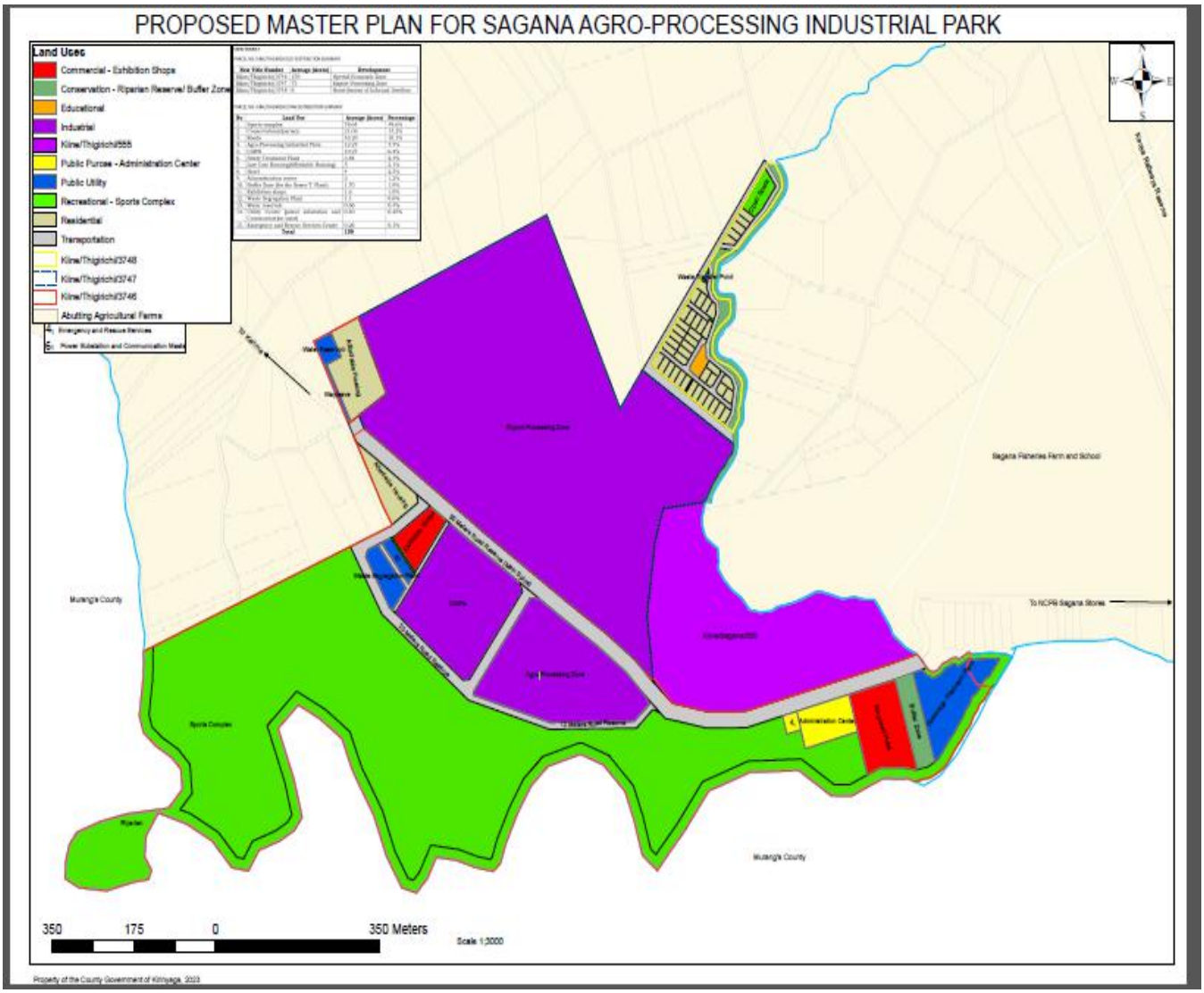
DRAFT STRATEGIC ENVIRONMENTAL AND SOCIAL ASSESSMENT (SESA) REPORT FOR THE PROPOSED MASTERPLAN OF SAGANA AGRO-INDUSTRIAL CITY (SAIC) ON L.R KIINE/THIGIRICHI/3746 ON 159 ACRES, KIINE/THIGIRICHI/3747 ON 75 ACRES AND KIINE/THIGIRICHI/3748 ON 8 ACRES (TOTAL OF 242 ACRES) KIRINYAGA COUNTY.



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MAY 2023

CERTIFICATION

Kirinyaga County Government sought to undertake Strategic Environmental and Social Assessment (SESA) for the proposed masterplan of Sagana Agro-Industrial City (SAIC) at Sagana in Kirinyaga County. This report is prepared in accordance with the Environmental Management and Coordination Act no. 8 of 1999, The Environmental (Impact Assessment and Audit) Regulations, 2003 and SESA/ESIA guidelines for submission to the National Environmental Management Authority (NEMA). To the best of our knowledge, all the information in this report is true and correct.

Proponent: County Government of Kirinyaga

Dr. Michael Ndwiga

Kirinyaga Investment and Development Authority

Signature / Date / Official Stamp …….

Submitted by:

The undersigned NEMA EIA/EA lead expert certify that the information in this SESA study report is correct representation as per the project's information provided by the proponent.

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ABBREVIATIONS

CIDP:	County Integrated Development Plan
COD:	Chemical Oxygen Demand
EA:	Environmental Audit
EHS:	Environment, Health and Safety
EIA:	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EPN:	Ethyl Prantrophenyl Phenylphosphorothroate
ESMMP:	Environmental and Social Management and Monitoring Plan
GCA:	Groundwater Conservation Area
KRC:	Kenya Railways Corporation
KURA:	Kenya Urban Roads Authority
KV:	Kilo Volts
KWS:	Kenya Wildlife Service
KWSB	Kirinyaga Water Services Board
LT:	Long Term
NPCC	National Public Complaints Committee
OSHA:	Occupational Safety and Health Act
PAPs:	Project Affected Persons
PEIA:	Plan Environmental Impact Analysis
PPE:	Personal Protective Equipment
PPP:	Policy, Plan and Programme
PSV	Public Service Vehicles
SAIC	Sagana Agro industrial city
SDG	Sustainable Development Goal
SEA:	Strategic Environmental Assessment
SGR	Standard Gauge Railway
WCAs:	Wetland Conservation Areas
WMP	Wildlife Management Plan
WRMA:	Water Resource Management Authority
WSP:	Water Service Provider
E&S	Environmental and social
ESMMP	Environmental and Social Management and Monitoring Plan

ESIA	Environmental and Social Impact Assessment
Cap.	Refers to ‘chapter’ in the Laws of Kenya
KEBS	Kenya Bureau of Standard
M	Metres (a unit of measuring distance)
TOR	Terms of Reference

NON-TECHNICAL SUMMARY

1. Background

Industrialization has been a crucial driver of economic development for over 200 years. Nearly every developed country has achieved high levels of economic and social progress by first establishing an advanced industrial sector. Recognizing its significance, the international community has prioritized industrialization as a key component of global development efforts. The 2030 Agenda for Sustainable Development, specifically Sustainable Development Goal (SDG) 9, emphasizes the importance of resilient infrastructure, inclusive and sustainable industrialization, and innovation. It acknowledges the industrial sector's potential to generate employment, stimulate economic growth, facilitate technology transfer, attract investment, and foster skills development.

African leaders have also emphasized the importance of industrialization on the continent. It is a prominent objective in the African Union's Agenda 2063 and its ten-year implementation plan, calling for a unified approach to African industrialization.

Kenya's Vision 2030 recognizes the crucial role of industrial development in creating jobs and generating wealth. The goal is to increase the industrial sector's contribution to the Gross Domestic Product (GDP) by at least 10% annually. The President's "The Bottom Up Economic Transformation Agenda 2022-2027" further aims to raise the manufacturing sector's GDP contribution from 8.5% to 15%.

In line with both international and national development agendas, Kirinyaga County is embarking on an ambitious plan to establish a state-of-the-art Climate Smart Agro-Industrial Park. Spanning 242 acres in Sagana, this prime location offers numerous advantages as an attractive investment opportunity. The county government of Kirinyaga is committed to adhering to environmental regulations and has engaged a licensed expert authorized by NEMA (National Environmental Management Authority) to conduct a Strategic Environmental Assessment (SEA). Following established procedures, the expert identified various positive and negative environmental impacts associated with the different stages of the industrial park's development. Mitigation measures have been recommended for each of these impacts.

Tekmat Solutions subcontracted Caleb Nyagah, Lead NEMA EIA/EA Expert together with other professional teams to conduct a Strategic Environmental and Social Assessment (SESA) of the proposed Sagana Agro-industrial City Master(SAIC) Plan in order to meet Regulation 42 of the Environmental

(Impact Assessment and Audit) Regulations of 2003, which requires all policies, plans, and programs to undergo a SEA. The SEA commission's responsibilities included carrying out the study in accordance with the established regulations and guidelines, submitting the scoping, draft, and final SEA reports to NEMA for evaluation, and following up to provide any extra information required for Master Plan approval.

2. The Sagana Industrial Park Master Plan

The Sagana Industrial Park Master Plan is set on 242 acres of land located within Sagana town, Ndia Subcounty, Kirinyaga County. The masterplan is comprised of various proposed land uses as outlined:

1. Industrial uses
2. Export Promotion Zone:
3. County Aggregration Industrial Park (CAIP):
4. Affordable Housing
5. Resettlement of informal dwellers
6. Sports Complex
7. Other Public uses (Internal roads, Reserves for sewer trunks and high voltage power lines, Space allocations for administration block and a hotel)

Table 1.1 SAIC proposed masterplan land use

Land Use	**Area (Acres)**
Special economic zone	159
Export processing zone	75
Resettlement of informal dwellers	8
Total	**242**

3. Rationale for Conducting Strategic Environmental Assessment

Policies, plans, and programs are subjected to Strategic Environmental and social Assessment (SESA). The Strategic Environmental and Social Assessment (SESA) is a crucial process that evaluates new management plans to ensure their environmental sustainability and compliance with existing

environmental policies, legal frameworks, strategic plans, and Multilateral Environmental Agreements (MEAs). A master plan is a dynamic long-term planning document that provides a conceptual layout to guide future growth and development. Master planning entails connecting structures, social settings, and their surrounding environments. The Master Plan analyzes, recommends, and proposes solutions for a site's population, economy, housing, transportation, community facilities, and land use. It is based on public feedback, surveys, planning initiatives; existing development, physical qualities, social and economic conditions, and so forth.

In the case of the proposed Sagana Master Plan, an Ex ante assessment was conducted to identify, describe, and evaluate the environmental and socio-economic opportunities and constraints associated with its implementation. The study aimed to develop practical mitigation measures to address any identified limitations and enhance opportunities. The overall objective of the SESAis to effectively integrate environmental and social considerations into the planning, implementation, and operation of the Sagana Master Plan.

4. Objectives for the SESA

1. To evaluate the extent to which the Sagana Masterplan has effectively integrated national environmental policies and legal frameworks;
2. To assess the degree of integration of the plan with other relevant strategies and plans;
3. To identify, describe, and evaluate the potential significant environmental impacts of implementing the plan;
4. To provide information that will aid in the integration of environmental considerations into decisions, implementation, and monitoring processes, thereby minimizing risks to the plan and risks originating from the plan;
5. To assess the compliance of the proposed activities in the Sagana Masterplan with the Environmental Management and Coordination Act (EMCA) of 1999 and its associated regulations;
6. To incorporate the socio-economic and environmental perspectives of stakeholders into the proposed land use plan;
7. To evaluate alternative options that can enhance the land use plan; and

8. To provide recommendations at a strategic level on how to minimize potential negative effects and optimize positive effects.
9. To construct County Aggregation Industrial Park (CAIP) agro-value addition warehouses and cold storage for the farmers.
10. Attract Investors through Export Processing zones (EPZ) favorable taxes initiatives.
11. Affordable Housing programs
12. Construction of Sports Complex and promotion of sports.
13. Development of other related amenities (Internal roads, Reserves for sewer trunks and high voltage power lines, Space allocations for administration block and a hotel)

5. SESA Approach and Methodology

Following the SESA guidelines, the study included the following components:

1. Clear project description: This encompassed the project's objectives, design concepts, proposed interventions, and anticipated environmental and social impacts.
2. Baseline conditions description: The study provided an overview of the existing conditions in the project area, covering aspects such as the physical location, environmental setting, and social and economic issues.
3. Legal, policy, and institutional framework: The study outlined the relevant legal, policy, and institutional context within which the proposed project would be implemented.
4. Project alternatives and selection criteria: The study described alternative options for the project and the criteria used to select the preferred approach.
5. Anticipated impacts: Details were provided on the expected environmental, social, and economic impacts within the project area.
6. Mitigation and corrective measures: Appropriate measures to mitigate or address the identified impacts were recommended.
7. Environmental and social management plan: The study developed an ESAIC (Environmental and Social Assessment and Impact Control) Masterplan. This plan presented the project's activities, potential impacts, mitigation measures, responsibilities, associated costs, and monitoring indicators.

By including these components, the SESA aimed to provide a comprehensive assessment of the project's environmental and social aspects and ensure that appropriate measures were implemented to minimize any adverse effects.

6. PPP framework

The proposed development is subject to multiple plans, policies, legislation, and programs, each having either a direct or indirect influence on the project. These instruments play a significant role in shaping the development and implementation of the Masterplan.

To ensure compliance with environmental obligations, a thorough analysis of the policy, plan, and program (PPP) was conducted. This analysis utilized a PPP framework specifically designed for the SESA process. The PPP framework included the examination of national environmental policies, legal frameworks, national strategic plans, and international environmental frameworks such as Multilateral Environmental Agreements (MEAs), which encompass global obligations.

By utilizing this PPP framework, the assessment aimed to evaluate the degree to which the Masterplan aligns with the various environmental obligations set forth in the relevant policies, laws, strategic plans, and international agreements. This comprehensive analysis ensures that the proposed development is in compliance with the required environmental standards and commitments at both national and international levels.

7. Findings

PPP Obligations and integration status

The PPP analysis established that the implementation of the SAIC MASTERPLAN will support the national goals for environmental sustainability as highlighted below.

Table 1.2 PPP

Environmental management framework	**Value addition**
a) Sessional Paper No. 6 of 1999 on Environment and Development (GoK, 1999)	Encouraging rain water harvesting around the country

b) Draft Environment Policy, 2012 (GoK, 2012)	Supporting the establishment of constructed wetlands for waste management and reuse
	Supporting the increase of forest and tree cover to at least 10% by 2030
c) National Land Policy, 2009 (GoK, 2009)	Encouraging the development of wildlife sanctuaries and conservancies
d) National Water Policy, 2012 (GoK, 2012)	Enhancing storm water management and rainwater harvesting
	Encouraging the treatment of effluent waters for recycling and reuse
	Supporting rain water harvesting
e) Draft National Policy on Wetlands Conservation and Management, 2013 (GoK, 2013)	Ensuring that natural wetlands under private ownership will be subject to regulations
f) Draft Wildlife Policy, 2011 (GoK, 2011)	Promoting the conservation and management of wildlife conservation areas and sanctuaries
g) Vision 2030 (GoK, 2008)	Supporting the increase of forest and tree cover to 10% by 2030
	Supporting water harvesting and storage
h) National Environment Action Plan, 2009 -2013 (GoK, 2009)	Enhancing the protection of wildlife resources
	Supporting the increasing of forest cover in Kenya
	Promoting efficient water harvesting, storage and usage
k) African Convention on the	Setting aside areas for the propagation, protection,

Conservation of Nature and Natural Resources (AU, 1968) l) Article II Fundamental Principle	conservation and management of wildlife

The findings indicated that the SAIC MASTERPLAN has not adequately integrated a number of national environmental PPP frameworks as highlighted below.

PPP Framework	**Integration gaps**
a) Draft Environment Policy, 2012 (GoK, 2012)	Developing response systems for climate change and disaster risks
b) National Policy for Disaster Management, 2009 (GoK, 2009)	Promoting the mainstreaming of disaster management and climate change into development planning and management for sustainability
	Integrating climate change disaster risk reduction initiatives
c) Environmental Management and Coordination Act (EMCA) No. 8 of 1999 (GoK, 1999)	Supporting environmental restoration
	Supporting the rehabilitation, regeneration and restoration of degraded rivers
d) Vision 2030 (GoK, 2008)	Supporting the rehabilitation, regeneration and restoration of degraded Rivers in the area
e) National Environment Action Plan, 2009-2013 (GoK, 2009)	Strategies for controlling of fire outbreaks
f) National Climate Change Response Strategy,2009 (GoK, 2010)	Ensuring that all new infrastructure is climate proof over its lifespan
g) Kirinyaga Integrated Development Plan, 2013-2017 (KCG, 2013)	Inadequate strategies for ensuring a reduction in carbon emission

8. Plan Environmental Impacts, Mitigation Strategies and Alternative Options

The report includes an in-depth section that outlines the environmental impacts expected from each development cluster in the SAIC MASTERPLAN. It also presents strategies and alternative options to address any negative impacts and unsustainable development practices.

Table 1.3 POSSIBLE IMPACTS MITIGATION MEASURES

Ecological imbalance induced by agricultural land loss.	The riparian Reserve area of 10Metres of Ragati river and sagana river will be green area restored with indigenous vegetation. Sustainable land use practices in the proposed sagana masterplan. Liaison with Kenya Wildlife Service and Kenya Forest Service on biodiversity restoration. Revegetation of the SAIC with indigenous species. conservation of biological diversity in Kenya and the control on access to genetic resources of Kenya by conforming to Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit Sharing) Regulations, 2006 (L.N. No. 160 of 2006).
Solid waste and waste water generation from the proposed project residential, commercial, and industrial project activities	Implementation of integrated waste management policy throughout the Project cycle. Segregation, Reuse and Recycling will be prioritised. All waste water will be directed to a sustainable waste water treatment plant. The reclaimed waste water will be tested and reused in restrooms, cleaning, and watering green areas. Environmental Management and Coordination Act 387 (Waste Management) Regulations 2006 and (Water Quality) Regulations 2006 compliance Dedicated solid waste stations in the SAIC conducting annual environment audits
An increased need for water sources	All waste water will be directed to a sustainable waste water treatment plant. The reclaimed waste water will be tested and reused in restrooms, cleaning, and watering Adoption of Water harvesting strategies in the SAIC. Accounting and auditing system for water use.

	SAIC complies with the Water Act of 2016, as well as the Environmental Management and Coordination (Water Quality) Regulations of 2006.
Increased Traffic	▪Design of a traffic management plan and adherence to the Traffic Act of 2014. adequate lighting for both pedestrian zones and automobiles. Sufficient places for automobile traffic, parking and bill boards, pathways for pedestrians Sufficient street lighting. Building and maintaining of all construction signs, signals, and markings used to control traffic.
Higher energy consumption	Annual Energy audit to help determine your baseline energy use and offer a clear outline for ways to save energy at work. Use of energy-efficient office equipment. Employees adopting energy saving policies in the SAIC. Adoption of green energy sources such as solar lighting.
Increased Dust and gaseous emissions	Construction vehicles' drivers will be under strict supervision and instructions to minimize unnecessary trips and minimize idling of engines. Covering all trucks hauling soil, sand and other loose materials and/or requiring all trucks to maintain at least two feet of freeboard Proper planning of transportation of materials will be done to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road. Waste-to-Energy Technologies - Incineration, when coupled with proper emission control systems, can generate electricity from non-recyclable waste All gaseous emitters must be tested and audited and licensed by an expert of NEMA.

9. Proposed Environmental Management and Monitoring Plan

The SESA report includes a comprehensive Environmental and Social Management and Monitoring Plan (ESAIC MASTERPLAN) designed for the implementation of the SAIC MASTERPLAN. The ESAIC MASTERPLAN encompasses the following components:

a) Specific management and monitoring actions: The plan provides detailed actions to address the recommended alternative options identified during the PPP analysis and the mitigation measures derived from the environmental impact analysis of the plan.
b) Monitoring frequency and indicators: The ESAIC MASTERPLAN offers recommendations regarding the frequency of monitoring and the selection of appropriate indicators for each management action.
c) Environmental management and monitoring standards: The plan establishes the standards and guidelines to be followed for effective environmental management and monitoring throughout the implementation of the SAIC MASTERPLAN.
d) Roles and responsibilities: The SAIC MASTERPLAN outlines the roles and responsibilities of key stakeholders involved in the implementation, management, and monitoring processes, ensuring clear accountability.
e) Implementation guidelines: Relevant guidelines and instructions are provided to facilitate the practical implementation of the plan and ensure consistent adherence to the prescribed environmental management and monitoring practices.
f) By including these components, the ESAIC MASTERPLAN provides a comprehensive framework for managing and monitoring the environmental and social aspects of the ESAIC MASTERPLAN. It ensures that appropriate measures are implemented, responsibilities are clearly defined, and standards are upheld throughout the implementation process.

10. Conclusion and Recommendation

The SESA for the Sagana Master Plan arrived at the following conclusions based on the findings of the baseline situation analysis, PPP analysis, and plan impact analysis and stakeholder consultations:

a) The SAIC MASTERPLAN is a good and commendable plan with minimal negative environmental impacts. The implementation of the plan will support sustainable environmental governance in the country.

b) The SESA findings showed that the SAIC MASTERPLAN is suitable for the area based on

the current state of environment and the available technology as established in the baseline survey. The overall benefits of the proposed development are far higher than the potential cost of the negative environmental changes are likely to occur. The master plan is desirable because it will improve the socio-economic status of Kirinyaga County. It will create employment and deliver a wide range of other socio-economic benefits. The implementation of the SAIC MASTERPLAN will also have a positive impact on social capital through direct employment, the multiplier effect in the local economy. The project will contribute to the development agenda in Kenya and it will as well help significantly in the realization of the goals for the Vision 2030 by contributing in the economic and social pillars.

CHAPTER ONE
INTRODUCTION

1.1 Background and Context

Agriculture has a significant impact on Kenya's economy, accounting for 26% of the country's GDP. This crucial industry is important for employment, employing more than 40% of the overall population and more than 70% of Kenya's rural populations. Furthermore, agriculture provides for 65 percent of Kenyan export income while providing subsistence and livelihood for more than 80 percent of Kenyans.

Kirinyaga County's agriculture sector contributes significantly to the county's economy, totaling to approximately Kshs 16 billion. Manufacturing and education are following closely behind. The 2030 Agenda for Sustainable Development, particularly SDG 9, emphasizes the importance of resilient infrastructure, inclusive and sustainable industrialization, and the encouragement of innovation. This global program recognizes that the industrial sector is vital not just for job creation and economic growth, but also for facilitating knowledge transfer, attracting investments, and promoting skill development.

Keeping this in mind, the Kirinyaga County Government is committed to increasing industrialization and developing the county into a middle-class industrialized region. The establishment of an agro-industrial park will create a favorable environment for a variety of activities, such as adding value to nearly all agricultural products, manufacturing and assembling agricultural inputs, providing logistical support, fostering innovation, and conducting research and development. This effort will result in countless job chances for unemployed young people. Furthermore, the agro-industrial park's formation is well-timed and well connected with both the county's development goals and national aspirations, particularly in terms of developing the manufacturing sector.

1.2 Vision of Sagana Industrial Park

To foster sustainable and inclusive economic development that not only benefits local communities but also contributes to the prosperity of the nation.

1.3 Aspirations of Sagana Industrial Park

1. To generate employment opportunities for the local population and alleviate unemployment rates within the county.
2. To stimulate economic growth and development in the region by attracting investments and bolstering local businesses.
3. To foster industrialization and create a favorable environment for the manufacturing sector.

4. To improve the existing infrastructure in the region, including roads, water supply, and electricity, to benefit not only the industrial park but also the local communities.
5. To ensure the sustainable operation of the industrial park and minimize its environmental impact are crucial, with an emphasis on promoting sustainable development practices.
6. To promote innovation and technology by attracting high-tech industries to the region. This initiative aims to enhance the skills and knowledge of the local workforce while promoting economic diversification.

1.4 General Plan Description

A master plan is a comprehensive blueprint that describes the intended use and administration of a given area, including the long-term utilization of its environmental and natural resources. It is essential as a reference point for determining the success or lack thereof of suggested management actions and interventions within the timeframe. The master plan is essential as a tool for monitoring and evaluating future development efforts, allowing the impact of environmental changes to be analysed.

1.4.1 Location of Sagana Industrial park

The proposed SAIC will occupy a 242-acre plot of land situated in Ndia sub-county. It is approximately 119.3 kilometers away from Nairobi and enjoys close proximity, just about 2 kilometers, to the Kenol-Sagana-Marua (A2) road, which is currently undergoing expansion to become a dual carriage road.

The land is strategically positioned, bordered by two permanent rivers, namely Ragati and Sagana Rivers and is located adjacent to the Nairobi-Nanyuki railway, which is anticipated to undergo an upgrade to a Standard Gauge Railway (SGR) in the future. The precise coordinates of the land are latitude -0.664607 and longitude 37.193038.

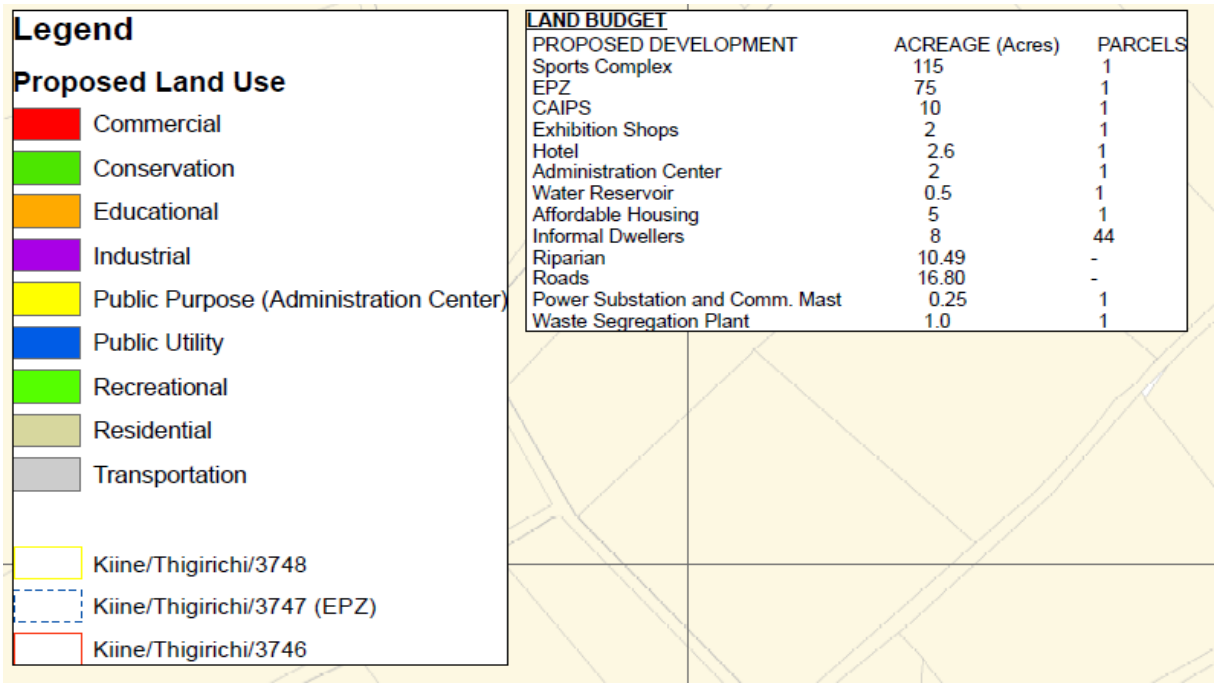
Figure 1. 1 Map of the Location of the SAIC

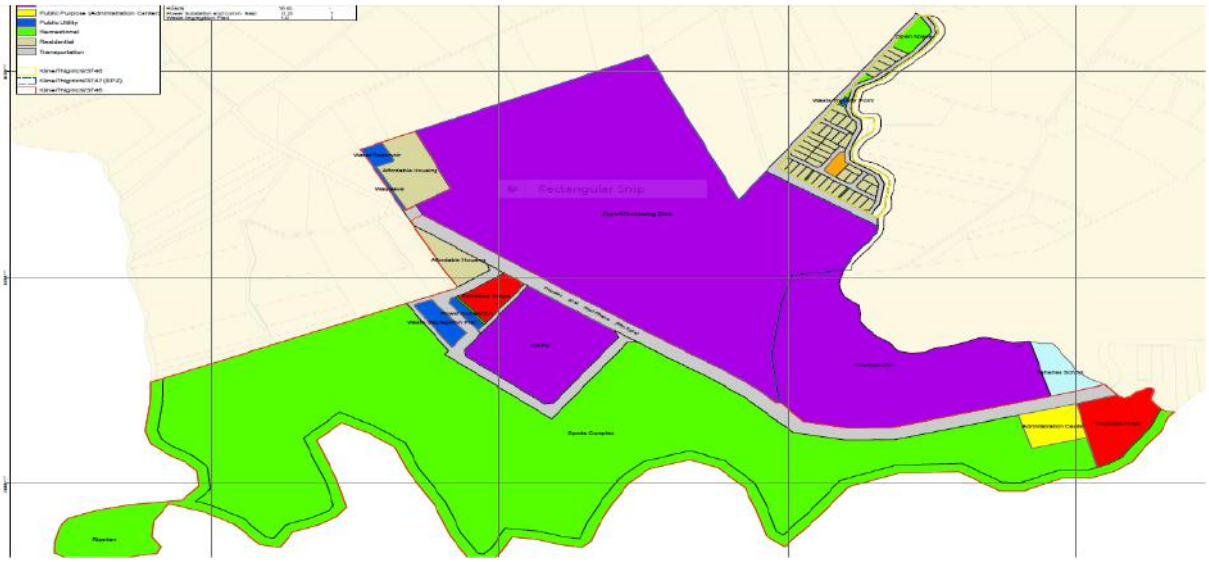
1.4.2 Description of Sagana Industrial Park Masterplan

The masterplan encompasses a range of proposed land uses, which are detailed as follows:

a) Industrial uses Export Promotion Zone
b) County Aggregation Industrial Park (CAIP)
c) Residential uses-Affordable Housing
d) Resettlement of informal dwellers
e) Sports Complex
f) Other Public uses
g) Internal roads
h) Reserves for sewer trunks and high voltage power lines
i) Space allocations for administration block, police station.

Figure 1. 2 Proposed SAIC land uses





1.5 Projections on population, resource use and waste generation and traffic

1.5.1 Population, resource use and waste generation

To provide a framework for future developments, zoning guidelines have been established for the SAIC Masterplan. These guidelines serve as a reference for the various land uses within the plan. Using these guidelines, projections have been made regarding population growth, energy and water demand, as well as the generation of waste, including both sewerage and solid waste. These projections inform the planning and management of resources to ensure sustainable development within the SAIC Masterplan.

1.5.2 Traffic Studies

Based on the traffic volume assessments conducted in 2023 along the current road network, the Nairobi-Nyeri Highway within the development area experiences a total daily traffic volume of 11,908 vehicles in both directions. The directional split reveals that 46 percent of the traffic is bound to Nairobi, while the remaining 54 percent is traveling away from Nairobi.

Considering the projected total daily vehicular trips to and from the development on the dual-carriage Kenol-Sagana-Marua (A2) road, the volume is estimated to projected to rise significantly. These increased traffic volumes are expected to have a significant impact on the flow of traffic and the capacity of existing roads, as well as the intersections in close proximity to the development area.

1.6 Masterplan Informants

A complete site analysis was undertaken in order to identify the important existing elements of the site in order to design the Masterplan strategy. The results of these studies were critical in establishing the development strategy, and a summary of these essential elements is provided below.

1.6.1 Landscape, Topography and Natural Features

The planned site location is near a semi-urban area characterized by numerous long-standing commercial and residential structures that have been in place for a long time. The project location is located between the Ragati and Sagana rivers, both of which are tributaries of the Tana River. Because the land has been unoccupied for several years, human activities have had little impact on the soils. The property is mostly composed of brown and red soils, which often have good drainage. There is little plant and no fauna in the area. There is a well-established infrastructural network in place, including electricity, a paved road, the Sagana Health Center, and multiple secondary and primary schools nearby. There is a police station nearby.

1.6.2 Existing Uses

The property has been vacant for a long time, with little human activity and no established land uses.

1.6.3 Transport

The proposed site is located approximately 119.3 km away from Nairobi and is conveniently situated around 2 km from the Kenol-Sagana-Marua (A2) road, which is presently undergoing conversion into a dual carriageway. Adjacent to the land is the Nairobi-Nanyuki railway, which is expected to undergo an upgrade to a Standard Gauge Railway (SGR).

A well-planned and well-designed road and walkway network is critical to the effective operation of the agro-industrial park. The industrial park, according to the masterplan, will include a main road that spans the property, as well as feeder roads that allow access to various industrial plots and facilities. These roads must be thoughtfully built to include enough room for pedestrians and designated bike and motorcycle lanes. The pathways and driveways design include wide enough to handle both people and cargo.

1.6.4 Environment

The site contains a variety of habitats, including wetland, riverine zones, and places with trees and shrubs. A significant chunk of the land is made up of dry savannah or open grass plains with scattered acacia plants dotted throughout.

1.7 Purpose of the SEA

Strategic Environmental Assessment (SEA) is defined as the identification, description, evaluation, and reporting of a variety of analytical and participatory approaches for integrating environmental considerations into Policies, Plans, and Programs (PPP) and evaluating the inter-linkages with economic and social considerations (NEMA, 2012). SEA is a proactive method to incorporating environmental factors into higher levels of decision-making.

An ex-ante evaluation was carried out in this study to review the proposed SAIC Masterplan and to systematically identify, describe, and evaluate the environmental and socioeconomic possibilities and challenges connected with its implementation. The study also included the development of practical strategies that mitigate constraints and improve the identified opportunities. The primary objective of the evaluation was to make sure that the Sagana Master Plan is implemented with social and environmental considerations forefront throughout the planning, implementation, and operational stages.

Strategic Environmental Assessment (SEA) will play a pivotal role in ensuring the comprehensive integration of environmental and social considerations into the Sagana Masterplan.

The objectives of the SESA are to:

- To evaluate the level of effective integration of national environmental policies and legal frameworks within the Sagana Masterplan.
- To assess the degree of alignment between the plan and other relevant strategies and plans.
- To identify, describe, and evaluate the potential significant environmental impacts that may arise from implementing the plan.
- To provide information that can facilitate the integration of environmental considerations into decision-making, implementation, and monitoring processes, thereby reducing risks associated with the plan and risks originating from the plan itself.
- To assess the compliance of the proposed activities in the Sagana Masterplan with the Environmental Management and Coordination Act (EMCA) of 1999 and its associated regulations.
- To incorporate the socio-economic and environmental perspectives of stakeholders into the proposed land use plan.
- To evaluate alternative options that have the potential to enhance the land use plan.
- To offer strategic-level recommendations on minimizing potential adverse effects and maximizing positive effects.

1.8 Strategic Environmental Assessment Requirement

To effectively manage the environment in a sustainable manner, it is essential to align and configure new management plans with national goals for environmental sustainability at all levels, ranging from local to global. This integration requires incorporating policies, legal frameworks, strategic plans, regional frameworks, and international multilateral environmental agreements (MEAs) to ensure compliance with national and international sustainability objectives. Failing to achieve such integration may compromise the effectiveness of management plans in achieving environmental sustainability. It is also crucial that development activities proposed in management plans do not have negative long-term environmental impacts that could be detrimental to the county and the nation.In this regard, Strategic Environmental Assessment (SEA) plays a critical role in evaluating new management plans to ensure environmental sustainability and adherence to existing environmental obligations outlined in policies, legal frameworks, strategic plans, and MEAs.

Kenya's central legislation for environmental protection is the Environmental Management and Coordination Act (EMCA, 1999). EMCA 1999 empowers the National Environment Management Authority (NEMA) to approve or disapprove major developments based on proper planning and assessment of environmental impacts. NEMA is authorized to implement precautionary measures

and promote sustainable development in conservation areas and other valuable and sensitive environments across the country. These measures aim to ensure that development activities do not undermine the objectives of environmental conservation, which is essential for deriving valuable goods and services from the environment.

The Environmental (Impact Assessment and Audit Regulations) 2003 provides provisions for conducting Strategic Environmental Assessments of Plans, Policies, and Programs (PPP). These assessments should consider the potential impacts of implementing PPP actions, including natural resource utilization, biodiversity protection and conservation, human settlements, cultural issues, socio-economic factors, as well as the preservation and conservation of natural physical environments of scenic beauty, and the protection and conservation of built environments of historical or cultural significance.

1.9 Methodology for carrying out the SESA

In accordance with section 58 of the Environmental Management and Coordination Act (EMCA), 2015, all projects listed in the second schedule of the Act are required to undergo thorough environmental and social impact assessment studies. The Strategic Environmental Assessment (SEA) study must also adhere to the guidelines outlined in the Environmental Impact Assessment/Environmental Audit Regulations of 2019, which provide the minimum and other conventional environmental standards.

The SESA study follows an integrated approach, incorporating desk documentary reviews, field investigations, consultations, as well as interviews and discussions with stakeholders and affected communities. The study is conducted in several stages, ensuring a comprehensive evaluation.

1.9.1 Environmental Screening

The screening process was conducted to determine the necessity of conducting an SESA study for the proposed project. After reviewing the relevant literature, it was determined that the project falls under category 2, which requires an SESA study, as specified in the second schedule of the Environmental Management and Coordination Act of 2015. Additionally, the project is categorized as Category B under the World Bank Environmental and Social Safeguards Policies, as defined in the Bank's Operational Procedures (OPs).

1.9.2 Environmental Scoping

The objective of this stage was to ensure that the SESA study effectively addresses the important environmental and social issues relevant to the decision-makers. To achieve this, the focus was narrowed down to the key aspects of the proposed project and those requiring detailed analysis. Dialogue with all stakeholders involved in the project was initiated to ensure the fulfillment of this

objective. Furthermore, primary and secondary data were collected during this stage. The data evaluation facilitated a rapid assessment of the project site and its surrounding areas. Scoping provided several key benefits, including the identification and engagement of key stakeholders, identification of existing gaps, and ensuring that the assessment concentrates on the significant potential environmental and social impacts.

1.9.3 Documentary Review

Various pertinent documents were carefully examined to gain a comprehensive understanding of the project area's terms of reference and its environmental conditions. This review encompassed data regarding demographic trends for the project area, beneficiary areas, and neighboring towns and counties. Information on land use practices in the affected areas, whether as catchment, irrigation scheme, or beneficiary areas, was considered. The review included an assessment of development strategies and plans at the local, national, and international levels, as well as relevant policy, legal, and institutional documents. The documents scrutinized for this purpose encompassed a range of materials, including pertinent legal, policy, and regulatory documents.EMCA (Amendment), 2015

- Climate change Act, 2016
- Kenya National Bureau of Statistics, 2009
- Kirinyaga County Integrated Development Plan (CIDP) 2022-2027.
- The County Government Act, (2012)
- The Constitution of Kenya 2010
- The Kenya Vision 2030
- The Environment Management and Coordination Act No 8, 1999 and the Relative Amendment Act No 5, 2015
- Environmental Impact Assessment and Audit Regulations, 2019
- Environmental Management and Coordination Act (Waste Management) Regulations, 2006
- Environmental Management and Coordination (water quality) Regulation 2006
- Environmental Management and Coordination (Water Quality) Regulations, 2006 arrangement Of Regulations
- Air Quality Regulation, 2014
- National policy for protection and response to gender-based violence, 2014
- National Construction Authority Act. No. 41 of 2011
- Environmental Management and Coordination Act (Noise and Excessive Vibrations Pollution Control) Regulations, 2009
- The Urban Areas & Cities Act, (2011)
- The National Land Commission Act (2012)
- The Water Act, 2002

- HIV/AIDS Prevention and control Act (Act No. 14 of 2006)
- Occupational Safety and Health Act OSHA, 2007
- Work Injury Benefits Act, 2007
- The Public Health Act (Cap. 242)
- The Physical Planning Act (Cap. 286) Revised Edition 2009
- Way Leave Act Cap 292
- The Building Code 2009
- Public Roads and Roads of Access Act (Cap 399)
- National Gender and Equality Commission Act, 2011
- The Sexual Offences Act (No. 3 of 2006)
- The Agriculture, Fisheries and Food Authority Act
- Traffic Act Chapter 403
- Crop Act ,2013
- The Employment (Amendment) Act, No. 15 Of 2022
- Children Act,2001
- EMCA (Amendment), 2015, Kenya National Bureau of Statistics, 2009, and Kirinyaga County Integrated Development Plan (CIDP) 2018-2022.

1.9.4 Site Assessment

A field assessment was carried out to physically examine the proposed site and its surrounding environment. The purpose of this assessment was to identify the potential positive and negative impacts on the physical and biological environment, including aspects such as hydrology, climatic patterns, and geology. It also aimed to evaluate social and economic trends, such as population trends, settlement patterns, economic activities, cultural dynamics, land ownership issues, and their linkages. Additionally, the assessment focused on understanding the perspectives and needs of the project-affected persons (PAPs) and beneficiaries. The specific objectives of the field assessment were as follows:

- Gathering relevant information and data from local public offices including environment, water, lands, and agriculture departments.
- Assessing the environmental context surrounding the proposed site, which involved observing and examining factors such as topography, land tenure, surface and groundwater sources, public amenities, land cover, climate, flora and fauna, soils, and other relevant aspects.
- Conducting comprehensive public participation exercises to engage a wide range of affected individuals and stakeholders. Public consultations were also organized to evaluate the environmental context surrounding the proposed site.
- Evaluating the social, economic, and cultural settings across the entire project site.

1.9.5 Socio-Economic Survey

A survey focusing on socio-economic aspects was conducted in the project area. Questionnaires were used as the primary tool to collect information from stakeholders and businesses located near the project site. The survey aimed to gather data on the potential socio-economic and environmental impacts resulting from the proposed project. The collected data was analyzed using Stata software, and the findings are presented in this report through charts, tables, and graphs.

1.9.6 Public Participation

To ensure active involvement of the public in the Strategic Environmental Assessment (SEA) process, various measures were taken to engage stakeholders and communities residing in the vicinity of the project area. The scoping exercise and field data collection were conducted to incorporate their perspectives. The detailed SESA report will be shared with stakeholders to gather their feedback and input. Several forums were organized, including sensitization and feedback sessions, involving stakeholders at all levels. Public participation was encouraged through the distribution of questionnaires and transect walks.

The questionnaires used during the interviews were specifically designed for two groups: the surrounding community and key stakeholders. These questionnaires consisted of of open-ended questions, allowing for comprehensive consultations. The objective of the public consultation was to

gauge the community's familiarity with the proposed project activities and its potential impacts, as well as to assess their readiness for the project to be implemented in their area.

1.10 Study Limitations

When the SESA began, a recently finalized comprehensive land use plan included clear definitions for different land uses. Zoning guidelines were established for developments within the Masterplan, enabling initial projections of population, water and power demand, effluent and solid waste generation, and traffic volumes based on the zoning plans. It is important to acknowledge that these projections offer a broad overview and are associated with a significant level of uncertainty regarding their secondary, tertiary, and quaternary effects on key resources such as energy, water, waste management, traffic, and transportation.

To obtain a more precise understanding of the potential impacts, it will be essential to conduct in-depth engineering studies across various aspects, including water and power demand and supply, management of solid and effluent waste, storm water management, hydrogeology, and traffic and transportation. These studies will yield crucial information to guide the implementation of the development and assist in mitigating any possible adverse effects on the environment and surrounding communities.

1.10.1 Recommendations

This SESA includes recommendations to carry out the following studies:

- **Water management**: The study established that there is a section of the land that is prone to flooding. Therefore, it is recommended that the county could consider developing a mini water dam in this section or develop a dyke to control flooding especially from river Ragati.
- **Waste management disposal**: The industrial park accommodates multiple factories that will generate varying forms of solid and liquid waste. It is of utmost importance for the Kirinyaga County government to establish a well-defined waste management system to prevent any form of pollution, particularly in relation to the two rivers, namely the Sagana and Ragati rivers, which border the industrial park. The county government should implement strategically located collection points for solid waste within the industrial park. Additionally, individual factories should have their own solid waste collection points within their premises. All solid waste generated will be gathered and appropriately disposed of through a licensed waste management company. Furthermore, the wastewater generated within the park will be directed to designated treatment lagoons situated within the park.
- **Traffic studies:** During the assessment process, it is necessary to estimate the anticipated levels of vehicular and pedestrian traffic that will be generated by the development. This involves evaluating the capacity of the current traffic and transport infrastructure to accommodate the projected traffic volumes. Additionally, appropriate traffic management options will be recommended to ensure efficient movement and control of the traffic.

In order to thoroughly assess the real effects of the development and propose any required enhancements or adjustments, it is crucial to determine the peak hourly traffic volume on the current roads, as well as from the development itself. Additionally, it is necessary to establish the trip distribution and route assignment of the traffic generated by the development. This data must be forecasted for the future planning period of each development phase to ascertain the future capacity requirements of the roads.

1.11 SESA Study Team

The study team consisted of professionals representing diverse disciplines. The team members comprised the lead expert, a sociologist, a geologist, water and structural engineers, urban planners, architects, and an economist.

CHAPTER TWO

GENERAL DESCRIPTION OF THE PROPOSED MASTER PLAN.

2.1 Introduction

This chapter examines the Sagana master plan's purpose, rationality, and objectives. The Master Plan provides an in-depth analysis of policy and strategies. The chapter additionally explores the sectors and areas to be affected by the masterplan.

2.2 Purpose and rationale of the master plan

The objective of the Sagana master plan is Development that blends world practice socioeconomic and ecological considerations by hosting an Agro processing community.

2.3 Proposed Master Plan area

The masterplan recommends creation of an Sagana agro-industrial park will foster a variety of activities, including adding value to nearly all agricultural products, manufacturing and assembling agricultural inputs, providing logistical support, fostering innovation, and conducting research and development, work opportunities and boosting the manufacturing sector.

The proposed SAIC will occupy a land area of 242 acres in Ndia sub-county. This location is situated approximately 119.3 km away from Nairobi and is conveniently positioned around 2 kilometers from the Kenol-Sagana-Marua (A2) road, which is presently undergoing expansion to become a dual carriage road.

The land is adjacent to two permanent rivers, namely the Ragati and Sagana rivers. Furthermore, it is in close proximity to the Nairobi-Nanyuki railway, which is anticipated to undergo an upgrade to a Standard Gauge Railway (SGR). The precise coordinates of the land are latitude -0.664607 and longitude 37.193038.

2.4 Objectives of the proposed masterplan

a) Agro-processing
b) Garments and textiles manufacturing
c) Aggregation centers for agricultural produce
d) Recreation facilities
e) Residential building construction
f) Support activities for agricultural production, garments and textiles manufacturing

2.5 Areas to be affected by the masterplan

2.5.1 Water Resources in Sagana

Sagana is a `home to various water resources. Two significant water resources that contribute significantly to the town's water supply are River Ragati and River Sagana. These rivers are essential in supplying water for domestic use, irrigation, and electricity generation, among other purposes.

River Ragati is a major water resource that flows through the Ragati forest, located on the slopes of Mount Kenya. The river is a major source of water for the town, especially during the dry season when water scarcity is experienced. River Ragati is a permanent river that has water flowing throughout the year, making it an important source of water for the town's people and the surrounding farms. The river is used for domestic purposes such as drinking, cooking, and cleaning. It is also used for irrigation purposes, especially for crops such as rice and maize, which require plenty of water. Additionally, the river is a source of food for fishers who catch fish in the river for commercial purposes.

Apart from domestic and irrigation purposes, River Ragati is also important for electricity generation. The river is harnessed by the Ragati Hydro-electric Power Station, which generates electricity for the town and its environs. The power station is a vital source of electricity for the town, providing a reliable and affordable source of energy. The electricity generated by the power station also supports economic activities in the town, such as small-scale industries that rely on electricity.

River Sagana is another major water resource that flows through the town of Sagana. The river originates from the Aberdare ranges and flows through various counties, including Kirinyaga, before emptying into the Tana River. River Sagana is also a permanent river that has water flowing throughout the year. The river is a vital source of water for domestic and irrigation purposes, especially during the dry season. The river is also used for recreational purposes, such as white-water rafting, which attracts tourists to the town.

Apart from domestic and irrigation purposes, River Sagana is also important for electricity generation. The river is harnessed by the Sagana Hydro-electric Power Station, which generates electricity for the town and its environs. The power station is a vital source of electricity for the town, providing a reliable and affordable source of energy. The electricity generated by the power station also supports economic activities in the town, such as small-scale industries that rely on electricity.

River Ragati and River Sagana are important water resources that contribute significantly to the water supply of Sagana town. These rivers are used for domestic, irrigation, and electricity

generation purposes, among others. However, these water resources face challenges such as pollution and deforestation, which affect their sustainability. Therefore, there is a need for concerted efforts to conserve and protect these water resources for the benefit of the present and future generations.

Figure 2. 1 River Sagana

Proposed master plan will be supplied water by Kirinyaga Water and Sewerage Company (KIRIWASCO). KIRIWASCO get water from river Sagana.

Sustainable water use will be employed by the proposed master plan users. All waste water will be treated, tested and re-used.

2.5.2 Sewerage treatment systems

There is no existing sewage treatment plants in sagana. Residents of sagana use septic tanks.
Sustainable water use will be employed by the proposed master plan users. All waste water will be treated, tested and re-used. The future of sewage treatment in Sagana is critical to the health and well-being of the city's residents and the surrounding environment. With the city's population expected to continue to grow, it is essential to consider the future scenarios for sewage The expansion and modernization of Sagana's sewage treatment facilities. This would involve significant investment in infrastructure to improve the efficiency and capacity of the existing treatment plants, as well as the construction of new treatment plants in areas where they are needed.

2.5.3 Storm Water Drainage

Storm water is collected in the Sagana area by both natural and man-made drainage systems and drained to the Tana River system, which includes the rivers Ragati and Sagana, and then emptied through the Tana River's main stream. The sagana master plan has an adequate drainage system. Furthermore, 10 million riparian reserves must be identified and protected in order to maintain a healthy river ecology.

2.5.4 Road network and traffic

The Master Plan presents an integrated approach to the mobility and transportation system, taking into account a more diverse availability of transport modes, as well as the forthcoming conversion of the Nairobi-Nanyuki train line to standard gauge railway.A comprehensive transport system is envisioned for Sagana Agro-Industrial City (SAIC) to promote efficient transportation inside the development and connecting to the neighboring areas. The transportation network will include walkways, cycling paths, and spine/feeder roads for vehicular access, ensuring the convenience and accessibility of residents, workers, and tourists. SAIC plans to build paved roads to meet the expected volume of traffic and to offer smooth connectivity between the development and the existing government highways in the area.

2.5.5 Electricity Supply

The main source of power in Nairobi is electricity supplied by Kenya Power. In Sagana Agro-Industrial City (SAIC), the estimated peak power demand for the development is 0.95 MVA (Mega Volt Ampere). To meet this demand, SAIC proposes to be connected to Kenya Power and Lighting Company (KPLC) network which is already within the surrounding of SAIC. This will be complemented by installation of solar energy which will be used for lighting and other purposes.

2.5.6 solid Waste Management

Integrated solid waste strategies have been designed min the sagana proposed masterplan. A garbage collection point and segregation point and the procedure will be provided for in the proposed SAIC. The garbage bins will be fitted with suitable lifting points, locking devices, which are strong enough to keep the doors of the loaded containers closed, and tipping bar covers. The Department of Environment of Kirinyaga County will be collecting the garbage for appropriate disposal. Solid waste management will be a shared responsibility among all the stakeholders who are the County Government, generators, contracted and licensed waste handlers, owners and occupiers of the SAIC. Master plan policy on reuse, recycling will be adapted to all occupiers of the SAIC.

2.5.6 The Proposed Sagana Agro-industry City master plan

The SAIC master plan will include a variety of land uses, as seen in the land is 242 acres in size:

1. Special economic Zones, L.R KIINE/THIGIRICHI/3746 (159 acres)
2. Export processing zones L.R KIINE/THIGIRICHI/3747 (75 Acres)
3. Resettlement of informal settlers L.R KIINE/THIGIRICHI/3748, (8 acres)
4. **Total 242 acres**

Table 2.1 Special economic Zones, L.R KIINE/THIGIRICHI/3746 (159 acres)

No.	**Land use**	**Acres**
1	sports complex	78.64
2	conservation (Riparian Reserve)	21.06
3	Roads	16.2
4	Agro-processing Industrail plots	12.27
5	CAIP	10.27
6	sewer treatment plant	3.84
7	Low cost Housing	5
8	Hotel	4
9	Administration center	2
10	Buffer zone- Waste water treatment	1.7
11	Exhibition shops	1.6
12	solid waste segregation	1.1
13	water resorviour	0.66
14	Utility(power substatiuon and communication mast)	0.4
15	emergency and rescue serviuces centre	0.26
	Total	159

CHAPTER THREE

ENVIRONMENTAL ANALYSIS OF THE MASTER PLAN

3.1 Introduction

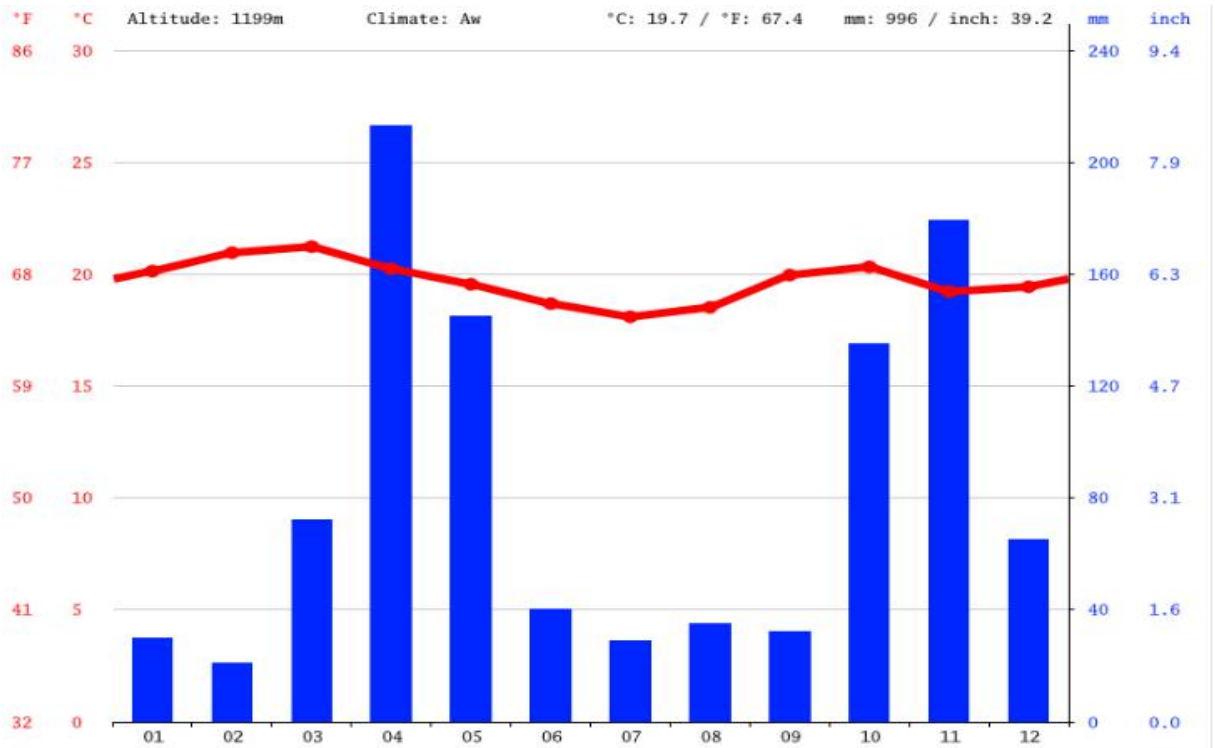
This Chapter covers the baseline environmental assessment as well as an extensive review of the areas that will be impacted by the planned Sagana Agro-Industrial City Master Plan. This comprises an overview of the proposed Master Plan's sustainability pillars, encompassing the physical, biological, socio-cultural, and socio-economic components.

3.2 Physical environmental setting

3.2.1 Climate

The proposed Industrial Park site and its surrounding area receive rainfall in a bimodal pattern. The first period of prolonged rains occurs from mid-March to mid-May, followed by a subsequent cold season. During the cold season, drizzles are characteristic between the months of June and August. Another period of short rains takes place from mid-October to November. The annual rainfall in the project region amounts to approximately 531 millimeters, accompanied by an average yearly temperature of 24 degrees Celsius. March represents the hottest month of the year, while July is the coldest, with average temperatures hovering around 18.1 °C | 64.6 °F.

Figure 3. 1 Climate Graph by month of Sagana



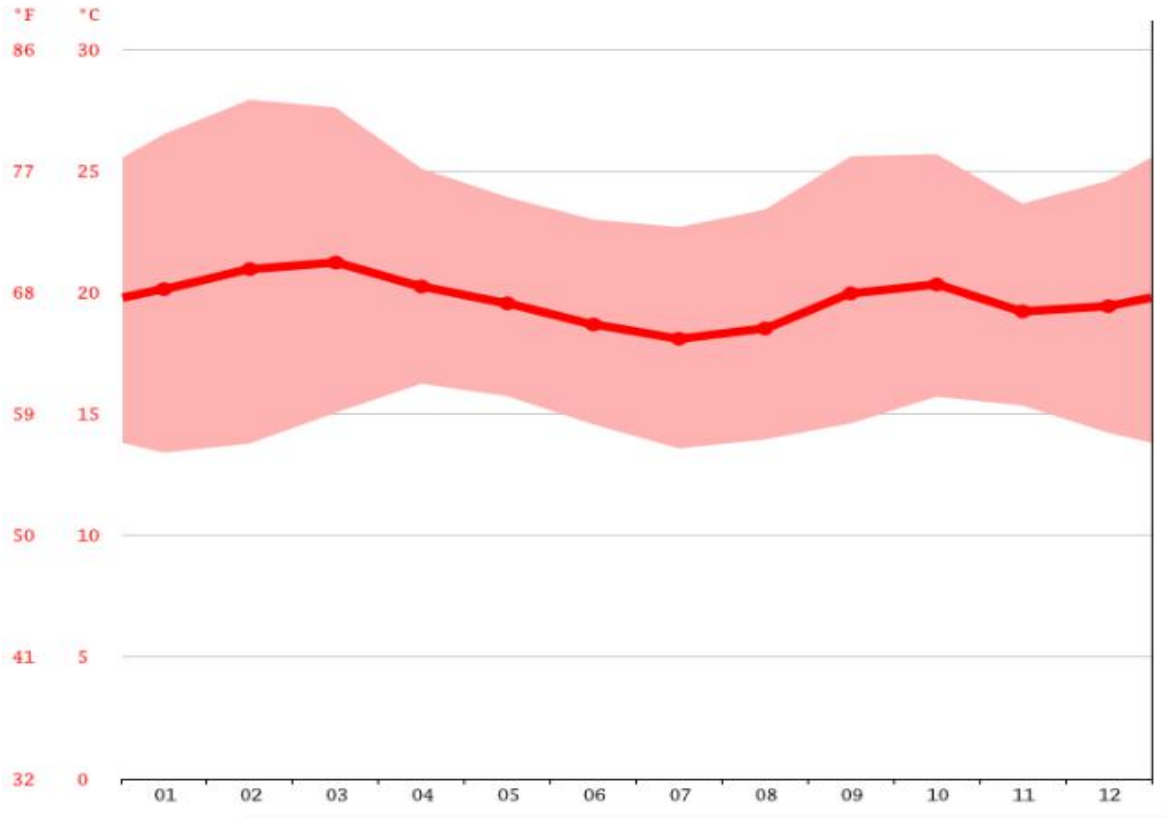


Table 1: Climate Table for Sagana

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	20.1 °C (68.2) °F	21 °C (69.7) °F	21.2 °C (70.2) °F	20.2 °C (68.4) °F	19.5 °C (67.2) °F	18.7 °C (65.6) °F	18.1 °C (64.6) °F	18.5 °C (65.3) °F	20 °C (67.9) °F	20.3 °C (68.6) °F	19.2 °C (66.6) °F	19.4 °C (67) °F
Min. Temperature °C (°F)	13.4 °C (56.1) °F	13.8 °C (56.8) °F	15.1 °C (59.1) °F	16.2 °C (61.2) °F	15.7 °C (60.3) °F	14.6 °C (58.2) °F	13.6 °C (56.4) °F	13.9 °C (57.1) °F	14.6 °C (58.3) °F	15.7 °C (60.3) °F	15.3 °C (59.6) °F	14.2 °C (57.6) °F
Max. Temperature °C (°F)	26.5 °C (79.7) °F	27.9 °C (82.3) °F	27.6 °C (81.7) °F	25.1 °C (77.2) °F	23.9 °C (75.1) °F	23 °C (73.4) °F	22.7 °C (72.8) °F	23.4 °C (74.1) °F	25.6 °C (78.1) °F	25.7 °C (78.2) °F	23.7 °C (74.6) °F	24.6 °C (76.3) °F
Precipitation / Rainfall mm (in)	30 (1)	21 (0)	72 (2)	213 (8)	145 (5)	40 (1)	29 (1)	35 (1)	32 (1)	135 (5)	179 (7)	65 (2)
Humidity(%)	66%	59%	64%	78%	78%	74%	71%	68%	61%	66%	81%	75%
Rainy days (d)	5	4	10	19	16	8	7	8	8	14	18	11
avg. Sun hours (hours)	9.8	9.8	8.6	6.9	6.4	5.2	4.2	4.5	6.4	7.0	6.8	8.7

3.2.2 Topography

Kirinyaga County possesses a diverse topography, ranging from elevations of 1,158 meters to 5,380 meters above SESA level. The southern part of the county is situated at lower altitudes, while the peak of Mt. Kenya marks the higher end. The presence of Mt. Kenya significantly influences the county's landscape and various topographical characteristics. The mountainous region showcases distinct features like prominent peaks, hanging valleys, and V-shaped valleys.

One notable impact of Mt. Kenya is its contribution to the county's water sources. The melting snow from the mountain serves as a crucial water supply for the rivers that traverse the county as

well as the surrounding areas to the south and west. The snowmelt follows natural streams, creating a radial drainage system that ultimately merges with downstream rivers, augmenting their water volume significantly.

3.2.3 Ecological Conditions

Kirinyaga County exhibits a distinct division into three ecological zones, which are categorized based on elevation.

The lowland areas stretching from 1,158 meters to 2,000 meters above SESAlevel, are characterized by gently rolling plains that predominantly define the Mwea constituency.

The midland areas encompass the Ndia, Gichugu, and Kirinyaga Central constituencies, spanning from 2,000 meters to 3,400 meters above SESAlevel. These midland zones comprise a significant portion of the county.

The highland zone encompasses the upper regions of the Ndia, Gichugu, and Central constituencies, as well as the entire mountainous area. Extending from 3,400 meters to 5,380 meters above SESA level, the highland zone represents the highest elevation within the county and presents its own distinct ecological features.

3.2.4 Geology and soils

Kirinyaga County is situated in a volcanic setting, primarily shaped by the presence of Mount Kenya. The geology of the region consists of volcanic rocks that contribute to the formation of remarkable natural features, including the renowned 'Ndarasa ya Ngai' (God's bridge) along the Nyamindi River and seven breathtaking waterfalls. These geological formations enhance the county's scenic beauty and offer opportunities for recreational activities and tourism.

The site is characterized by roam and red soils that generally exhibit good drainage. In the lower elevations, the soil is derived from precambrian basement system rocks, such as gneiss, banded gneiss, and schists. In areas influenced by volcanic activity, the soil originates from volcanic parent materials. Due to favorable precipitation patterns and productive soils derived from volcanic sources, the region is heavily utilized for agricultural purposes and experiences high population density.

3.2.5 Water resources

Kirinyaga County is intersected by six notable rivers: Sagana, Nyamindi, Rupingazi, Thiba, Rwamuthambi, and Ragati. These rivers collectively serve as vital water sources for the region. In addition to these rivers, the county boasts several other water resources, including 29 unprotected springs, 12 water pans, 3 dams, and 208 shallow wells, boreholes, and protected springs.

The upper regions of the county, where numerous springs are found, enjoy favorable water quality.

However, concerns arise regarding water contamination in the lower areas of Mwea Constituency, where the Thiba and Nyamindi rivers act as the primary water sources. The contamination is attributed to the use of fertilizers and pesticides in irrigation practices, adversely affecting the downstream water quality. Addressing the issue of water contamination in the lower parts of Mwea Constituency should be a priority.

The proposed Sagana site is adjacent to two permanent rivers, the Ragati and Sagana Rivers, ensuring an abundance of surface water resources. Although KIRIWASCO will provide bulk water to the agro-industrial park, it is advisable for the Kirinyaga County government to consider constructing large water storage tanks within the park. These tanks would ensure an adequate water supply for processing, sanitation, and firefighting emergencies within the park. Furthermore, the county government should contemplate the construction of a mini water dam within the park for additional water storage. Individual factories should also be encouraged to implement rainwater harvesting technologies, such as gutters and individual water storage tanks.

3.3 Biological environmental setting

3.2.1 Flora

The area is characterized by a diverse range of flora, including indigenous trees like Newtonia buchananii (Mukoi) and Trichilia-roke (Mutuati) trees. In certain regions, the vegetation primarily consists of dry savannah, featuring open grass plains with scattered Acacia bushes. Permanent rivers are accompanied by riverine forests. Stands of Olea africana and Croton dichogamus, Brachylaena hutchinsii, and Calodendrum capense can also be found within the Project area.

The dominant grass species encompass Themeda triandra, Cyperus spp, Digitaria spp, and Cynodon dactylon, interspersed with yellow-barked Acacia xanthophloea. Furthermore, there are areas of broken bush country, particularly along the wet valleys, creating a distinctive landscape.

3.2.2 Fauna

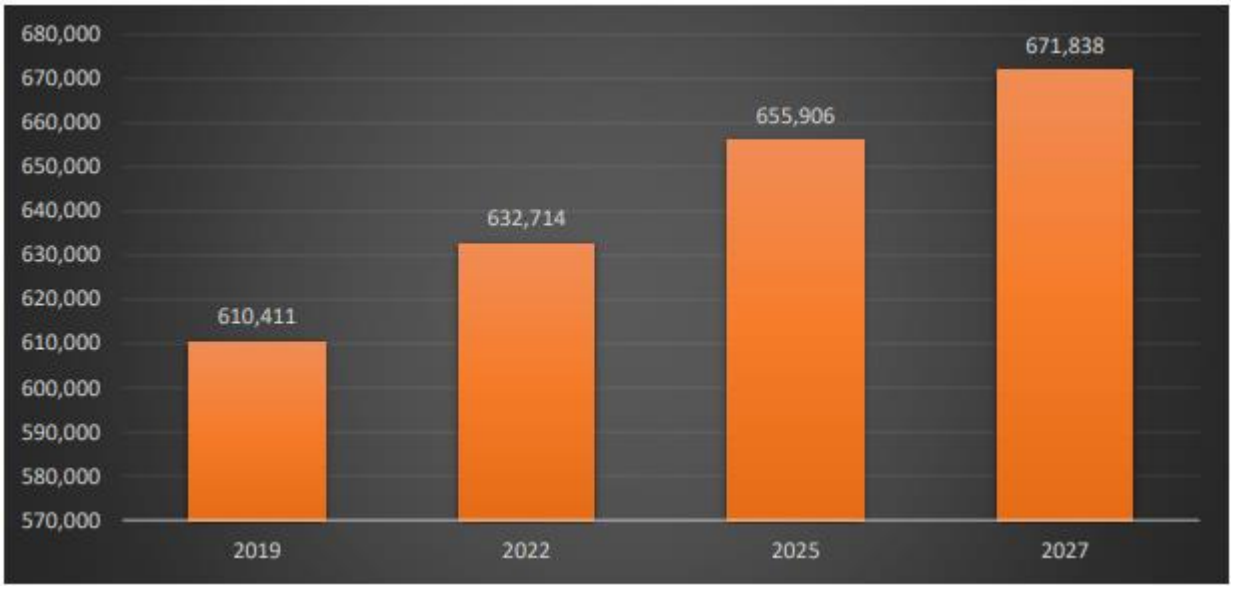
During the site visit there was no fauna observed.

3.4 Socio-economic environmental setting

3.4.1 Population

According to the National Census of 2019, Kirinyaga County is home to a population of 610,411 individuals. Projections indicate that this population is expected to grow to 671,838 by the year 2027. As a result, the establishment of the SAIC will cater to a sustainable consumer population. The dominant community in the county is the Kikuyu, and the primary religion practiced by the residents is Christianity.

Figure 3. 2 Population Projections



3.4.2 Land use and Local economy

Due to its advantageous combination of fertile soils, favorable climate, and strategic location in central Kenya, Kirinyaga County has emerged as a highly profitable region in the country. The county is renowned for its agricultural activities, particularly tea, coffee, and rice farming. With a growing population and the emergence of a middle class, the county provides a conducive economic environment for the establishment of an industrial park.

Kirinyaga County makes a significant contribution to Kenya's GDP, accounting for approximately 1.4%. The Gross County Product (GCP) of the county stands at Kshs. 100.8 Billion. The economy of the county has been experiencing a steady growth rate of 5% per annum (KNBS, 2019).

Among the top five sectors that contribute significantly to Kirinyaga's GCP are agriculture, forestry and fishing, transport and storage, financial and insurance services, water supply and waste collection, and manufacturing. These sectors play a crucial role in the economic prosperity of the county.

Table 2: Summary of Current Land Use in Kirinyaga County

Category	**Area(Km2)**
Total area	1478.1
Arable area	810.7
Non-arable area	307.4
Water mass	0.7
Urban area	84.2

3.4.2.1 Mean Land holding size

The arable land in Kirinyaga County spans an area of 810.7 square kilometers, while non-arable land covers 307.4 square kilometers. Water bodies, including dams, ponds, and rivers, occupy 0.7 square kilometers of the county's territory. The county is home to a total of 154,220 households, and its overall land area measures 1478.1 square kilometers. Consequently, the mean land holding size per household is calculated to be 0.0958 hectares.

In the lower regions of the county, specifically within Mwea Constituency, the average land holdings tend to be larger. Conversely, in the central and upper regions of Gichugu, Ndia, and Kirinyaga Central Constituencies, the average land holdings are relatively smaller.

3.4.3 Infrastructure and Access

Roads and Rail Network: Kirinyaga County benefits from an established road network that includes seven major tarmac roads traversing its territory. These roads are the Makutano – Embu road, Kutus – Karatina road, Baricho road, Kiburu road, Kutus – Sagana road, Kutus – Kianyaga road, and Kabare – Kimunye road. However, it is important to note that the gravel and earth surfaced roads in several areas become impassable during the rainy season due to inadequate maintenance, insufficient drainage, and unstable soils.

Within the county, there is a 5-kilometer railway line and a railway station situated in Ndia Constituency. Additionally, there is an underutilized airstrip located in Mwea Constituency, serving as the county's sole air transportation facility.

Posts and Telecommunications: The mobile phone coverage in Kirinyaga County is extensive, reaching an impressive 99 percent of the population. As for fixed lines, there are a total of 693 units in operation. The county also boasts 5 sub-post offices and 25 cyber cafes, contributing to the accessibility of postal and internet services. Moreover, there has been a noticeable increase in the utilization of computers and internet connectivity in government offices, private businesses, and residential households. This trend can be attributed to the availability of portable modems and the affordability of computers and laptops.

In terms of courier services, there are five private companies operating within the county. These courier services are mostly associated with Public Service Vehicles (PSV) and facilitate the delivery of parcels to and from major towns across the country. Some of the prominent courier services include Kukena Travelers Sacco, 4NTE Sacco, 2NK Sacco, Karombu Sacco, Emuki Sacco, Mt. Kenya Sacco, Supreme Sacco, G4S Courier Services, and Wells Fargo Courier Services.

3.4.4 Financial Institutions

Kirinyaga County is well-served in terms of banking services, with a total of 21 branches belonging to major commercial banks. These include prominent institutions such as Equity Bank, KCB, Co-

operative Bank, Barclays Bank, Family Bank, K-rep Bank, and Faulu Bank. Additionally, there are 8 microfinance institutions, 18 building societies, and 5 branches of insurance companies operating within the county. This diverse range of financial institutions caters to the various needs of the local population.

The county has experienced a growth in agency banking, with a registered number of 58 agents. This indicates the increasing popularity and convenience of agency banking services, providing additional accessibility to financial services for the residents. The flourishing financial sector in Kirinyaga County is a testament to the vibrant economic activities taking place, contributing to its status as one of the fastest-growing sectors within the county over the past five years.

3.4.5 Education Institutions

Within Kirinyaga County, there is a wide array of educational institutions available to the community. These include approximately 348 Early Childhood Development (ECD) centers, consisting of both private and public establishments. In terms of primary education, there are 326 schools catering to students from various backgrounds. As for secondary education, there are 143 schools in operation.

The county is also equipped with one public university, providing higher education opportunities for aspiring students. There are also eleven polytechnic university colleges, further enhancing the educational landscape and offering specialized training in various fields.

3.4.6 Energy Access

Electricity is readily available in all the prominent towns and urban centers within Kirinyaga County, including Kerugoya, Sagana, Wang'uru, Kianyaga, Kimunye, Kagio, Kutus, and Kagumo. The primary source of energy for the majority of households in the county is firewood, which is utilized by 105,756 households. Following firewood, charcoal and gas are used by 59,579 households and 28,987 households, respectively.

While electricity is accessible to a limited number of rural homes, with 11,652 households having access, there are still several trading centers that remain unconnected to the national power grid. This highlights the ongoing need to improve access to electricity in these areas and explore alternative sources of energy to reduce reliance on traditional biomass fuels.

3.4.7 Markets and Urban Centres

Kirinyaga County is home to a total of 143 trading centers, accommodating 7,361 registered retail traders and 19 registered wholesale traders. Among these, Kerugoya, Sagana, and Wang'uru are the designated towns, while Kagio and Kagumo serve as urban centers. The development and expansion of these towns and urban centers primarily rely on the agricultural subsector.

Wang'uru, the most populous town in the county, thrives on rice and horticulture cultivation within the vast Mwea irrigation scheme. Kerugoya, the second most populous town, has experienced significant growth due to its status as the district administrative headquarters. This has positioned Kerugoya as the economic hub of the county, attracting various financial institutions. On the other hand, Sagana, the least populous town, relies on mining activities such as sand, stone, and ballast extraction. Additionally, its location along the Nairobi-Nyeri highway provides a convenient market for travelers.

Among the urban centers, Kagio boasts the highest population, closely followed by Kagumo. These urban centers owe their growth to the presence of vibrant agricultural markets. These towns and urban centers suffer from inadequate planning, lacking basic sewerage systems, and proper solid waste management infrastructure.

3.4.8 Housing

Housing in the county is categorized based on the materials used for walls and construction. According to the Kenya Population and Housing Census of 2009, there were a total of 53,073 houses constructed with wood walls, 37,396 houses with stone walls, 28,517 houses with mud/wood walls, and 25,880 houses with brick/block walls.

In terms of floor materials, the census data reveals that the most prevalent flooring option is earth, with 92,239 houses using this material. Cement is the second most common flooring material, found in 60,133 houses. Wood and tiles are less commonly used, with 735 and 680 houses respectively having these materials for flooring.

CHAPTER FOUR

RELEVANT POLICY, PLAN, LEGISLATIVE AND REGULATORY FRAMEWORK

4.1 Introduction

This chapter provides an in-depth analysis of the policy, legal, regulatory, and institutional landscape in Kenya, specifically focusing on environmental management, protection, and assessment as they relate to the proposed project. The project will be obligated to comply with the extensive body of laws, regulations, guidelines, and standards established by the Government of Kenya. It is essential to note that in situations where conflicts arise between different laws, the Environmental Management and Coordination Act (EMCA) takes precedence, ensuring that environmental considerations remain at the forefront of decision-making processes.

4.2 Government of Kenya Policy Framework

The application of national statutes and regulations pertaining to environmental conservation underscores the legal obligation and responsibility of project owners to responsibly manage and dispose of waste materials in a manner that safeguards public health and safety, while also preserving the receiving environment. In this context, conducting a SESA for the proposed project becomes crucial, as it establishes a baseline for ensuring its sustainable operation upon its eventual commissioning.

The Sagana Ago Industrial Park project demonstrates compliance with the government's policy framework by adhering to the requirement of conducting an SESA study prior to commencing any civil works associated with the project. This proactive approach aligns with the project proponent's commitment to upholding environmental standards and aligning with regulatory requirements from the outset.

4.3 The Constitution of Kenya 2010

The Constitution of Kenya, which came into effect on September 27, 2010, serves as the supreme law of the Republic, providing a comprehensive framework that regulates both current and future development aspects of Kenya. All national and sectoral legislative documents are derived from and guided by this constitutional framework.

Within the Constitution, the Bill of Rights includes Section 42, which guarantees every individual the right to a clean and healthy environment. This encompasses the right to environmental protection for the benefit of present and future generations through legislative and other measures, as outlined in Article 69, and the fulfillment of environmental obligations under Article 70.

Chapter 5 of the Constitution, titled "Land and Environment," forms the foundation for the 77 environmental statutes in Kenya. It encompasses key provisions related to land policy, land

classification, land use, property, and the environment. Part 1 of the Chapter focuses on land, establishing principles that inform land policy and its utilization, while Part 2 emphasizes the environment and natural resources.

This chapter outlines the state's obligations concerning the environment and aims to eliminate processes and activities that pose risks to the environment. Article 69 obligates the State to ensure the sustainable exploitation, utilization, management, and conservation of the environment and natural resources, with equitable sharing of benefits. It also emphasizes the importance of maintaining a minimum tree cover of ten percent of the land area, protecting biodiversity and indigenous knowledge, promoting public participation, establishing systems for environmental impact assessment, audit, and monitoring, and utilizing natural resources for the benefit of the people of Kenya.

The Constitution further addresses enforcement of environmental rights and the establishment of environmental legislation in accordance with the guidelines provided. According to Section 70, if an individual alleges a violation or threat to their right to a clean and healthy environment, they can seek redress through the courts and request appropriate orders or directions to prevent harmful acts, compel public officers to take necessary measures, or provide compensation to victims of environmental violations. It is important to note that an applicant is not required to demonstrate loss or injury.

In line with the 2010 Constitution of Kenya, any activity or project undertaken within the country must align with the state's vision for the national environment and respect every individual's right to a clean and healthy environment. Section 72 of the Constitution allows for the enactment of laws to enforce any new provisions of the Supreme Law.

The proposed project demonstrates compliance with the Constitution by incorporating a framework in its Environmental and Social Impact Assessment (ESIA) that addresses social, health, safety, and environmental protection, aligning with the constitutional and legal requirements outlined in the Environmental Management and Coordination Act (EMCA) of 1999. The project's ESIA ensures that environmental considerations and protection are an integral part of the project's planning and implementation.

4.4 The Kenya Vision 2030

Kenya Vision 2030 is a comprehensive development program spanning from 2008 to 2030, with the objective of transforming Kenya into a newly industrialized, middle-income country that experiences a sustained annual growth rate of 10% by 2030.

The vision was formulated through a participatory and inclusive process, engaging stakeholders from all regions of Kenya. It is built upon three pillars: Economic, Social, and Political. In urban areas, the goal for 2030 is to ensure a well-housed population living in environmentally secure urban environments. This will be accomplished by providing essential infrastructure and services such as roads, street lights, water and sanitation facilities, stormwater drains, footpaths, and other necessary amenities. Moreover, the promotion of environmental conservation, pollution control, and waste management is vital and can be achieved by employing appropriate economic incentives in development initiatives.

To attain the objectives outlined in Kenya Vision 2030, the Kenyan government has adopted Medium-Term Plans (MTP). These plans serve as roadmaps for implementing various policies and strategies aligned with the vision's goals.

The realization of the proposed project represents a significant step toward fulfilling the aspirations of Kenya Vision 2030. By providing essential trading infrastructure, the project will create employment opportunities for the Kenyan population and stimulate economic growth across the country. It contributes to the overall development objectives outlined in the vision, bringing Kenya closer to achieving its long-term socioeconomic targets.

4.5 The County Government Act, 2012

The County Government Act of 2012 plays a significant role in Kenya's devolved governance structure, aligning with the provisions of the Constitution. The Act emphasizes the County Integrated Development Plan (CIDP) as a crucial instrument for county administration, mandating that all public spending must align with the plan. The CIDP encompasses the economic plan, physical plan, social environmental plan, and spatial plan. In the case of Kirinyaga County, they have developed a CIDP for the period of 2022 to 2027.

The Urban Areas and Cities Act outlines specific requirements for cities and urban areas, including the development of plans. It also designates the County Government as responsible for functions stated in Article 186 and assigned in the Fourth Schedule of the Constitution. These functions encompass the control of air pollution, noise pollution, management of public nuisances, and regulation of outdoor advertising.

To ensure compliance with the County Government Act of 2012, the project proponent will take measures to control all forms of pollution. This commitment aligns with the responsibilities assigned to the County Government under the Act. Furthermore, the project report includes an Environmental and Social Management/Monitoring Plan, which outlines measures for mitigating potential environmental pollution resulting from the project's development. This demonstrates the

project's commitment to adhering to the relevant laws and regulations while minimizing any negative environmental impacts.

4.6 Legal and Regulatory Framework

The Environment Management and Coordination Act No 8, 1999 and the Amendment Act No 5, 2015

The Environmental Management and Coordination (Amendment) Act 2015 No 5 of 2015 came into effect on June 17, 2015, with the purpose of amending the Environmental Management and Coordination Act of 1999. This amendment aligns the EMCA Act 1999 with the provisions of the Constitution of Kenya (2010), particularly with regard to the establishment of county governments and their involvement in environment and natural resource management. The EMCA Act is a parliamentary legislation that establishes a suitable legal and institutional framework for environmental management and related matters.

The main objectives of the Act are to enhance the legal and administrative coordination of various sectoral initiatives in the field of environment, thereby strengthening the national capacity for effective environmental management. Additionally, the Act aims to harmonize the 77 sector-specific environmental legislations in order to ensure comprehensive environmental protection. Serving as the principal environmental legislation in Kenya, the EMCA Act provides the legal framework for environmental management.

Part II of the Act emphasizes that every individual in Kenya has the right to a clean and healthy environment and bears the responsibility of safeguarding and enhancing the environment. Part VI of the Act mandates that any proponent of a new project, activity, or operation must undertake a Strategic Environmental Assessment (SEA). The proponent is required to prepare a report and submit it to the National Environmental Management Authority (NEMA), which may issue the necessary licenses or permits. Existing projects are obligated to conduct annual Environmental Audits (EA).

Section 58 of the Act specifies that irrespective of any approvals, permits, or licenses obtained under this Act or any other prevailing laws in Kenya, project proponents must submit a project report to the Authority before initiating or financing any undertaking listed in the second schedule of the Act. The report should contain the prescribed information and be accompanied by the relevant fee.

Sections 68 and 69 of the EMCA Act stipulate that ongoing projects must undergo an Environmental Assessment (EA) to identify any adverse environmental impacts resulting from the project activities and propose suitable mitigation measures. The EA process is further outlined in Regulation 35 (1) and (2) of Legal Notice 101 of June 2003. The EMCA Act of 2015 empowers

NEMA to issue guidelines and regulations governing the conduct of Environmental and Social Impact Assessments (ESIAs) as well as general environmental protection. These guidelines, including those outlined in the Contracts for Construction, bind contractors to undertake mitigation measures alongside their construction work. NEMA has published legal tools that govern the conduct of ESIAs and ensure overall environmental protection.

The proposed project falls within the scope of the EMCA Act and has undergone screening against the relevant legal tools, triggering five of them, as indicated in table 2. This demonstrates the project's compliance with the requirements outlined in the Act.

Table 3: Analysis of the Project triggers the EMCA and its tools

Legal Tool	Status	Trigger mechanism
SESA and Audit regulations	Triggered	SESA Study has to conform to these rules
Waste Management Regulations	Triggered	Construction likely to generate solid
Water Quality Regulations	Triggered	Water for construction will be drawn from rivers or other sources and have to adhere to ensuring water quality is observed
Conservation of Biodiversity regulations	Not Triggered	These regulations focus more on benefit sharing in biodiversity conservation.
National Sand Harvesting Regulations	Triggered	Construction works will require concrete mixture which shall include sand
Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009 Legal Notice No. 61:	Triggered	Both construction activities and construction equipment likely to generate noise
Air Quality Regulations (2014)	Triggered	Both construction activities and construction equipment likely to generate air pollution

To ensure contractors are legally obligated to implement mitigation measures during construction, the guidelines should be incorporated into the Contracts for Construction. A brief review of the EMCA tools applicable to the proposed project's construction is provided.

National policy for protection and response to gender-based violence, 2014

The policy framework outlined in this document is crucial for expediting the implementation of laws, policies, and programs aimed at preventing and responding to instances of gender-based violence (GBV). It emphasizes the role of both state and non-state actors in creating a societal environment where individuals of all genders can live a life free from any form of violence. The ultimate goal is to achieve a society where boys, girls, women, and men are protected from GBV and can thrive without fear of harm.

National Construction Authority Act No.41, 2011

The primary objective of the act is to establish and define the powers and functions of the National Construction Authority, along with its associated purposes. The National Construction Authority plays a crucial role in overseeing and coordinating the construction sector, as outlined in section 5(1). Its mandate, as specified in section 6(1), encompasses various responsibilities. These include setting out application requirements and procedures for the registration of construction firms and individuals engaged in construction contracts, as stated in section 19. The act also outlines punitive measures for individuals who violate its provisions, as described in section 15. By enacting this legislation, the aim is to effectively regulate the behavior and practices of contractors and other stakeholders in the construction industry, thereby promoting enhanced efficiency and professionalism.

Environmental Impact Assessment and Audit Regulations, 2003 and the amended ESIA Regulation, 2019

The Environmental and Social Impact Assessment (ESIA) is recognized as a crucial tool for promoting environmental conservation and is an integral part of implementing new projects. In Kenya, there are legislative measures in place that mandate the conduction of ESIA for every new project, activity, or program (as outlined in the EMCA). The resulting report is submitted to the National Environmental Management Authority (NEMA) for approval and the issuance of relevant certificates. These regulations establish the procedures for conducting an ESIA study and define the parameters that need to be evaluated during the assessment. They also provide guidance on the payment of ESIA license fees, the conduct of environmental audits, and the development of project monitoring plans.

Significantly, these guidelines specify that no project proponent should proceed with implementing a project that could have a negative environmental impact. The ESIA report presented here adheres to the Environment (Impact Assessment and Audit) Regulation of 2003, which operationalizes the Environment Management & Coordination Act (EMCA) of 1999, as well as its subsequent amendment, the Environmental Management and Coordination Act (Amendment) of 2015. The

report is prepared in accordance with the requirements stipulated in the Act and its amendment, as well as the Environmental Impact Assessment and Audit Regulations of 2003, specifically Regulation 7(1) and the second schedule.

Environmental Management and Coordination (Waste Management) Regulations, 2006

The regulations encompass comprehensive guidelines for the management of various waste streams, including domestic waste, industrial waste, hazardous and toxic waste, pesticides and toxic substances, biomedical waste, and radioactive waste. They address crucial aspects such as handling, storage, transportation, treatment, and disposal of these waste streams.

Under Regulation No. 4(1), it is considered an offense for any individual to dispose of waste in public areas such as highways, streets, roads, recreational areas, or any public place unless it is done in a designated waste receptacle. This provision emphasizes the importance of proper waste disposal practices and discourages littering.

Furthermore, Regulation 5(1) highlights the adoption of cleaner production methods by waste generators to minimize waste generation. These methods include improving the production process by conserving raw materials and energy, eliminating the use of toxic raw materials and waste, and reducing toxic emissions and wastes. Additionally, it encourages monitoring the product cycle from start to finish, identifying and mitigating potential negative impacts, facilitating the recovery and re-use of products when feasible, and incorporating environmental considerations into product design and disposal.

These regulations aim to promote responsible waste management practices, minimize environmental harm, and encourage sustainable approaches throughout the entire lifecycle of products.

The Proponent shall ensure that the main contractor adopts and implements all possible cleaner production methods during the construction phase of the project. Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 14 (1) requires every trade or industrial undertaking to install at its premises anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking. Regulation 15 prohibits any industry from discharging or disposing of any untreated waste in any state into the environment.

Under Regulation 17(1), it is deemed an offense for any individual to partake in activities that are likely to generate hazardous waste without possessing a valid Environmental Impact Assessment (EIA) license issued by the National Environmental Management Authority (NEMA). This

regulation emphasizes the need for proper assessment and authorization for activities that may result in hazardous waste generation.

According to Regulation 18, all generators of hazardous waste are obligated to ensure that each container or package used for storing such waste is labeled appropriately. The label should contain specific information, including the identity of the hazardous waste, the name and address of the waste generator, the net contents of the container, details regarding the storage stability and methods, the name and weight percentage of active ingredients, and any relevant cautionary statements or information regarding radioactive materials.

Furthermore, Regulation 19(1) requires every individual who generates toxic or hazardous waste to either treat the waste themselves or ensure that it undergoes appropriate treatment. This regulation underscores the importance of responsible waste management practices and the need to mitigate the potential risks associated with toxic or hazardous waste.

These regulations aim to enforce the proper handling, storage, and disposal of hazardous waste, as well as promote transparency and accountability in waste management processes. By obtaining an EIA license, labeling containers correctly, and ensuring proper treatment of hazardous waste, individuals and organizations contribute to the protection of human health and the environment.

During the construction phase of the project, the Proponent shall ensure that the main contractor implements the above-mentioned measures as necessary to enhance sound environmental management of waste.

Environmental Management and Coordination (water quality) Regulation 2006

The Regulations encompass provisions for the sustainable management of water resources, focusing on the prevention of water pollution and the protection of various water sources such as lakes, rivers, streams, springs, wells, and others. Regulation No. 4(2) establishes that it is an offense for any individual to introduce or allow the flow of any liquid, solid, or gaseous substance into or near a water resource in a manner that causes pollution.

Under Regulation No. 11, it is deemed an offense for any person to discharge or apply any poison, toxic, noxious, or obstructing matter, as well as radioactive waste or other pollutants into the aquatic environment. Exceptions to this offense exist only when the discharge or presence of such substances complies with the standards set for effluent discharge into the environment.

Moreover, Regulation No. 14(1) stipulates that all licensed individuals or entities responsible for generating and discharging effluent into the environment must conduct daily monitoring of the quality and quantity of the discharged effluent. Furthermore, they are required to submit quarterly

records of the monitoring to the National Environmental Management Authority (NEMA) or its designated representatives.

These regulations aim to ensure the sustainable and responsible management of water resources by preventing water pollution and safeguarding the integrity of water sources. By imposing strict prohibitions on the introduction of harmful substances into water bodies and enforcing regular monitoring and reporting requirements, the regulations seek to protect the environment and preserve the quality of water resources for present and future generations.

The proponent will have to ensure that appropriate measures to prevent pollution of underground and surface water sources are implemented throughout the project cycle.

Part of the study involves a review of the environmental standards that provides a basis for monitoring and future audits. The table below presents recommended guidelines on wastewater quality for discharge into the public sewers and open water bodies.

Table 4: Standards for Discharge into public sewers (mg/l)

Parameter	**Maximum Levels Permissible**
Suspended solids (mg/L)	250
Total dissolved solids (mg/L)	2000
Temperature 0C	20 - 35
pH	6-9
Oil and Grease (mg/L) -where conventional treatment shall be used	10
Oil and Grease (mg/L)- where ponds is a final treatment method	5
Ammonia Nitrogen (mg/L)	20
Substances with an obnoxious smell	Shall not be discharged
Biological Oxygen Demand BOD5 days at 20 oC (mg/L)	500
Chemical Oxygen Demand COD (mg/L)	1000
Arsenic (mg/L)	0.02
Mercury (mg/L)	0.05
Lead (mg/L)	1.0
Cadmium (mg/L)	0.5

Parameter	Maximum Levels Permissible
Chromium VI (mg/L)	0.05
Chromium (Total) (mg/L)	2.0
Copper (mg/L)	1.0
Zinc (mg/L)	5.0
Selenium (mg/L)	0.2
Nickel (mg/L)	3.0
Nitrates (mg/L)	20
Phosphates (mg/L)	30
Cyanide Total (mg/L)	2
Sulphide (mg/L)	2
Phenols (mg/L)	10
Detergents (mg/L)	15
Colour	Less than 40 Hazen units
Alkyl Mercury	Not Detectable (nd)
Free and saline Ammonia as N (mg/L)	4.0
Calcium Carbide	Nil
Chloroform	Nil
Inflammable solvents	Nil
Radioactive residues	Nil
Degreasing solvents of mono-di-trichloroethylene type	Nil

Table 5: Standards for Discharge into Environment (Water body)

Parameter	Max. Allowable (Limits)
1,1,1-trichloroethane (mg/l)	3
1,1,2-trichloroethane (mg/l)	0.06

Parameter	Max. Allowable (Limits)
1,1-dichloroethylene	0.2
1,2-dichloroethane	0.04
1,3-dichloropropene (mg/l)	0.02
Alkyl Mercury compounds	Nd
Ammonia, ammonium compounds, NO3 compounds and NO2 compounds (Sum total of ammonia-N times 4 plus nitrate-N and Nitrite-N) (mg/l)	100
Arsenic (mg/l)	0.02
Arsenic and its compounds (mg/l)	0.1
Benzene (mg/l)	0.1
Biochemical Oxygen Demand (BOD 5days at 20 oC) (mg/l)	30
Boron (mg/l)	1.0
Boron and its compounds – non marine (mg/l)	10
Boron and its compounds –marine (mg/l)	30
Cadmium (mg/l)	0.01
Cadmium and its compounds (mg/l)	0.1
Carbon tetrachloride	0.02
Chemical Oxygen Demand (COD (mg/l)	50
Chromium VI (mg/l)	0.05
Chloride (mg/l)	250
Chlorine free residue	0.10
Chromium total	2
cis –1,2- dichloro ethylene	0.4
Copper (mg/l)	1.0
Dichloromethane (mg/l)	0.2
Dissolved iron (mg/l)	10

Parameter	**Max. Allowable (Limits)**
Dissolved Manganese(mg/l)	10
E.coli (Counts / 100 ml)	Nil
Fluoride (mg/l)	1.5
Fluoride and its compounds (marine and non-marine) (mg/l)	8
Lead (mg/l)	0.01
Lead and its compounds (mg/l)	0.1
n-Hexane extracts (animal and vegetable fats) (mg/l)	30
n-Hexane extracts (mineral oil) (mg/l)	5
Oil and grease	Nil
Organo-Phosphorus compounds (parTanaon, methyl parTanaon, methyl demeton and Ethyl parantrophenyl phenylphosphorothroate, EPN only) (mg/l)	1.0
Polychlorinated biphenyls, PCBs (mg/l)	0.003
pH (Hydrogen ion activity----marine)	5.0-9.0
pH (Hydrogen ion activity--non marine)	6.5-8.5
Phenols (mg/l)	0.001
Selenium (mg/l)	0.01
Selenium and its compounds (mg/l)	0.1
Hexavalent Chromium VI compounds (mg/l)	0.5
Sulphide (mg/l)	0.1
Simazine (mg/l)	0.03
Total Suspended Solids, (mg/l)	30
Tetrachloroethylene (mg/l)	0.1
Thiobencarb (mg/l)	0.1
Temperature (in degrees celsius) based on ambient temperature	± 3
Thiram (mg/l)	0.06

Parameter	Max. Allowable (Limits)
Total coliforms (counts /100 ml)	30
Total Cyanogen (mg/l)	Nd
Total Nickel (mg/l)	0.3
Total Dissolved solids (mg/l)	1200
Color in Hazen Units (H.U)	15
Detergents (mg/l)	Nil
Total mercury (mg/l)	0.005
Trichloroethylene (mg/l)	0.3
Zinc (mg/l)	0.5
Whole effluent toxicity	
Total Phosphorus (mg/l)	2 Guideline value
Total Nitrogen	1 Guideline value

Sources: EMC (Water Quality) Regulations, 2006.

EMC (Air Quality) Regulations, 2014

The regulation in question is known as "The Environmental Management and Coordination (Air Quality) Regulations, 2014." Its primary objective is to prevent, control, and mitigate air pollution in order to maintain clean and healthy ambient air. The regulation establishes emission standards for various sources, including both mobile sources such as motor vehicles and stationary sources such as industries. Additionally, it covers any other sources of air pollution as determined by the Minister in consultation with the Environmental Management and Coordination Authority.

The regulations set specific emission limits for different areas and facilities. Prohibited actions under these regulations include:

- Engaging in activities that directly or indirectly cause, or have the potential to cause, air pollution levels to exceed the limits specified in the second schedule of the regulations.
- Permitting the release of particulate emissions into the atmosphere from sources not listed in the sixth schedule of the regulations.
- Allowing ambient air quality in controlled areas (listed in Schedule Thirteen) to exceed the limits specified in the second schedule.

- Permitting the emission of particulate matter above the limits stipulated in the second schedule during construction and demolition activities.
- Allowing the stockpiling or storage of materials in a manner likely to cause air pollution.
- Permitting emissions of oxides of nitrogen to exceed the limits specified in the eleventh schedule of the regulations.

By implementing these regulations, the aim is to ensure that air pollution is effectively controlled and maintained within acceptable levels. This helps safeguard public health, protect the environment, and promote the overall well-being of communities. Compliance with these regulations is crucial for maintaining clean and healthy ambient air quality in line with national environmental objectives.

Climate Change act, 2016

The purpose of this act is to facilitate the advancement, governance, execution, and oversight of strategies aimed at promoting sustainable development in Kenya through climate change resilience and low carbon development. It provides a framework for the development, management, implementation, and regulation of mechanisms that contribute to building resilience against climate change impacts and promoting the adoption of low carbon practices. By integrating climate change considerations into various sectors and fostering sustainable development, this act aims to create a more sustainable and climate-resilient future for Kenya.

The proponent shall comply with the provision of the Climate Change Act, 2016 by installation of energy efficient pwer systems and adoption of climate smart technologies in the industrial park.

Environmental Management and Coordination (Noise and Excessive Vibrations Pollution Control) Regulations, 2009

The regulations encompass a comprehensive definition of noise, characterizing it as any sound that is objectionable or has the potential to adversely impact human health or the environment. They explicitly prohibit individuals from creating or causing to be created loud, unreasonable, unnecessary, or unusual noises that disrupt the comfort, tranquility, well-being, or safety of others and the surrounding environment.

In accordance with Article 13(2)(d) of the regulations, limited exceptions are granted for nighttime construction activities related to public utility projects, construction of public infrastructure, and endeavors specifically associated with roads, bridges, airports, public schools, and sidewalks. However, it is crucial to note that noise generation should not occur within residential buildings or extend beyond residential property boundaries in a manner that disturbs the general public's comfort, tranquility, or safety. The second Schedule of the Regulations delineates the maximum

allowable noise levels applicable to construction sites. These provisions aim to strike a balance between necessary construction activities and the protection of public well-being and environmental quality.

Table 6: Maximum permissible noise levels for construction sites

Facility		Maximum Noise level permitted (leq) in dB (A)	
		Day (6.01am-6.00pm)	Night (6.01 pm-6.00am)
(i)	Health facilities, educational institutions, homes for disabled and residential areas	60	35
(ii)	Residential	60	35
(iii)	Areas other than those prescribed in (i) and (ii)	75	65

**Measurement taken within the facility*

According to section 15 of the Regulations, the Proponent is obligated to undertake specific actions during the conduct of the Strategic Environmental Assessment (SEA) studies. These actions include:

- Identification: The Proponent must identify natural resources, land uses, or activities that may be impacted by noise or excessive vibrations resulting from construction or demolition activities.
- Assessment of Measures: The Proponent is required to assess the necessary measures that should be incorporated into the plans and specifications to minimize or eliminate any adverse impacts of construction or demolition noise or vibrations.
- Implementation of Abatement Measures: The identified abatement measures must be incorporated into the plans and specifications to effectively mitigate any potential adverse impacts.

Considering the proximity of the proposed project to residential areas and businesses, it is anticipated that noise and/or vibration will be generated during the construction phase, stemming from construction equipment, vehicles, and workers. Consequently, it is strongly recommended that the construction team implements suitable mitigation measures to minimize the propagation of noise in the project area. By doing so, the project can effectively address any potential noise-related concerns and ensure a harmonious coexistence with neighboring homesteads and businesses.

The provisions of this Act will be applied by the proponent in the management of the where the contractor will be required to adhere to the provisions of this regulation.

EMC (Noise and Excessive Vibration) Regulations, 2014

The following guidelines will be used to monitor noise levels, especially during the construction stage of the project.

Table 7: Comparison between WHO and NEMA Noise Guidelines

Specific Environment	Critical Health Effects	LAeq dB(A) WHO	Time base (hours)	LAeq dB(A) NEMA	Time base (hours)
Outdoor living area	Serious annoyance Moderate annoyance	55 50	16 16	45 35	14 14
Indoor dwelling Inside bedroom	Speech interference Sleep disturbance	35 30	16 8	-	-
Outdoor bedroom	Sleep disturbance	45	8	35	-
School classroom Indoor	Speech and communication	35	During class time	Day 60 Night 35	14 14
School playground outdoor	Annoyance External	55	During play	45	Day
Hospital, treatment room indoor	night time daytime	30 30	8 16	-	-
Industrial, Commercial and traffic areas	Hearing impairment	70	24	60	12
Ceremonies, festivals entertainment events	Hearing impairment	100	4	-	-

The provisions of this Act will be applied by the Proponent in the management of the project where the contractor will be required to adhere to the guidelines to reduce the possibility of adverse noise and vibration impacts to human health. The regulation stipulates that the acceptable standard day and night noise levels should not exceed 65dBa and45 dBa respectively.

The Urban Areas and Cities Act 2011

Enacted in 2011, this law provides the legal foundation for classifying urban areas based on population thresholds. It designates an area as a City when its population exceeds 500,000, as a Municipality when it surpasses 250,000, and as a Town when it exceeds 10,000 inhabitants. Additionally, the law requires Cities and Municipalities to formulate County Integrated Development Plans, which serve as the central pillar in the public administration of these areas, as stated in Article 36 of the Act.

The County Integrated Development Plan encompasses various crucial aspects, serving as the basis for:

- Environmental management, including the preparation of property valuation rolls for property taxation plans.
- Provision of physical and social infrastructure, as well as transportation.
- Preparation of annual strategic plans for Cities or Municipalities.
- Disaster preparedness and response.
- Overall service delivery, encompassing water, electricity, health, telecommunications, and solid waste management.
- Development of a geographic information system for effective planning.

According to Article 39, the Strategy Plan, denoting an annual plan, is adopted by the county assembly following the Integrated Development Plan. The law stipulates that the board of the town committee must formulate the Strategy Plan soon after the adoption of the Integrated Development Plan.

The Integrated Development Plan, as mandated by the Act, should reflect several key elements, including a long-term vision for the city or urban area's development, an assessment of the existing level of development, affirmative action measures, development priorities and objectives, development strategies aligned with national or county sectoral plans and planning requirements, a spatial development framework, operational strategies, applicable disaster management plans, a regulated city and municipal agricultural plan, a financial plan, and key performance indicators with associated targets, as specified in Article 40.

Once the Integrated Development Plan is formulated, it must be submitted to the county executive committee, and within 30 days, the committee is required to present the plan to the county assembly along with their opinion, as outlined in Article 41. The proposed project adheres to the County

Integrated Development Plan, integrating with urban areas and complying with all the regulations set forth in the Act.

The project complies with the urban area and other cities that are integrated in the County integrated Development plan, and will comply with all the regulations set in the Act.

The National Land Commission Act (2012)

As per Section 5 of the Act, the Commission is entrusted with several essential functions. These include the management of public land, making recommendations on national land policy, providing advisory services to the Government of Kenya (GoK) regarding land registration programs, conducting research on land use and natural resources, and overseeing land use planning across the entire country.

Furthermore, Section 5 emphasizes that the National Land Commission (NLC) has a crucial responsibility to ensure the sustainable management of state-owned land for the benefit of future generations. By carrying out its functions diligently, the NLC plays a vital role in safeguarding and preserving land resources to meet the needs of present and future generations in a sustainable manner.

The project will be subjected to this act by ensuring the land used is land that has no encumbrances to be used for establishing the Sagana industrial park.

Traffic Act Chapter 403

This Act serves as a comprehensive consolidation of laws pertaining to traffic on public roads. It not only regulates various aspects of road usage but also addresses the prohibition of encroachment on and damage to roads, including the protection of land specifically designated for road purposes. By encompassing these provisions, the Act aims to ensure the orderly and safe use of public roads while preserving their integrity and functionality.

The proposed project is under the provisions of the Act, in that it will utilize the roads near the project.

The Water Act, 2002

The Act establishes the State's ownership of water resources and provides regulations for water management, encompassing areas such as irrigation, pollution control, drainage, flood control, and water abstraction. It serves as the primary legislation governing water usage. Regarding the proposed project, water will be required for construction purposes, potentially sourced from the local water provider and nearby rivers. Additionally, significant volumes of surface run-off will be generated during project operations, with drainage systems designed to discharge into nearby

rivers. Thus, these water sources will play a crucial role in supplying water for construction and receiving surface run-off from the project.

The contractor shall ensure that there will be no contaminated water that will be discharged into the drainage channels and will seek the necessary permits to abstract the water from the rivers, or any other sources, and shall abide by the conditions attached to the permit(s).

The Water Resources Management Regulations (2007)

The Rules outlined in Legal Notice Number 171 of the Kenya Gazette Supplementary Number 52 of 2007 govern all water resources and bodies in Kenya, encompassing lakes, watercourses, streams, rivers (perennial or seasonal), aquifers, and coastal channels leading to territorial waters. These rules grant the Water Resources Management Authority (WARMA) the authority to enforce management controls on riparian land use. They also provide a mechanism for individuals to lodge complaints regarding matters covered by these rules to the appropriate office within WARMA, as outlined in the Tenth Schedule. This schedule includes a complaint report format. Upon receiving a complaint, WARMA is required to respond to the complainant within twenty-one days, sharing copies of the response with all relevant parties. The response should outline the actions being taken, the Authority's position on the matter, and any recommendations made to the complainant.

The proponent will use water from KIRIWASCO and has adhered to the provision of this regulation by obtaining relevant water permits from WARMA

HIV/AIDS Prevention and Control Act (Act No. 14 of 2006)

According to Part 11, Section 7 of the Act, it is mandated that HIV and AIDS education be conducted in the workplace. The government has the responsibility to ensure that essential information and guidance on HIV and AIDS prevention and control are provided to employees across various sectors, including government ministries, departments, authorities, agencies, as well as private and informal sectors. It is crucial that the information regarding HIV/AIDS is treated confidentially in the workplace, and that a positive attitude is fostered towards employees who are infected. When assigning contractors to the proposed project, the proponent must ensure that the chosen contractor complies with the law by providing such training to their workers.

The proponent has instructed the contractor to strictly adhere to the above law by having a mobile VCT center on site where workers get information on HIV/AIDS.

Occupational Safety and Health Act OSHA, 2007

The Occupational Safety and Health Act of 2007 is a legislation enacted by the Parliament to ensure the safety, health, and welfare of workers and individuals present at workplaces, both temporary and permanent. The Act applies to all types of workplaces and their associated workers. Its primary objective is to protect and promote the safety, health, and welfare of both workers and non-workers.

Part 9 of the Act specifies that when there are twenty or more employees, the occupier or employer must establish a health and safety committee. Additionally, the employer is required to create a written statement outlining their general policy regarding workplace safety and health. Furthermore, the occupier is obligated to conduct annual safety and health audits performed by a qualified professional. These measures aim to ensure compliance with safety and health standards and to maintain a safe working environment for all individuals involved.

The proponent has instructed the contractor to adhere to all Sections of the Act as it relates to this project, such as observing safety guidelines, provision of protective clothing, clean water, and insurance cover to protect all from work related injuries or other health hazards.

Work Injury Benefits Act, 2007

The Act of Parliament under discussion is designed to establish a framework for compensating employees who sustain work-related injuries or contract diseases during the course of their employment. Its primary objective is to provide a means of compensation for employees who experience such incidents and ensure their rights are protected. According to the Act, an employee is defined as an individual who has been engaged in a work arrangement where wages or a salary are provided under a contractual agreement. This definition encompasses various types of workers, including apprentices and indentured learners.

The proposed project will adhere to the provisions of this act throughout the construction period of the project.

The Public Health Act (Cap. 242)

The Public Health Act is a legislative framework that aims to safeguard human health by preventing the introduction of infectious diseases into Kenya and promoting public health within the country. It empowers local authorities to address matters affecting public health, conduct research and investigations on human diseases, and establish regulations for waste management, pollution control, and human health.

Section 115 of Part IX prohibits any person from causing a nuisance or condition that poses a risk to human health. Section 116 requires local authorities to take necessary measures to maintain clean and sanitary jurisdictions to prevent nuisances or conditions that may endanger human health. Such nuisances are defined in Section 118 and include offensive waste pipes, sewers, drains, or refuse pits that are injurious to health. Discharging noxious matter or wastewater into public areas or unauthorized channels is also considered a nuisance. The accumulation of materials or refuse that may harbor vermin is likewise deemed a nuisance.

Section 126A supplements these provisions by mandating local authorities to develop by-laws for controlling and regulating private sewers, drainage systems, and sanitary conveniences associated with buildings, cesspools, and the disposal of foul matter.

Additionally, Part XII addresses the prevention and destruction of mosquitoes. Section 136 identifies collections of water, sewage, rubbish, refuse, and other fluids that facilitate pest breeding as nuisances, subject to appropriate measures outlined in the Act.

Given the potential risks posed by the proposed project, it is crucial to implement measures to protect human and environmental health and safety. Activities generating waste, dust, noise, and air emissions must comply with the Act to prevent environmental nuisances, ensure the well-being of inhabitants, and mitigate hazards to human health and the environment.

The proponent will therefore observe the public Health act to mitigate the negative environmental health and safety to the public

The Physical Planning Act (Cap. 286)

Section 24 of the Physical Planning Act enables the development of local physical development plans, which serve as guides for infrastructure and services within the jurisdiction of County, municipal, and town councils. These plans regulate land use and provide direction on how the land in the area should be utilized.

Section 29 of the Physical Planning Act grants county councils the authority to control and prohibit the use of land, buildings, and subdivisions to ensure proper and orderly development in their respective areas. They are responsible for approving development applications, granting development permissions, and ensuring the effective implementation of approved physical development plans.

In addition, county councils have the power to establish by-laws pertaining to zoning, including regulations on the use and density of development.

In summary, Section 24 of the Physical Planning Act facilitates the creation of local physical development plans, while Section 29 empowers county councils to regulate land use, approve development applications, and enforce zoning regulations through the establishment of by-laws. These provisions contribute to the organized and controlled development within their jurisdictions.

The proposed project will adhere to this act by ensuring that the proposed project is being developed as per the plans approved by the Ministry of Lands and Physical Planning in accordance with the law.

Way Leave Act Cap 292

Section 3 of the Act grants the Government the authority to construct sewers, drains, or pipelines across any land, as long as it does not disrupt existing buildings. However, the Government must provide one month's notice before commencing such works, as outlined in Section 4. This notice should include a detailed description of the intended works and specify the location for inspection.

If any damages occur during the works, Section 8 of the Act stipulates that the owner of the affected property must be compensated. It further states that anyone who constructs a new building without consent on a designated way leave or causes obstruction along the way leave will be considered an offense, and any necessary alterations will be at their own expense.

The proponent shall observe this Way leave Act when developing or improving the sewer and drainage system for the project.

The Building Code 2009

This code serves as a comprehensive framework for construction activities, outlining rules and guidelines that must be followed. The proponent of a construction project is obligated to comply with these regulations. One of the key requirements is the approval of building plans by the county government.

Furthermore, the code explicitly prohibits the erection of temporary buildings, such as site offices, stores, or builder's sheds, without the necessary permit granted under the regulations. It is also forbidden to knowingly occupy a temporary building that has been erected in violation of the regulations. These provisions aim to ensure compliance with safety and structural standards during construction.

The proponent is committed to developing the proposed project in accordance with the building codes, the national standards and other international building standards and guidelines.

Public Roads and Roads of Access Act (Cap 399)

Sections 8 and 9 of the Act address the dedication, conservation, or alignment of public travel lines, which includes the construction of access roads adjacent to lands from the nearest part of a public

road. These sections outline the procedures and requirements for establishing these travel lines and access roads.

In line with this, Sections 10 and 11 of the Act enable authorities to serve notices on adjacent landowners, seeking their permission for the construction of the respective roads. These sections provide a legal framework for the communication and consent process between the authorities and the affected landowners.

By incorporating these provisions, the Act aims to facilitate the proper planning and development of travel lines and access roads, ensuring efficient and safe transportation infrastructure for the public.

The proponent shall issue notices to land owners adjacent to the project area before construction works begin. In addition, the proponent will inform the relevant authorities on the intended modifications of the roads near the proposed project.

National Gender and Equality Commission Act, 2011

The Commission, established by an Act of parliament, has a broad mandate to carry out various functions, including but not limited to:

- Promoting gender equality and freedom from discrimination, in line with Article 27 of the Constitution.
- Monitoring, facilitating, and providing advice on the integration of equality and non-discrimination principles across national and county policies, laws, and administrative regulations in both public and private institutions.
- Coordinating and facilitating the incorporation of gender and disability issues into the overall national development framework.

Through these functions, the Commission plays a crucial role in advancing gender equality, preventing discrimination, and ensuring the inclusion of marginalized groups in all aspects of society, thereby contributing to a more equitable and inclusive society in accordance with constitutional provisions.

The provisions of this Act shall be invoked in the implementation of the project, especially in ensuring gender equality, by offering opportunities to women in employment and allocation of stalls.

The Sexual Offences Act (No. 3 of 2006)

Relevant Sections in this Act include:-

- 24- Sexual offences relating to position of authority and persons in position of trust.

- 25- Sexual relationship, which pre-date position of authority or trust.
- 26- Deliberate transmission of HIV or any other life threatening sexually transmitted disease.

The proposed project will ensure that this Act is adhered to, by ensuring that there will be NO sexual offences committed, especially during the construction period.

Children Act,2001

Child protection encompasses the measures and actions taken to ensure the safety and well-being of children and young people who are under the age of 18. It involves protecting them from various forms of harm, including violence, exploitation, abuse, and neglect.

Part II, section 4 of this act specifically focuses on the safeguards put in place to uphold the rights and welfare of children. This section outlines the legal provisions and procedures aimed at promoting and protecting the best interests of children. It provides a framework for establishing safeguards and mechanisms to prevent and respond to any threats or risks to children's rights and well-being. These safeguards are designed to ensure that children are provided with a safe and nurturing environment, and that their rights and welfare are given paramount consideration in all relevant contexts.

The proponent will instruct the contractor not to engage the persons below 18 years

4.7 The Institutional Framework

a) Ministry of Environment and Forestry

Kenya's Ministry of Environment and Forestry is responsible for overseeing and safeguarding the country's environment and natural resources. Its core objective is to ensure sustainable utilization of these resources, leading to socio-economic development that addresses poverty, enhances living standards, and preserves a clean environment for current and future generations.

EMCA Institutions

The Government established the administrative structures to implement EMCA as follows:-

The National Environmental Council

The National Environment Council (the Council) holds the crucial role of formulating policies and providing strategic guidance in accordance with the Environmental Management and Coordination Act (EMCA). By setting national goals and objectives, as well as establishing policies and priorities, the Council ensures effective protection of the environment. Its responsibilities encompass shaping the direction of environmental protection and conservation efforts at a national level.

The National Environmental Management Authority

The Environmental Management and Coordination Act (EMCA) establishes the National Environmental Management Authority (NEMA) as the primary governing body responsible for the overall supervision, coordination, and implementation of environmental matters. NEMA serves as the key instrument of the government in executing environmental policies.

Within the framework of the Strategic Environmental Assessment (SEA) process, NEMA plays a vital role. It is responsible for approving the Terms of Reference (ToR) for the SESAand granting approval for the SESAitself. Without the latter approval, the project cannot proceed. NEMA is tasked with reviewing the SESAreport for the proposed project, conducting site visits to verify the provided information, and issuing an SESAlicense once all relevant project issues have been identified and effectively addressed through proposed mitigation measures.

- **County Environmental Committees**

The involvement of County Environmental Committees plays a significant role in promoting decentralized environmental management and fostering the active participation of local communities. These committees, appointed by the governor, are entrusted with the responsibility of effectively managing the environment within their respective counties.

The County Environmental Committees are essential entities that facilitate local engagement and decision-making processes related to environmental concerns. Their formation allows for a more localized approach to environmental management, taking into account the unique characteristics and needs of each county. By ensuring proper environmental stewardship at the county level, these committees contribute to the overall protection and sustainable management of natural resources.

- **National Public Complaints Committee (NPCC)**

In accordance with the Environmental Management and Coordination Act (EMCA) of 2015, the establishment of a Public Complaints Committee serves as an administrative mechanism for addressing environmental harm. This committee consists of members representing various entities, including the Law Society of Kenya, non-governmental organizations (NGOs), and the business community. Its primary responsibility is to investigate and address complaints pertaining to environmental damage and degradation.

The Public Complaints Committee plays a crucial role in ensuring that concerns related to environmental harm are properly examined and addressed. Through its diverse membership, the committee brings together expertise from legal, environmental, and business backgrounds, enabling comprehensive investigations and resolutions. By providing an avenue for individuals and

communities to voice their environmental grievances, the committee promotes transparency, accountability, and the protection of environmental rights.

- **The cooperative society committees, local CBOs and other Civil Society**

The Industrial Park committees, along with civil society organizations working in relevant fields, assume the responsibility of raising awareness and empowering the local community to maximize the benefits of the project. Their involvement encompasses conducting training programs, creating awareness about the project, and providing assistance in handling grievances, if any, associated with the proposed project. These committees and organizations play a vital role in ensuring that the community is well-informed, engaged, and equipped to actively participate in and derive optimal outcomes from the project.

4.8 International Instruments

In compliance with the World Bank's Operational Procedures (OPs), which apply to projects funded or financially supported by the Bank, the environmental and social safeguards outlined in these procedures will be adhered to during the implementation of the project. The World Bank classifies its projects into four Environmental Assessment categories based on the potential environmental impacts they may have. These categories are as follows:

i. Category A: This classification is assigned to projects that are likely to have significant adverse environmental impacts. The specific subproject in question has been categorized as Category A.
ii. Category B: Projects classified as Category B have potential adverse environmental impacts on human populations or environmentally important areas, such as wetlands, forests, grasslands, and other natural habitats. However, these impacts are generally less severe than those of Category A projects. They are often site-specific, potentially reversible, and can be mitigated more easily than those of Category A projects.
iii. Category C: Category C projects are anticipated to have minimal or no adverse environmental impacts. These projects generally do not require further environmental assessment beyond the initial screening.
iv. Category FI: Category FI is applicable to projects that involve the investment of Bank funds through a financial intermediary, potentially leading to adverse environmental impacts. However, this categorization is not applicable to the project under consideration.

The Project Report has been prepared to meet the requirements of both Kenyan and international institutions regarding impact assessment. The World Bank's Operational Policies, known as "Good Practices," govern its projects and activities. These policies are designed to ensure that projects seeking Bank financing are environmentally and socially sustainable, thereby enhancing decision-

making processes. The operational policies encompass a range of areas, including environmental assessment, natural habitats, pest management, cultural heritage, involuntary resettlement, indigenous people, forests, safety of dams, projects on international waterways, and projects in disputed areas. The applicability of World Bank Operational Policies to the proposed project is summarized in the table below.

Table 8: Potential triggers to World Bank Safeguards Policies

OP	Title	Comments/Impact
4.01	Environmental Assessment	Applicable. As a result of environmental and social screening, the project was identified as a Category A
4.04	Natural Habitats	Not applicable - there no natural habitats at the project site
4.09	Pest Management	Not applicable- the project will not involve any pest management
4.10	Indigenous Peoples	Not applicable- there are no indigenous people at the site or project area
4.11	Physical Cultural Resources	Not applicable. Site inspections and literature searches have not indicated the presence of any cultural (historical, archaeological) sites in the construction area. However, to manage "chance finds" an appropriate procedure is included in this SEA. Such procedures to be followed by contractors during the construction phase.
4.12	Involuntary Resettlement	Not applicable. There are no settlers at the site
4.36	Forests	Not applicable- there is no forest at the site
4.37	Safety of Dams	Not applicable because the project will not involve construction of dams.
7.50	Projects on International Waters (OP 7.50)	Not applicable- the site does not sit on international waters
7.60	Projects in Disputed Areas	The site is not classified as disputed in the project area.

CHAPTER FIVE
STAKEHOLDER ENGAGEMENT

5.1 Purpose of the stakeholder consultation and participation

The aim of the stakeholder engagement process was to accomplish the following objectives:

1. Disseminate information to the stakeholders regarding the proposed plan and create avenues for them to exert influence or suggest amendments to the plans.
2. Gather stakeholders' perspectives on the proposed plan, including their assessments of potential positive or negative impacts associated with it, as well as their preferences for development.
3. Acquire local knowledge pertaining to any environmentally or culturally sensitive areas within the scope of the plan, as well as insights on proposed facilities.
4. Seek expert advice on matters such as land use and area zoning, water availability and supply, and the state of power and road infrastructure in the area.

5.2 Stakeholder Identification

The initial step involved conducting a stakeholder analysis to identify the relevant stakeholders. Subsequently, an engagement and disclosure plan was formulated to ensure a meaningful and productive process. The stakeholders identified during this analysis comprised:

5.2.1 Governmental Stakeholders

- Minister for Planning Kirinyaga County
- Minister for Environment, Water And Natural Resources Office
- Deputy County Commissioner
- Kirinyaga County NEMA County Director
- County Physical Planning Officer

5.2.2 Technical Stakeholders

- Kenya Power
- Kenya Electricity Transmission Company Limited (KETRACO)
- Kirinyaga Water and Sewerage Company
- Water Resources Management Authority (WRMA)
- Kirinyaga Water Services Board (KWSB)
- Kenya Urban Roads Authority (KURA)
- Kenya National Highways Authority (KeNHA)
- Kenya Wildlife Service (KWS)
- Kenya Railways Corporation (KRC)

- Kenya Civil Aviation Authority

5.2.3 Internal Stakeholders

- County Government of Kirinyaga- Owner of the land to be developed
- Kirinyaga Investment and Development Authority (KIDA)-Project implementer
- Existing manufacturers Potential investors in the project
- International and Local NGOs Capacity building and funding
- NEMA- ESSC compliance
- Commercial banks- Potential funders of the project
- Real Estate- Agents Marketing of industrial plots
- Department of Interior- Security
- State Department for Trade- Funding of basic infrastructure
- Export Processing Zone Authority- Registration and approval of site as Export Processing Zone
- Special Economic Zones Authority- Registration and approval of site as Special Economic Zone
- County Assembly of Kirinyaga -Adoption and approval of financing

5.2.4 Neighboring Institutions and Individual Households

5.2.5 Security Agencies

- The Kenya Police Service
- The Kenya Prisons
- The Judiciary

5.3 Stakeholder Analysis

The significance of a stakeholder in this study is determined by whether they are directly or indirectly impacted. For instance, stakeholders who are directly affected by the proposed development are considered more significant since they experience the immediate consequences.

Table 9: Stakeholder Characterization

	Category	Details	Level of impact Directly Affected (DA) /Indirectly Affected (IA)
Institutional Stakeholders			
Minister for Planning, Kirinyaga County	Government Agency	▪ In matters related to development projects like the proposed one, this serves as the primary hub of power for the region in the county. ▪ The Planning Minister will share details about the county's development plans and the potential impact of the proposed development on them, or vice versa.	IA
Minister for Environment, Water & Natural Resources	Government Agency	▪ This stakeholder is responsible for overseeing the monitoring, protection, conservation, and management of the environment and natural resources, even in the face of developments such as Sagana. ▪ As a result, he will be consulted to provide insights into the connection between the proposed development and the environment and natural resources in the project area.	IA
Deputy County Commissioner	Government Agency	▪ The Deputy County Commissioner is tasked with aiding in the coordination of national government operations within the county. ▪ As the government representative for the project area, his approval will be sought to conduct the consultation exercise in Kirinyaga West Sub-county.	IA
Kirinyaga County NEMA office	Government Agency	• The National Environment Management Authority (NEMA) is given the mandate to oversee and coordinate all aspects pertaining to the environment. • In the project area, the Kirinyaga County NEMA office, serving as	IA

		the main governmental entity, will be consulted for the implementation of environmental policies.	
County Physical Planning Office	Government Agency	• The person responsible for overseeing development and zoning plans at the County level. ▪ This individual will be approached for consultation regarding zoning plans in the project area and other relevant issues to ensure that the proposed project aligns with the County's zoning plans.	IA
▪ Kenya Police Service ▪ Kenya Prisons ▪ The Judiciary	Government Agencies	▪ Security is managed by governmental institutions. ▪ These stakeholders play a crucial role in the development process and will be consulted regarding their capacity to handle security concerns that may arise from the proposed project. ▪ Their expertise is sought to ensure the security of the proposed development and its surrounding areas.	IA
Kenya Power	Service Provider	▪ Kenya Power has the responsibility to ensure adequate electricity generation and transmission capacity to meet the demand. They are tasked with constructing and maintaining power infrastructure. ▪ As a result, this stakeholder will be engaged to offer essential information and expert advice regarding electrical transmission and distribution for the proposed development.	IA
Kenya Electricity Transmission Company Limited (KETRACO)	Government Agency		IA
Kirinyaga Water Services Board	Government Agency	▪ Mandated to develop bulk water infrastructure, this stakeholder will be consulted on matters water supply and sewerage connectivity	IA

		▪ KETRACO is entrusted with the responsibility of designing, constructing, operating, and maintaining new high-voltage electricity transmission infrastructure, which serves as the foundational framework for the National Transmission Grid. ▪ This stakeholder will therefore be consulted to provide insights into their plans regarding high-voltage electrical transmission in the project area and its surrounding area in the proposed development.	
Water Resources Management Authority (WRMA)	Government Agency	▪ WRMA (Water Resources Management Authority) has the primary responsibility of serving as the leading agency in water resource management throughout the entire country. ▪ WRMA-Kirinyaga County will therefore be engaged as the stakeholder responsible for the efficient regulation and management of water resources in the project area. This includes the issuance of permits for water abstraction.	IA
Kirinyaga Municipal Council-Fire Department	Government Agency	▪ The Fire Department in Kirinyaga is responsible for promptly responding to fires and fire alarms, ensuring effective emergency management. ▪ Therefore, this stakeholder will be consulted regarding their capabilities in handling emergency preparedness in the project area. Additionally, their expertise and recommendations on best practices for addressing such issues will be sought.	IA

Kirinyaga Water and Sewerage Company	Service Provider	▪ Kirinyaga Water and Sewerage Company is the designated stakeholder responsible for providing water services in Kirinyaga County. ▪ As a result, the company will be engaged for consultation regarding water supply and wastewater management in the project area. This consultation will particularly focus on their capacity to handle the water demand and wastewater generated by the proposed development.	IA
Kenya Civil Aviation Authority	Government Agency	▪ In accordance with the Civil Aviation Act, 2013, this stakeholder has the responsibility to strategize, construct, oversee, govern, and run a civil aviation system in Kenya that is secure, financially viable, and productive. ▪ Due to the potential inclusion of a heliport at the location, this stakeholder will be approached for consultation.	IA

5.4 Engagement Methodology

Engaging stakeholders involved the utilization of diverse communication approaches, including interviews, structured questionnaires, and stakeholder workshops.

Interviews were primarily employed to engage technical stakeholders on specific matters such as water, power, and transportation.

Internal stakeholders, as well as neighboring households and institutions, were provided with a standardized form for public consultation and participation, aiming to gather their opinions, feedback, and concerns.

5.5 Outcomes of stakeholder engagement

The proposed development has elicited a range of perspectives from various stakeholders, shedding light on the potential positive and negative impacts that may arise from the project. These viewpoints encompass:

Positive Impacts:

- Enhancing business prospects and generating employment opportunities through the implementation of the proposed developments.
- Bolstering the county's economy by fostering the creation of new industries, goods, and services resulting from the development.
- Advancing Health, Safety, and Security standards as hospitals, schools, shopping malls, and security organizations become more accessible to the local populace.
- Stimulating socio-economic development by unlocking the area's potential through improved infrastructure and services.

Negative Impacts:

- Escalating traffic congestion, leading to issues such as traffic jams, noise pollution, dust accumulation, air pollution, and an increased risk of accidents.
- Exerting pressure on existing water resources due to numerous competing demands.
- Potential exacerbation of air pollution caused by vehicular traffic, industrial activities, and residential expansions.
- Alteration of land quality and aesthetics as the landscape transitions from its natural vegetation to urbanized areas.
- Possible rise in insecurity accompanying the influx of people into the area.

Table 10: Stakeholder comments, issues and concerns

Stakeholder	Comment/issue/concern
Department of Planning Kirinyaga County	• Concerning the proposed wildlife conservancy, a sufficient buffer will be required to avoid human-wildlife conflicts. Kenya Wildlife • Service is to be consulted on any species to be introduced or trans-located; • The planning department has in principle accepted the Sagana land use plan. However, detailed plans for each of the projects within the master plan must be submitted for approval. Further, all infrastructure will have to be put in place before any building plan is approved, while a slip road of not less than 9m will be required along Nairobi-Thika-Marua superhighway to provide for deceleration lanes.
Department of Environment, Water and Natural Resources – Kirinyaga County	• Plans to include measures to avoid human-wildlife conflict • Ensure effluent and solid waste generated from the development is properly managed

NEMA – Kirinyaga County	• A safe transport system will be key for the development; • Anticipate loss of biological resources as a result of the development should be documented including any loss of endangered/threatened species; • Conservation of sensitive ecological areas within the development to be carefully looked into; • must be respected; • Solid waste management for the development is critical and the proponent can consider designating an area in the for a sanitary landfill. Working with the County government on this would give the best results

Stakeholder	Comment/issue/concern
Kenya Power	• The Proponent should reserve land for construction of a substation. • Land for this substation should be reserved at a location where most of the consumption will be e.g. the Industrial park; • The substation will most likely be connected to the nearby line. • The Proponent should observe power line way leaves requirements keenly
Kenya Electricity Transmission Co. Ltd	• The existing power infrastructure within the project site belongs to Kenya Power; • Care should be taken while handling electricity.
Water Resources Management Authority (WRMA)	• The handling of effluent discharge for the development must comply with established regulations. • Water abstraction for the development should be evaluated based on availability assessments and relevant laws. • Any activities involving rivers, should adhere to the applicable water resource management regulations. • Effective management of effluent discharge and solid waste is necessary to prevent water pollution. • The Proponent is responsible for mitigating or avoiding human-wildlife conflicts related to water resources. • Before releasing industrial effluent into the main treatment system, the Proponent must have a plant for treating it. • The planned development should be reviewed against the National Water Master Plan (2030) to ensure alignment with its goals.
Kenya National Highways Authority	• Any construction of additional interchange(s) will require thorough traffic studies; • Footbridges would be good alternatives to ensure safety for pedestrians crossing from one side to the other of the busy highway. • Proponent to confirm with the KeNHA surveyor about the proposed highways and how this relates to the SAIC development. • Commission so that when subdividing the land, the portion reserved for the road can be surrendered to KeNHA

The Kenya Police Service(Sagana OCPD)	• Sagana division has night mobile patrols; • The electric fence will improve security. • A police post is recommended nearby where businesses are growing. The area is also strategic for the location of a police post as there is a tendency for criminals to escape after committing crimes in Sagana.
The Judiciary	• The nearest Judicial Court is at Baricho which is 16.2 kms from Sagana therefore need for an establishment of another one near the park.

Stakeholder	Comment/issue/concern
Kerugoya- Kutus Municipality	• The development planners should consult the fire department when planning buildings. • The developer should provide roads passable by fire engines/hydrants within the estates. • Awareness creation should be done to all residents on 'What to do in case of a fire'. • Future Sagana residents should have volunteer firefighters within the community for easier management as the County fire department responds
Kirinyaga Water & Sewerage Company	• The Company currently has capacity to supply water capacity • The Company intends to decommission septic tanks within the service area • The company is well able to provide water supply and sewerage services to the proposed development.
Kenya Wildlife Service(KWS)	• Kenya Wildlife Service will require to know the habitat and soil characteristics of the area reserved for the wildlife conservancy. • The zone mapped for the wildlife conservancy will require a wildlife management plan to be prepared and submitted to Kenya Wildlife Service; • Kenya Wildlife Service will require the Proponent to specify the exact type of conservancy they intend to have.

5.6 Consultation and Grievance Redress Mechanisms

5.6.1 Overview

Stakeholder consultations and grievance redress play crucial roles in ensuring the acceptance, support, and successful implementation of any Public-Private Partnership (PPP) or project by affected parties (PAPs). Effective and well-aligned engagement with stakeholders can bring about several positive outcomes, including:

- Promoting equitable and sustainable social development by granting a voice to those with the right to be heard, thereby considering their perspectives in decision-making processes.
- Enhancing risk and reputation management by facilitating a better understanding of potential risks and enabling proactive measures to address them.
- Enabling collaboration and resource sharing (knowledge, personnel, finances, and technology) to tackle challenges and achieve objectives that individual organizations cannot

accomplish alone.

- Facilitating comprehension of the intricate business environment, including market trends, and identification of new strategic opportunities.
- Allowing corporations to learn from stakeholders, leading to improvements in products and processes.
- Informing, educating, and influencing stakeholders and the business environment to enhance their decision-making and actions, which have implications for the developer(s) and society.
- Establishing trust between the developer(s) and stakeholders, fostering a mutually beneficial relationship.

During implementation of the Masterplan, the Proponent will establish a management entity which will be responsible for management of the development and shall be the interface between the developer and stakeholders.

5.6.2 Mechanisms for engagement

The stakeholder consultation process will prioritize inclusivity as its fundamental principle. The management entity responsible for the process is dedicated to considering the perspectives and requirements of all stakeholder groups at every stage. To ensure this, stakeholders will have the opportunity to express their views freely and without any constraints through an engagement process. This commitment to inclusivity and open communication was highlighted in the Accountability report of 2005.

Achieving inclusivity will involve following three fundamental principles:

- Materiality: This necessitates understanding the significant concerns of the Proponent, the management entity, and the stakeholders involved.
- Completeness: This entails comprehending the impact of the development and considering the perceptions and expectations of the stakeholders.
- Responsiveness: This requires providing coherent responses to the material issues raised by both the stakeholders and the organization.

Different strategies will be employed to engage stakeholders, taking into account factors such as:

• The strategic engagement goals of the project;
• The existing level and method of engaging stakeholders;
• The complexity and importance of the issue at hand;
• The management entity's and stakeholders' expectations for the desired outcomes;
• The resources available for conducting the engagements; and
• The extent of change the management entity aims for and the flexibility within those boundaries.

Therefore, the overall engagement and communication strategy shall include:

• ***Communication:*** The objective here is to provide information or knowledge to the stakeholders. This can be achieved through consistent distribution of bulletins, letters, brochures, speeches, public presentations, or advertisements. To ensure effective communication, the proposer will place suggestion boxes at appropriate locations to gather feedback on written communication and advertisements regularly. The inclusion of speeches and public presentations is aimed at informing and involving stakeholders,

particularly individuals residing in densely populated neighborhoods, who may not have the means to provide written feedback on the information shared through bulletins or advertisements. These forums are ideally designed to create opportunities for individuals on the fringes of neighboring communities.

• ***Consultation***: The purpose of this phase is to gather information and feedback from stakeholders, allowing them to be informed about internal decisions. This process involves conducting surveys, organizing focus groups, conducting one-to-one meetings, holding public meetings, and facilitating workshops. By engaging in these consultation methods, stakeholders are given the chance to reflect on the issues at hand, mobilize their thoughts, and provide more critical responses compared to solely attending workshops. These lines of communication also serve the purpose of keeping the dialogue regarding the development ongoing, which in turn generates discussions in everyday life that better inform decision-making.

• ***Involvement***: The objective of this stage is to actively collaborate with stakeholders to ensure that their concerns are fully understood and taken into account during the decision-making process. This objective will be achieved by establishing multi-stakeholder forums, forming advisory panels, implementing consensus-building processes, and fostering participatory decision-making approaches. These avenues for engagement are designed to create opportunities for stakeholders to actively participate and freely inquire about the development as it takes shape and progresses.

• ***Social and Environmental Safeguards Office***: As part of the implementation process, the organization will appoint a competent officer to oversee engagement with stakeholders. This officer will be responsible for ensuring the communication strategy is effectively carried out, with a particular focus on adhering to all proposed social and environmental safeguards outlined in the Strategic Environmental Assessment (SEA) and relevant studies in the future. Additionally, the officer will ensure that stakeholders have the opportunity to be adequately represented in any environmental audits conducted both during and after the full implementation of the project.

5.6.3 Grievance Redress Mechanisms

The development and execution of a grievance mechanism are crucial for the success of the engagement process. The grievance mechanism will be tailored to match the risks and effects of the Masterplan, stemming from the broader stakeholder engagement and business integrity principles of the Sagana management entity. It will also incorporate diverse engagement approaches.

The management entity will establish grievance procedures in collaboration with stakeholders, ensuring their agreement. These procedures will be made publicly available and thoroughly explained to the relevant stakeholder groups. Their purpose will be to provide a platform for stakeholders, particularly the community, to freely express their complaints or concerns. The procedures will guarantee that these grievances are addressed promptly and resolved in a satisfactory manner, without any financial burden on the stakeholders. These grievance mechanisms will be implemented starting from the initial stages of the social and environmental assessment process and will remain in place throughout the construction, operations, and until the completion of the project.

In line with the broader approach to engaging stakeholders, the management will maintain continuous involvement and stay well-informed to promptly address disputes and prevent them from escalating (IFC, 2007). To foster a personalized relationship between the development and the community, a skilled individual will be employed as a community liaison and point of contact. This will create an informal environment where grievances can be expressed, resolved, or escalated if necessary. The grievance procedures are designed to facilitate speedy resolution of issues, aiming to avoid costly and time-consuming legal actions without replacing the existing legal process. A well-defined timeframe will be established for addressing all documented complaints, ensuring a timely response and alleviating frustration by providing complainants with clear expectations. Additionally, a transparent decision-making process will be implemented, enabling stakeholders to understand how decisions are made and inspiring confidence in the system.

All complaints will be recorded in a log or database to maintain a comprehensive record. The record will include details such as the name of the individual or organization, the date and nature of the complaint, any subsequent actions taken, the final outcome, and how and when the decision was communicated to the complainant. To prevent any perceived intimidation and increase the effectiveness of the mechanism, individuals uncomfortable with providing overly personal information will have the option to submit their complaint while preserving their privacy.

5.7 Stakeholder engagement levels achieved

5.7.1 Governmental Stakeholders

Consultations achieved in proposed SAIC master plan planning and design level(Minister for Planning Kirinyaga County, Minister for Environment, Water And Natural Resources Office, Deputy County Commissioner, Kirinyaga County NEMA County Director,County Physical Planning Officer)

5.7.2 Technical Stakeholders-

Involved in planning of the SAIC master plan and installation of infrastructure, restoration of biodiversity plans and riparian reserve creation. (Kenya Power, Kenya Electricity Transmission Company Limited (KETRACO), Kirinyaga Water and Sewerage Company, Water Resources Management Authority (WRMA), Kirinyaga Water Services Board (KWSB), Kenya Urban Roads Authority (KURA), Kenya National Highways Authority (KeNHA), Kenya, Wildlife Service (KWS), Kenya Railways Corporation (KRC)

5.7.3 Internal Stakeholders and members of the community-

(County Government of Kirinyaga- Owner of the land to be developed

1. Kirinyaga Investment and Development Authority (KIDA)-Project implementer
2. Existing manufacturers Potential investors in the project
3. International and Local NGOs Capacity building and funding
4. NEMA- ESSC compliance

5. Commercial banks- Potential funders of the project
6. Real Estate- Agents Marketing of industrial plots
7. Department of Interior- Security
8. State Department for Trade- Funding of basic infrastructure
9. Export Processing Zone Authority- Registration and approval of site as Export Processing Zone
10. Special Economic Zones Authority- Registration and approval of site as Special Economic Zone
11. County Assembly of Kirinyaga -Adoption and approval of financing
12. Members of the community- Respondents environmental andsocial surveys conducted.

CHAPTER SIX

IMPACT IDENTIFICATION AND ANALYSIS

6.1 Introduction

The SAIC underwent a thorough environmental impact analysis using a predetermined evaluation methodology. Indicators and targets were primarily derived from information and observations gathered during the baseline situation assessment.

6.2 Impact identification and evaluation methodologies used in the SESA study

The table below summarizes the impact identification and evaluation methodologies that were used in the SESA study.

Table 11: Impact identification and evaluation methodology

Theme	Aspects	Impact Identification	Evaluation
Biological Environment	• Habitats Biodiversity	• Document Review • On-site observation • Stakeholder working sessions	• Matrix and Multi-criteria analysis including compliance with the relevant environmental protection regulations • Stakeholder working sessions
Physical Environment	• Soil • Land quality • Water • Waste generation and management • Energy • Traffic and transport	• Document review • On-site observation • Interviews • Stakeholder working sessions	• Matrix and Multi-criteria analysis including compliance with the relevant laws and regulations on each aspect • Stakeholder working sessions

Social Cultural/economic environment	• Food security and Nutrition • Health • Gender & Children • Governance • Poverty and income • Livelihoods • Transport and infrastructure • Major development activities that are currently proposed • Potential forms of development including those that are compatible with the County's development plans for the area	• Document review • On-site observation • Questionnaire responses • Stakeholder working sessions	• Matrix • Stakeholder working Sessions
Institutional component	• Planning, Capacity and enforcement	• Questionnaire responses • Interviews • Stakeholder working sessions • Checklists	• Matrix • Stakeholder working Sessions

Impact characterization was undertaken by considering the following attributes:-

a) Level of impact (County- wide, Sagana area,
b) Probability and risk of occurrence,
c) Duration of impact,
d) Magnitude,
e) Impact reversibility, and
f) Level of importance.

Major and minor impacts were determined on the following basis:

Table 12: Determination of major and minor impacts

Major Impact	Minor Impact
Extensive	Localized
Will affect many people	Will affect few people
Large change in environmental conditions	Small change in environmental conditions
Effect will be unusual or particularly complex	Effect will be ordinary or simple
Will affect valuable or scarce features or resources	Will not affect valuable or scarce resources
High risk that environmental standards will be breached	Lower risk that environmental standards will be breached
High likelihood that protected sites, areas or features will be affected	Lower likelihood that protected sites, areas or features will be affected
High probability of effect occurring	Lower probability of effect occurring
Long term / permanent	Short term / temporary
Irreversible	Reversible
Mitigation difficult	Mitigation easier

Table 18: Indicators and targets for plan environmental impact analysis (PEIA)

Impact Category	SESA Objective	Potential Outputs(s)	Indicators
Biological Impacts			
Biodiversity, flora and fauna	• Promote the preservation and, when feasible, improvement of crucial habitats and species. • Safeguard and, whenever feasible, enhance the local biodiversity, plant life, and animal species.	• Implement a practical plan for enhancing biodiversity by promoting the growth of native vegetation on the site. • Undertake measures to conserve endangered species within the property. • Protect and preserve watercourses, rivers, and wetlands. • Establish sanctuaries that sustain traditional wildlife habitats. • Restore degraded areas on the property to create high-quality environments. • Address physical impacts through careful land use planning that aligns with local development plans. • Develop modern and environmentally-friendly	• Preserve and improve the area of green space as part of environmental enhancement efforts. • Implement measures to protect watercourses, rivers, and wetlands. • Implement measures to protect threatened species. • Maintain and support valuable wildlife habitats. • Implement measures to ensure environmental rehabilitation is carried out effectively.

		infrastructure that harmonizes with the surroundings. • Implement practical energy management and conservation measures. • Discourage environmentally harmful land uses and non-green infrastructure that could exacerbate the impacts of climate change. • Mitigate the adverse effects of urban heat island phenomenon.	
• Physical Impacts			
Development and land –use planning	• Ensure that land-uses are sustainable and compatible with local development plans • Reduce the level of negative visual impact through the use of green infrastructure	• A land use plan that is compatible with local development plans • Modern and green infrastructure that blends with the surrounding	• Conformity to land-use plans for the area • Green infrastructure developed on the property
Energy use and supply	• Ensure the conservative use of available energy resources • Ensure that renewable energy opportunities are identified and harnessed	• Practical energy management and conservation options	• Energy conservation measures Renewable energy opportunities harnessed

Climate Change	• Mitigation of climate change impacts	• Discouraging environmentally destructive land uses and improper non-green infrastructure whose impacts could eventually amplify the effects of climate change • Reduce the negative effects of urban heat island effects	• Measures in place for Climate change mitigation and adaptation • Measures to mitigate Urban heat island effects
Water supply and Sanitation	• Ensure the protection and improvement of the surface and groundwater environment, in terms of water quality and quantity, for the benefit of the human and/or natural environment • Ensure the conservative use of water resources • Ensure the disposal of effluent in an environmentally friendly manner	• Sustainable water resource protection, conservation and exploitation options	• Surface and ground water quality from periodic tests and analysis • Ground water yields from continuous monitoring • Quantities of water Recycled and/or harvested

Solid waste management	• Ensure the reduction in solid waste generation • Ensure the proper handling and disposal of generated waste	• Practical and sustainable waste management options / plans	• Number of transfer stations established in the development • Methods of collection and disposal of generated wastes

Traffic and Transport	• Mitigation of negative impacts from increase in vehicular traffic	• A practical and effective Traffic Management Plan for SAIC	• Seamless flow of traffic, few traffic incidences and accidents
Economic Impacts			
Micro/Macro scale economy	• Ensure the enhancement/ protection of important new and existing material assets and infrastructure in the area • Ensure the enhancement of economic benefits of the plan to the surrounding community	• Tangible socio-economic benefits to the community • Safeguards for important community/national assets	• Number of new infrastructure projects implemented/or existing infrastructure enhancements and attributable to the plan • Number of employment or business opportunities created as a result of the plan
Social Impacts			
Human health and safety	• Ensure the improvement/ enhancement of the health and wellbeing of the surrounding communities	• Practical safeguards for community health and safety	• Number of injuries / illnesses attributable to development activities i.e. construction phase and operation phase activities
Community integration	• Ensure integration of the in-coming community with the host community	• Community integration initiatives through information sharing, joint activities/ programmes and sharing of • resources/facilities	• Activities done jointly with surrounding community, information sharing, facilities open to other members of surrounding communities

6.3 Impact Characterization for the Potential Negative Impacts

6.3.1 General environmental social and economic impacts

Table 13: Zone 1

Potential negative impact	Principal Receptor	Probability & risk of occurrence	Duration of impact	Magnitude	Reversibility	Importance
Negative visual impact due to loss of visual amenity from dense urban structures	SAIC & neighborhood	High	Long-term	Medium scale	Irreversible	Moderate
Long term evolution of urban heat islands	SAIC and neighborhood	High	Long-term	Medium scale	Irreversible	Moderate
Risk of urban heat island effects	SAIC and neighborhood	High	Long-term	Medium scale	Irreversible	Moderate
Excessive water usage in office buildings, malls, and green/open spaces, particularly for lawn watering	SAIC and neighborhood	High	Long-term	Small scale	Reversible	Moderate
Increased water abstraction from Sagana and Ragati Rivers	SAIC	High	Long-term	Large scale	Reversible	High
High ground water abstraction leading to lowering of ground water levels and long term risk of land subsidence	Kirinyaga region	High	Long term	Large scale	Irreversible	High

Water pollution in the Ragati and Sagana River	Ragati and Sagana River	Low	Long-term	Large scale	Reversible	High
Increased traffic activities and traffic interruptions and traffic incidences	Sagana area	High	Long-term	Medium scale	Irreversible	High
Parking problems	SAIC	High	Long-term	Large scale	Reversible	High
Increased solid and sewerage waste generation	Kirinyaga region	High	Long term	Large scale	Irreversible	High
Increased crime from neighboring areas such as Sagana, town, Kagio Town etc	SAIC	High	Long term	Medium scale	Reversible	High
Spread/Transmission of HIV/AIDS and other STIs	Sagana area	High	Long-term	Medium scale	Irreversible	High
Increase in storm water generation resulting in flooding and soil erosion	SAIC	High	Long-term	Medium scale	Reversible	High
Increased energy consumption	SAIC and neighborhood	high	Long-term	Medium scale	Reversible	High
Loss of habitats for the hippos in the area	Sagana and Ragati Riverine ecosystems	Moderate	Long-term	Small scale	Reversible	Moderate
Loss of avian species habitats and avian species diversity	SAIC area and neighborho	High	Long term	Large scale	Irreversible	High

	od					
Clearance/modification of the riparian vegetation along Ragati and Sagana Rivers	Ragati and Sagana Riverine ecosystem	Moderate	Long-term	Small scale	Reversible	Moderate
Creation of new avian species habitats	SAIC area	Moderate	Long term	Medium scale	Irreversible	Moderate

1.3.1.2 Recreational Areas

Table 14: Zone 2

Potential negative impact	Principal Receptor	Probability & risk of occurrence	Duration of impact	Magnitude	Reversibility	Importance
Modification of avian species habitats and creation of new avian species habitats	SAIC area and neighborhood	Moderate	Long term	Medium scale	Irreversible	Moderate
Effect of wastes generated by visitors on avian species	SAIC area	High	Long term	Large scale	Irreversible	Moderate

6.3.1.3 Low, Mid and High Density Residential

Potential negative impact	Principal Receptor	Probability and risk of occurrence	Duration of impact	Magnitude	Reversibility	Importance
Loss of avian species habitats and avian species diversity	SAIC area and neighborhood	High	Long term	Large scale	Irreversible	High
Loss of natural vegetation and wildlife habitats	SAIC	Medium	Long term	Mediums scale	Irreversible	High
Negative visual impact due to loss of visual amenity from dense urban structures	SAIC & neighborhood	High	Long-term	Medium scale	Irreversible	Moderate
Modification of riverine vegetation	Kamiti River	Moderate	Long term	Medium scale	Irreversible	Moderate
Increased storm water generation with potential increase in soil erosion	SAIC area /Ragati and Sagana Rivers	Moderate	Short term	Small scale	Reversible	Moderate

Increased solid and sewerage waste generation	Sagana region	High	Long term	Large scale	Irreversible	High
Increased demand for water and energy resources	SAIC Area	High	Long term	Large scale	Irreversible	High
Increased traffic activities and traffic interruptions and traffic incidences	Sagana area	High	Long-term	Medium scale	Irreversible	High
Increased infestation by malaria transmitting mosquitoes due to water features	SAIC Area	Moderate	Long term	medium scale	Reversible	High

Table 15: Zone 4

Potential negative impact	Principal Receptor	Probability & risk of occurrence	Duration of impact	Magnitude	Reversibility	Importance
Loss of avian species habitats and avian species diversity	SAIC area and neighborhood	High	Long term	Large scale	Irreversible	High

Loss of natural vegetation and wildlife habitats	SAIC	Medium	Long term	Mediums scale	Irreversible	High
Modification of riverine vegetation along Ragati and Sagana Rivers	Ragati and Sagana Rivers	Moderate	Long term	Medium scale	Irreversible	Moderate

Increased storm water generation with potential increase in soil erosion	SAIC area / Ragati and Sagana Rivers	High	Long term	Large scale	Reversible	Moderate
Increased potential of air, noise, water and soil pollution from industries	SAIC area	High	Long term	Medium	Irreversible	High
Increased solid and sewerage waste generation	Sagana area	High	Long term	Large scale	Irreversible	High
Increased traffic activities and traffic interruptions and traffic incidences	Sagana area	High	Long-term	Large scale	Irreversible	High

6.3.1.5 Agriculture/Conservation Area

Table 16: Zone 5: County Aggregation Industrial Park (CAIPS)

Potential negative impact	Principal Receptor	Probability & risk of occurrence	Duration of impact	Magnitude	Reversibility	Importance
Effects of wildlife introduction	SAIC area	Low	Long term	Medium scale	Reversible	Medium
Concentration of wildlife, habitat degradation and conflict with livestock	SAIC area	Medium	Long term	Medium scale	Reversible	Medium
Risk of long term loss of species due to in-breeding	SAIC area	Medium	Long term	Medium scale	Reversible	Medium
Wildlife habitat deterioration due to low carrying capacity	SAIC area	Medium	Long term	Medium scale	Reversible	Medium

6.4 Risk Assessment

6.4.1 Overview

Risk refers to the possibility of an event happening that could lead to actual project circumstances differing from the initial assumptions made when estimating project benefits and costs. The level of risk can be influenced by one's control over events and the amount of information available about the present and future. Control is related to the ability to take action and determine outcomes, which can be influenced by effective management, organization, and specialized knowledge. The amount of information directly impacts the level of risk because uncertainty arises when we lack complete information to accurately predict future outcomes. Having better information enables us to anticipate and mitigate risk more effectively.

It's important to note that risk analysis is not an exact science, but rather a process that involves judgment and subjectivity in both the risk model and the data used to quantify it. Consequently, the risk assessment for the SAIC Masterplan is based on the provided details of the Masterplan components and the evaluation of the current and foreseeable environmental, social, political, and economic conditions as determined by the SESA team.

6.4.2 Risk of incompatibility with surrounding land uses or inappropriate land use

Conflicts in land use, whether within the SAIC Masterplan or between SAIC and surrounding areas, can have negative impacts on the affected communities in economic, physical, and social terms. Incompatible land uses can create obstacles to new investments and discourage existing property owners from investing, leading to a decline in the overall well-being of the community. Similarly, inappropriate land uses in SAIC may hinder the realization of potential benefits and opportunities, as the full potential and achievable goals were not adequately recognized prior to land development.

The SAIC Masterplan incorporates a Planned Unit Development approach, which encourages a mix of land uses and densities and allows for the inclusion of nonresidential facilities within residential developments to enhance convenience and variety. However, inconsistencies can arise if nonresidential uses intrude into areas primarily intended for residential purposes, making it difficult to achieve a cohesive and socially connected neighborhood concept.

There is a potential risk that proposed land uses in SAIC may not effectively mitigate their negative impacts on adjacent land uses, resulting in conflicts. Undesirable characteristics such as increased traffic, air and water pollution, odors, noise, excessive lighting, vibrations, increased storm runoff, or unattractive building appearances could adversely affect residential, industrial, commercial, and recreational areas. Additionally, there is a risk that land development may lead to the loss of the site's intrinsic environmental qualities, such as scenic wetlands, savannah grasslands, and forests.

To mitigate these risks, the Plan Proponent has engaged a team of land use planners to identify appropriate land uses that optimize the use of land and avoid inefficient spatial arrangements. Strict enforcement of the plans will be necessary during implementation to prevent encroachment of one land use onto another. Detailed site planning will also involve careful selection of facilities to maintain the intended character of the land use. Buffer zones of sufficient size and the implementation of relevant technologies will be established in areas where potential conflicts between land uses may arise, particularly where industrial zones are located near residential and recreational areas. The development of SAIC should align with the existing characteristics of the area and enhance its qualities, considering natural features and cultural elements of the landscape such as wetlands, grasslands, woodlands, and other man-made elements.

6.4.3 Sustainability Risks/Environmental degradation

Land use plays a crucial role in determining wildlife habitat and has direct implications for local and global biodiversity. When natural landscapes, such as wilderness areas, are transformed into other land uses by human activities, it often leads to the loss, degradation, and fragmentation of habitats, which can have severe consequences for biodiversity. In fact, land conversion stands as the primary driver behind the extinction of terrestrial species.

6.4.4 Planning risks

This refers to the risk associated with insufficient or weak pre-development studies, including technical, legal, financial, and other aspects, which can lead to deviations from the intended outcomes in the SAIC development. Inadequate studies may involve inaccurate forecasts and assumptions regarding demographics, demand, and limited understanding of market dynamics. Planners and project sponsors may be inclined to adopt assumptions that favor the development, which could involve strategic misrepresentation or genuine optimism. This risk highlights the importance of conducting thorough and robust studies to ensure accurate and reliable information for the planning and implementation of the SAIC project.

6.4.5 Risk of mushrooming of slums in the area

A slum refers to a contiguous settlement where residents experience inadequate housing and basic services. Often, slums are not recognized or addressed by public authorities as an integral or equal part of the city. This definition encompasses various low-income settlements characterized by poor living conditions. It includes traditional slums, which were once respectable but have deteriorated over time due to neglect and subdivision of units rented out to poorer households. Squatter settlements or informal settlements, created through illegal occupation of land in violation of building regulations, are also considered slums. These settlements emerge due to the inability of conventional housing markets to meet the demand generated by rapid urbanization.

Living conditions in slums are deplorable, with inadequate water supply, unsanitary environmental conditions, inadequate waste disposal, overcrowded and dilapidated housing, insecure tenure, and vulnerability to health risks. Slum residents face exclusion from economic, social, political, and cultural spheres of the city, limiting their capabilities.

Rapid urban growth and rural-urban migration are major factors driving the proliferation of slums in developing countries. While urbanization plays a significant role, other economic, social, political, institutional, and historical factors have not been extensively investigated. The regulatory framework governing the delivery of planned residential land is a significant factor contributing to the prevalence of slums, as bureaucratic procedures make land unavailable and unaffordable for low-income households. In response, low-income families resort to constructing unauthorized

housing or sharing limited space, leading to slum-like conditions.

The detrimental impact of urbanization on slum prevalence reflects urbanization without sufficient development. This form of urbanization occurs alongside economic stagnation, poor agricultural performance, rising unemployment, weak municipal authorities, poor governance, and a lack of coherent urban planning policies.

To prevent the growth of new slums, the SAIC planning team should actively advocate for improved performance of local authorities, such as the Kirinyaga County Government, in managing urban growth through effective land use planning and mobilization of local resources. The government should also formulate strategies to develop property rights, including regularizing insecure tenure in informal settlements near SAIC. Secure tenure provides benefits such as addressing insecurity in established slums, encouraging provision of urban services, motivating resident investment and contribution to the built environment, improving tax recovery, and promoting social cohesion and stability in cities.

Investing in infrastructure, such as roads, can reduce slum prevalence and improve access to employment and activity nodes for slum dwellers. Additionally, investments in trunk infrastructure for access, water, sanitation, and power supply can prevent the formation of new slums, reduce health burdens, and contribute to economic growth, poverty alleviation, and environmental sustainability.

In the context of preventing the proliferation of slums around SAIC, the Kirinyaga County Government should develop and enforce land use plans, conduct land surveys, establish ownership, and provide infrastructure services for orderly development. Notably, all land in the area has undergone adjudication, converting customary tenure into individual holdings and registering land parcels, which supports controlled and organized development and helps prevent slum growth.

6.4.6 Financing Risks

This risk pertains to the possibility of insufficient financing being available for the Masterplan at a reasonable cost. Factors such as changes in market conditions or limited credit availability can contribute to this risk. Consequently, there may be delays in achieving financial closure for the development of the Masterplan.

6.4.7 Design Risks/ Technology Risks

Design risk refers to the potential for proposed designs to fail in meeting the performance and service requirements specified in the output specification. This risk can lead to additional costs for modifications and redesign. In the case of the SAIC Masterplan, design risk is particularly relevant to the infrastructure services, such as access roads, junctions, water supply, power, and sewerage network. There is a risk that the designs of these infrastructural services may not adequately

accommodate the needs of the population generated by SAIC.

Technology risks also come into play, as there is a possibility that the technology utilized in the design of the infrastructure may unexpectedly become outdated during the lifespan of the Masterplan. In such cases, the technology may no longer meet the requirements specified in the output specifications, resulting in increased costs for replacing the outdated technology.

6.4.8 Political and Regulatory Risks

Political and regulatory risk refers to the risks arising from political and regulatory decisions that can impact a development project or an existing asset. Regulatory risk specifically refers to the risk of changes in the current legal or regulatory framework that could have a significant negative impact on the project. In the infrastructure sector, private sector owners are often subject to regulation, and the decisions made by regulators can greatly influence investment programs.

While a well-designed regulatory system is beneficial for society, the concern lies in the unpredictability of changes in laws and regulations, leading to political and regulatory risks. Large-scale development projects often outlast the term of any individual government, creating a mismatch between the project cycle and political cycle. Investors seek assurance that not only will the current government fulfill its commitments, but also that decisions made by future governments or administrations will not severely impact their investments.

Political uncertainty can arise from evolving public interests and can affect projects that are sensitive to various stakeholders. The concept of "public interest" is not fixed and can change over time due to evolving societal concerns. For instance, perceptions of technological safety or environmental responsibility may shift during the long lifespan of a project, leading to potential changes in regulations.

Misconceptions by private actors can also contribute to political and regulatory risks. Investors or developers may perceive political decisions as unpredictable and risky, even though such decisions are almost inevitable. This faulty perception may stem from investors' limited sensitivity to shifting societal concerns, leading them to be surprised when political decisions are driven by public pressure or a new understanding of socially desirable policies. Under political and regulatory risks, there are other risks that can be classified into the planning/design/construction phases or the operational phase of a project.

6.4.9 Risks during the planning/design/construction phases

The risk associated with environmental and other permits involves the complex permit requirements for SAIC, which may involve multiple agencies or branches of government. This poses a potential approval risk, meaning that delays in obtaining the necessary approvals during the construction phase can lead to delays in implementing the Masterplan according to the

established schedule. These approval delays can result in cost overruns, as cash flows start later than anticipated. Even when permits are issued promptly, they may contain unforeseen and costly conditions such as compensation requirements or restrictions on resource usage, such as groundwater.

Another risk is the opposition from community stakeholders. Local communities have formal and informal veto rights over projects that could have adverse impacts within their territories, as provided by the Constitution of Kenya. Action groups can organize protests that prompt politicians and regulators to withdraw or suspend permission for the project. The lack of an institutionalized process to manage stakeholders can lead to inadequate stakeholder involvement, misunderstandings, and a lack of cooperation, which can ultimately impact the approval and implementation of the Masterplan.

6.4.10 Risks during the operation phase

The risk of expropriation is a political risk faced by private infrastructure owners, which involves the potential for outright confiscation or nationalization of their assets. In addition, a series of renegotiations or regulatory changes can lead to de facto expropriation or "creeping expropriation." In the case of SAIC, the infrastructure established for access, transportation, water and power supply, and effluent disposal could potentially be taken over by the government in the public interest.

The risk of asset-specific regulation applies to projects or assets that have the potential to significantly impact communities or the natural environment, such as industries and waste disposal plants. The operating regulations for these projects are specific, and even small changes to details like permissible noise levels or water quality requirements can have a significant negative impact on revenues or costs, potentially affecting the viability of the project or asset.

Force majeure refers to unforeseeable events or circumstances that are beyond the control of the project owners or developers. In the case of SAIC, the topography of the land is relatively flat, with a gentle slope towards the northeast. This makes the risk of landslides negligible. However, the predominant black cotton soil, which is expansive clay and unsuitable for foundation works, combined with the flat nature of the site and poor drainage characteristics, increases the risk of waterlogging in the absence of proper drainage structures.

6.4.11 Climatic risks

Land-use change, particularly the conversion of savannah grassland to urban developed areas, can contribute to climate change by releasing significant amounts of carbon dioxide (CO_2) into the atmosphere. The carbon stocks in grassland are primarily stored below ground, mainly in roots and soil organic matter. Soil carbon stocks are highest in forestland, followed by grassland, cropland,

wetland, settlements, and other land uses. When there is a change in land use, the inputs and outputs of carbon in the soil are altered, leading to a new equilibrium. Converting land use from forestland to grassland, cropland, or settlements generally results in a reduction of soil carbon stocks, with the greatest reduction observed when forestlands are converted to settlements, followed by croplands and grasslands.

Planting trees in grasslands can increase soil carbon storage, while converting croplands to forestland or grassland can also lead to gains in carbon storage. Conversely, converting settlements to forestland, grassland, or cropland can improve soil carbon storage. In terms of biomass carbon storage, forestlands have the highest above-ground carbon stocks. Any land use change away from forestland will result in carbon loss, while transitioning from grassland, cropland, or settlements to forestland can increase carbon storage. Changes between cropland, grassland, and settlements have minimal effects on biomass carbon stocks.

To mitigate the climate risks associated with implementing the SAIC Masterplan, the planning team can develop a biogeochemical model that considers existing carbon stocks, soil type, and weather conditions. This model can estimate the carbon lost during the conversion of grasslands to settlements or other developments at both property and regional scales. Additionally, the retention of Eucalyptus plantations and the planting of Bamboo along rivers within the SAIC Masterplan can help offset carbon losses and contribute to climate change mitigation. Increasing tree cover in green and open spaces can enhance carbon sequestration in both soil and biomass, thereby reducing net greenhouse gas emissions.

6.4.12 Best-practice framework for risk mitigation

Appropriate use of financial instruments: Within the framework set by the government, SAIC has to effectively and efficiently manage the risk inherent in the Masterplan. An array of measures is available to this end, such as financial instruments that allow SAIC to directly address important aspects of political & regulatory risk. Risk guarantees and political-risk insurance are instruments that can be used to transfer political & regulatory risk from the Plan Proponent and financiers to a party better suited to bearing it (such as a development bank or an insurance company), and thereby protect themselves from adverse incidents.

Effective interaction with the public sector: To mitigate political & regulatory risk, the Plan Proponent should make a conscious effort to facilitate constructive interaction with the public sector. Such interaction will prevent misunderstandings, create transparency on the impact of regulations for the public and private sectors, and contribute to an overall mutually beneficial atmosphere. This can be done through constructive communication with public agencies and sharing of information, monitoring of political developments, and advocacy strategy in order to

influence matters of industry-wide regulation.

Inclusive community engagement: The Plan Proponent will also need to engage constructively with the public at large. By involving the affected communities throughout the Masterplan's life cycle – from planning and construction through to operations, the Plan Proponent can reduce the chance of political intervention. Engagement will include:

- *Early and meaningful community consultations* through appropriate formats. Such consultations will help to ease local anxieties, and improve the Masterplan and project design by taking the community's concerns into account;
- *Continuous communication*. Starting in the planning period, and continuing during construction, the Plan Proponent should communicate with local residents on progress and potential impacts – to satisfy curiosity, allay justified fears and dismiss those unjustified, and generate a positive public involvement with the project;
- *Responsible business conduct*: Responsible business conduct is a prerequisite for sustainable economic success. If the society at large accepts the behavior of the developer(s), stakeholder satisfaction will increase and the likelihood of policy-makers intervening will be reduced. Responsible conduct will include managing their operations sustainably, which involves respecting norms on the environment, human health and safety, and other areas

6.5 Direct and indirect Drivers of Change Resulting from the PPP Implementation

The implementation of the PPP in the SAIC area is expected to have various implications for the existing society. These implications have been previously discussed in this chapter and can be summarized under the following sub-headings:

6.5.1 Demographic

According to the 2009 Kenya Population and Housing Census, the population of Kirinyaga County in 2019 was 610,411, consisting of 302,011 males, 308,369 females, and 31 intersex individuals. The rural population was 474,187, while the urban population was 136,224. The population is projected to reach people by the end of 2029, driven by the county's high population growth rate of 1.5 percent per annum and the influx of people seeking employment opportunities within the county.

With the commencement of the PPP implementation, it is expected that there will be an influx of people from various parts of the country, including Kirinyaga City, as well as from within Kirinyaga County and neighboring counties, in search of job opportunities at the construction sites and emerging enterprises. This influx of people will put pressure on neighboring facilities such as housing estates, water supply systems, health facilities, and security structures during the

construction phase. As the different phases of the Masterplan are completed, both the resident and working population will significantly increase as residential developments are occupied and commercial and industrial activities become operational.

6.5.2 Economic

The implementation of the PPP presents economic opportunities for the local population in Kirinyaga County. These opportunities include business ventures and employment prospects, both during the construction phase and upon commissioning. Furthermore, the PPP is expected to stimulate economic growth in the county through increased trade, commerce, and government revenue. The establishment of SAIC as a prominent economic hub aligns with the objectives of Kenya Vision 2030, which seeks to drive economic development and prosperity in the country.

6.5.3 Social

The commencement of the PPP implementation and the subsequent increase in the local population may disrupt existing social networks and organizations, giving rise to new social challenges. These challenges can include a potential increase in crime rates and cultural adjustments for migrant workers. The need for affordable housing to accommodate the unskilled and semi-skilled labor force required for the successful implementation of the Masterplan may lead to the growth of informal settlements in the area. Such settlements are often associated with antisocial behaviors and crime.

As the Masterplan implementation progresses, it will attract people from diverse backgrounds to SAIC and its surroundings. This influx of people may initially result in tensions and crimes such as robbery, car-jacking, and vandalism as individuals adjust to the changes in the social landscape. However, over time, the provision of improved social services within Kirinyaga County is expected to raise the standards of social welfare.

To mitigate the impacts on the surrounding community, effective planning is crucial. The management of the project should collaborate with the Kirinyaga County Government to ensure proper planning not only for the PPP but also for the surrounding neighborhood. This includes providing suitable housing facilities, such as labor camps, for low-income staff and workers to minimize the impact on the local community.

6.5.4 Political

The significant increase in population associated with the implementation of the PPP will have political implications, particularly in terms of representation and political boundaries. The sudden population growth may lead to demands for the redrawing of political boundaries to ensure better representation at the county assembly and national parliament. Kirinyaga County currently consists of four constituencies: Mwea, Gichugu, Ndia, and Kirinyaga Central, which are further divided into

20 electoral wards. Ndia Constituency, where SAIC is located, has 3 wards, while Kirinyaga Central has 4 wards, Mwea has 8 wards, and Gichugu has 5 wards.

The new population at SAIC will require political representation, which may lead to alterations in the political boundaries of the county. This can potentially create tensions between the host population and the immigrant population, as they may have differing views on who should be the legitimate representatives of the people. Given that a majority of the residents are likely to come from outside the local area, there may be political challenges and debates regarding representation and power dynamics within the county.

6.5.5 Science and Technology

The implementation of the PPP will introduce new scientific and technological advancements, particularly in the field of green development, construction, rainwater harvesting, and water recycling. However, it may take time for these concepts and technologies to be widely accepted in the emerging SAIC. The diffusion of these new ideas and practices from the core SAIC to the surrounding areas may initially disrupt existing norms and values but will ultimately lead to a change in local perspectives.

The overall impact of the PPP will be significant, transforming the social, political, and economic landscape of the SAIC and its neighboring regions. This transformation necessitates more efficient governance structures that can effectively respond to emerging challenges and facilitate the harnessing of new opportunities and resources for the benefit of all residents. The goal is to achieve sustainable development that considers the long-term well-being and prosperity of the community.

6.6 Social and economic benefits at strategic level to the local and national development

6.6.1 Residential uses

The SAIC Plan predicts a significant level of growth in Kirinyaga County by 2030. While the exact population and household numbers for 2029 are not provided, it is expected that the population of Kirinyaga County will increase from the 2019 figure of 610,000 residents. Similarly, the number of households is projected to rise from its 2019 value. Unfortunately, the specific numbers for 2029.

6.6.2 Qualitative factors informing the proposed mix of development at SAIC

6.6.2.1 Housing supply

The housing supply in Kirinyaga County has witnessed growth, particularly in the form of apartment-style housing. However, there has also been a significant increase in slum development, contributing to an overall densification of the urban and suburban areas. This growth in housing density can be attributed to infilling, settlement expansion, and the emergence of slum areas.

The demand for housing has been on the rise due to social changes, such as the growth of smaller nuclear families seeking independent living arrangements. With its favorable location,

accessibility, and ample space, SAIC has the potential to capture a significant portion of the housing market in Kirinyaga County.

The allocation of land for housing within the SAIC Masterplan takes into account the balance between commercial and residential activities that may be attracted to the area, as well as the suitability of the land based on environmental considerations.

6.6.2.2 Non-residential Uses

To evaluate the future possibilities for non-residential utilization in SAIC, a thorough assessment was conducted at the city level. This involved examining projected economic growth and its corresponding demands for commercial and industrial spaces. Additionally, various documents, strategies, and surveys pertaining to future industrial and commercial development were taken into account.

The purpose of this evaluation was to determine the potential demand for non-residential facilities in SAIC and align the city's planning and development accordingly. By considering anticipated economic growth and the specific requirements of businesses and industries, the aim was to ensure that SAIC is adequately prepared to accommodate and facilitate non-residential activities in the coming years.

6.6.2.3 Kirinyaga County's Floor-space requirements

Vision 2030 outlines a comprehensive economic strategy for Kenya, encompassing plans and recommendations for future economic development. It sets forth the objective of achieving a rapid annual GDP growth rate averaging 10%. Within this framework, specific plans and proposals have been formulated to foster the growth of various pivotal sectors, such as agriculture, business process outsourcing, financial services, tourism, wholesale and distribution, and industrial activities. The anticipated expansion in these sectors is expected to generate substantial demand for floor-space in Kirinyaga County.

6.6.2.4 Business Process Outsourcing (BPO) and Information Communication Technology (ICT)

Vision 2030 aims to position Kenya as the leading destination for Business Process Outsourcing (BPO) in Africa. Kirinyaga, in particular, offers several key advantages that make it an attractive location for BPO companies. These strengths include a highly skilled and competitive labor force, a strategic regional hub for communication and finance, and a robust telecommunications infrastructure.

BPO companies typically seek business park environments with modern purpose-built premises, excellent ICT infrastructure, and supporting amenities such as banks, shops, restaurants, leisure

facilities, and open spaces. SAIC has the potential to create an environment that caters to the needs of local and international BPO firms seeking to diversify and expand their operations. The site's favorable location can provide easy access to the high-quality telecommunications infrastructure required by BPO businesses, with fiber optic cables passing along Thika Super Highway, which can serve SAIC.

Moreover, many BPO providers prefer to have their workforce accommodated in close proximity to the workplace, given that BPO operations often run 24 hours a day. The mixed-use potential of the SAIC site allows for the possibility of providing suitable accommodation options for BPO employees, including serviced apartments and entry-level apartments tailored to graduates' needs.

6.6.2.5 Financial and business services

Vision 2030 seeks to create a vibrant and globally competitive financial sector in Kenya. The Vision sets out the aim of introducing legal and institutional reforms, and the creation of a critical mass of skills in financial management. With the establishment of an East African Community (EAC) Common Market in 2010, opportunities have been created to take advantage of a much larger market place. Kirinyaga is already the biggest commercial center in the East Africa region and the opportunities provided by freedom of trade and greater integration amongst the EAC nations will allow the City to build on this position. There is scope for growth in the banking and insurance sectors and other supporting industries such as consultancy, accountancy, legal and other professional services.

The City has out grown it’s Central Business District (CBD), and experiences problems of congestion, lack of adequate office and parking facilities and a poor environment. Many of the office buildings within the CBD are not well suited to modern business requirements, and some businesses are now considering moving out of the CBD, or have moved out and have opted for edge of city centre or suburban locations. However, many of the new office locations which have been developed lack critical mass and do not provide the full range of amenities and facilities. They also do not provide a vibrant and quality environment which is better able to attract higher skilled employees and which can be an important consideration in a competitive labor market. Located just 90 KM from the City, SAIC has the potential to create an integrated central business district and business park environment which provides for the needs of the sector.

6.6.2.6 Light Industry

The Vision 2030 plan recognizes manufacturing as a key priority sector and aims to position Kenya as a preferred provider of basic manufactured goods in eastern and central Africa. The focus is on niche products such as organic foods and beverages, as well as medium and light industries. The government's vision is to develop consumer goods that can compete with imports in local industries

and increase the market share in the regional market from 7% to 15%. To achieve this, Kenya aims to enhance value addition through further processing of local agricultural products. Secondary products have broader market demand, higher income potential, and create job opportunities.

The Vision sets a target for manufacturing to increase its contribution to GDP by 10% per year. SAIC has the potential to attract businesses in need of high-quality light manufacturing facilities that are compatible with other activities in the area. Its advantageous access to the strategic road network and the ability to provide a secure environment make it an attractive prospect for potential occupiers.

6.6.2.7 Wholesale and Retail

Currently, both informal and formal trade contribute approximately 10% to Kenya's GDP and employment. The trade sector has experienced rapid growth since the 1990s, although the majority of employment remains in the informal sector. Formal sector jobs are more stable and of higher quality, so the focus is on providing support to encourage the formalization of the sector. Key subsectors within the trade industry include wholesaling, retail, distribution, logistics, and haulage, all of which have the potential to be located at SAIC. The site offers significant opportunities for accommodating distribution and logistics operations, benefiting from its favorable access to the national road network, airport, and other industrial areas.

6.6.2.8 Tourism

Tourism plays a crucial role in realizing the objectives of Vision 2030, and the plan outlines three specific goals for the tourism sector: increasing its contribution to GDP, attracting more international visitors, and expanding the capacity of high-quality hotel beds. To generate greater revenue from tourism, there is a focus on extending the duration of visitors' stays by offering improved accommodation options, including international chain hotels and boutique hotels. Additionally, there is potential, especially in Kirinyaga, to develop facilities for business tourism, such as meeting venues, conference centers, and exhibition spaces.

SAIC presents an opportunity to cater to various tourism niches, including the attraction of boutique hotels, MICE (meetings, incentives, conferences, and exhibitions) tourism, business tourism, and event-related tourism. Given Kirinyaga's growing prominence, SAIC can serve as a hub for these tourism segments, while also contributing to domestic tourism by providing leisure facilities and hospitality services for weddings and other events.

6.6.2.9 Education

Vision 2030 places emphasis on the growth of university education and training to align with population growth. SAIC presents a significant opportunity in this regard, as it has the potential to accommodate the expansion or establishment of institutes affiliated with Kirinyaga University,

which is located on the eastern side of the site. The site could attract additional further education colleges and training institutes, contributing to the overall educational and training ecosystem in the area.

6.6.2.10 Health care services

The Government's Vision 2030 seeks to enhance access to healthcare services. With increasing affluence, there is a growing demand for private healthcare. SAIC presents an opportunity to establish a dedicated healthcare cluster that is connected to a major private facility. This would help meet the rising demand for quality healthcare services in the region.

6.7 Other Benefits of the PPP Implementation

The SESA studies and the stakeholder consultations (as shown in Section 5.5) reveal a number of strategic social and economic benefits accruing from the PPP implementation. These include:

6.7.1 Improvement of County and National Economy

The investment in SAIC will not only contribute to the growth of the county economy but also have a positive impact on national development, inspiring confidence to replicate similar projects in other parts of the country. Furthermore, SAIC presents opportunities for tourism development, attracting domestic and regional tourists, particularly from the East African Community, to both the conservancy and the planned city.

6.7.2 Social Infrastructure

The development of SAIC will include the establishment of high-end social infrastructure such as schools, roads, hospitals, and shopping malls. This will not only benefit the local communities within SAIC but also neighboring middle-class communities. They will have access to improved healthcare services and convenient amenities nearby. Additionally, the property prices in these estates are expected to increase, providing economic benefits to the residents.

6.7.3 Security

To ensure smooth and successful business operations, steps will be taken to enhance security in and around SAIC due to the increased population concentration. This will not only benefit the local communities but also instill confidence in other investors to undertake similar private ventures in different parts of the county.

In the long run, the PPP implementation will bring benefits to the local people, the county, and the national economy. These benefits will be realized both during the construction phase and after completion. The success of the PPP will not only have a positive impact on the proponent and the emerging SAIC communities, but it will also inspire similar developments across the country, regardless of their scale. Therefore, the PPP will serve as a confidence booster for investors in Kenya.

CHAPTER SEVEN
IDENTIFICATION OF ENVIRONMENTAL PROBLEMS AND MITIGATION MEASURES

7.1 Introduction

The PEIA established that the Masterplan will have significant impacts on the following environmental and social themes in the plan area.

- Traffic and Transport
- Water Resources
- Water Resources
- Energy Resources
- Soils and Geology
- Biodiversity and nature conservation

7.2 Traffic and Transport

The development in Sagana is anticipated to have significant impacts on traffic and transportation in the area, both during the construction and operation phases. Here are some key considerations regarding these impacts:

- **Increased Vehicle Volume and Traffic:** The development will likely result in a higher number of vehicles, leading to increased traffic along major roads such as the Murang'a-Sagana Road, Nyeri-Nairobi Road, and Kagio-Sagana Road. This surge in traffic can place additional demands on existing road infrastructure and may require additional maintenance due to vehicle-induced damage, especially from heavy construction vehicles.
- **Air and Noise Emissions:** The increased vehicular traffic associated with the development can contribute to higher levels of air and noise emissions, potentially impacting local air quality and ambient noise levels. Measures should be taken to mitigate these impacts and ensure that air quality standards are not exceeded and noise levels are within acceptable limits.
- **Traffic Management Plan and Impact Study:** To address the negative impacts of increased traffic, it is essential to develop a comprehensive Traffic Management Plan. This plan should be based on a thorough Traffic Impact Study (TIS) of the highway network in the area. The TIS will assess potential delays, traffic flow conditions, and the increased risk of traffic incidents, such as congestion-related collisions and compromised sight distances.
- **Roadway Improvements:** The TIS will help identify necessary roadway improvements to ensure the safe and efficient operation of the road network upon completion of the development. These improvements may include widening of roads, construction of additional lanes,

installation of traffic control measures, and implementation of intersection improvements to mitigate congestion and enhance traffic flow.

By conducting a detailed Traffic Impact Study and developing a comprehensive Traffic Management Plan, the potential negative impacts on traffic and transportation can be effectively addressed. Implementing recommended roadway improvements will ensure the safe and efficient movement of vehicles, reduce congestion-related issues, and minimize the environmental impacts associated with increased traffic.

7.3 Water Resources

The proposed development in Sagana is expected to result in an increased demand for water resources, both during the construction phase and in the operation phase. Here are some key considerations regarding water usage:

- **Water Sources:** Water for the development will be sourced from various existing and new boreholes, supply from KIRIWASCO (Kirinyaga Water and Sanitation Company), floodwater and rainwater harvesting, as well as river abstraction. These sources will provide the necessary water supply for construction activities and operational needs.
- **Water Conservation:** It is crucial to implement water conservation measures throughout the development process to ensure the sustainable use of water resources. The master planning for Sagana has already incorporated measures to ensure adequate water supplies. Additionally, specific water conservation measures will be outlined in the environmental management plans for both the construction and operation phases of the proposed projects.
- **Groundwater Depletion and Water Scarcity:** Without careful management and conservative use of water resources, there is a risk of adverse impacts such as groundwater depletion from excessive abstraction and increased water scarcity in the Sagana area. It is important to monitor and regulate water abstraction to prevent overexploitation and ensure the availability of water resources for present and future needs.
- **Effluent Management:** Effluent generated from the proposed developments has the potential to cause pollution in ground and surface water, posing risks to both human health and aquatic life. To protect water resources, effective management of construction wastewater, implementation of spill control mechanisms, and proper treatment of effluent will be required. This will minimize the discharge of pollutants into water bodies and ensure the preservation of water quality.
- **Sustainable Water Practices:** The development should incorporate sustainable water practices such as water recycling, efficient water use technologies, and stormwater management systems.

Rainwater harvesting systems can be implemented to capture and store rainfall for non-potable uses, reducing the demand for freshwater sources.

By implementing water conservation measures, managing effluent properly, and adopting sustainable water practices, the proposed development in Sagana can minimize its impact on water resources. This will contribute to the preservation of water availability, protect water quality, and ensure the sustainable use of water throughout the construction and operation phases.

7.4 Energy Resources

The proposed development will have a significant impact on energy resources, both during the construction and operation phases. The primary forms of energy to be utilized will be grid energy and fossil fuels. Here are some key considerations related to energy usage:

- **Construction Phase**: During the construction phase, fossil fuels will predominantly be used to power construction vehicles and generators. This is essential for carrying out construction activities efficiently. However, it is important to implement measures to minimize energy consumption and promote energy-efficient practices, such as using fuel-efficient machinery and optimizing construction schedules to reduce energy waste.
- **Operation Phase:** In the operation phase, a combination of grid energy and fossil fuels will be required. Grid energy will be needed for lighting and powering machinery and equipment in residential, commercial, and industrial establishments. The availability of reliable power supply in the development area is advantageous. However, energy conservation measures should be implemented to reduce overall energy consumption and promote sustainable practices.
- **Government Energy Goals:** The Government of Kenya (GoK) has set ambitious targets to increase energy production to meet growing industrial and domestic energy demands. This commitment is reflected in the plan to increase energy production from 1,800MW to 23,000MW by 2030. It is important for the proposed development in Sagana to align with these energy goals and contribute to a sustainable energy future.
- **Energy Conservation Measures:** The development in Sagana should prioritize energy conservation measures to minimize the overall energy demand. This includes promoting energy-efficient building design, using energy-saving appliances and equipment, and implementing smart energy management systems. By adopting these measures, the development can reduce its carbon footprint and contribute to a more sustainable energy consumption pattern.
- **Renewable Energy Opportunities:** Sagana presents opportunities for harnessing renewable energy sources. Solar energy can be harnessed through the installation of solar panels for

electricity generation, reducing reliance on grid energy. Additionally, the generation of energy from waste, such as through waste-to-energy technologies, can be explored as an environmentally friendly option.

By instituting energy conservation measures, embracing renewable energy opportunities, and aligning with the government's energy goals, the proposed development in Sagana can contribute to a more sustainable energy future. This will not only reduce the environmental impact but also enhance the resilience and long-term viability of the development.

7.5 Soils and Geology

It is crucial to address and mitigate the potential impacts on soil and geology during the construction and operation phases of the development. Adequate measures should be incorporated into the Environmental Management Plans to ensure responsible management of these resources. Here are some key considerations related to the soil and geology of the Sagana area:

- Geology: Sagana exhibits a diverse geological composition, including metamorphic rocks (e.g., gneiss and schist), volcanic rocks (e.g., basalt and tuff), and sedimentary rocks (e.g., sandstone and shale). Understanding the distribution and characteristics of these geological formations is important for effective project planning and management.
- Soil Types: The predominant soil types in Sagana are red and yellow loamy soils. These soils are generally fertile and well-drained, providing a favorable environment for agricultural activities. However, it is crucial to implement measures to prevent soil erosion, nutrient depletion, and compaction during construction activities that could degrade the soil quality.
- Soil Depletion and Degradation: The development activities may involve excavation and removal of soil, which can lead to local soil resource depletion. Additionally, compaction and soil sealing resulting from construction activities may increase surface runoff and soil erosion. Proper soil conservation practices, such as implementing erosion control measures and using appropriate soil management techniques, should be integrated into the Environmental Management Plans to mitigate these impacts.
- Contamination Risks: The handling and storage of construction chemicals pose a potential risk of soil contamination. Spillage of hazardous substances like oils, fuels, paints, solvents, and acids should be strictly monitored and managed to prevent soil contamination. Adequate containment measures and proper disposal practices should be in place to minimize the risk of soil pollution.
- Introduction of Invasive Species and Pathogens: Importing soil for landscaping or fill activities may introduce invasive plant species, noxious weeds, and pathogens such as bacteria, fungi,

and nematodes. It is important to implement appropriate protocols for soil importation, ensuring that it is free from harmful organisms and invasive species. Additionally, monitoring and early detection programs should be established to prevent the establishment and spread of invasive species.

By incorporating effective soil and geology management practices into the Environmental Management Plans, the potential impacts on soil depletion, degradation, contamination, and the introduction of invasive species can be minimized. Implementing appropriate measures during construction and operation phases will help protect the soil and geological integrity of the Sagana area, ensuring its long-term sustainability and ecological health.

7.6 Biodiversity and nature conservation

The Sagana area is renowned for its rich biodiversity and abundant natural resources, and various initiatives have been implemented to ensure the conservation of these valuable assets. Here are some notable examples of biodiversity and nature conservation efforts in the Sagana area:

- **Sagana Forest**: The Sagana Forest is a significant natural resource that serves as a habitat for a diverse range of wildlife, including various bird species, monkeys, and antelopes. Conservation efforts have focused on implementing sustainable forest management practices to ensure the long-term health and vitality of the forest. Additionally, community-based conservation initiatives have been established to actively involve the local community in protecting and preserving this vital ecosystem.
- **Sagana River**: The Sagana River plays a vital role as a water resource for the town and supports a wide array of aquatic species. Conservation efforts have been directed towards sustainable water management practices, ensuring the river's ecological integrity and safeguarding the diverse aquatic life. Measures to control pollution and maintain water quality have also been implemented to protect the river's ecosystem.
- **Community conservation initiatives:** The Sagana area has witnessed the implementation of various community-led conservation initiatives. These initiatives actively engage the local community in biodiversity and nature conservation efforts. Activities such as reforestation programs, eco-tourism initiatives, and the promotion of sustainable agricultural practices have been undertaken, empowering the community to take an active role in preserving the area's natural heritage.
- **Wildlife conservation**: The Sagana area boasts an impressive array of wildlife species, including monkeys, antelopes, and birds. To safeguard these species, wildlife conservation programs have been established. These programs focus on critical aspects such as habitat

restoration, anti-poaching measures, and raising awareness about the importance of wildlife conservation. By addressing key threats and implementing appropriate management strategies, these initiatives contribute to the long-term protection of Sagana's wildlife.

- **Sustainable agriculture practices:** Agriculture plays a vital role in the Sagana area, and efforts have been made to promote sustainable agricultural practices that harmonize with biodiversity conservation and natural resource management. Initiatives such as crop rotation, organic farming methods, and integrated pest management techniques are being encouraged. These practices minimize the negative impact of agriculture on the environment, preserve soil fertility, and protect water resources, thus supporting both sustainable food production and biodiversity conservation.

Through these concerted efforts, the Sagana area is striving to strike a balance between socio-economic development and the preservation of its unique biodiversity and natural resources. By integrating conservation principles into various sectors, Sagana is taking significant steps towards ensuring the long-term sustainability of its natural heritage for future generations.

7.7 Air quality

The local air quality is expected to be affected by the construction and operation phases of the development. During construction, the primary sources of air pollution will be dust emissions from excavation and earthworks, as well as the transportation of aggregates to construction sites. Additionally, construction vehicles and machinery will release carbon oxides, nitrogen oxides, and sulfur oxides into the atmosphere.

Upon completion of the development, potential sources of air pollution include emissions from standby generators, motor vehicles, and kitchen fires. There may also be air pollution from on-site incineration and odors emanating from sewer treatment plants or waste transfer sites.

To mitigate these air quality impacts, it is crucial to implement adequate environmental management plans during both the construction and operation phases. These plans should include measures to control dust emissions during excavation and earthworks, such as using water suppression techniques and covering stockpiles. Additionally, promoting the use of low-emission construction vehicles and machinery can help minimize carbon, nitrogen, and sulfur oxide emissions.

During the operational phase, it is important to ensure proper maintenance and emission control of standby generators and motor vehicles. Implementing measures to reduce kitchen fire emissions, such as using efficient cooking equipment and proper ventilation, can also contribute to improving

air quality. Additionally, appropriate waste management practices should be in place to prevent on-site incineration and minimize odors from sewer treatment plants or waste transfer sites.

By adhering to these environmental management plans and implementing mitigation measures, the potential impacts on local air quality can be effectively addressed, resulting in a healthier and cleaner environment for the surrounding community.

7.8 Noise and vibration

During construction, it is anticipated that noise will be generated due to the operation of machinery, such as excavation equipment, mixers, and construction vehicles transporting materials to active construction sites. This noise is expected to persist throughout the construction period and may have an impact on neighboring residents and institutions. Additionally, noise from construction activities can be experienced along the access roads to the construction material sources.

Upon completion and occupation of the developments, there is likely to be a permanent increase in ambient noise levels. This elevation in ambient noise arises from the everyday activities in an urban developed area.

To mitigate the impact of noise, proper planning of land use is crucial. By strategically locating noisy activities, such as industrial and commercial uses, near main roads or peripheral areas, and positioning residential, recreational, and educational uses in quieter areas, the effects of noise can be minimized. Creating buffer zones between different land uses can also help attenuate noise, further reducing its potential impacts.

Implementing these measures in the planning stage of the development can contribute to mitigating noise-related issues. By considering the placement of different land uses and incorporating buffer zones, the adverse effects of construction and ambient noise on residents and institutions can be mitigated, providing a more peaceful and conducive environment for all stakeholders.

7.9 Health and safety

During the construction phase, it is important to acknowledge that safety hazards are likely to increase, potentially leading to accidents involving workers and the general public. Construction activities expose workers to occupational health and safety risks, including injuries resulting from accidental falls, improper use of hand tools, and mishaps with construction equipment.

The presence of construction sites also poses safety hazards to the public, particularly pedestrians and motorists passing in close proximity. Additionally, the absence of sufficient provision for sanitary facilities can lead to health hazards, affecting both workers and the surrounding community.

Once the development is completed or as various phases/projects are completed and the facility enters its operational phase, it is crucial to address potential health and safety hazards. This includes ensuring the availability of adequate facilities, implementing protection measures, adhering to worker-protection protocols, and maintaining a high level of commitment to best practices.

To mitigate foreseeable health and safety risks during both the construction and operational phases, it is imperative to implement comprehensive health and safety plans. These plans should encompass various aspects, including risk assessments, hazard identification, safety training, the provision of necessary safety equipment, and ongoing monitoring and evaluation to ensure compliance with established protocols and standards.

By prioritizing and implementing robust health and safety measures, potential risks can be minimized, creating a safer environment for workers, the public, and the surrounding community throughout the construction and operation of the development.

7.10 Waste

The proposed projects, both during construction and operation phases, will generate various types of waste. Construction activities will result in the generation of spoil materials (such as soil, rocks, and vegetation), packaging materials (such as paper, polythene, plastic, and metallic packaging), reject materials (including damaged bricks, concrete, mortar, and plastics), waste water, and used oil, among others.

It is crucial to implement adequate waste management measures to prevent environmental pollution, maintain aesthetic standards, and avoid the creation of breeding grounds for vermin. Improper disposal, whether on-site or off-site, can have adverse impacts on the environment. Therefore, effective waste management practices need to be in place during the construction phase.

Furthermore, households, commercial establishments, and industrial developments are likely to generate significant amounts of effluent, organic waste, and inorganic waste. It is essential to handle and dispose of these wastes properly to prevent environmental pollution.

Inefficient management of solid waste and sewerage waste from development projects can lead to pollution and pose health hazards to residents and the public. To mitigate potential adverse impacts, proper effluent management plans, including treatment and discharge into existing trunk sewer systems, as well as recycling of wastewater, are necessary.

The management of solid waste from the developments will require an integrated approach that includes strategies such as source reduction, reuse, recycling, incineration, and disposal in designated landfill sites. Additionally, exploring opportunities for generating energy from solid waste and/or effluent can be considered.

A comprehensive waste management strategy encompassing proper handling, treatment, and disposal of different types of waste will be essential to ensure environmental protection and minimize adverse impacts on human health and the surrounding community.

7.11 Indirect, Cumulative and Synergistic Impacts

Cumulative effects refer to the overall impact resulting from the combined influence of multiple projects and activities on the environment. In the context of development plans, cumulative effects can occur when the collective impacts of policies and proposals affect specific areas or sensitive receptors. This can manifest in various ways, such as the interaction between the impacts of one plan and another on the same receptor, the interplay of policies within a plan on the same receptor, or the cumulative impacts of proposals within a plan affecting the same receptor (Cooper, 2004).

Cumulative effects occur when there is spatial crowding or temporal overlap between plans, proposals, and actions; repetitive removal or addition of resources due to proposals and actions; or repeated alteration of the landscape within the planned area.

To assess whether the implementation of the Sagana Masterplan could lead to significant cumulative effects, the following questions were considered:

- Are the combined effects of the plan and impacts from other plans likely to be significant?
- Is there a likelihood of cumulative effects from the plan itself or its individual proposals?
- Are there valuable environmental resources in the broader plan area that may be affected by the proposals within the plan?
- What is the sensitivity or capacity of these valued environmental resources? How do they currently fare in relation to environmental quality standards or thresholds? Would additional impacts lead to breaches of these limits?
- How long-lasting and frequent are the potential impacts?

Studies have indicated that the implementation of the Sagana Masterplan has the potential to significantly impact valued environmental resources in the surrounding area. These potential impacts can be cumulative, exhibiting additive, synergistic, or neutralizing effects, and in part, they can be indirect in nature.

7.12 Potential Risk for River Ragati and Sagana flooding upon SAIC infrastructure

There are some low-lying places along the Rivers Ragati and Sagana that could induce flooding into the SAIC infrastructure. Floodwaters can endanger lives, inundate homes and businesses, destroy assets, damage critical infrastructure, and restrict access to crucial amenities as they spread.

Floods frequently have long-lasting repercussions that can be exceedingly expensive, disruptive, and unpleasant for the communities affected.

Mitigations of possible flooding

1. The building of dykes.
2. reshaping rivers to increase their capacity for discharge, dredging channels to make them deeper,
3. Re-vegetation of the zone area using native species at a distance of 10 meters from the water's highest point.
4. Constructing artificial retention ponds to hold extra water.

Figure 1: A photo of River Ragati

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CHAPTER EIGHT

ALTERNATIVE PLAN OPTIONS FOR THE MASTER PLAN CONSIDERED

8.1 Introduction

The process of identifying alternative options primarily involved thorough assessments based on the following key factors:

- An extensive exploration of diverse possibilities regarding land use and infrastructure. This involved analyzing different scenarios and potential configurations to determine the most suitable options.
- A comprehensive effort to enhance the integration of obligatory public-private partnership (PPP) environmental issues within the SAIC Master Plan. This crucial step aimed to ensure that the Master Plan aligns effectively with Kenya's overarching goals, principles, and strategic plans for environmental sustainability.
- The critical evaluation of all activities proposed within the Master Plan to identify those with the potential to cause adverse environmental impacts. Any such activities were subject to rigorous scrutiny and underwent a process of elimination, downsizing, or modification to mitigate their negative effects.

8.2 Land use options

Four options have been developed to test the capacity of the site and to help establish the optimum mix of land uses.

8.3 Infrastructure Options

8.3.1 Water supply

8.3.1.1 Potential water supply sources

The identification of potential water supply sources for SAIC was founded upon prior examinations of water resources in the broader Kirinyaga area. The specific water sources that were investigated and identified include:

- Thiba Dam
- Water from River Sagana and River Ragati
- Dam on Ragati River
- Boreholes
- Utilization of wastewater through reuse methods

8.3.1.2 Kirinyaga Water Supply system (from KIRIWASCO)

KIRIWASCO, also known as Kirinyaga Water and Sanitation Company, is a water utility firm that operates within Kirinyaga County, Kenya. Its primary responsibility is to provide the community with clean and safe water supply, as well as sanitation services, within its designated service area.

To fulfill its duties, KIRIWASCO extracts water from various sources such as rivers, dams, and boreholes. The company then treats the water to ensure it meets quality standards before distributing it to households, businesses, and institutions throughout the region. Additionally, KIRIWASCO manages the sanitation infrastructure, including the collection and treatment of wastewater. In the context of SAIC, KIRIWASCO will play a crucial role in ensuring access to reliable water and sanitation services. Working in collaboration with SAIC management, stakeholders, and the community, KIRIWASCO aims to provide efficient and sustainable water management solutions.

One of the notable advantages of sourcing water from KIRIWASCO is its cost-effectiveness. This approach involves payment for bulk water supply without the need for developing and maintaining source works, treatment facilities, pumping stations, and water transmission systems. The development of this water source would typically entail constructing a one-day storage reservoir and a short transmission pipeline to connect to the CAIS system.

Below is a list of the advantages and disadvantages of utilizing KIRIWASCO as a water source, as compared to other potential sources:

Advantages:

- Cost-effective in terms of infrastructure development and maintenance.
- Established water treatment processes ensure water quality meets standards.
- Existing distribution network enables efficient water supply to SAIC.

Disadvantages:

- Reliance on an external entity (KIRIWASCO) for water supply, which may introduce dependency and potential coordination challenges.
- Limited control over the operations and management of the water supply system, as it is under the purview of KIRIWASCO.
- The need to align goals and priorities between SAIC and KIRIWASCO to ensure a seamless and mutually beneficial partnership.

8.3.1.3 Thiba Dam

The proposed dam site is situated in Kabare ward, Gichugu Constituency, adjacent to River Thiba, approximately 24.9 kilometers away from the SAIC site. The water supply to SAIC from this source will be facilitated through gravity flow, eliminating the need for pumping. The development of this water source will require acquiring land and constructing the following components:

- Short raw water pipelines

- Treatment facilities
- A one-day storage tank for treated water
- A transmission pipeline spanning approximately 30 kilometers to transport the treated water.

Below is a comparison of the advantages and disadvantages of this particular water source in relation to other potential sources:

Advantages:

- Gravity-based water supply, reducing the need for pumping and associated energy costs.
- Proximity to River Thiba provides a readily accessible water source.
- Potential for reliable water supply due to the presence of a dam.
- Enables the development of a significant storage capacity for treated water, ensuring a steady supply to SAIC.

Disadvantages:

- Land acquisition may pose logistical challenges and require negotiations with local communities.
- Construction of the various components entails additional costs and efforts.
- The length of the transmission pipeline may lead to potential maintenance and operational complexities.

8.3.1.4 Intake Weir on River Sagana and River Ragati.

The proposed intake site is situated within the SAIC project area. Unlike the previous source, gravity supply of water is not feasible, and both raw and treated water will require pumping. The development of this water source does not necessitate land acquisition and will involve the construction of the following components:

- A concrete weir across Sagana and River Ragati to facilitate water intake.
- A short raw water pipeline.
- Treatment facilities for water purification.
- A one-day storage tank for treated water.
- Both raw and treated water pumping stations.
- A treated water pumping main, approximately 6 kilometers in length.

Here are the advantages and disadvantages of this particular source in comparison to similar alternative sources:

Advantages:

- Located within the SAIC project area, minimizing the need for extensive water transmission

infrastructure.

- No land acquisition required, potentially reducing project costs and complications.
- Enables the establishment of a significant storage capacity for treated water, ensuring a consistent supply to SAIC.

Disadvantages:

- Dependence on pumping for both raw and treated water, which incurs energy costs and requires operational maintenance.
- Construction of multiple components, including the weir, pipelines, treatment works, and pumping stations, may involve higher upfront investments.
- The length of the treated water pumping main introduces considerations for maintenance and operational efficiency.

8.3.1.5 Dam on River Ragati

The proposed intake site is situated to the east of SAIC, downstream of the point where Ragati River joins. To supply water from this intake site to SAIC, the use of pumps will be necessary. The development of this water source does not require the acquisition of land and will involve the construction of the following components:

- A dam on Ragati River.
- A short raw water pipeline.
- Treatment facilities for water purification.
- A one-day storage tank for treated water.
- A transmission pipeline spanning approximately 17.0 kilometers to transport the treated water.
- A pumping station for the treated water.

Here are the advantages and disadvantages of this specific water source in comparison to other alternative sources:

Advantages:

- The location downstream of the confluence with Ragati ensures an abundant supply of water for treatment and distribution to SAIC.
- No land acquisition is needed, potentially reducing project costs and complications.
- The construction of a dam on Ragati River enables the regulation and utilization of water resources.

Disadvantages:

- The need for pumping treated water introduces energy costs and operational maintenance

requirements.

- Construction of multiple components, including the dam, pipelines, treatment works, storage tank, transmission pipeline, and pumping station, may involve higher initial investments.
- The length of the transmission pipeline and the requirement for a pumping station may introduce considerations for maintenance and operational efficiency.

8.3.1.6 Boreholes within SAIC

The boreholes, previously identified in hydrogeological reports encompassing the CAIS site, will be situated within the project area. The development of this water source entails the drilling and equipping of boreholes, with the requirement of pumping treated water to supply SAIC. The construction of the following components will be involved:

- Four boreholes.
- A network for collecting raw water.
- Treatment facilities for water purification.
- A one-day storage tank for treated water.
- A pumping station for the treated water.
- A transmission pipeline spanning approximately 6.0 kilometers to transport the treated water.

Here are the advantages and disadvantages of this particular water source in comparison to other alternative sources:

Advantages:

- The boreholes are located within the project area, minimizing the need for extensive water transmission infrastructure.
- Utilization of existing hydrogeological reports provides a foundation of knowledge for drilling and equipping the boreholes.
- The construction of a network for raw water collection enables efficient water intake.

Disadvantages:

- Pumping treated water introduces energy costs and requires ongoing operational maintenance.
- Construction of multiple components, including the boreholes, treatment works, storage tank, pumping station, and transmission pipeline, may involve significant upfront investments.
- The length of the transmission pipeline may require periodic maintenance and operational considerations.

8.3.1.7 Waster water reuse

An upcoming possibility for water supply in SAIC could entail the utilization of a strategy called artificial recharge and recovery (ARS), which involves the re-use of wastewater. This approach

involves pumping semi-treated wastewater into the local groundwater aquifer through recharge boreholes. Subsequently, the water is recovered through regular groundwater abstraction boreholes after undergoing additional natural treatment. The application of this option has been implemented successfully in other water-scarce regions around the world.

8.3.2 Power supply

Energy plays a crucial role in realizing Kenya's Vision 2030, which aims to transform the country into a middle-income nation with improved living standards for all its citizens. Kenya boasts one of the most advanced power sectors in sub-Saharan Africa, boasting a total installed capacity of 2,840 MW. In recent years, the government has embarked on an ambitious endeavor to provide access to competitively priced, reliable, high-quality, safe, and sustainable energy solutions.

Kenya possesses a fascinating energy mix, with renewable energy resources accounting for approximately 73% (2,042 Gigawatts) of the total installed capacity, while the remaining portion relies on thermal-based fossil fuels. Specifically, hydroelectric power (818 MW) and geothermal energy (678 MW) comprise the majority, representing 59% of the renewable energy share, with wind power (12%) and solar power (2%) making up the rest.

Considering the increased power demand for the site, particularly as the load demand per phase grows, the establishment of substations becomes necessary to ensure the fulfillment of specific phase requirements. Various potential sources of power for the site include hydro energy, geothermal energy, wind power, thermal energy, and solar power.

8.3.2.1 Hydro energy

The primary source of power supply for SAIC will be hydroelectric power, which is obtained from the Kenya Power and Lighting Company (KPLC). Additionally, the County Government is undertaking a project to harness the hydropower potential of its water resources. This generated hydropower will be utilized to meet the energy requirements of SAIC, depending on the total power produced. In the event that the generated power exceeds the site's demand, there is an opportunity to sell the surplus electricity to KPLC. KPLC would then distribute the power to supply other customers.

8.3.2.2 Geothermal energy

Geothermal energy serves as the second prominent power source and is being expanded to meet the growing energy demand. One of the advantages of geothermal energy is its renewable nature, unaffected by variable weather conditions. The energy from the geothermal source is transmitted to the site through the Olkaria power line, which then proceeds to Dandora for distribution to other regions of the country.

SAIC stands to benefit from this expansion as KenGen, the primary geothermal power producer, is

increasing generation capacity to ensure energy self-reliance for the nation. To supply SAIC, KPLC has the potential to tap into the power available at the Dandora substation. This allows for the reliable and efficient supply of energy to meet the needs of SAIC.

8.3.2.3 Wind energy

Upon completion of production in various locations such as Ngong Hills, Turkana, Isiolo, Lamu, Marsabit, and Malindi, it is anticipated that these projects will contribute approximately 20% of the energy supplied to the national grid. Consequently, SAIC will benefit from this energy supply as it will be integrated into the national grid and utilized on the site.

However, establishing a wind farm directly on the SAIC site may face limitations. This is primarily due to the relatively low wind speeds in the area and the potential impact of urbanization, which could affect local wind patterns in the future. Therefore, other renewable energy sources, such as hydro and geothermal power, may be prioritized for meeting the energy needs of SAIC, while wind power may have limited feasibility in this specific location.

8.3.2.4 Thermal energy

In addition to other power sources, generator energy is utilized to contribute to the national grid in order to meet power demands. At the site, standby power will be necessary based on the requirements of different clients. However, implementing this option on a Masterplan scale may not be cost-effective as generator plants tend to be relatively expensive to operate and maintain.

8.3.2.5 Solar energy

Solar energy presents an opportunity for harnessing power and reducing electricity expenses specifically for water heating in individual properties and premises. Implementation of solar water heating systems can help to minimize the reliance on conventional power sources for water heating purposes. Additionally, solar energy can be considered for applications such as street lighting, water pumping from boreholes and rivers, and other forms of utilizing ambient solar energy.

8.3.3 Effluent Management

The design criteria guidelines to be adopted for SAIC Sewerage design are those widely used in Kenya and recommended by the Ministry of Water and Irrigation Design Manual for Sewerage Services in Kenya, 2009 edition. However, some changes will be made to address the unique nature of the proposed SAIC Plan. This zoning is intended to eliminate any need for pumping and therefore all sewage will be collected and transmitted to the treatment works by gravity, thus minimizing operations and maintenance costs.

8.4 Solid Waste Management (SWM)

The National Environment Management Authority (NEMA) has developed a comprehensive National Solid Waste Management Strategy to guide sustainable solid waste management practices

in Kenya. The objective is to ensure a healthy, safe, and secure environment for all citizens. This strategy represents a visionary commitment for the country in solid waste management. A key principle of the strategy is the Zero Waste Principle, which views waste as a valuable resource that can be utilized to create wealth, generate employment, and reduce environmental pollution. The implementation of the strategy encourages the active involvement of government bodies, civil society, private sector, and the general public.

The SAIC Masterplan recognizes the importance of waste composition data in developing an effective integrated solid waste management strategy. Analyzing the waste composition provides crucial insights into the types, quantities, and quality of different waste components, leading to the selection of appropriate technologies for waste handling, processing, and treatment. While the SAIC Masterplan draws upon waste characterization studies conducted in Nairobi and other major towns, it expects similar waste composition patterns within SAIC, albeit on a smaller scale.

It is acknowledged that solid waste management poses significant challenges for Kirinyaga County, as well as all other 47 counties in Kenya. In the past, local authorities did not prioritize the establishment of proper waste management systems, resulting in the inherited burden for County Governments. The problem has been further exacerbated by the growing population, increasing household incomes, and the overall development of the Kenyan economy, coupled with insufficient mechanisms for waste collection, transportation, and disposal.

The proposed Solid Waste Management (SWM) strategy for the SAIC Masterplan aligns with the National Solid Waste Management Strategy and adopts a multi-faceted approach based on the "4R" participatory principle: Reduce, Reuse, Recycle, and Reject. The strategy encompasses four main elements, which include:

- Utilizing a cost-effective combination of appropriate technical options for waste reduction, reuse, recycling, and rejection.
- Involving all stakeholders in the implementation process.
- Strengthening the institutional capacity of the SAIC management entity in solid waste management.
- Enforcing relevant laws and policies related to waste management.

8.4.1 Engaging an affordable mix of appropriate technical options to Reduce, Reuse, Recycle and Reject

The strategy is based on the widely accepted waste management hierarchy, which provides a prioritized list of available waste management options. This hierarchy offers valuable guidance on the relative desirability of different management approaches. The SAIC management entity will prioritize the use of an affordable combination of appropriate technical options, moving away from

solely relying on conventional waste collection and disposal methods. The proposed mix of options includes:

- Creating an environmentally friendly and eco-sensitive plan area.
- Promoting waste reduction at the source of generation.
- Implementing waste separation at the source of generation.
- Facilitating the return of recyclable materials to the market.
- Encouraging composting and home gardening.
- Conducting research on anaerobic digestion.
- Exploring waste-to-energy opportunities through incineration of combustible waste in SAIC.
- Ensuring the proper handling of clinical and hazardous waste.
- Implementing door-to-door collection of household waste.
- Establishing a polluter pay system for special waste, such as hazardous waste.
- Utilizing sanitary landfill as a last resort.

SAIC aims to achieve 100% collection of all solid waste generated within the development, either directly or through an intermediary. To achieve this, a solid waste management fee will be incorporated into the sale or lease agreements of all residents, offices, industrial, and commercial properties. This recognizes the necessity of a waste collection levy for a sustainable waste management plan. The waste management levy will be applied in two categories: one for premises that fully separate their solid waste at the source, and another for premises that fail to conduct such full separation.

Solid waste that is not separated at the source will be sorted at a dedicated transfer station, and each waste group will be transported to appropriate sites for further processing. It is anticipated that 51% of the solid waste will be organic, which will be separated and mixed with animal organic waste to produce biodynamic fertilizer. In the future, organic waste may also be used in bio-digesters to generate energy for SAIC.

Recyclable waste such as paper, plastic, glass, and metals is expected to constitute 38% of the total waste generated. Glass and metals will be separated and sold to recycling operators, while paper and plastics will be separated and sold to operators or, in the future, incinerated to generate energy for SAIC.

Residual waste, which includes hazardous waste, is projected to make up 11% of the total waste generation. SAIC will collaborate with the Kirinyaga County Governments to effectively manage these wastes.

8.4.2 Engaging stakeholders in the implementation

The strategy is founded on the principle that effective solid waste management necessitates the involvement of every resident and user of SAIC's facilities. To mobilize their cooperation and support, the SAIC management entity will employ the following approaches:

- Establishing institutional mechanisms such as a waste management committee and conducting regular consultations to engage residents on an individual and collective level.
- Implementing education programs focused on waste management.
- Encouraging educational institutions within the SAIC area to establish School Environment Committees and actively participate in social mobilization.
- Publishing waste collection schedules for transparency and convenience.
- Recognizing and supporting the private informal sector, particularly in the areas of reuse and recycling.

8.4.3 Strengthening Solid Waste Management/Environmental Planning and Management Institutional Capacity of the management entity

The management entity will undertake the following initiatives to enhance its institutional capacity in addressing Environmental Planning and Management (EPM) and Solid Waste Management (SWM) issues:

- Embrace a comprehensive environmental management approach that encompasses various aspects of EPM and SWM.
- Place a non-negotiable emphasis on waste reduction as a key priority.
- Mobilize, train, and educate staff to build their knowledge and skills in EPM and SWM practices.
- Strengthen the Environmental Management Committee to ensure effective coordination and implementation of strategies.
- Develop and implement a Strategy Implementation Plan that outlines actionable steps to operationalize the EPM and SWM strategy.
- Enhance public relations efforts to foster better interaction and cooperation between the management entity and the public.
- Establish a system for regular process and progress documentation to facilitate efficient administration and decision-making.
- Create a Complaints Redress System to collect and address feedback and complaints from residents and users of SAIC facilities.
- Improve the management and monitoring of the SWM strategy's implementation to ensure its effectiveness and progress.

8.4.4 Strict enforcement of Laws & Policy

This Strategy is designed to support the management entity in implementing the National Strategy for Solid Waste Management in a manner that aligns with the specific local conditions. It draws authority from the National Strategy, the Environmental Management and Coordination Act of 1999, and the Environmental Management and Coordination (Waste Management) Regulations of 2006, along with other relevant sectoral laws and regulations.

The Environmental Management Committee will take the following actions to ensure effective implementation:

- Initiate studies to assess the existing legal and administrative provisions that govern solid waste management at both the national and Kirinyaga County levels. Based on these findings, appropriate revisions will be proposed to make the frameworks more resident-friendly, efficient, and expedient.
- Conduct a comprehensive review of available environmental by-laws related to solid waste management and promptly implement them. This will be accompanied by extensive publicity efforts and community-level public education to raise awareness and understanding.
- Establish an enforcement mechanism that includes effective punitive actions as a deterrent. Prior to enforcement, a time-bound phase of public education, domestic sensitization, and social mobilization will be undertaken to ensure the community's understanding and cooperation in enforcing the laws and policies.

8.4.5 Alternative Solid Waste Management Approach

The SAIC Masterplan could consider an alternative and sustainable approach, which involves the establishment of a sanitary landfill by the Kirinyaga County Government. This landfill would cater to the growing urban areas of Sagana Kagio, Kutus, Kerugoya, Ngurubani, and Kagumo. The adoption of this solid waste management (SWM) solution offers several key advantages, including:

- Reduction of odor levels: The sanitary landfill design and operation will effectively minimize unpleasant odors associated with waste disposal, contributing to a more favorable environment for residents and nearby areas.
- Reduction of rodents and birds: Proper waste containment and management measures implemented at the landfill will help control and minimize the presence of rodents and birds that are attracted to unmanaged waste.
- Prevention of leachate leakage: The sanitary landfill will incorporate appropriate engineering measures to prevent the leakage of harmful leachate into the surrounding soil and water sources, ensuring environmental protection.

- Improvement of waste unloading and waste reduction: The establishment of a designated landfill site will streamline waste unloading processes, facilitating efficient disposal and promoting waste reduction through proper management practices.
- Improvement of waste picking: The sanitary landfill can be designed to enable effective waste sorting and picking by waste management personnel, enhancing the recovery of recyclable materials and reducing the amount of waste that ends up in the landfill.

CHAPTER NINE
ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLANS (ESMMP)

9.1 Introduction

The purpose of the Environmental and Social Management and Monitoring Plan (ESAIC MASTERPLAN) is to provide a comprehensive outline of the measures and actions needed to effectively address the identified environmental concerns and gaps highlighted in the Strategic Environmental Assessment (SEA). This plan, as detailed in Section 3 and Section 7, aims to achieve the following objectives:

- Minimize negative impacts: The plan outlines specific actions and strategies to minimize any adverse effects that may arise from the implementation of the SAIC Masterplan. By proactively addressing potential environmental issues, the plan seeks to ensure that the overall impact is kept to a minimum, while maximizing positive outcomes.
- Enhance positive impacts: The ESAIC MASTERPLAN also focuses on enhancing the positive impacts of the SAIC Masterplan. It identifies opportunities to optimize environmental benefits, such as conservation, sustainability, and resource efficiency, thereby maximizing the plan's overall positive contribution.
- Support long-term management and monitoring: The plan provides a framework for the ongoing management and monitoring of environmental issues throughout the implementation of the SAIC Masterplan. It ensures that environmental considerations remain a priority, and appropriate measures are in place to assess, mitigate, and address any emerging challenges or changing circumstances.

It is important to acknowledge that the ESAIC MASTERPLAN is a dynamic document that may require periodic review and updates. As new information, policies, national strategies, and plans emerge over the lifespan of the SAIC Masterplan, the ESAIC MASTERPLAN will be adapted accordingly to incorporate the latest insights and align with evolving environmental priorities.

9.2 Management and monitoring action

The Strategic Environmental Assessment (SEA) has provided specific mitigation measures and alternative options to address potential negative environmental impacts associated with each activity outlined in the plan. Additionally, the SESAhas identified environmental obligation gaps through the Public-Private Partnership (PPP) analysis and recommended suitable alternatives to address them.

The recommended management actions, derived from the SEA, are practical, straightforward, and directly targeted at managing the identified environmental challenges in the SAIC Masterplan.

These actions serve as prescriptions for environmental management, offering tangible solutions.

Implementation of these actions is crucial to effectively address the environmental vulnerabilities within the locality. Given the complexity of cumulative effects at a strategic level, there may be uncertainties in impact predictions. Therefore, monitoring becomes essential to assess the accuracy of predictions and evaluate the effectiveness of mitigation measures.

For each management action, the SESA has provided recommendations regarding monitoring frequency and indicators. Regular monitoring, using these recommended indicators, will gauge the progress made towards ensuring environmental sustainability in SAIC. This will enable continuous evaluation and adjustment of measures to maintain and improve the environmental outcomes.

9.3 Environmental management and monitoring standards and guidelines

For each management action, precise standards and guidelines have been identified. These standards and guidelines were primarily derived from the evaluation of the SAIC Masterplan against the Public-Private Partnership (PPP) framework within the Strategic Environmental Assessment (SEA). They will serve as a reference for environmental management and monitoring throughout the implementation of the SAIC Masterplan.

9.4 Roles and responsibilities

The implementation of the ESAIC MASTERPLAN and the execution of all actions outlined within it is the responsibility of the SAIC Management. It is crucial for the successful implementation of the ESAIC MASTERPLAN that the roles and responsibilities for each management action are clearly defined, as stated in the ESAIC MASTERPLAN itself. Furthermore, these actions should be carried out in collaboration with stakeholders, as emphasized in the ESAIC MASTERPLAN.

9.5 ESAIC MASTERPLAN schedule

The schedule provides a comprehensive list of environmental actions to be undertaken. The tables in the ESAIC MASTERPLAN present the detailed schedule for these actions.

9.5.1 Waste Management

Table 17: ESAIC MASTERPLAN for solid and effluent waste

Potential Adverse Impact:	High generation of solid and effluent waste from residential, commercial and industrial areas
Objective	Eliminate impact on public health due to the poor waste management on location
Management strategy	Removal of agents of environmental pollution and proper disposal of wastes

		Responsibility SAIC Management	Timing During Plan implementation	Costs Cost of waste collection and disposal systems to be determined in the detailed planning for each phase of the development
Recommended Management and Monitoring Action	● Adoption of an integrated solid waste management plan that includes reduction, reuse, recycling, incineration, composting and land filling ● Pursue waste minimization at source principles e.g. zero generation, reduction, re-use and/or recycling; ● segregation of domestic and industrial waste to be done and managed separately ● Provide mechanisms to segregate wastes at source to enable recycling ● Provision of transfer stations from where waste will be disposed in designated areas ● and ensure that all wastes are stored temporarily at the designated transfer stations, and that they are regularly carried away for disposal in designated areas; and ● connection to existing trunk sewers in SAIC pre-treatment of industrial effluent before discharge into sewers			
Performance indicators	Housekeeping, littering, and status of solid waste management in SAIC, functional waste management facilities			
Monitoring requirements	Periodical inspection of waste management operations			
Reporting	Environmental Audits and other Statutory and non-statutory reports			
Interface	Comply with the provisions of the Waste management Regulations on Waste management			

9.5.2 Traffic and Transport

Table 18: ESAIC MASTERPLAN for Traffic and Transport

Potential Adverse Impact:	● Increased human and vehicular traffic/ Risk of traffic congestion within SAIC ● Increased traffic activity and traffic interruptions along the Thika Super Highway and Eastern Bypass
Objective	• Ensure the smooth flow of pedestrian and vehicular traffic and minimize risks of accidents
Management strategy	● Provision of adequate facilities and infrastructure, ● separation of pedestrian and vehicular traffic; ● Continually monitoring traffic incidences, establish their root cause and

	provide solutions			
		Responsibility	Timing	Costs
		SAIC Management	During Plan implementation	Cost of waste collection and disposal systems to be determined in the detailed planning for each phase of the development
Recommended Management and Monitoring Action	● Ensure a good connection between spine roads and the Nairobi Marua Super Highway, Provision of adequate vehicular circulation space and parking areas ● Provision of pedestrian walkways along all roads within the development. ● Paving all pedestrian walk ways with robust, durable, and non- slippery materials. ● Provision of all necessary street furniture along all roads within the development to accommodate users (including the disabled, elderly, and children) and to enhance security. ● Provision of bollards in appropriate areas to prevent vehicles from encroaching into the pedestrian domains. ● Provision of street lights to provide sufficient light for both pedestrian areas	SAIC Management	During Plan implementation	●Cost of signage and warnings in hazard prone areas and other infrastructure shall be included in the project costs during construction: Additional safety measures/features to be procured at prevailing rates during operations

	and carriage ways. ● Provision of trees along pedestrian walkways for shading and that require minimum maintenance; preferably indigenous for ecological and cultural advantages.			
Performance indicators	● Traffic status ● Ease of access and circulation			
Monitoring requirements	Regular monitoring of traffic flow			
Reporting	Incidence logging			
Interface	● Physical Planning Handbook ● Traffic design and management guidelines			

9.5.3 Water Resources

Table 19: ESAIC MASTERPLAN for Water Resources

Potential Adverse Impact:	● High water demand in residential, commercial and industrial areas and from irrigation of recreational areas ● High water abstraction from Sagana and Ragati Rivers ● Pollution of Sagana and Ragati Rivers ● Decline in groundwater levels			
Objective	Minimize impact on available water resources and ensure their conservation			
Management strategy	Conservation of water resources through sustainable utilization			
		Responsibility	Timing	Costs
Recommended Management and Monitoring Action	● Rain water harvesting ● Conservative water use in low volume fixtures in buildings ● Use of recycled and harvested storm water in	SAIC Management	During Plan implementation	Cost of water efficient fixtures and appliances will be part of project costs

	cleaning and irrigation ● Incorporate water accounting systems and metering for all areas ● Continually seek new avenues for water conservation as international best practices evolve ● Limited abstraction of river water and instead use of alternative sources of water such as roof catchment rain water harvesting and harvesting of flood waters ● Undertake EIA for all development activities along the rivers ● Pre-treatment of all effluent before discharge into rivers Undertake a hydrogeological study in collaboration with WRMA to determine the sustainable ground water abstraction levels			Cost of water monitoring including viable conservation measures to be determined and procured at prevailing rates during operations
Performance indicators	● Water use levels ● Borehole yields			
Monitoring requirements	A water use monitoring and evaluation schedule			
Reporting	Logs of inspections			
Interface	The Water Act, Water Resource Management Rules 2007			

9.5.4 Energy Resources

Table 20: ESAIC MASTERPLAN for Energy Resources

Potential Adverse Impact:	● High water demand in residential, commercial and industrial areas
Objective	● Minimize impact on available energy resources and ensure their conservation

Management strategy	● Conservation of energy resources through lowering of consumption levels			
		Responsibility	Timing	Costs
Recommended Management and Monitoring Action	● Institution of awareness programmes to conserve energy; ● Energy conservation through installation/use of energy efficient appliances/fittings; ● Adoption of green energy sources e.g. solar energy, waste to energy projects etc ● Use of green building designs that allow for passive heating and cooling, and maximum utilization of natural light in buildings Continually seek avenues for energy conservation as international best practices evolve	SAIC Management	During Plan implementation	• Cost of energy efficient fixtures and appliances will be part of project costs • Cost of energy monitoring including viable conservation measures to be determined and procured at prevailing rates during operations
Performance indicators	Energy use levels against benchmarks			
Monitoring requirements	Metering, Energy use monitoring and evaluation schedule			
Reporting	Energy Audit reports			
Interface	● The Energy Act 2006, ● Subsidiary legislation under the Energy Act ● International Best Practices			

9.5.5 Biodiversity and Nature Conservation

Table 21: ESAIC MASTERPLAN for Biodiversity and Nature Conservation

Potential Adverse Impact:	● Loss of habitats for the hippos in the area ● Modification of riverine vegetation ● Modification of river channels ● Clearance of the riparian vegetation and pollution along Sagana and Ragati Rivers. ● Loss of wildlife habitats especially for the Grants Gazelles and Bush bucks ● Disturbance of the grey-crowned crane habitat ● Wildlife habitat deterioration due to low carrying capacity			
Objective	Conservation of wildlife and biodiversity on site			
Management strategy	Protection of endangered/threatened/vulnerable species and habitats, enhancement of biodiversity on site			
		Responsibility	Timing	Costs
Recommended Management and Monitoring Action	● Protection of the riparian environment and establishment of a riparian reserve management plan ● Establishment of a wildlife management plan in collaboration with KWS ● EIAs to be undertaken for all development activities along the rivers ● Relocation of mammals to the Agricultural and Conservation Zone through the use of a wildlife management plan ● Preservation of the grey crowned crane habitat near the Brookside Milk Processing Plant	SAIC Management	During Plan implementation	Cost of EIAs and preparation of management plans to be determined at prevailing rates during plan implementation

Performance indicators	● Number of hippos; ● Size of riparian zone ● Numbers of gazelles and Bush Bucks ● Number of grey-crowned cranes
Monitoring requirements	● Periodical ecological surveys and mammal counts
Reporting	● Ecological Survey Report
Interface	● Riparian Reserve Management Plan ● Wildlife Management Plan ● Wildlife Management and Conservation Act 2013 ● The Water Act 2002, ● Water Resource Management Regulations 2007, ● Wetlands, Riverbanks, Lakeshores and SESAShores Management Regulations 2009

9.5.6 Environmental and Landscape Changes

Table 22: ESAIC MASTERPLAN for Environmental and Landscape Changes

Potential Adverse Impact:	● Negative visual impact due to loss of visual amenity from dense urban structures ● Long term evolution of urban heat islands ● Risk of urban heat island effects ● Increased risk of flooding due to increase in storm water generated on site ● Poor ambient air quality and increase in background noise levels			
Objective	Ensuring positive landscape changes and enhancement of environmental quality			
Management strategy	Protection of endangered/threatened/vulnerable species and habitats, enhancement of biodiversity on site.			
		Responsibility	Timing	Costs
Recommended Management and	● Ensure adequate tree cover and gardens within	SAIC Management	During Plan implementation	Cost of landscaping to

Monitoring Action	developed areas to provide shade and cooling effect ● Ensure adequate drainage of the site through drainage works. Plenty of gardens and green areas within developed areas will enable percolation of rainfall and reduce runoff ● Ensure plenty of vegetation cover (trees and shrubs) as buffers between land-uses to reduce noise effects ● Enforcement of pollution control measures for air pollution sources in SAIC Tarmacking all major roads to enhance movement in all-weather and to avoid dust generation			be determined at prevailing rates during plan implementation
Performance indicators	● Percentage green spaces vis a vis developed spaces ● Size of buffer zones ● Background noise and ambient air quality			
Monitoring requirements	Periodical surveys and measurements			
Reporting	Audit Report			
Interface	Physical Planning Handbook			

9.5.7 Potential Risk for River Ragati and Sagana flooding upon SAIC infrastructure

Table 23: ESAIC MASTERPLAN for Flooding of River Ragati and Sagana onto the SAIC

Potential Adverse Impact:	The potential Risk for River Ragati and Sagana flooding upon SAIC infrastructure			
Objective	• Mitigate flooding of River Ragati and Sagana onto the SAIC infrastructure			
Management strategy	• Prevention of flooding.			
		Responsibility	Timing	Costs
Recommended Management and Monitoring Action	Construction of dykes. straightening rivers to increase discharge capacity, dredging to deepen channels, Re-vegetation of zone area using indigenous species of 10 metres from the highest water level. Building of artificial retention areas to store excess waters.	SAIC Management	During Plan implementation	• Cost od design, construction of dykes na artificial water retention areas. • Cost of monitoring and prediction of water quantity. • Coast of re-vegetation of Riparian zone.
Performance indicators	Energy use levels against benchmarks			
Monitoring requirements	Prediction and measurement and monitoring			
Reporting	Energy Audit reports			

Interface	• **The Water act 2002,** • **The Water Act 2016.** • **Water resource authority**

9.6 Construction environmental management and monitoring plans

Prior to implementing specific projects within the SAIC Master Plan, project-specific Environmental Impact Assessments (EIAs) will be conducted. The environmental management and monitoring plans developed in these EIAs will align with the ESAIC MASTERPLAN created for the SAIC Masterplan. The Construction Environmental Management and Monitoring Plans (CEMMP) to be developed will address the following key issues identified in SAIC:

- Physical setting, flora, and fauna
- Noise and vibrations
- Water resources
- Energy resources
- Air quality
- Traffic management
- Waste management
- Occupational health and safety.

The contractors who shall be appointed for construction of the various developments shall develop their own EMPs to ensure actions and mitigation necessary to protect the environment are incorporated into all site procedures. At a minimum, a contractor's EMP must address the following:

- Policy
- Planning
- Implementation and Operation.

The appointed contractors responsible for the construction of different developments will be required to develop their own Environmental Management Plans (EMPs) to ensure that necessary actions and mitigation measures are incorporated into all site procedures to protect the environment. The contractor's EMP must cover the following minimum aspects:

- Policy
- Planning
- Implementation and Operation

9.6.1 Policy

The contractor will formulate an environmental policy that encompasses, at the very least, the following elements:

- A pledge to adhere to relevant regulations and other subscribed requirements.
- A commitment to ensuring a safe working environment.
- A dedication to providing necessary training and equipment for employees to perform their work safely.
- A commitment to ongoing improvement and pollution prevention.
- A commitment to effectively communicate the policy to all individuals working for or on behalf of the company.

9.6.2 Planning

The environmental concerns and relevant legal and regulatory obligations for the development have been identified in the SEA. These will be further elaborated upon in subsequent EIAs for the various projects within the SAIC Masterplan. The Contractor is required to provide evidence within their plan that they have thoroughly reviewed and comprehended the SESA and EIA Reports, including their provisions for environmental management and monitoring.

9.6.3 Implementation and Operation

To ensure effective environmental and social management, it is crucial to define, document, and communicate roles, responsibilities, and authorities. A designated management representative should be assigned to oversee the establishment, implementation, and maintenance of the Environmental Management Plan (EMP). This representative is also responsible for reporting performance, reviewing the plan, and making recommendations for improvement.

It is essential to have documented confirmation that the training needs of all individuals working for or on behalf of the company, whose work poses significant hazards to health and safety or may have a significant environmental impact, have been identified. Records of all training activities must be maintained.

Clear communication of management, supervisory, and employee responsibilities is vital and can be achieved through training, formal job descriptions, work experience, and hiring practices. Awareness training should emphasize the importance of conforming to policies and procedures, understanding the significant environmental aspects, and familiarizing individuals with their specific roles and responsibilities.

Records should be legible, identifiable, and traceable to their corresponding activities. Proper storage and maintenance of records are necessary to ensure their irretrievability and protect them from damage, deterioration, or loss.

The contractor must establish, implement, and maintain procedures to identify potential emergency situations and accidents that could impact the environment, surrounding communities, employees, or the public. Adequate preparedness to respond to actual emergencies and accidents and prevent or mitigate associated adverse environmental or social impacts is crucial. The EMP should also address how the contractor will receive, document, and respond to external interested parties.

9.7 Environmental Monitors

To ensure effective environmental monitoring during the construction phase, Independent Environmental Monitors will be identified and contracted. Their responsibilities will include:

- Verifying that all necessary project approvals and permits are obtained before construction commences.
- Evaluating contractor plans such as the Environmental Management Plan (EMP), Spill Response Plan, and Waste Management Plan, and monitoring their implementation.
- Developing inspection checklists to ensure focused and useful site inspections.
- Conducting environmental monitoring activities throughout the construction process. The environmental monitor will ensure environmental protection, proper implementation of mitigation measures, and facilitate communication between the Contractor, Project Team, and the National Environmental Management Authority (NEMA).
- Preparing regular written reports on an agreed schedule to be submitted to the Project Team, Contractor, and, if required, NEMA.
- By fulfilling these responsibilities, the Independent Environmental Monitors will contribute to maintaining compliance with environmental regulations, identifying potential issues, and ensuring effective environmental management during construction.

CHAPTER TEN

SUMMARY OF THE MASTER PLAN'S POTENTIAL SIGNIFICANT IMPACTS

10.1 Introduction

This part of SEA details the proposed Master Plan's primary potential and important impacts. The impacts were assessed using the SEA study as well as stakeholder interactions. Kirinyaga County Government must consequently prioritize the aforementioned impacts and significant concerns.

10.2 Possibility of Degradation of aquatic environments

Storm water from Sagana Agro-industrial city will be channeled to the river Ragati and Sagana. Storm water/surface run-off from agro-industrial zone is recognized to be of poor quality due to silt and contaminants. The introduction of such waters into river Ragati and Sagana is likely to damage the quality of aquatic ecosystems. SACI master plan will have rain water harvesting initiatives and creation of buffer zones will go a long way toward protecting the areas from the projected SAIC's spill-over effects.

10.3 The Effect on Traffic

The envisioned development by the proposed Master Plan is likely to result into an increase on current levels of human and vehicular traffic. Key insights should be on how traffic in the Master Plan area will be managed including design standards for connections to the existing national roads. Further, capacity of existing traffic and transport infrastructure to support the traffic is required.

A comprehensive transport system is envisioned for Sagana Agro-Industrial City (SAIC) to promote efficient transportation inside the development and connecting to the neighboring areas. The transportation network will include walkways, cycling paths, and spine/feeder roads for vehicular access, ensuring the convenience and accessibility of residents, workers, and tourists. SAIC plans to build paved roads to meet the expected volume of traffic and to offer smooth connectivity between the development and the existing government highways in the area.

10.4 Impacts of solid waste and waste water

The proposed SAIC will result in developments that are known to generate solid and waste water. This will mostly be the result of commercial and industrial activity. SAIC intends to build a sustainable waste water treatment plant to ensure that treated waste water is tested and re-used in common area cleaning, green zone irrigation, and washrooms

Priority will be given to solid waste segregation, followed by processing and recycling. SAIC will engage licensed waste professionals.

Priority will be given to solid waste segregation, followed by processing and recycling. SAIC will engage licensed waste professionals.

CHAPTER ELEVEN

CONCLUSION AND RECOMMENDATIONS

11.1 Conclusion

The Strategic Environmental Assessment (SEA) for the SAIC Master Plan has reached the following conclusions based on the findings of the baseline situation analysis, PPP analysis, plan effect analysis, and stakeholder consultations: The SAIC Masterplan is a well-designed and commendable plan that is predicted to have minimal negative environmental and social impacts. Its execution will contribute to the country's sustainable environmental governance, with numerous areas of value addition.

ENVIRONMENTAL MANAGEMENT FRAMEWORK	**VALUE ADDITION**
Sessional Paper No. 6 of 1999 on Environment and Development	Encouraging rain water harvesting around the country
Draft Environment Policy, 2012	Supporting the establishment of constructed wetlands for waste management and reuse
	Supporting the increase of forest and tree cover to at least 10% by 2030
National Land Policy, 2009	Encouraging the development of wildlife sanctuaries and conservancies
National Water Policy, 2012	Enhancing storm water management and rainwater harvesting
	Encouraging the treatment of effluent waters for recycling and reuse
	Supporting rain water harvesting
Draft National Policy on Wetlands Conservation and Management, 2013	Ensuring that natural wetlands under private ownership will be subject to regulations
Draft Wildlife Policy, 2011	Promoting the conservation and management of wildlife conservation areas and sanctuaries

Vision 2030	Supporting the increase of forest and tree cover to 10% by 2030
	Supporting water harvesting and storage
National Environment Action Plan 2009-2013	Enhancing the protection of wildlife resources
	Supporting the increasing of forest cover in Kenya
	Promoting efficient water harvesting, storage and usage
Kirinyaga County Integrated Development Plan (CIDP) 2023-2027	Increasing forest cover in the county
	Promoting and sustaining a vibrant, competitive and diversified industrial sector in the county
African Convention on the Conservation of Nature and Natural Resources (AU, 1968) Article II Fundamental Principle	Setting aside areas for the propagation, protection, conservation and management of wildlife

The findings of the Strategic Environmental Assessment (SEA) indicate that the SAIC Masterplan is well-suited for the area, taking into account the current environmental conditions and available technology as determined in the baseline survey. The potential benefits of the proposed development outweigh the expected negative environmental changes.

The master plan is highly desirable as it will greatly enhance the socio-economic status of Kirinyaga County. It will generate employment opportunities and deliver a wide range of socio-economic benefits.

The implementation of the SAIC Masterplan will also positively impact social capital through direct employment and the multiplier effect on the local economy. The project will contribute to the development agenda in Kenya and significantly contribute to the realization of the goals outlined in Vision 2030, particularly in the economic and social pillars.

11.2 Recommendations

The Consultant recommends approval of the SAIC Masterplan However, implementation of the Masterplan should consider the following: -

11.2.1 Location of Educational Institutions and recreational facilities around residential areas

A desirable type of land use compatibility is the one that exists between educational and recreational facilities and residential land use forms. From the residential standpoint, it is desirable to have schools and parks located in close proximity to residential areas. Likewise, it is desirable to have the parks and educational facilities in close proximity to their primary users. Consideration of the planning principles above should therefore be made in the detailed planning of different SAIC zones.

11.2.2 Location of high density residential uses near commercial uses

A favorable land use relationship is observed between high density residential areas and professional office/neighborhood commercial uses. This relationship aligns with the principles of Transit Oriented Development (TOD), which promotes compact, mixed-use, and pedestrian-friendly development. TOD incorporates various types of spaces such as residential, commercial, retail, and recreational, aiming to facilitate connections between transit options, bicycles, and pedestrians. By maximizing access to public transportation, TOD encourages transit ridership. In a TOD neighborhood, there is typically a central area with a transit station, surrounded by higher-density development that gradually transitions to lower-density development further away from the center. This approach considers the proximity of commercial services to high density residential areas and recognizes the benefits of apartments and other multi-family residential developments in acting as a buffer between traffic-generating commercial uses and less intense residential uses. The SAIC site presents a favorable opportunity for controlled Transit Oriented Development (TOD), and it is important to incorporate the aforementioned planning principles into the detailed planning of residential areas surrounding all SAIC Zones.

11.2.3 Location of Industrial uses away from residential uses

Residential land uses, particularly low density residential developments, are not considered suitable neighbors for both light and heavy industrial activities due to their incompatible characteristics. The ambiance desired in residential areas is generally not conducive to industrial development. Likewise, industrial development does not benefit from proximity to residential areas. To address the potential conflicts arising from these divergent land uses, it is advised to incorporate appropriately sized buffer zones between residential and industrial areas during the detailed planning of these zones. This will help mitigate the effects of conflicting land uses and promote a more harmonious coexistence.

11.2.4 Restrictions on the type of industrial use

The SAIC Masterplan acknowledges the potential for industrial growth in the area due to recent and ongoing infrastructure upgrades. However, it is crucial to consider the compatibility of

different types of industries with other land uses, such as residential, commercial, and recreational areas. In the case of SAIC, industrial activities should be limited to light industrial developments, as defined in the Physical Planning Handbook published under the Physical Planning Act, 1996. These types of industries have minimal adverse impacts on neighboring land uses and include workshops, laundries, printing, packaging, food processing, light assembly, furniture making establishments, as well as warehousing and logistics establishments. Priority should be given to agro-processing industries that utilize the agricultural potential of Kirinyaga and neighboring counties, as well as logistics companies that require proximity to major population centers. The location of the site provides convenient access to the national road network, making it an ideal location for efficient distribution center operations.

Furthermore, it is important to encourage industrial establishments in SAIC to adopt low carbon technologies to reduce emission levels, aligning with the objectives outlined in the Kirinyaga Integrated Development Plan (2023-2027).

11.2.5 Location of residential land uses away from utilities right of way

There are unfavorable land use relationships between residential areas and utility rights-of-way and utility sites. Although it is understood that some small-scale utility facilities can be integrated into residential areas, larger utility sites and rights-of-way are generally not suitable for such areas. Additionally, these facilities do not derive any advantages from their proximity to residential zones. The site, particularly High Density Residential Zone 8 and Low Density Residential Zone 7, is traversed by high voltage power lines such as 220kV, 132kV, and 2x66kV lines. To address this issue, it is recommended to establish a buffer zone beyond the specified wayleave distance for the respective utility in the affected zones. Furthermore, buildings should be positioned at the greatest possible distance from these utility installations.

11.2.6 Industrial Waste Management

The SAIC Masterplan should actively promote the adoption of an Industrial Ecology Approach within the Industrial Park. Industrial Ecology is a conceptual framework that aims to make industrial systems more sustainable and efficient by emulating the principles observed in natural systems, thereby minimizing their environmental impacts. A key principle of Industrial Ecology is transitioning from linear (open) processes to cyclical (closed) processes, where the waste generated by one industry becomes a valuable resource for another industry, resembling the functioning of an ecosystem.

For instance, in the context of SAIC, waste produced by an agro-processing enterprise could be repurposed as raw materials for manufacturing animal feeds or other products. By implementing such closed-loop processes, the overall volume of solid waste requiring offsite disposal from

SAIC would be significantly reduced. This shift towards an Industrial Ecology Approach within the Industrial Park is an important step towards achieving greater sustainability and minimizing environmental burdens.

11.2.7 Habitat and Wildlife management

In consultation with the Kenya Wildlife Service (KWS), the SAIC management will undertake the preparation of an Integrated Wildlife Management Plan (WMP) to effectively conserve and manage the wildlife in the area. The WMP will address various aspects, including the translocation of excess wildlife species from the sanctuary to other wildlife conservation areas in the country. Specifically, the plan will focus on the conservation of threatened species such as the Jackson's widowbird and hippo, as well as endangered species like the Grey crowned crane and Nile crocodile. While these species exist in other natural habitats, measures will be taken to ensure their habitats within the study area remain as natural as possible. The agricultural/conservancy zone within the study area presents an opportunity for the continued conservation and management of these four species. It is crucial to prevent degradation and modification of riverine vegetation in the development of various zones to minimize any potential displacement or alteration of habitats for the Grey crowned crane, crocodile, and hippo along the Sagana River.

11.2.8 Environmental and Social Management and Monitoring

The SAIC Management should establish a dedicated entity responsible for monitoring and evaluating the implementation of the SAIC Masterplan. This entity will ensure strict adherence to the ESAIC MASTERPLAN developed for the Master Plan. Additionally, it will oversee the conduct of Environmental and Social Impact Assessments (ESIAs) for each proposed activity and ensure the development of effective environmental management plans in accordance with the Strategic Environmental Assessment (SEA) for all the developments.

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APPENDIX

Appendix I: Land ownership document

Appendix II: SESA NEMA approval

Appendix III: Experts Practising License

Appendix IV: Filled Questionnaires from respondents

Appendix V: SAIC proposed master plan

Appendix VI: Copy of meeting, attendance lit