoring Plan

S.No.	Key Indicators	Location of Monitoring	Frequency of Monitoring/ Observations	Parameters to be monitored/Observed	Responsibility
Construction Phase					
1	Drinking water Quality	Construction sites	Monthly; Contractor can undertake but on a Quarterly basis from accredited lab (external)	Parameters as per WASREB guidelines on drinking water quality	Contractor
2	Air Quality	Construction sites	Quarterly, Contractor to undertake from accredited lab (external)	PM10, PM2.5, SOx and NO2	Contractor
3	Noise levels	Construction sites	Monthly; Contractor can undertake but on a Quarterly basis from accredited lab (external)	Day time and Night-time levels	Contractor
4	Soil Quality	Material storage site and fuel, storage site	Quarterly, Contractor to undertake from accredited lab (external)	Physio-chemical parameters	Contractor
5	Occupational health and Safety	Construction sites, material storage sites	Daily	Availability and use of barricades, Availability of traffic marshals, Use of PPE by workers, Availability of firefighting equipment, Outcome of daily safety meetings, analysis of incidents/accidents if any	Contractor
6	Solid Waste Disposal	Construction sites, site office and storage yards	Monthly	Compliance to EMP requirements with regard to storage, transportation & disposal of Debris, excess earth and other waste.	Contractor
8	Construction vehicles	Construction sites and material storage sites	Monthly	Availability of Safety kit, first aid kit, maintenance &service records, DL (driving license), PUC, drivers training records, driver awareness	Contractor
9	Sanitation	Construction sites, labour camps, site office & storage yards	Monthly	Condition of toilets, availability of water in toilets, provision of septic tank, availability clean drinking water	Contractor
Operation Stage					

1	Ambient Air quality	At 3 locations within1-2 km of plant (120 degree to each other; at human settlements)	Quarterly	$PM_{2.5}$, PM_{10}, SO_2, NO_2 , CO	MMFL
2	Stack Monitoring	Coal stack	Quarterly	PM & Flue gases (For regular stack monitoring online monitor shall be installed in later stage).	MMFL
3	Plant Noise Level	Plant Boundary (4 sides), Equipment and Workplace (all units)	Quarterly	Average Leq values and Maximum value of Sound Pressure Level in dB(A)	MMFL
4	Ambient Noise Level	Two nearest villages outside the plant	Quarterly (day & night-time)	Leq values in dB (A)	MMFL
5	Drinking water Quality	Boreholes inside the plant	Once during dry and rainy season	pH, TDS, TSS, Total hardness, Fluoride, Heavy metals	MMFL
6	Waste Management	Within Plant area	Every year 30th June While sending for disposal	Maintaining Records of generation, receipt and disposal Filling of annual returns Hazardous waste handling	MMFL

11 CONCLUSION

This report presents an environmental and social impact assessment for the proposed expansion of the fertilizer plant. The project comes at a time when there is drive for self-sufficiency in agricultural production, which calls for increased local fertilizer production. The assessment evaluated project alternatives and contains proposed measures for mitigating the adverse impacts while enhancing the positive ones during the phases of construction, operation and maintenance of the selected project option. The proposed project, when executed, will enhance the socio-economic status of communities in its zone of influence.

The Environmental Impact Assessment for the proposed expansion project was in accordance to existing national and international guidelines and regulations. Stakeholder's consultation during the study will safeguard the success of the implementation of the environmental and socio-economic management framework for the project. The study has investigated the baseline conditions of the project area, identified the potential environmental impacts of the project and appropriate mitigation measures these detailed in the Environmental Management Plan designed for the project. The associated and potential impacts of the proposed project were identified and include operational/equipment noise, potential for soil erosion and water pollution.

The impact of the project on development of the agricultural potential of the area will be immense, as it will significantly improve food and cash crop production. The identified negative impacts will be mitigated as proposed in the EMP that will be strictly implemented. We strongly contend that NEMA will find this ESIA study satisfactory and the project environmentally and socially viable for permitting.

12 BIBLIOGRAPHY

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13 APPENDICES

13.1 APPENDIX 1: List of Public Consultation

ENVIRONMENTAL IMPACT ASSESSMENT FOR EXPANSION OF MAISHA MINERAL FERTILIZER, MAVOKO SUB COUNTY, MACHAKOS COUNTY

STAKEHOLDER CONSULTATION LIST

VENUE..Maisha fertilizer Company (Main Plant)

DATE..05/12/2020

Name	Designation	Telephone No.	Signature
Polycarp Odiedo	Consultant	0705924038	
Alfred Kasale	EHS MGR	0704579493	
Philip Mwangi	Design Engineer	0725704047	

ENVIRONMENTAL IMPACT ASSESSMENT FOR EXPANSION OF MAISHA MINERAL FERTILIZER, MAVOKO SUB COUNTY, MACHAKOS COUNTY

STAKEHOLDER CONSULTATION LIST

VENUE..MMFL.....

DATE..08/12/2020.....

Name	Designation	Telephone No.	Signature
Yo Shafia	—	0718745496	
Osmas Ndivo	—	0721449586	
Alex MUKATWA	—	0701920629	
Juliana Mwikali	—	0745168673	
Brian Ndolo	Business Man	0790127773	
Bubbie Achungo	Business Woman	0715587000	
Alfred Wafula	—	0746500719	
Damaris Wanjiku	—	N/A	
Lilian Sammy	B/L Woman	N/A	
George Odour	—	0114163296	
Teresia Wambua	—	0729885884	

13.2 APPENDIX 2: Sample Questionnaires

PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

The environmental impact Assessment and audit regulation 2003. Public participation and consultation is a key input in this process. Consultations are held with members of immediate community and he interested or affected parties. Inorder to obtain their views regarding he project. As a valuable stakeholder, we kindly request you to provide us with opinion regarding the environmental and social impact assessment associated with the proposed expansion of Maisha Mineral Fertilizer plant

Name	Brian Ndi
ID NO	—
Signature	—
Date	08/12/2020
Mobile No.	0790620773

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or ~~NO~~
   If yes kindly mention

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2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)Yes or No
   If yes kindly mention,

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..... Employment Increase to both of the
..... Division
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3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

- Mini Mization of dust and Noise from production
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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	Juliana Mwikali
ID NO	31547657
Signature	
Date	08/12/2020
Mobile No.	0745168673

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention
   - Increased dust level at night due to increased production
   - Increased Noise during operation and construction activities

2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)Yes or No
   If yes kindly mention,
   Increased employment opportunities

3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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- Community to monitor plant operation
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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	Robbie Achungo
ID NO	33511108
Signature	
Date	05/12/2020
Mobile No.	0715587000

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention
   - Increased dust production in the region
   - Noise

2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income) Yes or No
   If yes kindly mention,
   - Increased employees
   - New Increased Capital to business
3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	Alfred Wafula
ID NO	24875895
Signature	
Date	
Mobile No.	0741500719

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention

Dust: The vibration caused by heavy machines in the company might pose risk to the air that human being is inhaling thus causing breathing problem.
Noise: The vibration of the mills will probably cause abnormal noise to the environment

2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income) Yes or No
   If yes kindly mention,

Employment; due to the addition of another Company will cause high demand of labour and that will forces the company to employ ppl and thus will make many ppl earn their daily living.

3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	Cosmas Ndiso
ID NO	25956472
Signature	
Date	08/12/2020
Mobile No.	0721445586

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or ~~NO~~
   If yes kindly mention

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2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income) ~~Yes~~ or No
   If yes kindly mention,

creation of employment to youths
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3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

- provide job opportunity to all youths.

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	ALEX MUKATHA
ID NO	37600442
Signature	
Date	03.12.2020
Mobile No.	0701920629

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention

YES. Due to dust from the Plant., some life abundat e.g Plants it may ~~soja~~ dry up.

2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)Yes or No
   If yes kindly mention,

YES : as employement will be available young youths we will be able to work and ~~earn~~ earn the living

3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

Please as the company apart us youths we require to get employement thus to reduce small crime

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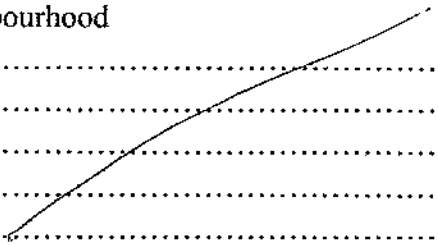
b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood



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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	George Udoor
ID NO	NA
Signature	
Date	08/12/2020
Mobile No.	0114163296

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention

.....NO.....
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2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)Yes or No
   If yes kindly mention,
   .....Increase employment.....
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3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	L. Liag Sammy
ID NO	28951453
Signature	
Date	08/12/2020
Mobile No.	N/A.

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or ~~NO~~
   If yes kindly mention

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.....N/A.....
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2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)~~Yes~~ or No
   If yes kindly mention,

.....Increased income due to increased ppl in the area.....
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3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

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Name	Damaris Nduma
ID NO	25678667
Signature	
Date	08/12/20
Mobile No.	N/A

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or ~~NO~~
   If yes kindly mention
   The current production doesn't have any problem.

2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income) ~~Yes~~ or No
   If yes kindly mention,
   Increased employment due to increased production

3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

The environmental impact Assessment and audit regulation 2003. Public participation and consultation is a key input in this process. Consultations are held with members of immediate community and he interested or affected parties. Inorder to obtain their views regarding he project. As a valuable stakeholder, we kindly request you to provide us with opinion regarding the environmental and social impact assessment associated with the proposed expansion of Maisha Mineral Fertilizer plant

Name	Teresia Nambua
ID NO	20655525
Signature	
Date	08/12/20
Mobile No.	0712788588

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention

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.....N/A.....
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2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)Yes or No
   If yes kindly mention,

.....- Increased employment rights.....
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.....- Provision of income to employees.....
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3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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PUBLIC PARTICIPATION AND CONSULTATION FORM

ENVIRONMENTAL AND SOCIAL IMPACTASSESSMENT FOR PROPOSED EXPANSION OF MAISHA MINERAL FERTIIZER PLANT

The environmental impact Assessment and audit regulation 2003. Public participation and consultation is a key input in this process. Consultations are held with members of immediate community and he interested or affected parties. Inorder to obtain their views regarding he project. As a valuable stakeholder, we kindly request you to provide us with opinion regarding the environmental and social impact assessment associated with the proposed expansion of Maisha Mineral Fertilizer plant

Name	Joyce Chedra
ID NO	22275133
Signature	Joy.
Date	08/12/2020
Mobile No.	0716945496

1. Environmental Health and Safety issues
   Do you think the project will poses any environmental , health and safety risks to you or the public? Yes or NO
   If yes kindly mention
   The direction of wind is in the opposite direct...

2. Socio – economic issues
   Will the project generate any socio economic benefits within the neighbourhood e.g (employment , source of income)Yes or No
   If yes kindly mention,
   - Employees eat in our hotels
   Employment of youths

3. General Concerns
   a. What other issues or considerations do you have in regard to the proposed plant expansion
   N/A

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b. Propose ways on how the proposed project expansion in collaborations with the community can enhance a sound environment as well as health and safety if the neighbourhood

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13.3 APPENDIX 3: Photographic Plate

	
Perimeter Wall Within the Site	Some of the trucks used in transportation of materials within the existing site
	
Lockable warehouses for storing granulated imported fertilizers	Access roads to the site that's used and shall be used during the proposed plant operation

	
Small scale business directly opposite the site	Equity bank ATM located adjacent to the plant
	
Way bridge and go down for the existing site	Small scale retail shops within the periphery of the site

	
Crushing section for the micro nutrients	Flora within the proposed site

Appendix 4: Expert License

FORM 7 (r.15(2))

NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT

ENVIRONMENTAL IMPACT ASSESSMENT/AUDIT (EIA/EA) PRACTICING LICENSE

License No : NEMA/EIA/ERPL/14165

Application Reference No: NEMA/EIA/EL/19175

M/S **Joel Tito Kodiaga**
(individual or firm) of address

P.O. Box 9648-00100, Nairobi

is licensed to practice in the

capacity of a (Lead Expert/Associate Expert/Firm of Experts) **Lead Expert**
registration number **0160**

in accordance with the provision of the Environmental Management and Coordination Act Cap 387.

Issued Date: **2/18/2021** Expiry Date: **12/31/2021**

Signature…..

(Seal)

Director General
The National Environment Management Authority

P.T.O.

Appendix 4: Minutes and Consultations

Minutes of Stakeholder Consultations Meeting Held at Maisha Mineral Fertilizer Plant on 08/12/20 Starting at 09.30 a.m.

Preparation of Environmental Impact Assessment for Proposed Expansion of a Blending fertilizer plant at Athi River, Mavoko Sub County, Machakos County, Kenya Participants

Participants

1. Village Admin
2. NCCL Representatives
3. Consultants

Agenda

1. Opening of the meeting and introductions
2. Discussions on potential impacts of the Expansion of MMFL Plant
3. AOB/ Closing of the meeting

Minute1: Introductions

The meeting commenced after a short word of prayer by the consultant. Members were given an opportunity to introduce themselves. Mr. Alffrey facilitated the meetings He gave a brief over-view of the intended project and the purpose and objectives of this meeting. He thereafter invited the consultants to hold brief about the proposed study.

Minute 2: Discussions on potential impacts of the project

Mr Odiedo proceeded to the next meeting agenda by giving a detailed project description and enumerating the objectives of the assignment. He then called on members present to voice their concerns, ask any questions and make general comments on the proposed project. The table below summarizes comments raised and the consultants' responses.

Discussions / questions/comments	Responses
The Village elder wanted to know if there would be any effects to the already existing plant	The consultants informed him that the plant will not be affected since the project entails only its expansion
Considering the region is traffic prone, how will that be looked into considering the increased number of vehicles in the area during project processes?	A Traffic Management Plan shall be issued before earth movements and construction start in order to minimize traffic disruptions.
The elder wanted to know if there will be employment opportunities, and what would be the criteria for employment. Particularly, she wanted to know if local people would be given priority whenever opportunities arose	The team informed them that the proponent would put in place a labour recruitment plan to guide all matters touching on employment.

The official were concerned about social impacts such as the increase of instances of SGBV, SH, child labour and the spread of HIV/AIDs	The team will develop and implement and SEA action plan with an Accountability and Response Framework

Minute 3: AOB /Closing Remarks

There being no other business the meeting ended at 10.00 a.m

Signed by:

---------- Date……

Mr. Polycarp Odiedo

---------- Date……

Allfrey Kasalu

Maisha Mineral Fertilizer Limited

Minutes of Community Consultations Meeting Held at Maisha Mineral Fertilizer premises on 10/12/20 Starting at 11.00 a.m.

Preparation of Environmental Impact Assessment for Proposed Expansion of a Blending fertilizer plant at Athi River, Mavoko Sub County, Machakos County, Kenya Participants

1. Village elders
2. MMFL Representatives
3. Consultants
4. Community members

Agenda

1. Opening of the meeting and introductions
2. Project Brief
3. To discuss potential impacts of the Expansion of Fertilizer blending plant
4. AOB
5. Closing of the meeting

Minute 1: Introductions

The meeting kicked off at 11:00am with a word of prayer from one of the community members present at the venue. The village elder thereafter made an introduction of all those who are present and elaborated on the reason the exercise. He stressed on the importance of public participation exercise on any project that's undertake within community neighbourhoods since any positive and negative impacts that results from the process is experienced by them. He invited the client together with the consultants to the meeting and to further elaborate to the members on the reason for the consultations

Minute 2: Project Brief

The client representatives introduced themselves and elaborated on the proposed plant expansion and activities that will be taking in case the project is approved. He further illustrated on the benefits the community will accrue in essence to the project upgradation. He assured the members that as part of the community, the plant is well in tune with local community concerns and was happy to serve them. He proceeded to explain the project terms of reference to the community and invited members to ask any questions or raise any concerns.

Minute 3: Discussions on potential impacts of the project

T h e Consultants were invited to facilitate this part of the meeting. The team leader kicked off the session by giving a detailed project description and the objectives of the assignment. Following this explanation, he called on the community members to voice their concerns, ask any questions and make general comments on the proposed project. The table below summarizes comments, questions, concerns raised, and the consultants' responses.

Theme	Comments and Issues	Response
Air Pollution	Some of the community members feared that the project will generate emissions and generate dust leading to air pollution.	The ESIA team informed the members that the project will manage the emissions in accordance with the air quality regulations and mitigation measures to reduce dust including watering the sites to keep down dust.
Noise and Vibration	Questions concerning potential air and sound pollution arising from excessive noise and vibration also arose from community members	Noise and vibration plan will be implemented as per the ESMP.
Employment	Community members enquired if there will be employment opportunities, and what would be the criteria for employment. They asked to be given first priority whenever employment opportunities arise.	The client informed the community members of their intention to hire locally whenever possible and further that there are plans to develop a community engagement plan which will cover all employment issues. However, he cautioned that where specialist skills are required for the project and the skills are not locally available, specialist would be hired from other jurisdictions. The contractor will develop a Labour Recruitment Plan to guide recruitment.
Corporate Social Responsibility	The communities inquired as to the nature of benefits that they would receive from the project. Would their houses be connected to the national grid? Would they get opportunities for employment? Would they be trained on energy generation? etc.	The client informed the community members that there will be both direct and indirect benefits arising from the project such as employment, improved roads since they will need to be upgraded to facilitate transportation of project equipment‘s and other opportunities etc. The CLO will work with the communities to develop a CSR plan.
Health and Safety	Communities wanted confirmation from the client that their safety will be	The team informed the community that measures will be

Issues	considered at all times during project operation.	put in place to ensure health and safety measures are observed at all times. Contractor will prepare a detailed Community Health and Safety Plan.
Social impacts ▪	It was a concern of the community members that the proposed project will increase the number of people in the project area and its surroundings which could lead to socio-cultural diversification and cultural contamination There were also fears that with the increase in population into the project areas, there will be an increase in the spread of HIV and AIDS. Furthermore, there was concern that enhanced economic status particularly among the women would lead to increased occurrences of GBV and SH.	The contractor will develop a GBV Plan and SH policy and Code of Conduct including HIV/AIDS, prevention and awareness plan.

Minute 4: AOB

The community members inquired whether there were going to be further consultations on the project. They were informed that the consultants would remain behind after this consultation meeting as they had various meetings scheduled with a number of stakeholders in the county. The consultations would therefore go on past this meeting. Community members were invited to make further contributions in future planned forums if they desired.

Minute 5: Closing Remarks

There being no other business the meeting ended at 1.20pm with a word of prayer from the village elder.

Signed by:

---------- Date……

Polycarp Odiedo

---------- Date……

Allfrey Kasalu

Maisha Mineral Fertilizer Limited