ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTSTUDY REPORT FOR THE PROPOSED SUBATI GROUP COMMERCIAL PLANTATION FOREST (PHASE 2) ON MAKUENI/ KITENG'EI SCHEME 'B'/1593 AND MAKUENI/ KITENG'EI SCHEME 'B'/1594 IN KITENGEI LOCATION, KIBWEZI SUB-COUNTY, MAKUENI COUNTY

(Site Coordinates:** -2.52222271, 38.28225320**)

Conducted by:	Project Proponent
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SUBMITTED TO: *THE NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY(NEMA)*

P.O BOX 67839-00200, NAIROBI.

November 2022

CERTIFICATION

This EIA Study report has been prepared by ECONEST Consultants Limited (NEMA Reg. No. 7875) in accordance with the Environmental Management and Coordination Act 1999 (revised 2015) and the Environmental Impact Assessment and Audit Regulations 2003 (revised 2019) which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We the undersigned, certify that the particulars in this report are correct and true to the best of our knowledge.

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- The shareholders and directors of Subati Group limited
- The staff of Kenya Forest Service (KFS), Kenya Forest Research Institute (KEFRI) and KEPHIS.

Gratitude is also due to all the Kibwezi Sub-county officials and local leaders consulted; for being very helpful and making very useful contribution to the ESIA process. The Ngwata community in the project area were very responsive for which the team is grateful.

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ASAL	-	Arid and semi- arid lands
Asl	-	Above sea level
EA	-	Environmental Audit
ESIA	-	Environmental and Social Impact Assessment
EMCA	-	Environmental Management and Coordination Act
FAO	-	Food and Agricultural Organization
IEMP	-	Integrated Environmental Management plan
IUCN	-	International Union for Conservation of Nature
KALRO	-	Kenya Agricultural and Livestock Research Organization
KEFRI	-	Kenya Forest Research Institute
KFS	-	Kenya Forest Service
LR map	-	Land Registration map
MW&E	-	Ministry of Water and Environment
NEMA	-	National Environment and Management Authority
NEC	-	National Environmental Council
NFTP	-	National Forest and Tree Planting
OEL	-	Operator Exposure Limit
OSH	-	Occupational Safety and Health
PPE	-	Personal Protective Equipment
PCPB	-	Pest Control Products Board
Sq. Km	-	Square Kilometres
WHO	-	World Health Organisation
WRUA	-	Water Resources Users' Association
WSSD	-	World Summit for Social Development

EXECUTIVE SUMMARY

This ESIA Study report entails the description of the proposed forest plantation on Subati Group Limited's Kibwezi farm located on L.R. No. MAKUENI/ KITENG'EI SCHEME 'B'/1593 AND MAKUENI/ KITENG'EI SCHEME 'B'/1594 IN KITENGEI LOCATION, Makueni County. The farm's defining coordinates are 2°32'16.7"S 38°18'21.4"E (-2.52222271, 38.28225320).

The project has been designed to cater for cultivation of sandalwood hardwood tree species for commercial use. The trees will be cultivated under a plantation area of approximately 150 Ha. It is on this basis that the proponent has embarked on an Environmental and Social Impact Assessment (ESIA) study to ascertain the impacts likely to be associated with the implementation of the proposed project.

Need for Environmental Impact Assessment

In line with the Environmental Impact Assessment (EIA) Regulations, it is the responsibility of any developer intending to set up a project for which an EIA is required to carry out the EIA and bear all the costs associated with its conduct.

Because the proposed plantation forest development falls under the category of a sensitive ecological nature among the projects requiring mandatory Environmental Impact Assessment, the proponent is seeking NEMA Approval before commencement of implementation process.

Methodology for Environmental Assessment

In general, the scoping exercise will use a combination of the following methodologies:

- ✓ Meetings and discussions with stakeholder.
- ✓ Field surveys of the proposed project site, including baseline inventory of environmental conditions and resources in the project area,
- ✓ Expert judgment and technical evaluation of technical issues related to thenature of the proposed activities, and
- ✓ Review and reference to literature, including existing laws, regulations, policies and plans to verify how the proposed project conforms to them.

Anticipated Positive Impacts

The study identified a number of anticipated positive and negative impacts during and after the forest management plan is implemented. Among the positive impacts expected, the communities in project areas are expected to benefit in a number of ways; namely:-

- ✓ Improvement on climate change and the environment in general.
- ✓ Employment opportunities to communities living around the area during implementation.
- ✓ increased acreage of planted tree species country wide;
- ✓ reduced soil erosion and sedimentation;
- ✓ increased groundwater recharge with related increase in spring discharges and base flow, or at least more even year round flow;
- ✓ preserved varied hardwood tree species;
- ✓ improved people's livelihood especially for the private plantations;
- ✓ The proposed tree planting will lead to growth in the local economy and

wealth creation.

- ✓ The sales of carbon emissions reductions will also lead to revenue
- ✓ Beneficial income to the proponent

As a requirement in the National Environment Management Authority, developers of projects for which ESIA has been carried out are required to carry out periodic monitoring to ensure that the mitigation and environment management measures identified and recommended through the ESIA are adhered to and implemented. It is further required, under the law, that such developers keep and maintain monitoring records which should be made available during inspections and that monitoring reports should be submitted to the appropriate authorities on an annual basis. We thereby conclude by putting the condition on the PROPONENT to ensure that periodic monitoring is carried out after implementation.

CHAPTER ONE

1 INTRODUCTION

1.1 General Information

The global forest cover is estimated at 4.06 billion hectares according to *Global Forest Resources Assessment Report 2020*. The plantation forests cover approximately 131 million hectares which is just 3% of the total global forest area. At the same time, 420 million hectares of forests have been lost globally since 1990. According to UNREDD, the global annual forest plantation production capacity should be at 1.8 billion m2 by 2020 to meet the growing wood demand.

In Kenya, the forest sector plays a key role in socio-economic development, contributing to approximately 3.6% of the country's GDP which is exclusive of the environmental services. It further supports the urban and rural population through the provision of charcoal and wood fuel. The sector has also provided jobs for approximately 18,000 to 50,000 people directly and 300,000 to 600,000 indirectly.

Name of variable	Area ('000 hectare)			
	1990	2000	2005	2010
Indigenous closed Canopy	1,240	1,190	1,165	1,140
Indigenous Mangroves	80	80	80	80
Open woodlands	2,150	2,100	2,075	2,050
Public Plantation Forests	170	134	119	107
Private Plantation Forests	68	78	83	90
Sub-total (Forests)	**3,708**	**3,582**	**3,522**	**3,467**

Source: FAO. 2010. Global Forest Resource Assessment Country Report: Kenya. *Rome: FAO. page 9.*

As Kenya experiences a wood deficit, commercial forestry is one approach that will bridge this gap. It will further lead to an increase in forest cover and reduce the pressure on the natural forests. Commercial forestry entails tree growing for the purpose of sale and wealth creation. Private lands, rangelands, and suitable grasslands are some of the potential areas for commercial forestry in Kenya. Similarly, public and community forests also have the potential for commercial plantation either by the government or by private entities through concessions.

The establishment of 150,000 hectares of commercial private forests plantations is one of the Nationally Determined Contributions (NDCs) Adaptation Actions for the period 2020-2030. This is expected to give impetus to the aspiration to have a sustainable wood supply within the country. Though the opinion is divided on where these hectares for

commercial forestry will come from, consensus exists on the immense opportunity of the ASAL areas which constitute up to 80% of the total land in Kenya and can be utilized for commercial forestry. Therefore, the need for more research and development of commercial tree species adaptable to the climatic conditions of the ASAL regions cannot be overemphasized

Subati Group Limited is a grower and exporter of over 100 varieties of spray and single head roses. The company has also diversified its agricultural portfolio through cultivation of herbs in its Kibwezi Farm. As of 2021, Subati ventured in plantation forests and commercialization of forest products, with particular interest in hardwood species (rosewood and sandalwood). The Company's main strategy has always been to create a brand by producing an extremely high quality product with the service tomatch.

1.2 Proposed Project Objectives

The proposed project has the overall objective of growing approximately 200ha of hardwood tree species that include sandalwood and rosewood for commercial purposes (extraction of oil and other products from seeds, stem and roots)

- To be in the hardwood (sandalwood and rosewood) business.
- To support the Government in its policy of creating employment,particularly for the local community
- To contribute to foreign exchange earnings for Kenya
- To contribute to the revenue base of the exchequer

1.3 Objectives of carrying out the ESIA study

The aim of this Environmental and Social Impact Assessment (ESIA) is to provide guidelines that are easy to follow and practical means for assessing environmental impacts, recommending mitigation measures and proposing monitoring for:

- Planning the actual extent and location of area to be planted
- Land clearing activities
- Biomass management and disposalFurther objectives of the study include:
- To assess the activities and impacts that will take place during the establishment and operation of the proposed Project
- To assess the Social Impacts of the proposed tree plantation in the proposed locality.
- To increase the projects proponent's awareness of Environmental Management (Environment Awareness Policy and Regulations)
- To comply with the EMCA 1999 (Revised 2015) and EIA/EA Regulations 2003 (Reviewed 2019).
- To prepare an Environmental management Plan for the proposed Project.

1.3.1 Specific Aims and Objectives of the EIA study

To submit report findings acquired from the Environmental and Social Impact Study acquired from the site that provided the basis for establishment and

maintenance of internal environmental management program within the proposed project.

To formulate an ESIA Study report based on the Environmental (Impacts Assessment and Audit) Regulations, 2003(2019) of National Environmental Authority (NEMA).

To establish recommended action plans and mitigating measures for the possible environmental impacts likely to be posed by the proposed project to the environment with a view to demonstrating its performance to other interested parties and affected groups.

1.4 Terms of Reference

The terms of reference agreed between the expert and the project proponent were as follows:-

i. To provide a description of the proposed project activities with a potential focus on potential adverse impacts in the design, construction, operation and abandonment (decommissioning) phases caused by the inputs, waste generated and disposal and social economic aspects.

ii. To establish the legal and regulatory aspects, administrative frame of reference, to identify governing standards, legislation and guidelines, and to determine permits and authorizations which will be required for the different sectors agencies and institutions involved.

iii. To describe the area of influence, and select methods of measuring the environmental aspects of concern including physical (water, air, soil and noise), biotic environment (vegetation, flora and fauna), chemical, socioeconomic (socio and economic structure, demographic, and socioeconomic background), cultural (aspects of cultural, archaeological, or anthropological interest) and landscape.

iv. To establish the methods to be used in identifying and quantifying environmental impacts, methodologies for predicting those impacts and how those impacts will be described in terms of; character (negative or positive), condition (reversible or irreversible), period (short, medium, or long-term), scope (cumulative, synergistic, direct, indirect) and establishing what standards will be used for the EIA.

v. To establish at what stages of the project the mitigating, corrective, compensatory and other measures will be used to eliminate, minimizing or mitigating adverse/significant impacts and how these measures will be selected.

vi. To define a schedule of activities, reaction with regard to risk prevention and accident control, objectives, specific tasks and budget through an Environmental Management Plan (EMP) and a Social Impact Assessment Plan (SIAMP).

vii. To provide a monitoring program of relevant environmental issues, specific variables to be included in the environmental follow-ups, detection limits and standards to be used and contents of the follow-up program.

viii. To establish the stakeholders to be involved in the community/public participation process, methods of reporting the project to the public, procedures to be used for community participation and aspects to be considered in the community participation plan during the development and review of the study.

ix. To establish the criteria to be used in defining the composition of theworking team of experts and the special requirements and information needed to form the team and characterize the same respectively.

x. To produce a systematic EIA report in accordance to the Environmental Impact Assessment and Audit Regulations of 2003 (2019).

xi. Final ESIA Study report to the client which will be submitted to NEMAas required by law

1.5 ESIA Study Methodology

In carrying out of the Impact Assessment, the following methodology aspects were incorporated:

1. **Semi structured interview:** this involved holding individual interviews with the project proponent and other stakeholders using a pre- prepared questionnaire and Impact Assessment checklists and recording the feedback.The importance of this methodology was to create confidentiality of the source of the information.
2. **Literature review:** this involved the review of all literature and data relevant to the project. The literature included legislation, data kept by the proponent,lead agencies, and government agencies.
3. **Site observation:** this involves a transect walk across the farm and the area to get acquainted with the natural environment and also to cross check issues, arising from the semi- structured interviews above.
4. **Public participation and consultation:** this involved holding public barazas with residents and stakeholders of the project to get their views regarding environmental/ social aspects of the project.

Figure 1: Some Members of the public During Baraza meeting

Other methodologies incorporated in the Impact Assessment include:

- Site reconnaissance
- Use of an observation schedule
- Recordings by use of camera
- Key informants
- Recording GPS coordinates

1.6 Justification of the ESIA

Concern has been growing in Kenya and at global level that many forms of development activities cause damage to the environment. The main challenge today is how to maintain sustainable development without damaging the environment. Environmental and social impact assessment is a useful tool for the protection of the environment from negative effects of development activities. Development projects must be viable, socially acceptable and environmentally sound.

It is now a statutory requirement that developers involved in the scheduled activities (*Second Schedule of EMCA*) conduct environmental impact assessment (EIA), especially for those activities that are likely to have significant impacts on human health and the environment.

2 PROJECT DESCRIPTION AND DESIGN.

2.1 Project Description and Design

The project will involve setting up the second phase of a hardwood plantation forest comprising of sandalwood and rosewood species. Currently, the farm propagated is own seedlings which are later transplanted into the main fields. The seeds are imported and the farm has an import license from Kephis (annexed).

Figure 2: Propagation of seedlings to be transplanted in open fields

The proposed project will be carried out in an area that has not been cultivated before and is currently covered in grass and shrubs. The area that will be opened up for cultivation initially will be approximately 150 hectares on LR MAKUENI/ KITENG'EI SCHEME 'B'/1593 AND MAKUENI/ KITENG'EI SCHEME 'B'/1594 IN Kitengei Location, Kibwezi Sub-County Makueni County and will be used for production of forest and forest related products for export markets. The water for irrigation will be drawn from abstraction of flood water from adjacent River Athi, earth Dams that exist in the proponent's farm and water harvested from the roofs of the green house.

2.2 Literature Review

2.2.1 Sandalwood

Sandalwood is a class of woods from trees in the genus Santalum. The woods are heavy, yellow, and fine-grained, and, unlike many other aromatic woods, they retain their fragrance for decades. Sandalwood oil is extracted from the woods for use. Sandalwood is often cited as one of the most expensive woods in the world. Both the wood and the oil produce a distinctive fragrance that has been highly valued for centuries. Consequently, some species of these slow-growing trees have suffered over-harvesting in the past.

Kenya's government banned the harvesting and trade of sandalwood in 2007. However, the trees continue to be cut for their essential oil, which is extracted to manufacture medicines and cosmetics. The whole tree is uprooted to access the sandalwood oil, most

of which is found in the roots and trunk.

S. album occurs from coastal dry forests up to 700 metres (2,300 ft) elevation. It normally grows in sandy or well drained stony red soils, but a wide range of soil types are inhabited. This habitat has a temperature range from 0 to 38 °C (100°F) and annual rainfall between 500 millimeters (20 in) and 3,000 millimeters (120 in). S. album can grow up to 9.1 metres (30 ft) vertically. It should beplanted in good sunlight and does not require a lot of water. The tree starts to flower after 7 years. When the tree is still young the flowers are white and with age they turn red or orange. The trunk of the tree starts to develop its fragrance after about 10 years of growth. Its IUCN Red List status is "vulnerable."

Figure 3: Plate showing photo of a mature Sandalwood tree

Sandalwood plantations constitute a highly lucrative business. Globally, the sandalwood supplies are not able to match its rising demand. In India, sandalwood is used for a variety of reasons: Making idols of gods and goddesses, furniture, medicine and religious purposes. Traditionally, the sandalwood was sourced from forests under strict government supervision and control. With large scale cutting down of sandalwood tress, illegal trade in sandalwood, and the rising demand for sandalwood imports from Australia, the government had to change its sandalwood policy. In 2001, government of India legalized the cultivation of sandalwood.

2.2.2 Global Facts about Sandalwood

- Globally, India and Indonesia are the two major producers and exporters of sandalwood. The United States and France are the two largest importers of sandalwood.
- India accounts for some 90% of sandal oil production in the world.
- Sandalwood trees tend to grow very slowly, gradually developing a core of heartwood.
- Flowering in 4-5 years signals the formation of heartwood.

- Sandalwood trees that are of 12-15 years produce higher heart wood yield anywhere between 20 and 40 kilo with higher rate of returns assured.
- The environment has an effect on the quality of the wood and oil. Much of the sandalwood is obtained from natural forests, small quantities are also obtained from plantations and trees growing in private fields.
- Harvested wood is cut into billets and transported.
- The heartwood of the trunk, main branches and roots is used in essential oil distillation.
- The sapwood is used for carving. Sandalwood is much prized as a wood. In India, the sapwood is used for wood turning, particularly toy making.
- Sandalwood oil has been widely used in folk medicine for treatment of common colds, bronchitis, skin disorders, heart ailments, general weakness, fever, infection of the urinary tract, inflammation of the mouth and pharynx, liver and gallbladder complaints and other maladies

Figure 4: Sandalwood Seedlings

2.2.3 Rosewood

Rosewoods are tropical trees, native to South America, India and Pakistan and Madagascar. The rosewood tree consists of a type of tropical hardwood that has become a very expensive commodity. The Brazilian rosewood (Dalbergia nigra), Indian rosewood (Dalbergia latifolia) and Madagascar rosewood (Dalbergia baronii) are the most dominant species of the rosewood tree. The rosewood tree (Dalbergia ssp.) is unfortunately in the category of flora that borderlines extinction due to its highly desired unique characteristics.

There are many species of rosewood which come from all around the world. Depending on the source country, the colour of rosewood can vary from nearly ebony through dark browns to rich reds and therefore make it an ideal choice for furniture and decorative items. The origin of the rosewood also affects its strength, durability

and hardness with Indian and African rosewood being the hardest.

Figure 5: Rosewood Seedlings

Figure 6: Mature Rosewood leaf and Rosewood Trunk

2.2.4 Uses of Rosewood

Rosewood is desired is for the benefits of the essential oils that are extracted from the wood. These oils are relatively easy to obtain since rosewood has a high oil content that can be found throughout the wood itself. The oil is extracted by steaming chips of rosewood.

The health benefits of Rosewood essential oil can be attributed to its possible properties as an analgesic, antidepressant, antiseptic, aphrodisiac, antibacterial, cephalic, deodorant, insecticide, and a stimulating substance.

Rosewood essential oil can be used to treat external skin problems such as acne, scars or even stretch marks. It can also be used to treat other frequent issues like the common cold or flu.

Indian rosewood is the most common rosewood to be used for high-end musical

instruments such as guitars. Its unique colouring and durability are what make rosewood usage in instruments so interesting.

Furniture makers share the desire to use rosewood in their large and small wood works because it is resistant to rot and water damage.

2.3 Description of the project cycle

A project cycle involves several stages, which include project concept, feasibility study, operation, implementation and decommissioning phases. Each phase is associated with certain activities. The activities associated with each of these phases in the project are described below.

2.3.1 Initial Phase

The following activities will be undertaken at onset of the project

- *Sourcing for seedlings.*

The proponent will work with relevant authorities (KEFRI and Kephis) to obtain permits to import the species seedlings. ***Attached find a no objection letter from Kefri and a Seed Import permit from Kephis***.

Other activities undertaken at the onset of the project will include:

- Soil and water analysis
- Site clearing
- Bed making and modelling
- Earthworks, drainage & irrigation
- Field Lining and holing
- Actual Planting and maintenance of seedlings

2.3.2 Operation phase

This phase shall involve the following activities;

- Procurement of inputs
- Application of fertilizers
- Planting/gapping/transplanting of different varieties of the hardwood tree species
- Irrigation
- Control of diseases and pests
- Harvesting, storage and packaging
- Waste management activities

2.3.3 Decommissioning phase

Although the project is expected to remain in operation for a long time to come, whether it remains operational depends on market conditions as determined by changes in consumer preferences and competition. However, it is important to consider the types of activities which would arise as a result of closure of the enterprise and their potential environmental impacts. Decommissioning, for whatever reasons, would lead to stoppage of all production operations. The activities associated with this phase include; dismantling of plant and equipment, clearance of the site, closure of septic tanks and re-establishment of grass/vegetation on the land and possibly growing of other viable

crops.

Other activities during decommissioning include:

- Removal of old trees
- Evacuation of plantation staff & workers
- Biomass management & disposal
- Removal of equipment, machinery & structures
- Site restoration/ rehabilitation

Prior to the decommissioning the following stepswill be undertaken:

- The current conditions, areas of concern and alternatives for future action will be put into consideration.
- An environmental assessment (EA) will performed to identify and determine the nature and extent of any hazardous materials or environmental contaminants in the tree plantation farm. This assessment will be directed to areas of concern.
- An equipment inventory will be undertaken, as it is important to determine the equipment and materials present inside the farm before it can be decommissioned.
- A farm inspection will be done to provide valuable information for decidingon alternative for future use. There will be an inspection or the facility design, materials or construction and current condition.

From this assessment the decommissioning will include:

i. **Remediation**: whereby the immediate environmental concerns will be remedied and the rest of the horticulture crops farm area left as they are,for a future buyer or occupier.

ii. **Hazardous** materials that are found will be dismantled and the contaminated materials sent to an appropriate landfill in lieu of clean up ordecontamination of these materials.

iii. **Equipment**: equipment that cannot be used at the plantation will be cleaned and taken to another facility of the same nature of business or sold. This will include components to water systems, process piping andother reusable specialized equipment.

iv. **Decontamination and remediation**: Equipment's that may be contaminated and require decontamination will be identified. Decontamination will involve removal, purging and proper disposal of liquids and solids contained in equipment, and rinsing or high pressure washing with water and detergent. Chemical analysis of wipe samples taken from washed equipment surfaces will be performed to document thatresidual hazardous substances have been removed.

2.4 Project Design

The property on which the project will be laid out is approximately 150 Ha. The land for the proposed project is privately owned by the Subati Group Limited asevidenced by ***title deeds***. The parcel of land is highlighted in the maps shown below.

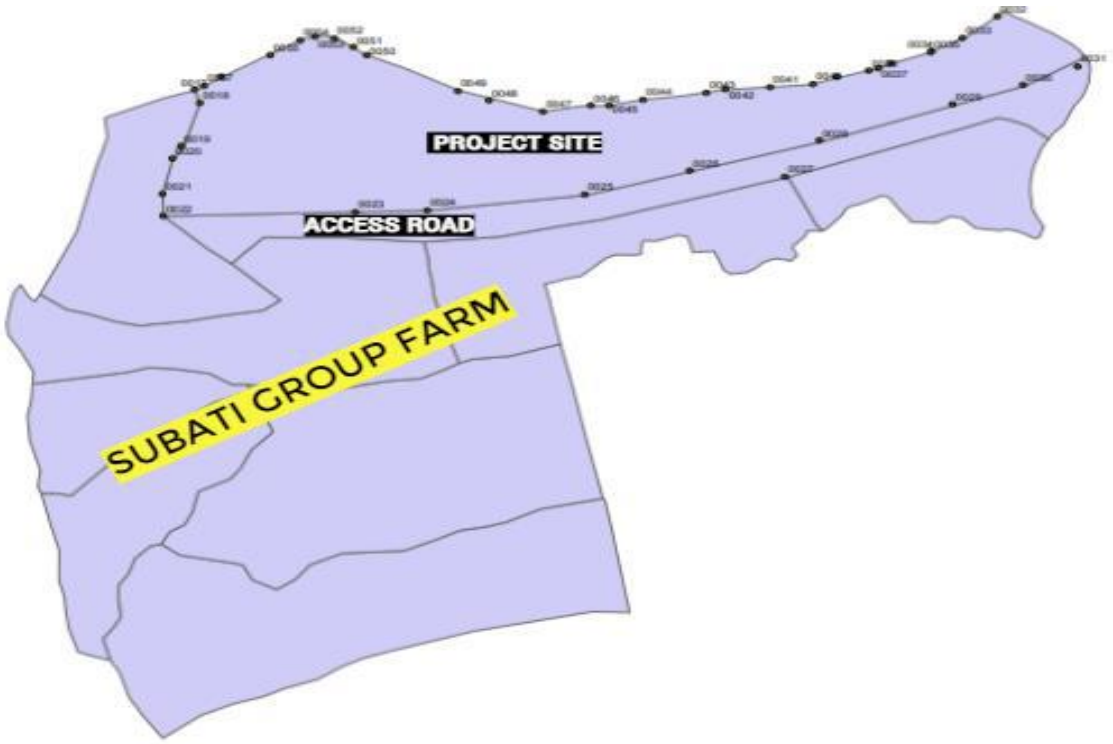

Figure 7: Layout of The proposed Project site

2.4.1 Utilities

- **Fertigation** - Precise fertilizer and water application will be centrally controlled. Production and quality both depend on how good and versatile this system isand how well it is run.
- **Fencing** – Adequate provision for proper boundary fencing all around the farm has been made.
- **Land Development** - Land development also includes ploughing, harrowing and application organic manure.
- **Electricity** from KPLC & Standby Generator.
- **Access roads** – there exists access roads within the proposed project site.

2.4.2 Materials to Be Used, Products and By-Products

a) ***Land-*** The land for this Project belongs to Subati Group Ltd. (see the attached title deeds)

b) ***Materials and machinery-*** Farm machinery such as tractors shall be used during the initial phase of the project. Materials use shall include pools from recycled plastic, wood, shade net, polythene, water pipes, and pumps among others. Tree cutting machines will also be used during harvesting.

c) ***Planting materials -*** tree seeds for the hardwood species to be planted. Plastic sleeves for seedling propagation will also be used. These will be sourced from a licensed supplier.

d) ***Agrochemicals - The*** chemicals to be used include fertilizers, pesticides, and compost. The total range of pesticides to be used is ones approved by PCPB.

e) ***Water***- Sourced from Athi River and a borehole will be sunk if need be, to

supplement the needed water.

f) ***Energy***- The main source of energy will be the Kenya Power and Lighting Co. Ltd. This is automatically backed up by a generator.

g) ***Products and by-products-*** The product from this project will solely be sandalwood and rosewood trees. The by-product is mainly green manure comprising cuttings, broken vegetation and other weeds/ crops during the operation phase.

CHAPTER THREE

3 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

3.1 Introduction

The Environmental Management and Coordination Act 1999 (Revised 2015) provides for the legal and institutional framework for the management of the Kenyan environment. Under the framework law, the *Second Schedule* provides guidance of activities which should undergo Environmental Impact Assessment (EIA) while projects already in place should undertake annual Environmental Audits (EA). However, there are other national legislative provisions which project proponent will be required to comply with in regard to air emissions, effluents, solid waste, and hazardous materials and work environment management. There are also international conventions which Kenya is signatory to.

3.2 Legal Framework

Most existing environmental legislation in Kenya was originally formulated in response to specific problems. The thrust of the legislation is almost entirely negative; stressing what should not be done. It bears little relationship to environmental management, a concept emphasizing planning and incentives for environmental sound choices.

There are 57 separate statutes in Kenya, which relate to the protection of the environment and the management of natural resources, e.g. the 1989 Wildlife Conservation and Management (AMENDMENT) Act, and further 20 statutes, which relate indirectly to the environment. It is because of this lack of a comprehensive Act on the environment that the Environmental Management and Co-ordination Act No. 8 of 1999 was enacted. This Act was a review of the 77 statutes related to environment. The EMCA 1999/2015 guarantees every Kenyan a clean and healthy environment.

A further deficiency of the legislation was that they did not provide any specific remedies or confer any rights on private citizens, either individuals or in groups,in the event of their interests being infringed upon by Acts of environmental mismanagement. Although the law of torts provides a framework within which many environmental problems can be resolved, its use in combating environmental problems is extremely limited. The principal National Legislation "triggered" by this project includes the following:

- *Environmental Management & Coordination Act (1999)*
- *The Agriculture Act Cap* 318
- *Forest Conservation and Management Act, 2016*
- The *Pesticide Control Products Act Cap* 346
- The *Employment Act Cap 226/229*
- *The Food, Drugs and Chemical Substances Act Cap 254*
- *The Irrigation Act Cap 347*
- *The Lakes and Rivers Act Cap 409*
- *The National Hospital Insurance Act Cap 255*
- *The National Social Security Fund Act Cap 258*

- *The Physical Planning Act (2019)*
- *The Regulation of Wages and Conditions of Employment Act Cap 229*
- *The Standards Act Cap 496*
- *The Trade Disputes Act Cap 234*
- *The Water Act, 2016*
- *The Workmen's Compensation Act Cap*
- *The Occupational Safety and Health Act, 2007*
- *The Agricultural Produce Export Act Cap 319 (u)*
- *The Wildlife Conservation and Management Act, 2013*
- *The County Governments Act, 2012*
- *The Constitution of Kenya, 2010*

3.2.1 Environmental Management and Coordination Act (1999).

This is an Act of Parliament that provides for the establishment of the appropriate legal and institutional framework for the management of the environment and for matters connected there with and incidental there to. The Act recognizes the fact that the environment constitutes the foundation of national economic, socio- cultural and spiritual advancement.

Section 51 of the Act provides for the conservation of biological resources in-situ and mandates NEMA to issue guidelines that can be used to ensure that biological resources are protected. This include the development of land use guidelines that are compatible with the conservation of biological resources, selection and management of buffer zones including special arrangements for the protection of species, ecosystems and habitats threatened with extension. Section 112, 113, 114 and 115 provide for the application, granting enforcement and compensation for environmental easement, which may be done if, found necessary for purposes of conserving and enhancing the environment.

This Act requires every development likely to have an impact on the environment to undertake an environmental impact assessment. The second schedule of the Act states that any activity out of character with its surrounding; or any structure of a scale not in keeping with its surrounding; or any activity leading to major changes in land use must undergo an EIA.

The proponent is in compliance with the Act by undertaking this ESIA which has incorporated mitigation measures and the environmental management plan that guides the farm's management in its operations.

3.2.2 Forest Conservation and Management Act, 2016

Forests may be classified as public, community or private forests.

(i) ***Public forests*** include—

i. public forests classified under Article 62 (1)(g) of the Constitution
ii. Forests on land between the high and low water marks classifiedunder Article 62 (1) (1) of the Constitution.

All public forests in Kenya are vested in the Service, subject to any rights of userin respect thereof, which by or under this Act or other written law, have been are

granted to any other person. The Cabinet Secretary may, on the recommendation of the Board and after consultation with the National Land Commission declare through a Gazette notice any un-alienated public land or any land purchased or otherwise acquired by the Service to be a public forest.

(ii) ***Community forests*** include—

- ✓ Forests on land lawfully registered in the name of grouprepresentatives;
- ✓ Forests on land lawfully transferred to a specific community;
- ✓ Forests on any other land declared to be community land by an act of parliament
- ✓ Forests on land that is lawfully held, managed or used by specific communities as community forests
- ✓ forests on ancestral lands and lands traditionally occupied by hunter-gatherer communities
- ✓ Forests lawfully held as trust land by the county governments, but not including any public land held in trust by the county governments under Article 62 (2) of the Constitution.

All community forests shall be vested in the community, subject to any rights of user in respect thereof, which by or under this Act or other written law, have been or are granted to any other person. The Service shall register each community forest in accordance with Regulations prescribed in accordance with this Act.

The Service shall notify the relevant county government of the registration of a community forest as soon as is practicable of the registration. Upon registration under subsection (2), the community may apply—

- o To the county government for technical advice regarding appropriate forestry practices and conservation; or
- o To the fund, subject to availability of funds, loans from the fund for the development ofthe forest.
- o A community that establishes or owns a community forest may apply to the relevant authorities for exemption from payment of all or part of the land rates and such other charges as may be levied in respect of the land on which the forest is established.

(iii) ***Private forests*** include—

- Forests on registered land held by any person under any freehold tenure;
- Forests on land held by any person under leasehold tenure;
- Any forest owned privately by an individual, institution or body corporate for commercial or non-commercial purposes
- Forests on any other land declared private land under an Act of Parliament.

A person who owns a private forest, including a forest in the course of establishment, on land owned by the person, may apply to the Service for

registration of the forest under this section.

The Service shall register a forest under subsection (1) where the forest meets the criteria prescribed in rules made under this Act.

Upon registration under subsection (2), the owner of a private forest may apply

- To the Service for technical advice regarding appropriate forestry practices and conservation
- To the Fund, subject to availability of funds, loans from the Fund for the development of the forest,
- Provided that the funds are obtained and utilised in accordance with the procedures set out by the Service.
- A person who establishes or owns a private forest may apply to the relevant authorities for exemption from payment of all or part of the land rates and such other charges as may be levied in respect of the land on which the forest is established.

Variation of boundaries or revocation of public forests

(1) Any person may petition the National Assembly or the Senate, for the variation of boundaries of a public forest or the revocation of the registration of a public forest or a portion of a public forest.

(2) A petition under subsection (1) shall demonstrate that the variation of boundaries or revocation of the registration of a public forest or a portion of a public forest does not—

(a) Endanger any rare, threatened or endangered species; or

(b) Adversely affect its value as a water catchment area; and prejudice biodiversity conservation, cultural site protection of the forest or its use for educational, recreational, health or research purposes.

(3) A petition made under subsection (1) shall be considered in accordance with the provisions of the Petitions to Parliament (Procedure) Act and the Standing Orders of the relevant House.

(4) The Cabinet Secretary shall, within thirty days of the petition being committed to the relevant Committee, submit a recommendation on whether the petition should be approved subject to-

- The petition being subjected to an independent Environmental Impact Assessment; and
- Public consultation being undertaken in accordance with the Second Schedule.

3.2.3 Water Act of 2016

This prohibits the pollution of water. Part II, Section (3) states "every water resource is hereby vested in the State, subject to any rights of user granted by or under the Act or any other law. In addition, the right to use of water from any water resources is vested in the Minister of Water Resources Development and Management, except to the extent that is alienated by or under the Act or any other written Law (Section 5). Consequently, a water permit must be obtained before using any water resource. Section 29 (1), (2) and (3) stipulates the procedure for obtaining a water permit,

while Section (4) states "except as provided in Section 33, an application for a permit shall be subject to the public consultation and, where applicable, of environmental Impact Assessment in accordance with the requirements of the Environmental Management and Coordination Act, 1999. Section 73 of the Act allows a person with a license (licensee) to supply water to make regulations for the purposes of protecting against degradation of water resources. Section 75 and sub-section 1 allows the licensee to construct and maintain drains sewers and other works for intercepting, treating or disposing of any foul of arising or flowing upon land for preventing pollution of water sources within his / her jurisdiction.

Section 76 states that no person shall discharge any trade effluent from trade premises into sewers of a licensee without the consent shall be issued on conditions including payment of rates for the discharge as may be provided under section 77 of the same Act.

3.2.4 Land Planning Act (cap 303)

Section 9 of the subsidiary legislation (The Development and Use of Land Regulations, 1961) under this Act requires that before the local authorities submit any plans to then Minister for approval, steps should be taken as may be necessary to acquire the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should be submitted. This intended to reduce conflict with the interest such as settlement and other social and economic activities.

The Proponent; has been granted land use rights by the relevant department of the County Government of Makueni. The NEMA office will evaluate this report and, if satisfied by its content, grant the Proponent the right to continue with their operations.

3.2.5 Penal Code Act (Cap 63)

Section 191 of the penal code states that if any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use is guilty of an offence. Section 192 of the same act says persons / institution is dwelling or business premises in the neighbourhood or those passing along public way, commit an offence.

3.2.6 Food, Drugs, and Chemicals substances Act (Cap 254)

The Food, Drugs and Chemicals Substances Act (Cap 254) whose purpose is to make provision for the prevention of adulteration of food, drugs and chemical substances. This Act (which has been invoked for the consumption of genetically modified food), requires that food, drugs, cosmetics, devices and chemical substances should not be sold if they are unwholesome, poisonous, or adulterated. It further prohibits deceptive labelling.

3.2.7 Agriculture Act (Cap 318)

The Agricultural Act cap 318 of the laws of Kenya seeks to promote and maintain a stable Agriculture to provide for the conservation of the soil and its fertility and to stimulate the development of Agricultural land in accordance with the accepted practices of good land management and good husbandry.

3.2.8 The Work Injury & Benefits Act, 2007

An act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes.

3.2.9 Occupational Health and Safety Act 2007

The Safety Health and Welfare at Work Act 2007 requires employers "to manageand conduct work activities in such a way as to ensure, so far as is reasonably practicable, safety, health and welfare of his or her employees". As a legal requirement, all the workers within the facility will be provided with the appropriate personal protective equipment (PPE) and the contractor will ensure proper workmanship.

The issue of health and safety precautions in the workplace will be adhered to in order to ensure that the project takes advantage of the benefits afforded by Occupational Health and Safety (OSHA Act of 2007), which include but not limited to:

- Reduction of incidence of occupational diseases within the project site
- Reduction of incidence of occupational accidents
- Reduction of incidences of occupational injuries and death
- Reduce costs associated with occupational diseases, injuries and deaths
- Reduce insurance related costs
- Improvement of the public image of the project

The most relevant legislations applicable to the project include;

- Occupational Safety and Health Act (OSHA) 2007 which replaced the Factories and Other Places of Work Act Cap. 514.
- Work Injury Benefits Act (WIBA) which replaced the Workmen'sCompensation Act.
- ISO 18001 series on Occupational Health & Safety Assessment Systems (OHSAS)

This is as stipulated in the legal legislations and standards together with best practices in the market. Where gaps are identified mitigation measures will be putin place.

In compliance to the above the proponent will ensure that

- Protective clothing is provided for the workers and any visitors to the site.
- Proper and adequate working environment. Presence of an Emergency response Plan
- Proper workmanship to caution against building collapsing
- Safety of the workers, suppliers and the neighbouring community

3.2.10 Public Health Act (Cap 242)

Part IX, section 115 of the act states that no person/institution shall nuisance or condition liable to be injuries or dangerous to human health. Section 116 requires that Local Authorities take all lawful, necessary and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable to be injuries or dangerous to human health.

Such nuisance or conditions are defined under section 118 as waste pipes, sewers, drainers or refuse pits in such state, situated or constructed as in the opinion of the medical officer of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into the public street or into

the gutter or side channel or watercourse, irrigation channel, or bed not approved for discharge is also deemed as nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbor rats or other vermin.

On responsibility of the Local Authorities, Part XI, section 129, of the Act states in part "It shall be the duty of every local authority to 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 district has a right to use and does use for drinking or domestic purpose…"

Section 130 provides for making and imposing regulations by the authorities and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth or noxious matter into water supply as mentioned in section 129. this provision is supplemented by section 126A that requires local authorities to develop by laws for controlling and regulating among others private sewers communication between drains and sewers and between sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc for reception or disposal of foul matter.

Part XII, section 136, states that all collections of water, sewage, rubbish, refuse and other fluids which permits or facilitates the breeding or multiplication of pests shall be deemed nuisances and are liable to be dealt with in the matter provided by this Act.

The owner(s) of premises responsible for environmental nuisance such as noise and emissions at levels that can affect human health are liable to prosecution under this Act. An environmental nuisance is one that causes danger, discomfort or annoyance to the local inhabitants or which is hazardous to human health. It also outlines the standards of construction of sanitary facilities of any premises.

3.2.11 The County Government Act 2012

The Act requires that every County shall have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise dealing with, all kinds of refuse and effluent and, where any such service is established, to compel the use of such service by persons to whom the service is available;

Section 201(1) – (4) expands the jurisdiction of county governments to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of the health, safety and well-being of the inhabitants of its area or any part thereof and for the good rule and government of such area or any part thereof and for the prevention and suppression of nuisances. The by- laws so made may control, regulate, prevent, prohibit or compel certain activities to be undertaken and prescribe offences in case of contraventions.

3.2.12 Constitution of Kenya (2010)

For the purpose of sustainable management of environment, the state is obliged under Article 69, clause (1) to:

- Ensure sustainable exploitation, utilization, management and conservation of the environment and natural resources and ensure the equitable sharing of the accruing benefits

- Work to achieve and maintain a tree cover of at least ten per cent ofthe land area of Kenya
- Encourage public participation in the management, protection and conservation of environment
- Protect genetic resources and biological diversity
- Establish systems of environment 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 thepeople of Kenya.

Under clause (2), every person has the duty to cooperate with the state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and use of natural resources.

3.2.13 Physical Planning Act (Cap 286)

The County Governments are empowered under section 29 of the Act to reserve and maintain all land planned for open spaces, parks, urban forests and green belts. The same section, therefore allows for the prohibition or control of the use and development of land and buildings in the interest of proper and orderly development of an area.

Section 30 states that any person who carries out development without development permission will be required to restore the land to its original condition. It also states that no other licensing authority shall grant license for commercial or industrial use or occupation of any building without a development permission granted by the respect local authority.

Finally, section 36 states that if connection with a development application, local authority is of the opinion that the proposed development activity will have injurious impact on the environment, the application shall be required to submit together with the application an environment impact assessment EIA report. EMCA, 1999 echoes the same by requiring that such an EIA is approved by theNEMA and should be followed by annual environmental audits.

3.3 Regulations and Policies

3.3.1 EIA/EA Regulations 2003/2019

The environmental (Impact Assessment and Audit) Regulations 2003, provide the basis for procedures for carrying out Environmental impacts Assessments (EIAs) and Environmental Audits. The Environmental Impact Assessment and Audit regulations states that the regulations should apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the second schedule of the act.

Regulation 4(1) further states that

"…… no proponent should implement a project

(a) Likely to have a negative environmental impact; or

(b) For which an environmental impact assessment is required under the act or these regulations unless an environmental impact assessment has been

concluded and approved in accordance with these regulations

3.3.2 EMCA (Waste Management) Regulations 2006

These are described in legal notice No 121 of the Kenya Gazette supplement no 69 of September 2006. These regulations apply to all categories of waste as provided in the regulations. These include;

- Industrial wastes
- Hazardous and toxic wastes
- Pesticides and toxic substances
- Biomedical waste
- Radioactive substances

These regulations outline requirements for handling, storing, transporting and treatment/ disposal of all waste categories as provided therein

3.3.3 EMCA (water quality) Regulations 2006

These are described in legal notice 120 of the Kenya Gazette supplement No 68 of September 2006. These regulations apply to drinking water, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. These include thefollowing

Protection of sources of water for domestic use Water for industrial use and effluent discharge Water for agricultural use

These regulations outline

- Quality standards for sources of domestic water
- Quality monitoring for sources of domestic water
- Standard for effluents discharge into the environment
- Monitoring guides for discharges into the environment
- Standard for effluents discharged into the public sewers
- Monitoring for discharge of treated effluents into the environment

3.3.4 Conservation of Biological Diversity (BD) Regulations 2006

These regulations are described in legal notice No 1600 of Kenya Gazette supplement of No 84 of December 2006. These regulations apply to conservation of biodiversity, which includes conservation of threatened species, inventory and monitoring of BD and protection of environmentally significant areas.

These are the regulations for conducting the EIA and EA concerning the general principle in the Act that entitles every Kenyan with the basic right to a clean and health environment.

1. Part 5 sections 31.

It stipulates that an Environment Impact Assessment should be undertaken on proposed projects that are listed as mandatory, to minimize the negative impacts such projects may have.

2. Section 72 (1) (EMCA, 1999) Water Pollution Prohibition

It prohibits the discharge of poisonous, toxic, noxious or obstructing matter, radioactive wastes or other pollutants and faulty dumping or discharge of such

matter into aquatic environment in contravention of water pollution control standards established by the Act.

Contravention of the above is an offence punishable by imprisonment for a term of not exceeding two years or a fine not exceeding one million or to both such imprisonment and fine. In addition to any sentence or fine imposed by the court, the offender shall pay costs of the removal of the substances mentioned in section 72 (1) above.

Notwithstanding sentence, fine or payment of costs for removal the offender shallpay third parties reparation, restitution by such third parties.

3. Effluents to be discharged only into the sewerages system Section 74

The Environmental Management and Coordination Act (EMCA 1999) requires every owner or operator of a trade or industrial undertaking to discharge effluents or other pollutants originating from trade or industrial undertakings into existing sewerage systems and the local authority, the relevant supervising body, shall issue a prescribed fee or the license necessary for the discharge. License of discharge effluents into the environment shall only be granted upon installation of an appropriate plant for the treatment of the above effluents.

4 Air quality standards Section 78 (2)

The Act (EMCA 1999) prohibits emission of any substances that causes air pollution and the offender is liable to imprisonment of two years, a fine of Ksh.7,500, payment of the cost of removal of the pollution and any third party costs for reparation, restoration, restitution or compensation as may be determined bythe court.

5 Section 82 Emission by motor vehicles and other conveyances

The environmental management and coordination Act (EMCA 1999) prohibits emission of any pollution by operator of motor vehicles, train, ship, aircraft or other similar conveyances [Homes equipment devices etc] whose operation will bein contravention of the established emission standards of NEMA.

3.3.5 Pest Control Products (Disposal) Regulations, 2006.

These regulations forbid the indiscriminate disposal of any pest control product or discarding its containers without prior knowledge and approval of the relevant authority.

- Refresher trainings need to be conducted annually and induction training facilitated for new employees handling chemicals.
- Reuse of containers for domestic purposes should be discouraged and containerspunctured.

3.3.6 National Environment Action Plan. (NEAP)

The NEAP for Kenya was prepared in mid 1990s. It was a deliberate policy effortto integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectoral approach to develop a comprehensive framework to ensure that environmental management and the conservation of natural resources are an integral part of societal decision –making.

The NEAP also established the process of identifying environmental problems and issues, raising environmental awareness, building national consensus, defining policies, legislation and institutional needs, and planning environmental projects.

3.3.7 Environment and Development Policy (Sessional paper No.6 of 1999).

The goal of this policy paper is to harmonize environmental and developmental goal so as to ensure sustainability. The paper provides comprehensive guidelines and strategies for government action regarding the environment and development. The World Commission on Environment (The Brundland Commission of 1987) recommends development that produces no lasting damage to the biosphere and of particular ecosystem.

Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. Similarly, socio- sustainable development is development that maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement.

3.3.8 The National Poverty Eradication Plan (NPEP) and the Poverty Reduction Strategy Paper (PSRP)

The NPEP has the objective of reducing the incidence of poverty in both rural and urban areas by 50 percent by the year 2015; as well as strengthening the capabilities of the poor and vulnerable groups to earn an income. It also aims at narrowing the gender and geographical disparities and at creating a healthy, educated and more productive population. This plan has been prepared in line with the goals and commitments of the World Summit for Socio Development (WSSD) of 1995. The plan focuses on the four WSSD themes of poverty eradication, reduction of unemployment, socio-integration of the disadvantaged people and creation of an enabling economic, political and cultural environment.

This plan is to be implemented by the Poverty Eradication Commission (PEC) formed in collaboration with Government Ministries, community based organizations, private sector, non- governmental organizations, bilateral and multilateral donors. This strategy is important in raising human capabilities and thus human development. The PRSP has the twin objective of poverty reduction and economic growth. The paper articulates Kenya's commitment and approach to fighting poverty; with basic rationale that the war against poverty cannot be won without the participation of the poor themselves.

3.4 Institutional Framework

Two institutions are in place for the purpose of administration of the Environmental Management and Coordination Act, namely, National Environmental Council (NEC) and National Environmental ManagementAuthority (NEMA)

3.4.1 National Environmental Council (NEC)

The act establishes the NEC chaired by the Minister for Environment and natural resources with membership from all the relevant ministries as well as broad range of other interests. The functions of the council shall be to formulate national policies, goals and objectives and determination of policies and priorities for the environmental protection. The council also promotes co-operation among all the players engaged in environmental protection programmes.

3.4.2 National Environment Management Authority (NEMA)

NEMA is the organization responsible for the administration of the environmentalact. The Director General appointed by the president heads it. Among the functions of NEMA, include;

a. Co-ordination of various environmental management activities.
b. Initiation of legislative proposals and submission of such proposals to Attorney General
c. Research, investigate and carry out surveys in the fields of environment
d. Enhance environmental education and awareness on the need of sound environmental management.
e. Advice the government on regional and international agreement to which the country should be a party and issue an annual report on the state of environment.
f. Charged with the responsibility of the execution of Environmental Impact Assessment (EIA) and Environmental Audit (EA).

3.4.3 KEFRI

The Kenya Forestry Research Institute (KEFRI) is a state corporation established in 1986 and mandated to undertake research in forestry and allied natural resources. The institute conducts research and development activities under five thematic areas namely: Forest productivity and Improvement; Biodiversity and Environment Management; Forest Products Development; Social-economics, Policy and Governance and Technical Support Services. It has a Mandate to:

-Conduct research in forestry and allied natural resources;

-Disseminate research findings; and

-Establish partnerships and cooperate with other research organizations and institutions of higher learning in joint research and training.

Its Strategic Objectives are:

-To enhance: Vision 2030 delivery; customer/stakeholder satisfaction and retention; linkage and partnership with stakeholders; and livelihoods.

-To increase forest technologies and innovations; enhance multi-sectoral and public-private sector research; enhance knowledge management anddissemination systems.

3.4.4 KFS

The Kenya Forest Service is a state corporation that was established under the Forest Act, 2005 (henceforth referred to as the Act). Commencing its operations in February 2007, the Service's expressed mandate is to enhance development, conservation and management of Kenya's forest resources base in all public forests, and assist County Governments to develop and manage forest resources on community and private lands for the equitablebenefit of present and future generations.

In carrying out its mandate, the functions of KFS include among others:

1) Conserve, protect and manage all public forests in accordance with theprovisions of the Act;

2) Prepare and implement management plans for all public forests, and upon request, prepare management plan for forests on community land or privateland in consultation with forest owners;
3) Assess applications for the use of forests and forest resources to individuals, corporate bodies and communities, and issue licenses to thiseffect and in accordance with the Act;
4) Establish and implement benefit sharing arrangements in accordance withthe provisions of the Act;
5) Assist County Governments to build capacity for forestry development oncommunity and private lands;
6) In consultation with relevant stakeholders, develop programmes for tourism and for recreational and ceremonial use of public forests;
7) Promote forestry education and training;
8) Register and maintain a register of all forest management plans on publicland
9) Collaborate with individuals, as well as private and public research institutions in identifying research needs and applying research findings;
10) Manage water catchment areas primarily for soil and water conservation, carbon sequestration and other environmental services; and
11) Enforce the provisions of the Act and any forestry and land use rules andregulations made pursuant to any other written law.

From its mandate and functions, KFS is therefore both a service provider working with partners and stakeholders for the sustainable management and utilization of forest resources, and an enforcement agency.

The other agencies which will be involved in this process are the

- KEPHIS
- KWS

All the above mentioned will play a vital role in the implementation of the proposed project, and their feedback will make NEMA have an informed decision on the project.

3.5 The International agreements/conventions/Code of Practice

3.5.1 Montreal and Kyoto protocols – greenhouse gases & ozone depletingsubstances

The Montreal Protocol of 1996 deals with the elimination of the production and consumption of ozone-depleting chemicals (namely CFCs and Halons). The substances which are controlled by the Montreal Protocol include the following:

- CFCs (CFC-11,12,13, 112, 113,114,115, 211, 212, 213, 214, 215, 216, 217)
- Solvents (carbon tetrachloride, methyl chloroform) and

- Methyl bromide, HBFCs, HCFCs and Bromochloromethane (BCM)

The UNFCCC (adopted in 1992) is a global legal instrument for the control and management of greenhouse gases (GHG) which are not controlled by the Montreal Protocol. The Kyoto Protocol is an affiliated instrument which commits industrialized countries to achieve quantified targets for decreasing their greenhouse gas emissions.

Greenhouse gases are radiative gases of the atmosphere, both natural and anthropogenic, which absorb and re-emit infrared radiation. They include carbon dioxide (CO2), methane (CH4), nitrous oxide (NO2), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6). The importance of each gas is based on its Global Warming Potential (GWP).

3.5.2 Convention on International Trade in Endangered Species (CITES)

The Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The plan provides for protection and continuous monitoring of rare and endangered plant species within the forest reserve.

3.5.3 The Stockholm convention (2001) - pesticides

This is a global treaty aiming to protect human health and the environment from persistent organic pollutants (POPs). The convention focuses initially on twelve chemicals that can be grouped into three categories:

- *Pesticides:* Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene (industrial chemical and by-product), Mirex and Toxaphene
- *Industrial chemicals*: PCBs (also by-product)
- *Unintended by-products*: Dioxins and Furans

3.5.4 Codes of practice relevant to the proposed project

There are several codes / standards which the proposed enterprise could join and subscribe to. These include:

- EUREPGAP Control Points & Compliance Criteria
- BV Non-Food Factory Inspection Technical Standard/Checklist

3.6 Other relevant laws

- ✓ Article 69 of the Constitution of Kenya on environment protection of environment and biodiversity.
- ✓ Forest conservation and management Act 2016 under section 22 which mandates KEFRI to be lead agency in forestry research and development.
- ✓ The provisions of Forest conservation and Management Act 2016,provisions of sections 40, 60 and 61.
- ✓ The mandate of KEPHIS as provided under KEHPIS 2012 , the seeds andplant varieties Act (Cap 326) and the plant protection Act (Cap 324)

CHAPTER FOUR

4 BACKGROUND INFORMATION

4.1 Project location

The proponent (SUBATI GROUP LIMITED of P.O. BOX 25130-00100, NAIROBI) has proposed to put up a plantation forest comprising of sandalwood and rosewood species on MAKUENI/ KITENG'EI SCHEME 'B'/1593 AND MAKUENI/ KITENG'EI SCHEME 'B'/1594 IN KITENGEI LOCATION, KIBWEZI SUB-COUNTY, MAKUENI COUNTY. The project area lies along Nairobi- Mombasa highway, off the junction at Kambu Trading Centre.

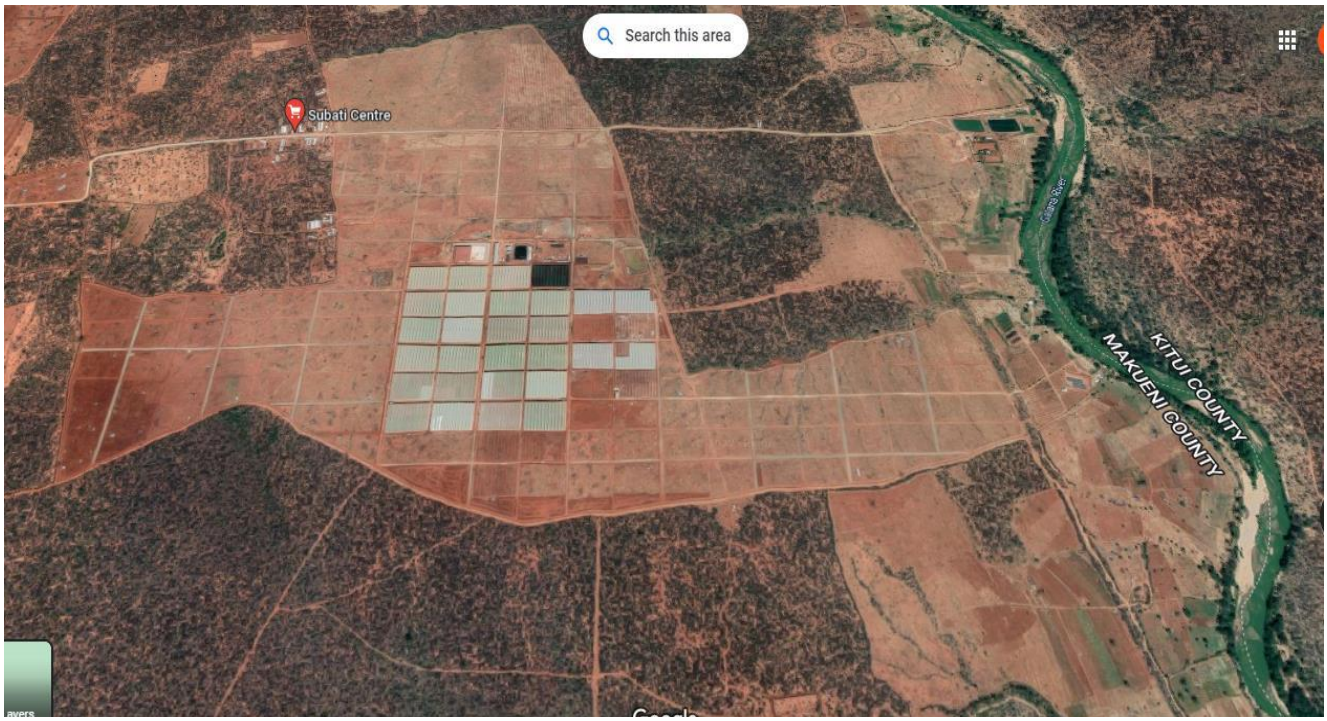

Figure 8: Satellite Image Of the proposed project site

The project site is in Ngwata area which can be accessed via a murram road at a distance of approximately 35km from Kambu Centre. Administratively, it is situated within Iani village, Kathekani location, Mtito Andei division, Kibwezi East District. Its defining coordinates are 2°32'16.7"S 38°18'21.4"E (-2.52222271, 38.28225320).

4.2 Environmental Conditions

The environmental conditions referenced in this section are with regard togeneral information pertaining to the site and its surrounding environs according to the literature review, field study and site personnel.

4.2.1 Topography

The physiography of the area is generally flat, but gently slopes towards the eastward direction. The site lies at an altitude of 570m asl and is covered by grey sandy soils underlain by reddish soils. Vegetation cover is planted trees and savannah land type of grass. The area is drained by Athi River and its tributaries.

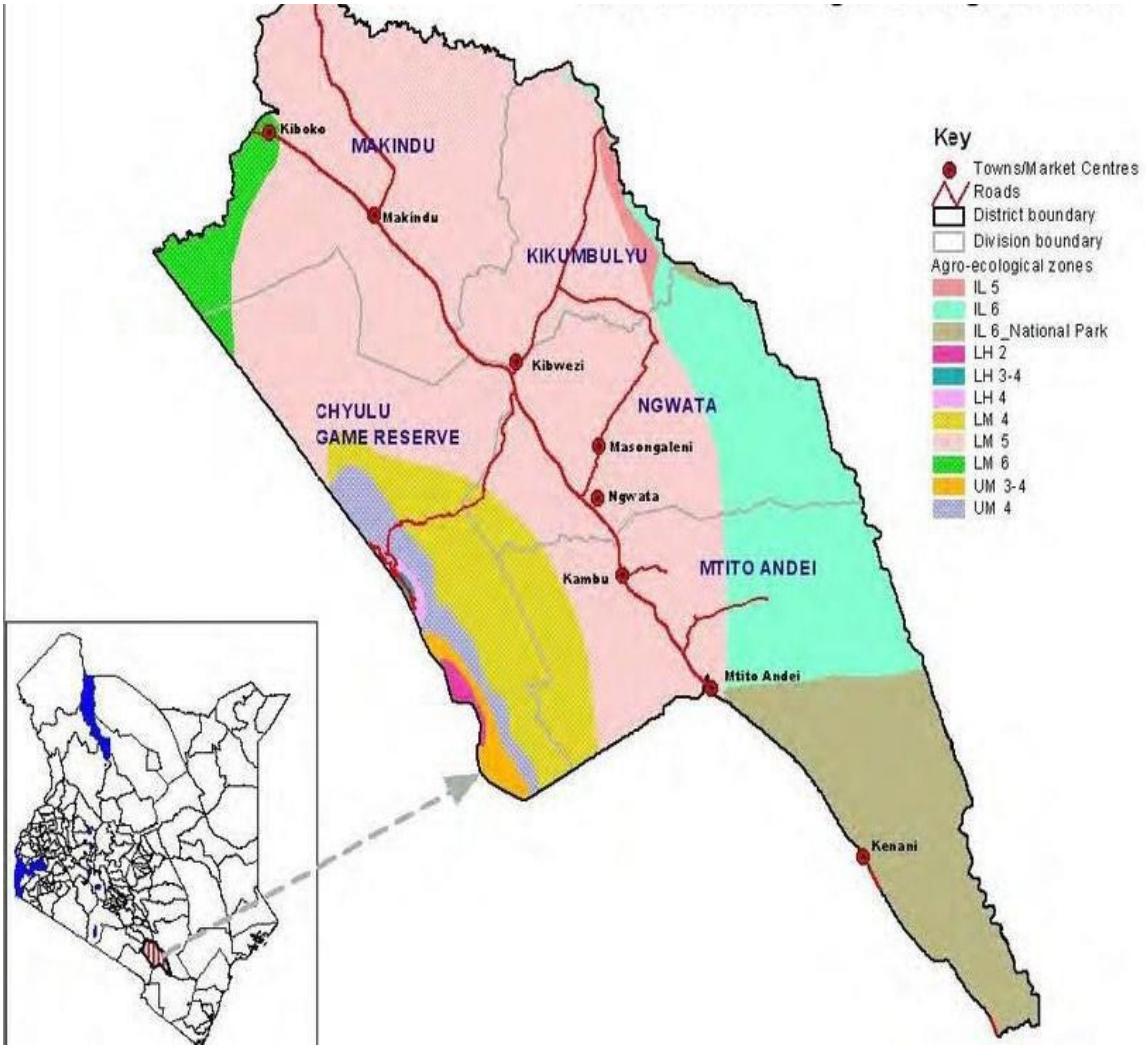

Figure 9: Makueni County Agro-ecological Zones

4.2.2 Climate

Kambu lies on 863m above sea level. Kambu's climate is a local steppe climate. During the year there is little rainfall. The climate here is classified as BSh by the Köppen-Geiger system. The temperature here averages 23.1 °C | 73.5 °F. The annual rainfall is 627 mm | 24.7 inch.

Kambu has 2 types of climates prevailing, namely the tropical savanna climate and semi-arid climate. If you want to know what the average temperature is in Kambu or when most precipitation (rain or snow) falls, you can find an overview below. This way, you are well prepared. Our average monthly climate data is based on data from the past 30 years.

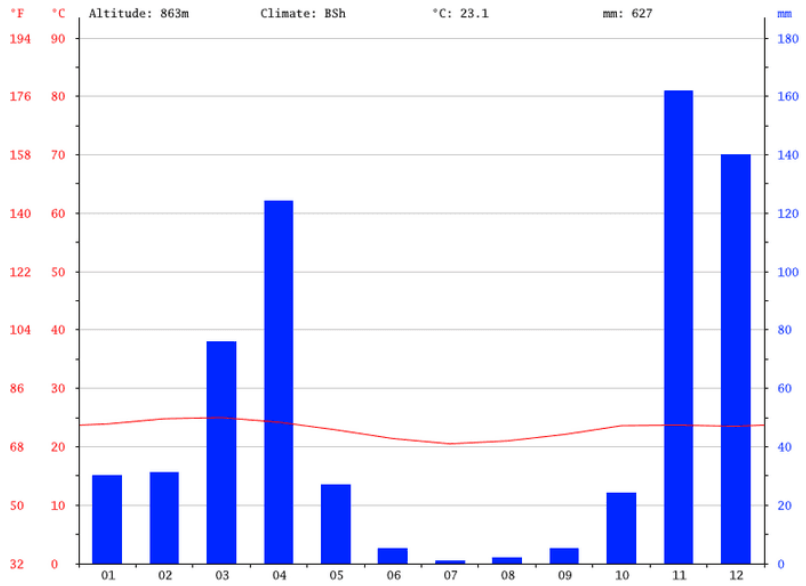

Figure 10: Showing Climate Graph of Kambu, Makueni County

Precipitation is the lowest in July, with an average of 1 mm | 0.0 inch. Most ofthe precipitation here falls in November, averaging 162 mm | 6.4 inch. At an average temperature of 25.0 °C | 77.0 °F, March is the hottest month of the year. July is the coldest month, with temperatures averaging 20.5 °C | 68.9 °F. Between the driest and wettest months, the difference in precipitation is 161 mm| 6 inch. Throughout the year, temperatures vary by 4.5 °C | 40.1 °F.

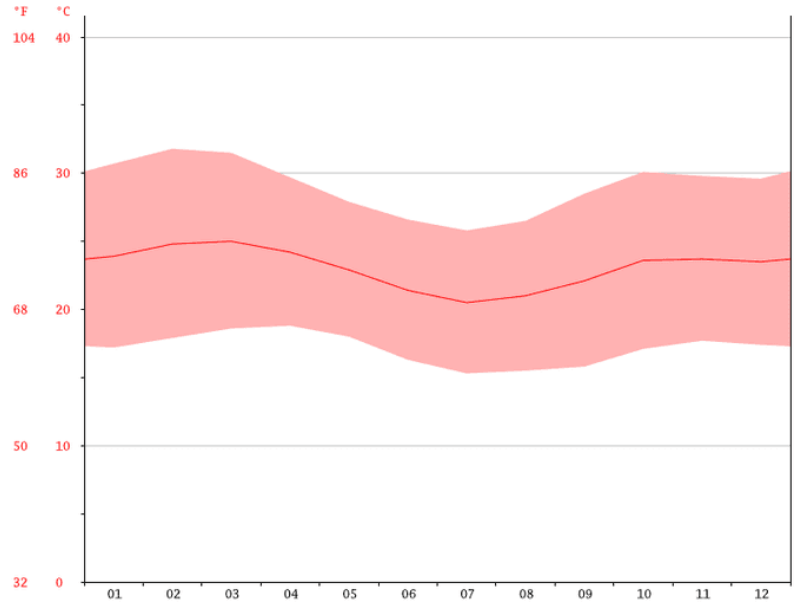

Figure 11: Showing Temperature Graph of Kambu, Makueni County

Generally, the district experiences high temperatures during the day and low temperatures at night. During the dry periods between May and October the lower parts of the area

experience severe heat.

4.2.3 Geology and Soils

The study Area is characterized by an extensive contact between the Precambrian metamorphic rocks and the overlying volcanic rocks. The area underlain by metamorphic rocks is characterized by lowlands with an average altitude of between 400-900m above mean sea level (amsl) and the area underlain by volcanic rocks forms the Chyulu Hills with an altitude of between 1200m and 2000m amsl. Thus geologically, the project area can be divided into two distinct regions; those underlain by the Precambrian rocks of the Basement Systemcomprising of gneisses, schists, quartzite, marbles etc and those underlain by the volcanic rocks.

Most areas around the Kibwezi District are generally covered by deep sandyalluvium and red sandy soils in addition to patches of black cotton soils and murram that exist at the project site. Valleys and river flood plains, however, have notable productive soils due to accumulation of silt and minerals though they are limited by lack of adequate rainfall.

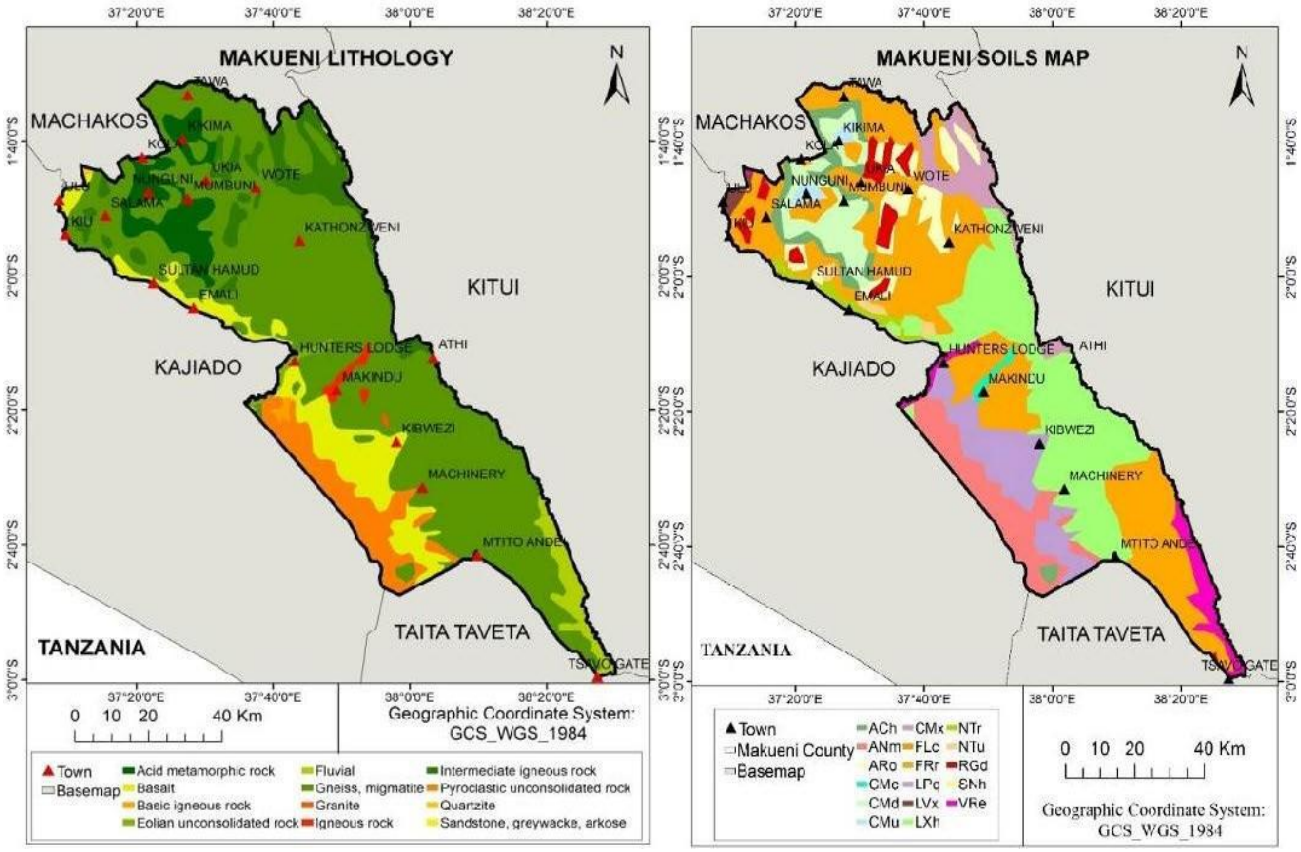

Figure 12: Summary of Makueni County Soils and Physical Characteristics

4.2.4 Water resources

Kibwezi District is generally a water scarce area. Athi is the biggest river in Makueni County. There are other semi-permanent rivers such as Kibwezi and Kiboko rivers. The County has four protected springs, 117 boreholes, 289 water pans and 159 surface dams. The average distance to nearest water sourcewhich is

Athi river is eight Kilometers, indicating that there is need for initiating more water projects such as borehole sources. (Source: Makueni County Integrated Development Plan, 2013).

Figure 13: Photos of Athi River

4.2.5 Commercial activity

Apart from agriculture, other commercial activities being carried out in Kibwezi area include sand harvesting, tourism activities, bee keeping, fishing along rivers, jua kali/ artisan industries including wood carving, basketry and dye making.

4.2.6 Vegetation

The distribution of the vegetation in the area is controlled by a number of complex interrelated factors such as, climate, geological formation, soil type and the presence or absence of ground water. The area is a typical semi-arid rangeland dominated by Commiphora locally known as “Ikuu”, Acacia and allied genera, mainly of shrubby habitat such as “Mwabuyu”. Baobab trees (Adansonia digitata) are common. Perennial grasses such as Cenchrus ciliaris, Enteropogon macrostachyus and Chlorisroxburghiana are dominating.

Figure 14: Photo of Indigenous Mwabuyu and other shrub vegetation

4.2.7 Agriculture

The people of Kambu area, Kibwezi practice mixed small-scale farming. The farmers in the project area practice mixed farming with growing of subsistence food crops taking a greater portion of their plots. The main crops produced in the County are Maize, Green grams, pigeon peas and sorghum. Mangoes, pawpaw and oranges are also being produced. Livestock kept in the area include beef, cross breeds for milk production, goats and sheep. Horticultural crops are also grown using irrigation along the rivers such as River Athi.

CHAPTER FIVE

5 PUBLIC PARTICIPATION AND PROJECT ALTERNATIVES

5.1 Public Participation

Public participation is basically concerned with involving, informing and consulting the public, planning, management and other decision-making activities which can be considered part of the project process. It offers and encourages the public to express their views. Public participation tries to ensure that due consideration will be given to public values, concerns and preferences when decisions are made. Methods of public participation applied included:

- Informing the public about the proposed project;
- Participation in the scoping exercise;
- Public meeting or hearings about the project
- Written comments
- Use of community representatives
- Making relevant documents and ESIA report available and invitation to comment.

Community participation and consultation has been done and views and opinions analyzed. A synopsis of the views of the forest beneficiaries, project affected people, as well as national and local district representatives, who have been interviewed, are presented. Sector specific information solicited during these discussions has been included in the identification of impacts and mitigation measures. There will be continuous community awareness throughout the project cycle.

5.2 Issues Considered for Determination of Extent of the Impacts

The following are the issues considered for determining the extent of the impacts:

a) Plantation of tree in a sensitive ecological system such as wetlands, (description of the wetland weather seasonal/permanent), type of vegetation, flood characteristics if any.
b) Soil structures, stability, susceptibility to erosion.
c) Community use of valuable resources i.e. wood collection, honey collection, charcoal burning, hunting, grazing, and sand/brick mining, within the forests.
d) Opening of access road within the project area.
e) Matching of species to soil suitability.
f) Social/cultural acceptance of the project.
g) Water sources such as catchment areas, rivers and streams.
h) Cattle route/ access to water.
i) Occupation, safety and health of workers.
j) likely general and specific impacts (positive and negative)
k) Tree plantation may eliminate food and shelter of some species of animals.

Some of the most common methods used to consult stakeholders included:

- Phone calls

- One-on-one interviews
- Workshop/focus group discussions
- Public meetings
- Newspaper/magazines/radio.

Table 1: Stakeholder Engagement Method

STAKEHOLDER GROUP	CONSULTATION METHOD
Government officials	• Phone/ Email • One on one interviews • Formal meetings • On farm visits
Neighbouring communities	• Print media, Radio announcements • Public meetings (Barazas) • Focus group meetings • Surveys • Information exchange
Vulnerable groups	• Print media, Radio announcements • Public meetings (Barazas) • Focus group meetings • Surveys • Information exchange
Employees and managers	• Notice boards • Focus group meetings • Questionnaire surveys
NGOs and Conservation groups,	• Print media, Radio announcements • Public meetings (Barazas) • Focus group meetings • Surveys • Information exchange
Institutions of Education Research Institutions	• Print media, Radio announcements • Information exchange

5.3 Summary of the Baraza Meeting Held at Mkomani

A public engagement meeting was held at Mkomani centre to assess the possible impacts of the project to the local community. The meeting that was attended by village representatives, representatives of different stakeholders and area chief sought to inform the members of public of the proposed project as well as collecttheir input on the same.

The minutes of the meeting are annexed on this report.

RE: ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED PLANTATION FOREST (PHASE 2) IN MAKUENI COUNTY.

(LR. NO. MAKUENI / KITENGEI SCHEME 'B' / 1593 AND 1594 **)**

PARTICIPANTS LIST

NO.	NAME	VILLAGE/POSITION	TELEPHONE NO.	SIGN
1.	Bilha Muhoro	NEMA	0704464154	
2.	BRAMWEL MNGOKO	AST. CHIEF	0722682461	
3.	Jeremiah Sunza	Neighbour	0728374548	
4	Titus M Muindi	V/Elder	0711955921	
5	DANIEL M KIMWELI	Neighbour	0700067982	
6	JACINTA M. LUKE	Neighbour	0740740129	
7.	Patricia N. Wambua	Neighbour	0712725132	
8.	Mbinya Kiio	Neighbour	0718726371	
9.	Josphat Kyambati	Neighbour	0715382623	
10	Justus M. Kioko	Neighbour	0726057330	
11	Julius Sakayo Kimyoweli	Neighbour	0701186729	
12	Stephen Kyalo Kioko	Resident (IIAM)	0726811781	
13	Josphat Muinga	Resident	0730160245	
14.	Sammy Ndeto	Resident	0712683743	
15.	S. Wambua Nguiti	Staff	0725631266	
16.	Jackson Kiio	Neighbour	0725917243	
17.	Jackson M. Muindi	Mikomani/pastor	0726655452	
18	Kailash Bhadania	Subati Group Ltd	0791578844	
19	Joab Okello	Expert (NEMA)	0715647651	

CONFIRMED BY AREA CHIEF/ASSISTANT CHIEF/COUNTY COMMISSIONER:

NAME: BRAMWEL MNGOKO **DATE:** 19.10.2022

OFFICIAL STAMP:

ASSISTANT CHIEF
KATHEKANI SUB-LOCATION
P. O. Box 45, MTITO - ANDEI

ASSISTANT CHIEF
KATHEKANI SUB-LOCATION
P. O. Box 45, MTITO - ANDEI

Figure 16: Public participation forum with members of the community at Mikomani

5.3.1 Analysis of public views from Stakeholders

Views were collected from 17 persons drawn from the local community using semi-structured questionnaires and baraza meeting (Minutes Annexed to the report). The respondents were persons aged 18 years and above and residing in the project area. The respondents cited the following as the anticipated environmental and social impacts.

Table 2: Summary of Feedback from Public Participation

Negative impacts	**Number of Respondents (%)**	**Positive impacts**	**Number of Respondents (%)**
Movement of people into the area Security and encroachment issues	3 (18%)	Creation of employment	13 (76%)
Herding issues when animals graze in the company Land	6 (35%)	Improved livelihoods/Economic Development	8 (47%)
Blocking of local access Roads	7 (41%)	Infrastructural development	2 (0.1%)
Noise and Air Pollution During land Clearing	2 (0.1%)	Increase in Land Value	3 (18%)
		Availability of more Rainfall in the area	14 (82%)
		Availability of wind Breakers	3 (18%)

All the respondents were in support of the proposed project. The following measures were suggested to mitigate against the negative environmental and social impacts.

- Adherence to set regulations
- Develop policies outlining how impacts will be prevented or controlled
- Provision of PPEs
- Safely store agrochemicals
- Use agrochemicals in moderation
- Use the right type of chemicals

5.4 Input From KEFRI

KEFRI had no objection to the approach and continuity of the project asevidenced by the attached letters.

KENYA FORESTRY RESEARCH INSTITUTE

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+254 722 157 414
+254 724 259 781/2
+254 734 251 888
Email: director@kefri.org
Website:www.kefri.org

P. O. Box 20412
00200, Nairobi
KENYA

Ref:KEFRI/46/05/VOL.I/(49)

Date: 16th August 2021

Ravi Patel
Subati Group Limited
P O Box 25130-00100
NAIROBI

Dear Mr. Patel

REF: NO OBJECTION LETTER TO IMPORT SEEDS FOR INDIAN SANDALWOOD (SANTALUM ALBUM) FOR ESTBALISHMENT OF COMMERCIAL PLANTATIONS

Please refer your letter dated 12th August 2021 on the above subject.

Since 2007 KEFRI has been doing research on East African Sandalwood (*Osyris lanceolate)* that is predominantly found the Kenya's drylands that has been overexploited for export as a substitute to Indian and Australian sandalwoods in global markets. However, the science on commercialization is still at infancy stages as compared to Indian sandalwood that is currently commercially grown in India and Australia.

You have also indicated that many countries have already commercialized growing of Indian sandalwood that include Tanzania, Uganda, Zimbabwe, Australia and the country should not be left behind in the global green economy based on sandalwood.

This is to update that KEFRI has been working with Sandalwood Plantation Limited a local company since 2013 on Indian sandalwood and we are now undertaking pilot nursery and field experimentation.

This is also to indicate that KEFRI is happy to welcome your company to join the team to promote investments in commercial sandalwood growing in the country's for both East African and Indian sandalwoods in Kenya. From global study reviews by KEFRI Indian sandalwood have no known negative impacts on the environment for it requires highest order on nursing and management to grow.

KEFRI therefore, has no objection to your importation of high quality Indian sandalwood seeds for establishment of plantations in the country and will work closely with your firm throughout the process.

Figure 17: A no objection letter issued by KEPHIS

5.5 Grievance Handling and Feedback

The Developer will implement a Grievance Mechanism to ensure that it is responsive to any concerns and complaints particularly from affected stakeholders and communities. The following timeframe will be used:

- Written acknowledgement of receipt of the grievance: within 5 days of receiving the grievance
- Proposed resolution: within 30 days of receiving the grievance.

Initially, liaison officer assigned on behalf of the Developer(s) will handle all grievances received from the community during the life time of the Project. The Developer and their Contractor(s) will accept all comments and complaints associated with the Project.

The grievances shall be submitted to: Subati Group Ltd.

P.O Box 12503-00100, Nairobi.

Tel: +254 (20) 204 8483

A sample of the Projects Public Grievance Form is provided at the end of this document. Results of consultation processes are provided back to Affected Communities andother stakeholders in order to explain:

- How the Affected Communities' inputs have been accommodated in the design of the project, Pre- Development and/or planned Development phase activities;
- Where impact mitigation measures have been incorporated;
- How development benefits and opportunities will benefit the community
- Where required, the reasons why comments and recommendations suggested by Affected Communities have not been accommodated.

The Grievance Procedure will be free, open and accessible to all and comments and grievances will be addressed in a fair and transparent manner.

5.6 Project Alternatives

5.6.1 No Project Alternative

The No Project option in respect to the proposed project implies that the statusquo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. This option will however, involve several losses both to the landowner and the community as a whole. The No Project Option is the least preferred fromthe socio-economic and partly environmental perspective due to the following.

- The economic status of the Kenyans and the local people would remain unchanged.
- The local skills would remain under-utilized.
- Reduced interaction both at local, national and international levels.
- No employment opportunities will be created for thousands of Kenyans who will work in the proposed fruits and vegetables farm.
- Increased urban poverty and crime in Kenya.

- The ecological gains expected from the project would not be realized
- From the analysis above, it becomes apparent that the No Project alternative is no alternative to the local people, Kenyans, and the government of Kenya.

5.6.2 Relocation Alternative

Relocation option to a different site is an option for the project implementation. Atthe moment, the proponent has no alternative sites for relocation. Looking for land to accommodate the scale, type and size of the project and completing official transaction on it may take a long period. Besides, the proponent has already invested in purchasing the land and is looking for more land for further expansion.

The proposed project does not have any other land apart from the one they are holding. Therefore the relocation alternative does not best suet the project.

5.6.3 Alternative design and Technology

a) Species grown

This would involve raising other types of crops other than the proposed forest plantation. The proponent may consider planting other crop species which will be friendlier to the environment. In consideration of other species, due consideration must be given to biodiversity, the climate as well as the usefulness of the species for the proponent needs. In arriving at the proposed option, the proponent had given due consideration to all this factors.

b) Mode of Growth

The seedlings will be grown in the soil media, other mediums are not suitable, for the growth of this seedlings. The need firm, solid medium for their growth.

c) Technology Alternative

It is envisaged the project will basically be labour based and we don't anticipate the use of heavy machinery during planting, weeding and opening of access roads. The purpose is to ensure that many locals in the area are employed in planting, nursery bed, and weeding and food provision. Heavy machinery is often associated with noise, accidents, vices which the project wants to control such as carbon emission from vehicle exhaust pipes.

5.6.4 The Comparison of Alternatives

i) Under the relocation alternative, the proponent would have to look for another piece of land in a favourable area. Land is nowadays a scarce commodity. This would not be a preferred option as the proponent has already procured this land and it would not be wise to leave it bare.

ii) Under alternative design and technology, the proponent would be required to plant other types of crops. The proponent has considered this option in line with the suitability of the area and the demand factors and settled for the hardwood tree species.

iii) Current action: - having assessed all the options, the proponent settled for the current action. There are however associated environmental degradation with the project implementation but provided the recommended Environmental Impact mitigation measures are adopted and implemented, negative impacts will be avoided /minimized.

CHAPTER SIX

6 ANALYSIS OF ANTICIPATED IMPACTS AND RISK ASSESSMENT

An important component of sustainable development is the process of assessing the potential environmental, economic and social impacts of a project prior to its implementation. This is aimed at identifying, evaluation and predicting possible impacts of a project with the sole aim of enhancing anticipated positive impacts while at the same time incorporating into the project design measures for minimization of negative impacts. In order to establish and assess the likely social and economic impacts of the proposed Subati plantation forest in Ngwata area, Kibwezi, Makueni County, views were obtained from the members of the public residing close to the project site. In addition, the assessors reviewed reports on similar projects and other literature. This section discusses the anticipated social economic impacts of the project based on the aforementioned sources.

6.1 Impacts of plantation Forest on the rural economy

Setting up of a horticulture farm in a rural setup has welfare-enhancing impacts derived from:

a) Increased land utilization.

This land in Kathekani Location, Kibwezi District has in the past been left idle with some few farmers using it for grazing of animals. Setting up of plantation forest on it will increases utilization of the land, and increase the lands economic productivity.

b) Increased employment and wealth creation.

This commercial venture opens up opportunities to increase income. These opportunities employ rural labor which would otherwise be idle. Increased farmincomes mean increased savings leading to increased investment and therefore wealth creation.

c) Reduction in rural-urban migration.

Most young people migrate to urban areas to look for employment opportunities. Setting up of such a farm stems this outflow and could potentially reverse the trend because of the attractive farm incomes earned.

d) Improvement of rural infrastructure.

Many commercial developments must be accompanied by infrastructure development to increase access to factor and product markets. Growth of incomes and wealth also mean that rural inhabitants can be able to cooperate and provide infrastructure like schools, health centres, market facilities, etc., particularly in areas where government has not been able to.

6.2 Negative Social-Environmental Impacts

6.2.1 Loss of vegetation and bio-diversity

The land on which the proposed project is to be constructed currently has natural trees and shrubs as it has never been cultivated before. The change in land use will lead to a significant loss of vegetation biodiversity. There is likely to be loss of natural vegetation, which will take place on previously vegetated land. There is possibility of habitat fragmentation, interruption of ecological corridors and migration paths, loss of some natural species, erosion and stream sedimentation. The costs associated with disturbance of vegetation and

biodiversity are considered negligible.

Mitigation Measures

It is proposed that unnecessary clearing of vegetation should not be encouragedor done. It is advisable that there should be replanting of vegetation with appropriate species wherever the gaps occur.

6.2.2 Noise

Predicted noise source at this proposed farm is that emanating from the construction equipment and vehicles. Also, noise and vibration nuisance may arise from traffic during both site preparation and felling phases. This noise is predicted to be intermittent in nature and will most likely not exceed thestatutory limit of 90dBA. This means that both the magnitude and the time of exposure of both the personnel and the people in the neighbourhood will be limited. *As such, occurrence of noise induced hearing loss is unlikely. Rather, the noise will in fact lie well below 90 Dba and hence will be a disturbance or distraction.*

6.2.3 Human health and occupational safety

Human health and occupational safety may be threatened where adequate facilities and equipment do not exist to support the population within an area, project or locality. However, the locality of the proposed project has a number of nearby health facilities that can adequately cater for the anticipated labor force.

Mitigation Measures

- The company will engage the services of qualified and licensed consultants to develop an up-to-date occupational health and safety policy.
- Workers should be provided with adequate protection gear such as hard hats, boots, gloves, overalls, pangas and safety latches to workers working higher than2 meters off ground level.
- Workers involved in herbicides application should be trained and provided with adequate protective gears such as; eye protection, breathing protection (masks), gloves, protective clothing during spraying or handling and rubber boots.
- The workers should be sensitised on the use and importance of PPE's. And there should be equally punitive measures for those who disregard their use such as warnings for first time offenders; suspensions for second time offenders andexpulsion for those who make it a habit not to use the PPE's.
- There should be a first aid kit on site during work. The workers should also be trained on how to use the first AID kit.

6.2.4 Water pollution

Surface water hydrology can be affected during all phases of forestry operations. During site preparation, road-building and vehicle movements on the proposed site can result in compaction of soils and an increase in impermeable (or slowly permeable) surfaces.

The subsequent increase in surface runoff may, in turn, increase the risk of flooding and soil erosion. Surface drains, installed chiefly to prevent water- logging of the soil, may also increase flood risk.

Following deforestation, a return to bare ground conditions will cause increased runoff

and a more rapid response to rainfall events within nearby streams, possibly increasing flood risk.

Water pollution may also arise during the operational phase of the project. Water pollutants may arise mainly from fertigation effluents, chemical residue slurry and wash off from spray equipment and chemical containers. This may be a threat to both surface and groundwater.

The possibility of water pollution has however been eliminated through carefully considered management system for chemical policy on rational use of fertilizers has been considered to ensure that only amounts, which are deemed necessary to substitute for soil nutrients, are utilized. This will be done by ensuring that soil sampling is carried out prior to the implementation or fertilizer application regimes.

6.2.5 Waste disposal

Waste products if not recycled or properly disposed of may be costly lo the safety of the environment. The proposed project report has an elaborate waste management strategy to manage and minimize wastes. Solid waste generated during preparation, planting and harvesting will include: food wastes, human wastes, paper, oils, cans, polythene bags, timber pieces etc. This waste will negatively impact on the site and the surrounding environment if not properly managed and disposed off. Wastes burned onsite would generate smoke, negatively impacting ambient air quality.

Mitigation Measures

A site waste management plan should be prepared by the proponent prior to commencement of the forest planting exercise. This should include the designation of appropriate waste storage areas, collection and removal schedule, identification of approved disposal site, and a system for supervision and monitoring.

6.2.6 Land/Soil

Forestry projects will have implications for the physical characteristics and land use of the site. By their nature, such projects have the potential to change the site significantly. Activities such as cultivation, planting and felling can cause soil disturbance, compaction and increased erosion, while the character of the landscape will vary depending on whether the area is newly planted, comprises mature trees, or has recently been felled.

The physical planting of a prepared site usually involves manual spadework and therefore causes little disturbance to the site. *However, impacts on soils do not necessarily result in long-term soil degradation aslong as compaction, nutrient removal and erosion rates are less than, or of a similar magnitude to, the recovery capacity (soil formation, nutrient input, etc.) of the soils.*

6.2.7 Air and Climatic Factors

Afforestation and deforestation have the potential to affect local air quality and climate, and to contribute to global climate change. During ground preparation, planting and harvesting, local air quality may decline as a result of dust from vehicle movements on and off site. However, the principal impacts of forestry works can be described as net-positive during growth and maturation of the crop, and net-negative following deforestation.

During growth, there is an uptake of carbon dioxide (CO2), a major "greenhouse gas." This provides some compensation for CO2 emissions from activities using fossil fuels.

Deforestation, while not contributing directly to global warming, does remove this beneficial effect until the next cycle is initiated with replanting.

6.2.8 Surface water quality and hydrogen

The threat of siltation and sedimentation of the adjacent rivers is reduced by the project idea of beginning an afforestation programme, maintaining the riparian vegetation and soil and water conservation measures. This project will completely eliminate erosion and siltation problem.

6.2.9 Moral decadence

The presence of large workforce in an area, some of whom will move away from their families in order to reside near the place of work may ultimately lead to vices such as prostitution, drug abuse, increased incidence of HIV/AIDS among the workers and neighbouring community. Cases of insecurity may also increase targeting the working class.

6.2.10 Fires

Fires are detrimental forest activities and cause destruction of fragile ecosystemsand trees. Since this proposed project involves planting of fire prone tree, there is need for proper planning and fire management. Fire in this case if not properly managed may become a danger to the whole tree planting project.

Mitigation Measures

Sensitization of the stakeholders to avoid burning bushes within the project site.The project site should also be well fenced to control against illegal hunting activities often responsible for starting forest fires.

Fire line of not less than 5 metres should be established between tree blocks and spacing between lines to ensure that in case of fire, it does not affect all the blocks;

Firefighting equipments such as fire extinguishers and a fire brigade vehicle should be provided for the respective field stations to ensure that there is rapid response in case of fire.

6.3 Positive Social-Environmental impacts

6.3.1 Creation of employment

The proposed project will create employment opportunities for both skilled andunskilled labour. Much of the work will be manual and will not require any specialized training. This will thus open opportunities for the rural women and youths who comprise the largest proportion of the rural population. Priority will be given to persons from the local community to ensure that the project uplifts their living standards. Unemployment is rampant in rural areas and especially in areas that have low agricultural potential.

6.3.2 Boost local economy

The proposed project will boost the local economy through payment of loyalties, taxes, levies and other charges to the County and central governments. The project will also open up the area for similar and other varied investments. The net effect will be improved infrastructure in the area and better living standards.

6.3.3 Impact on culture

Movement of new comers into the area will expose the local culture to integration with

cultures of other people leading to gradual cultural change as has happenedin other areas. The loss of culture not only eliminates the harmful practices in a community but may also interfere with the norms and value systems that helps sustain peace and harmony within a community. There may be changes intraditional livelihood strategies, conflict resolution mechanisms e.g. that mayhave a significant impact on development of the community (either negative of positive).

6.3.4 Exposure to new technologies

The development of the proposed flower farm will expose the local community to new agricultural technologies that could help boost agricultural production in the area. Also a potential for research activities especially on hardwood forest ecology

Other benefits that will come with the project are namely:-

- Improvement on climate change and the environment in general
- Increased acreage of planted tree species country wide
- Reduced soil erosion and sedimentation
- Increased groundwater recharge with related increase in spring dischargesand base flow, or at least more even year round flow
- Improved peoples livelihood especially for the private plantations
- The proposed tree planting will lead to growth in the local economy and wealth creation
- Increased income from the sale of good quality trees
- May improve the appearance of the landscape
- Restoration of degraded areas
- Will increase on supply of improved charcoal, construction materials andother forest products, even while protecting soil and water resource

6.4 Cost-Benefit Analysis

A cost benefit analysis has been performed in order to weigh the advantages associated with the proposed project against the disadvantages. In this way the viability of the project can be reasonably determined through comparing the positive effects against the negative effects.

The positive effects are reflected as benefits while the negative effects are ref1ected as costs. The cost-benefit analysis (CBA) technique used in this reportassigns arbitrary values of I to 5 on the total benefits and costs for eachanticipated parameter in the project. An overall evaluation of the costs and benefits is done to determine the projects' feasibility. A ratio of benefits to costs is computed, if the ratio is more than one (I), the project benefits (both environmental and socio-economic) are more than the total costs and hence suitable. The larger the Benefit-cost ratio, the more suitable the project is, in environment, social and economic terms. The scores are assigned as follows:

1 =Very low benefit/cost

2 =Low benefit/cost

3 =Moderate benefit/cost

4 =High benefit/cost

5 =Very high benefit/cost

Where:

Very high: the impact is considered as constituting a major and permanent change to the natural and social-economic environment and affecting large area or large number of people.

High: the impact constitutes long-term change affecting wide area and large number of people.

Moderate: constitute major change but limited, do not affect large number of people. They are of medium term benefits or costs.

Low: Results in short-term benefits or costs on the natural and socio-economic environment. Affects small number of people directly.

Very low: No benefit or cost can be directly related to the parameter under consideration.

Table 5: **Cost-Benefit analysis**

POTENTIAL IMPACT		BENEFITS	COSTS
l. Soil conservation		4	1
2	Loss or vegetation and biodiversity	1	2
3.	Soil erosion	1	2
4.	Human health and occupational safety	2	3
5.Water pollution		1	2
6.	Waste disposal	4	1
7.	Infrastructure development	4	1
8. Economic empowerment		4	1
9.	Employment opportunities	4	1
10.Governmet revenue		5	1
11	Improved livelihood	4	1
12 Increased land use values		4	1
13	National economy	4	1
14	Aesthetics	3	1
I5 Surface water quality and hydrology		3	1
16	Ground water	3	1
17	Noise	1	3
18	Air quality	1	3
19	Accident	3	1
Totals		54	33

Calculations:

Benefits - Cost ratio: = Total benefits/Total costs

=54/33

= 1.64

Total benefit expressed as a percentage of total costs = 164%

Inference:

The Benefit-Cost ratio was to be 1.6 which is above 1, signifying that the project is feasible.

6.5 Risks Assessment.

Identifying, assessing, managing and monitoring risks and hazards should be the top health and safety priority.

In harvesting critical risks might involve:

- Tree felling (manual felling, including machine assist)
- Machine operations on processing pads (including log loading) and anywhere people work closely with machines
- Operating machines on steep slopes
- Repair and maintenance of plant and equipment and vehicles used.

In silviculture critical risks might involve:

- Thin to waste and/or high pruning
- Agrichemical use and vehicle use.

6.5.1 Chainsaw milling

Freehand chainsaw milling is associated with a high risk of injury and fatigue. Removing chain depth gauges to increase cutting speed is a common practice that also increases the risk of kickbacks. Other health hazards are associated with poor posture and high noise and vibration levels. Most of the risk factors associated with chainsaw milling can be greatly reduced by the use of chainsaw milling attachments, which unfortunately are still rare in many countries.

6.5.2 Forest fire management and control

The main activities involved in fire management are controlled burning and fire prevention, detection and suppression. Risks include exposure to excessive heat from the fire, the inhalation of toxic fumes (e.g. carbon monoxide), eye irritation from particulates, and burning. Factors that can increase the risks posed by fire include poor visibility, difficult terrain, difficult logistics, and night work, changes in wind direction, stress and fatigue. An effective organizational structure for fire suppression can help avoid fatalities and the loss of property.

6.5.3 Chemical hazards

Chainsaws and brush cutters are sources of exhaust emissions, which include the suspected carcinogens benzene and formaldehyde. Aerosols from the oils used in chainsaws and brush cutters can cause irritation to skin, eyes and the respiratory system, which can be reduced by the use of goggles and gloves and by regular washing. Exposure to herbicides and pesticides in forestry can lead to a variety of health problems. Personal protective equipment, such as overalls, boots, gloves, and, for toxic agents, respiratory devices, should be used.

Smoking and eating should be avoided when working with chemicals.

6.5.4 Biological hazards

Biological hazards include allergic reactions to plants, pollen, wood products and insect bites, as well as snakebite and diseases that can be contracted from, for example, mosquitos and ticks. The risks posed by many biological hazards can be reduced through adequate training, effective management (e.g. by reducing mosquito breeding grounds in the vicinity of camps and the use of mosquito nets), and an adequate level of personal hygiene. Living conditions Forest workers often live in camps in remote areas, which should meet certain minimum standards of sanitation, comfort and services. A well-balanced diet should be available, and an adequate supply of safe drinking water and other non-alcoholic drinks is also essential.

CHAPTER SEVEN

7 MITIGATION OF ENVIRONMENTAL AND SOCIAL IMPACTS

7.1 Aesthetic value and soil erosion

The management should ensure that the aesthetics of the area is restored. Continual monitoring of the soil components in the farm is advised. This will ensure that the effectiveness of soil erosion control measures. The proponent needs to;

- Ensure that that the activities of farm do not encroach into riparian reserve
- Plant trees along the perimeter fence and other area within the farm.
- Carry out soil conservation measures

7.2 Noise Pollution and Air quality

Control at source:

- Use of ear protectors and dust masks by workers.
- Minimize generation of air pollutants through modification/replacement orworn out process equipment and use or alternative better methods to achieve the same goals.
- Ensure all containers containing volatile products are kept closed.
- Regular monitoring of air quality in the farm. Monitoring items include:SO2, dust and other pollutants.

Maintenance of an optimum level of green spaces in the compound is important. Vegetation extracts pollutants from the air, stimulates turbulence and interrupts sound and shock waves. Furthermore, green spaces have beneficial effects on microclimate and also on the psychological state of the inhabitants due to its aesthetic appeal.

7.3 Water use

Economical use of water should be encouraged as availability is not always ensured. Water supply for the Subati Farm will be from water reservoirs, and rainwater. Water conservation measures within the farm will be encouraged. The method of irrigation which will be used is drip irrigation which is one of the most efficient irrigation method

7.4 Health and safety

The proponent understands that its activities will interact with the environment in a very complex manner and economic prosperity is dependent on how well the environment is taken care of.

The goal of the proposed HSE policy will therefore be to assist the company to maintain position with full commitment to minimize the negative impacts of the company's activities on the environment, to conserve existing habitats, reduce use of agrochemicals, improve its efficiency in the use of natural resources and ensure good health, safety and welfare of employees and the neighborhood. The company will be fully committed to complying with all Kenyan regulations and the highest standards of Good Agricultural and Forest Practice.

7.4.1 Elements of the HSE Policy

The company shall develop a HSE policy that should contain the followingessential elements:

i. **Impact assessment guidelines**: These guidelines will provide for the assessment of the impacts of the plantation Forest operations on the natural environment and in particular the effects of the pesticides and fertilizers used their effect on workers and environment.

ii. **Pollution prevention and control:** The policy will provide for adoption or processes, practices, materials or products that avoid reduce or control pollution.

iii. **Efficient natural resource utilization**: To better utilize natural resources including water, the company wherever possible will incorporate recycling, treatment, process changes, control mechanisms, resource conservation and material substitution.

iv. **Risk Reduction**: The HSE will lay down a strategy for minimizing. Health and safety risks to workers. The company will regularly conduct health, Safety and Environmental audits whose outcomes will enable the company to fully understand the impacts of its operations and corrective actions to be put in place. Based on the outcomes, the company's health. Safety and Environment Committee will set objectives and targets for continuous improvement, prevention of pollution and reducing risks to workers and the environment.

v. **In-house training**: All the farms personnel in positions of responsibility will be trained to ensure full understanding· of the reasons, targets and requirements of the HSE policy.

vi. **Effective communication**: The policy will provide guidelines to ensure effective communication channels, both internal and external, and at all levels.

vii. **Enforcement:** To ensure that Farms operations are conducted in a safe and healthy environment and that the welfare of employees is monitored and maintained, managers, heads of departments and supervisors will be required to ensure that the HSE policy is enforced and observed by employees and those who may be affected by the company's activities.

viii. **Right to know**: The Farm will emphasize that employees and other persons affected by the rules contained in the HSE Manual must know, understand and adhere to the risks. Awareness-raising enhances the understanding of the risks and responsibilities of each worker.

ix. **Participatory processes**: Employees will fully participate and make suggestions in the development of the HSE guidelines.

7.4.2 Personal Protective Equipment (PPE)

Provision of appropriate protective clothing such as dust masks, gloves, and safety goggles to workers during construction and operations phases.

7.4.3 Employees' pro-active safety attitudes

Regular training on pro-active safety attitudes for employees would install a sense of responsibility upon the employees, and in this way, increase employee's efforts towards avoiding occurrence of accidents due to negligence, ignorance or carelessness.

7.4.4 Training in Occupational Health Safety

This is most important and should be regular. Health and safety audits should be carried out every year.

7.4.5 First Aid

Training and availing First Aid kits is recommended

7.4.6 Sanitary provision

These should be provided. Toilets should always be clean and drinking water should be free of pathogens. There will be separate toilet facilities for male andfemale workers, with those for females being fitted with disposable sanitary towels receptor bins. In addition, hand washing facilities should be provided near the toilets to promote personal hygiene.

7.4.7 Control of Health Hazards

There should be adequate medical supervision personnel comprising pre-hiring clinical screening, periodic medical examination and rehabilitative care for any affected workers. A comprehensive risk assessment should be carried out on commencement of operations so that specific measures for control and mitigation of workplace hazards and risks are put in place.

7.4.8 Ergonomics

All personnel should be trained on the basic ergonomics principles. This should cover the correct lifting, carrying and setting down techniques to prevent incidences of hernias, sprains, strains, back injuries and other muscular-skeletal disorders due to improper handling heavy objects.

7.5 Irrigation Water

Regular monitoring of irrigation water is advised. Monitoring items should include temperature, pH and heavy metals among others. (The *water quality is within limits set out in the eighth schedule of the Environmental Management and Co-ordination (Water Quality) Regulations, 2006.)*

7.6 Proposed Management practices

7.6.1 Pesticides Management

The overall aim of the proposed plantation forest with respect to pesticides is to reduce the pesticide load on the environment year after year whilst ensuring that pesticides application is safe. This takes place within set guidelines laid down by Codes of Practice and Statutory regulations subscribed to. The company will maintain a continuous improvement strategy based upon audit and risk analysis using the following guidelines:-

- A system of ordering, transporting, receiving, storing and applying pesticides
- Methyl Bromide and other banned/restricted pesticides will not be used by (Methyl bromide has been replaced with Methane Sodium).
- Efficient and economical use of pesticides and fertilizers. These will be monitored daily, monthly, yearly, crop by crop and on a square meter basis.
- Prophylactic use of all pesticides is discouraged. Scouting will be done to ensure that prophylactic use and blanket spraying arc avoided whenever possible.
- Pesticides with least impact on mammalian avian and aquatic life are of first choice.
- The spray programme will be a supervised exercise that links the levels ofpest

and disease monitoring and control through scouting and spot spraying. Once spraying has been done adequate warning signs on countrywill be displayed.

- Efforts to develop and implement an alternative pest and disease control strategy through the use biological, physical and cultural control will be continually pursued. Integrated Pest Management (ICM) and Integrated Chemical Management (ICM) will also be: encouraged.
- Over- or under-application of pesticides will be avoided and confirmation of this will be done through analytical examination of tissue samples.
- Knowledge of the various pesticides and their toxicity by the Technical Manager which ensures that the right pesticide is applied.
- A report of pesticides usage is submitted to the Horticultural Crops Directorate (HCD) after every 4-wcek period (28 days). The aim is to achieve continuous annual reduction of pesticide usage.
- Ensuring that the technical personnel with overall responsibility for spray programmes and decisions on their application arc suitably qualified and trained.
- Policy on professional development of senior and supervisory staff relating to pest and disease control and the minimizing of pesticide usage.
- To continually improve production practices so as to be more socially responsive and environmentally friendly.
- On-going research and development.
- Worker training on pesticide toxicity/classification and first aid measures.
- Empty pesticide containers will be triple-rinsed, punctured and flattened and then sent to the incinerator. The company will investigate the possibility of' suppliers taking back the containers for disposal. Dilute pesticide residue (rinsate) from the containers will safely be disposed of by flushing it into the soak pit and constructed waste water ponds.

7.6.2 Fertilizers Management

The Proponent will promote the rational use of fertilizers so as to minimize negative environmental impacts while consistently attaining production or high quality crops. The following guidelines will be used: -

- Utilization or fertilizers and Compost in line with Code or Good Agricultural Practices.
- Applying fertilizers based on sound principles, leaf tissue: analysis and soil analysis to provide a guideline to the soil nutrient levels and in particular nitrates, phosphates, potash and magnesium levels.
- Leaf samples and soils are tested on a 2 monthly rotational schedule to check on any compound build-ups or depletions in the soil fertilizers will then be applied based strictly upon these results.
- Only qualified personnel will have responsibility for fertilizer programmes and decisions on their application
- Training of all personnel involved in and the rational use of these fertilizers.
- Fertilizers will not be applied to conservation areas, wildlife corridors or

within 25 meters or watercourses.

- All of the organic waste will be composted to maximize nutrient recyclingand maintain soil fertility.
- Fertilization will be tied to soil. tissue and water analysis from the laboratory results
- The Farm will recycle waste water.
- Any increases in fertilizer usage for the same period over the previous yearmust be justified.
- The composition of each fertilizer materials used will be determined. All fertilizer applications will be monitored and audited. Storage facilities willbe constructed to contain any possible spills that could contaminate soil or water.

7.6.3 Water Resources Management

The proponent will foster efficient use of water through a range or conservation techniques. To ensure continual improvement, the following guidelines will be observed:-

- Record the total water consumption, per production unit, in m^3/ha/day.
- Application of water to the soil will be based on sound agronomic principles of soil-water relations (using tensiomenter readings) to provide a guide to the soil water status.
- All water utilized will be metered and recorded
- Water will be harvested from greenhouse roofs and stored in a lined reservoir.
- Drip irrigation will be used to supply water to the crop to avoid water wastage.

7.6.4 Soil Resource Management

The objective where is to ensure that all land use pesticides are carried out in an environmentally responsible manner in line with the Code or Good Agricultural Practice. As indicated above, fertilizers will be applied based on sound principles,leaf tissue and soil analysis to provide a guide to the soil nutrient levels and in particular nitrates phosphates, potash and magnesium levels.

The following "best practice" methods for soil conservation will be applied:

- **Grassing**: all earth areas not specifically required to be tilled will be grassed and terraced to minimize erosion.
- **Drainage**: all drainage will be in concrete or precast culverts to avoid soil erosion and siltation of the Athi River.
- Maintenance or indigenous vegetation along the river bank.
- No cultivation will be carried out on land with a slope or more than 35% in accordance with the Agriculture Act.

7.6.5 Waste Management

Polythene

To minimize environment pollution caused by polythene, the proponent willensure:

- That all used polythene is collected, bailed and transported to a recycling facility
- That all used polythene is returned to the storage facility.
- That no polythene is incinerated.
- That drivers and turn-boys are trained on polythene disposal.

Paints and thinners

- Training of painters on safe disposal of thinners and paints.
- Implementing a system for collecting waste material and incineration.
- Implementing a system for safe disposal paint Containers.

Inorganic waste

- Fertilizer sweepings will be re-used.
- Chemical spillage will be soaked in sawdust and disposed in approved disposal sites.
- Waste oil/grease from the garage will be returned to Kenya Shell forincineration.

Organic waste

- Plant refuse, the result of pruned, discarded or broken in the field and grading halls will be composed to provide organic manure.
- Biodegradable materials like cartons and other packing materials will be re-used or shredded and composted.

Toilet & Septic Tanks

Toilets and sewage water treatment units will be constructed in accordance with MOH Standards.

7.6.6 Biological Resources Management

To protect and conserve wildlife, natural habitats, respecting and enhancing the landscape character, the company will emphasize efficient use of resources including energy, water, land use practices, use of pesticides, fertilizers, compost, prevention of pollution and conservation of natural flora and fauna and the landscape. To ensure no damage is done to these resources, the company will strictly follow guidelines regarding avoidance of use of pesticides and has a full understanding of:-

Mammalian Toxicity
Aquatic Toxicity Avian Toxicity

WHO Classification Red List and Green List

7.6.7 Air Pollution Management

To reduce negative impacts on the air, the following measures will be observed:

- Non-use of methyl bromide for fumigation due to its ozone depleting effects.
- Incineration of materials will be minimized and all organic waste will becom posted and polythene wastes recycled.
- Use of unleaded petrol and regular servicing of the company vehicles to reduce emissions.
- Use of products with chlorofluorocarbons (CFCs) will be avoided as much as possible.

To minimize air pollution when spraying, the following measures are observed:-

- Minimizing and monitoring use of all pesticide products.
- Effective scouting will be done to minimize blanket spraying
- Use of Integrated Pest Management (IPM) methods.

7.7 Environmental monitoring

The company will formulate a comprehensive environmental monitoring programme. This will among others include;

- Regular environmental audits
- Health and safety audits
- Water quality monitoring
- Soil analysis on regular basis
- Internal inspections by EHS team
- Maintain waste tracking records at the farm
- Monitor water and power consumption
- Air quality monitoring
- Apply for effluent discharge license

CHAPTER EIGHT

8 ENVIRONMENTAL MANAGEMENT PLAN FOR THE PROPOSED PLANTATION FOREST

The company will employ "Best practices" in order to improve the implementation of the plantation Forest Project to forestall any predicted significant environmental impacts. To manage the predicted environmental and social impacts, the following environmental and social management framework is proposed:

8.1 Environmental Management Plan during Plantation Forest Establishment

Potential Impact	Project Activity	Level of significance	Mitigation	Time Frame	Mitigation cost (Kshs)	Responsibility
Loss of vegetation cover	Clearing of existing vegetation	Moderate	Restrict clearing only to cultivation area Human labor to be used during fence clearance	During the establishment period	To be determined	Proponent
Soil & soil organism disturbance	Digging holes	Low	Return soil to site after post are erected	During the establishment period	To be determined	Proponent
Air pollution	Construction and landscaping	Low	Sprinkling of water on soil surface to minimize the generation of dust Use dust masks	During the establishment period	To be determined	Proponent
	Pesticide use	Moderate	Scouting, spot spraying and integrated pest management	Always	To be determined	Proponent
	Transport of hardwood tree products and farm inputs	Low	Emphasize on switching of engine when not in use	Always	To be determined	Proponent
Water pollution	Pollution from agrochemicals	Low	Continuous monitoring of irrigation, water. Safe disposal of water through constructed wetlands	Quarterly	**80,000**	Project Manager
Soil erosion	Cultivation process	Moderate	Soil quality monitoring Ensure good agricultural practices	Always	**100,000**	Proponent
Loss of	Destruction of	Low	Nutrient fixing plants like	During the	**40,000**	Proponent

Soil Fertility	natural vegetation to give way for the planting exotic species may remove nutrient fixing plants		arerecommended for planting	initial Phase		
Water misuse	Planting and general cultivation activities	Moderate	Water storage facilities Encourage roof harvesting of the commodity	Always	**100,000**	Proponent
Occupatio nalHealth and safety.	Production process and handling	Moderate	Have a Safety and Health Work Plan	On commen cement of farm operatio ns	**100,000**	OSHA Expert
Transport of materials	Increase in air pollution by smoke and dust particles during transportation of construction materials to site	Moderate	Control vehicle speeds to minimize dust and encourage use of serviceable vehicles	During the construc tion period	To be determined	Proponent
	Potential injuries to construction workers	Moderate	Always provide a well-equipped First Aid Kit at the project site Carry out an induction course on safety precautions	Continuous	**80,000**	Proponent
Ecological Disruption	Alien and invasive species may be attracted as a result of the	Moderate	Emphasis should be on protecting the natural habitat from any exotic species The ecology of the area should be	Continuous	**30,000**	**Supervisors/ Plantation Manager**
	exotic tree species		recorded and studied to ascertain the best environment that will enhance their continued stay and minimize migration		To be determined	
Fires	Smoking habits especially the	Moderate	Portable fire extinguishers as well as fire hoses connected to	annually	**250,000**	**Proponent DOSH**

	workers who hide in forested areas to smoke cigarettes and other burned substances		the water supply will be Installed. The extinguishers Will regularly be inspected. Awareness campaigns shall be conducted before and during the volatile dry season to enlist community support in firefighting and control Fire line of not less than 5 metres should be established between tree blocks and spacing between lines to ensure that in case of fire, it does not affect a large area.			
Health and Safety Impacts	Injuries and accidents during planting, weeding, cutting of trees and handling of herbicides. E.g. falling trees, snake bites and axe cuts etc.	High	Personal Protective Equipment (PPE) will have to be supplied to the workers. Workers involved in applying and handling herbicides will be provided with training and PPEs such as eye protection, breathing protection (masks), gloves, protective clothing during spraying or handling and rubber boots. Training and sensitization of workers on the importance of using PPE'S Presence of First Aid Kits at planting, weeding and cutting points; Enforcement of use of personalprotective gears.	Annually	**1,000,000**	**Proponent**
	Improper sanitation resulting in diseases such ascholera and poor aesthetics.	Moderate	Provision of waste bins at working point in the forest Provision of temporary toiletson site and placed in environmentally acceptable areas.	continuous	**100,000**	**Proponent**

Waste Management	Oil wastes from axe saws and other equipment may affect water aquifers and soil	Moderate	The developer should ensure clean up and proper disposal of any used oil and chemicals that may result to oil spills at the site. Oiling should be restricted to aparticular area with fill and leak prevention measures through routine checkup of theoil tanks to detect leakages and standard safety measuressuch as impervious lining.	Continuous	**Nil**	**Proponent**
	Herbicides especially at the nursery beds may affect ground water.	Moderate	Herbicides should be stored properly, transported and disposed of in accordance withregulations and Standard and Special	Continuous	**Nil**	**Proponent**
Physical-cultural resources such as; archaeological sites, historical sites and remains	There were no such resources identified but in case of chance finds necessary measures shouldbe undertaken	Low	Stop the ongoing activities in the area of the chance find; Delineate the discovered site orarea; Secure the site to prevent anydamage or loss of removable objects; Notify relevant authorities.	Duringthe initial Phase	**80,000**	**Proponent**

8.2 Environmental Management Plan during Plantation Forest Decommissioning Phase

ENVIRONMENTAL MANAGEMENT PLAN (EMP)				
Planned activities and Mitigation Measures		**Responsible Party**	**Time Frame**	**Cost (Kshs)**
1. Pre-decommissioning requirements				
1.	Obtain all licenses necessary for demolition to kickoff from	Proponent	2 months	To be determined
	NEMA and other relevant authorities.			
2.	Provide information to workers on project terminationand create awareness to workers who are losing employment about alternative income generating activities (includes giving notes of termination of contracts).	Proponent	1 month	
3.	Payment of compensation and terminal benefits toworkers	Proponent	1 month	
2. Demolition waste management				

1.	All buildings, machinery and equipment that will notbe used for other purposes must be removed and recycled/reused as far as possible	Contractor, Proponent	2 months	
2.	All foundations must be removed and recycled, reusedor disposed of at a licensed disposal site.	Proponent	3 weeks	
3.	Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolitionwaste is not possible, the materials should be taken to a licensed waste disposal site	Contractor, Proponent	2 weeks	
4.	Donate/ sell reusable demolition waste to other organizations, individuals and institutions in need.	Proponent	1 month	
3. Rehabilitation of the project site				
1.	Levelling of site to match its original state	Proponent	2 months	
2.	Implement an appropriate re-vegetation programme torestore the site to its original status	Contractor, Proponent	3 months	
3.	Consider use of indigenous plant species in re-vegetation	Contractor, Proponent	One-off	
4.	Trees should be planted at suitable locations so as to interrupt slight lines (screen planting), between the adjacent homesteads area and the development.	Contractor, Proponent	Once-off	

CHAPTER NINE

9 CONCLUSION AND RECOMMENDATION

The project has clear social and economic benefits and will contribute to the improvement of the quality of life for the people associated with it and the neighbors and the society in general. The project will not be ill any serious conflict with any major national physical or environmental protection policies. The on-site or off-site anticipated impacts identified are of varyingsignificance and these could be adequately mitigated to reduce any threat tothe environment. When the environmental management plan developed in the assessment is fully implemented and the health and safety and environment policy is set up. Then this will result in an overall improvement in the environmental quality or the project area and its surrounding.

From the foregoing discussions, it is recommended that;

1. The proponent shall ensure that the development camouflages withinthe setting and offers a serene environment to allay concerns.

2. All activities concerning the plantation forest shall be strictly monitored by a contractor or a designated official who shall be trained and experienced enough to judge the appropriateness of the works being carried out.

3. Implementation of an environmental management plan is an integral part of growth and development of any company and makes employees and contractors aware of the need to take a responsible approach to the management of the environment in their operations.This overall objective is to achieve continual improvement through monitoring and measuring performance.

4. Waste management strategy is critical to such operations. Application of 7Rs-refuse, return, refill, reduce, reuse, recycle and recover- are good practices for the operational activities.

5. The proponent shall comply with the relevant principle laws, by-laws and guidelines issued for the development of such projects.

6. Annual environmental audits should be carried out on the project in order to ensure the compliance of the project with mitigation measures outlined in the Environmental Management Plan (EMP).

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Government of Kenya The Wildlife (Conservation and Management) Act (CAP 376), Government of Kenya Food, Drugs and Chemical Substance Act (CAP 274),

Government of Kenya The Chiefs Authority Act (Cap128), Government of Kenya The Penal Code Act (Cap63)

Government of Kenya The Forest Act, 2005.

Attachments

1. Certificate of Incorporation and PIN
2. Land Ownership Documents
3. Minutes of Public Participation
4. Practising Licenses for the Experts who prepared the report
5. Public Participation Forms