

# Pre-feasibility Study: Solid Waste Management Formalisation in Isiolo

April 2021



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***“Develop Isiolo as  
a Centre  
of excellence and a  
major  
economic hub in  
Kenya with  
resilient and  
inclusive growth  
through the  
responsible use of  
its natural  
resources”***

Isiolo municipality, with support from the Sustainable Urban Economic Development (SUED) programme, developed an Urban Economic Plan (UEP) which outlines the economic vision for Isiolo. SUED is a £70 million, five-year programme supported by the British Government through the Foreign, Commonwealth and Development Office (FCDO).

The Isiolo UEP provides a development framework to realise Isiolo municipality's vision by focusing on:

- Effective Town Planning
- Best Practices for Value Addition
- Market Access and Development

To bring this plan to fruition, Isiolo municipality, in conjunction with SUED, has embarked on an investment attraction process including prioritising and refining the projects under this development framework. This pre-feasibility study focuses on assessing a proposed solid waste management project to formalise waste operations and promote climate-resilient infrastructure within the municipality<sup>1</sup>.

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# Abbreviations and Acronyms

<b>CAGR</b>	Compound Annual Growth Rate
<b>CBD</b>	Central Business District
<b>CBO</b>	Community-Based Organisation
<b>CIDP</b>	County Integrated Development Plan
<b>EIA</b>	Environmental Impact Assessment
<b>EPRA</b>	Energy and Petroleum Regulatory Authority
<b>GCP</b>	Gross County Product
<b>ICAP</b>	Isiolo County Action Plan
<b>ISWA</b>	International Solid Waste Association
<b>ISWM</b>	Integrated Solid Waste Management Plan
<b>KES</b>	Kenyan Shillings
<b>LAPSSET</b>	Lamu Port-South Sudan-Ethiopia-Transport
<b>MSW</b>	Municipal Solid Waste
<b>NCA</b>	National Construction Authority
<b>NEMA</b>	National Environment Management Authority
<b>PPP</b>	Public-Private Partnerships
<b>PWD</b>	People with Disabilities
<b>SUED</b>	Sustainable Urban Economic Development
<b>SWM</b>	Solid Waste Management
<b>UEP</b>	Urban Economic Plan
<b>WASREB</b>	Water and Sanitation Regulatory Board
<b>WM</b>	Waste Management
<b>HCW</b>	Health Care Waste
<b>WTV</b>	Waste to Value

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# 1. Executive Summary

## 1.1. Project Context

**Isiolo Municipality is looking to formalise its solid waste management system and integrate the private sector into its waste collection and commercialisation activities.** Isiolo municipality has experienced rapid population growth along the A2 highway and has seen increased urban sprawl, placing significant pressure on the existing waste management infrastructure and resources. As a result, current waste collection structures are not adequate to address the growing population's needs. With an annual average growth rate of 6.3% Isiolo Municipality's population increased from 46,500 in 2009 to 82,533 in 2018 and is projected to reach 109,000 by 2023. This growth is driven by rapid urbanisation attributed to Isiolo's strategic location on the A2 highway and the projected impact of the LAPSET<sup>1</sup> projects on job creation as residents migrate from rural to urban settlements in search of better jobs. The increase in urbanisation, has led to a corresponding increase in waste generation, requiring investments in an improved waste management system.<sup>2</sup> Isiolo currently produces an estimated 13,500 tonnes of waste annually<sup>3</sup>, which is more than the municipality can collect and properly dispose of with its two waste collection trucks that have a capacity of 2,400 tonnes of waste annually, assuming 6 collection days per week.

Isiolo Municipality undertakes waste collection in the Central Business District (CBD) and does not levy fees with residential areas served by small private operators that charge households fees ranging from KES 200 to KES 500 per month. The waste collected by these private operators is transported to the current open-air dumpsite, located approximately 5 km from the CBD or disposed of illegally along the river and drainage channels. The lack of a formalised waste sorting and management system has created opportunities for pickers, primarily from Meru, Laikipia and Nyeri Counties, to collect the more valuable products (plastic bottles and metal cans) which they sell to dealers at low prices due to their inability to consolidate volumes. This highlights the importance of a waste sorting facility to capture the significant value being lost, which would help offset the collection costs incurred and support additional monetisation through recycling and composting.

**The lack of an adequate solid waste management system is a key development challenge identified by the county government in the Isiolo County Integrated Development Plan (CIDP)<sup>4</sup>,** leading to the prioritisation of this project as part of the municipality's development agenda. In addition, open-air dumpsites, such as the one in Isiolo where organic matter is left to decompose in the open air, contribute to methane generation and emission which causes significant environmental concerns.

## 1.2. Project Overview

### Project Description

To improve the municipality's ability to serve its growing population and ensure resilient and resource-efficient urban and economic growth, this study evaluates the development of a solid waste management project in Isiolo. This project will serve the 25 formal and informal settlements in Isiolo town, the Central Business District (CBD), and the military training facility (School of Combat Engineers) at Archers Post by formalising and commercialising collection and waste disposal by implementing waste segregation, paid collection, recycling, and composting, therefore capturing previously lost value.

Over the first ten years, coverage is expected to extend to approximately 11,000 households and businesses in Isiolo, with 16k tonnes of waste collected.

### Project Operations

**Isiolo Municipality would like to improve its solid waste management (SWM) activities by expanding beyond the current provision of free collection services within the CBD.** The proposed SWM project will include expanding and commercialising collection services to cover households and businesses, while also monetising the value chain through composting organic waste and selling recyclable waste to off-takers. The municipality will be responsible for purchasing the land required for the construction of a new landfill, a sorting facility and a new composting site, but will outsource the operations of the sorting facility and composting site to private operators through a standard procurement exercise.

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<sup>1 1</sup> The LAPSET (Lamu Port, South Sudan, Ethiopia Transport Corridor) Corridor Program is a transport and infrastructure project cutting across Kenya, Ethiopia, and South Sudan, with the aim of linking them to each other and to their neighbours in Eastern Africa



Financial investments are needed at various points of the project to support the expansion with the purchase of vehicles and equipment needed as well as for the construction of a new landfill, a sorting facility, and a composting site. Isiolo municipality will continue to manage the SWM project through its Environmental Department while integrating private sector actors to support waste collection, sorting, and disposal. The proposed project will involve interventions in two key areas:

- **Formalising waste collection activities:** The municipality currently manages collection services in the Central Business District (CBD) and will expand its operations to include household collection services in residential areas around Bulla Pesa and Wabera wards. Collection services will be done in partnership with private sector operators, and household and business segregation will be introduced. To inculcate responsible public behaviour on waste management, the municipality will need to sensitise the public on sustainable waste management options and the new integrated waste management approach that will incorporate household segregation. In the past, Isiolo has also had challenges with enforcement of waste collection activities due to gaps in the enforcement framework. To address this, the municipality has presented a bill to the Isiolo county assembly to develop guidelines around waste collection and enforcement activities. In line with the National Solid Waste Management Strategy (2019), the municipality will also facilitate clean-ups aimed at further reinforcing this behavioural change as well as introducing enforcement officers available to ensure adherence to the new regulatory framework. The municipality will also need to acquire new waste collection vehicles to be able to serve the expanded area, increase the department's headcount, develop waste transportation routes, and set up collection points at key locations across the municipality.
- **Investment in waste segregation, recovery, and disposal infrastructure:** The municipality also plans to invest in a waste sorting and recovery facility located within a proposed new landfill on a 7-acre plot of land being identified to be purchased and established either in Isiolo or the neighbouring Meru County with potential sites already identified in Burat and Ngaremara Wards 5 to 10 km from the CBD. At the sorting facility to be built, recyclable waste will be separated for onward sale to recyclers, and suitable organic waste will be directed to a nearby composting facility yet to be built. The remnants will be consolidated and disposed of in the new landfill to be constructed. As the volume of waste generated in Isiolo Municipality increases, there is an opportunity to commercialise other components of the waste value chain e.g., glass, paper and textiles, whose current volumes are not yet sufficient to support off-take agreements.

The municipality will procure the services of an enterprise like TakaNiMali, to work alongside a Community Based Organisation (CBO) in Isiolo to educate households and businesses on how to correctly identify and segregate the different categories of waste. Takanimali is an organisation that educates, empowers, and trains individuals on different ways to implement sustainable waste practices. They have a track record of carrying out sensitisation programs in various counties with local residents and private organisation working in the waste management space.

The municipality will also work with private-sector actors to develop waste-to-value (WTV) projects to commercialise waste disposal. For example, Sanivation, a social enterprise that provides cost-effective sanitation services, has indicated an interest in exploring the opportunity to work with Isiolo in this aspect.

The proposed SWM project will require investments in several aspects of the value chain, as outlined below:

- **Purchase of waste collection trucks and equipment:** The municipality will need to purchase three new 9m<sup>3</sup> trucks in the first year of operations in order to have the capacity to collect 2,700 tonnes of waste annually, generated from the 20% of households and businesses that are projected to sign up for the improved waste collection services in year 1. The municipality will also purchase 5 large waste collection bins to serve as waste collection points. The waste collection bins will be placed along the waste collection routes in the town. Given that some households are located in areas with inaccessible roads for the waste collection trucks to pass through and collect waste directly from the households, the large collection bins act as an area where waste from those households will be collected and aggregated by youth groups and CBOs, and then collected by waste collection trucks along the collection route. Additional investment will be required by year 3 to cater for the projected increase in waste volumes as the population grows.
- **Purchase of land for waste sorting and disposal infrastructure:** The current dumpsite in Isiolo municipality sits on an unfenced 2.5-acre piece of land located close to the CBD in Wabera Ward. The dumpsite is almost at full capacity, with only 0.5 acres remaining that is expected to be filled up in 2021. The current dumpsite has been poorly managed, with waste having been unsuccessfully sorted and disposed of in the past and left to naturally decompose or collected by scavengers. Given that some of the waste comprises plastics, textiles, metals, and other materials with minimal decomposition, the volume of waste has accumulated quickly filling up the current dumpsite. For the new landfill, the municipality plans to purchase a 7-acre parcel of land about 5 to 10 kilometres from the CBD at an estimated cost of KES 15 million. Three potential plots have been identified, one in Ngaremara Special Ward in Meru County and two others in Burat



Ward in Isiolo County. This amount has been included in the municipality's budget, which is expected to be passed and made available in the 2021/2022 financial year, and the land will be purchased soon after, likely by September 2021. The expanded capacity of this new facility is anticipated to serve Isiolo's needs for the next 20 years, assuming a 60% waste recovery rate.

- **Construction of waste sorting facility, landfill, and composting site:** An investment in the construction of a waste sorting facility, a landfill, and a composting site will need to be made to support the disposal segment of the proposed project. The sorting facility will require a total processing capacity of 100 tonnes of waste per week to accommodate the waste generated in Isiolo, and include a weighing scale, an integrated waste sorter, a storage area and an office for the facility supervisor and administrative staff. The landfill will require bulk excavation for depth and will require thick clay soil liners to cover it, a concrete layer of asphalt and gravel drainage to prevent liquid impurities from seeping into the soil underneath, making the landfill environmentally friendly, longer lasting and more sustainable. The composting site will need to be near the sorting facility and have enough space to construct 3 to 5 compost mounds to absorb the organic waste generated in Isiolo. Investment in these facilities will be privately sourced, with the municipality contributing to the development of the land on which the facilities will be built. The sorting facility and composting site will be operated by private entities with experience in running such facilities, working in partnership with the municipality. The labour needed, which include waste sorters, sorting facility managers, composting staff, composting site managers and security personnel, will be sourced from the municipality to ensure job creation and economic empowerment in the municipality.

## Enabling Environment

**Solid waste management activities are primarily carried out and overseen by Isiolo Municipality.** The municipality has developed and submitted to the Isiolo county assembly, a draft legislative framework that will guide the management of waste collection and disposal activities. Enforcement of guidelines has been inadequate, and the municipality currently struggles to penalise offenders for failing to comply with sanitation and waste management regulations due to the lack of enforcement personnel and lack of a clearly defined legislative framework. To ensure the effectiveness of this project, the municipality's updated legislative framework will provide for additional enforcement capacity to ensure adherence to the new waste management rules and guidelines and has submitted a budgetary request for the 2021/2022 financial year to support this personnel recruitment.

**The construction of a waste management facility and landfill will require an Environmental Impact Assessment (EIA) to be approved by the National Environment Management Authority (NEMA).** Laws and guidelines, in addition to details about the EIA required, are codified and easily accessible. NEMA approval will be needed for the site selection and establishment of the facilities proposed. Regular engagement with the environmental body will also be required for continued operations of the waste management facilities. Potential private operators will also need to demonstrate adherence to health and safety regulations to mitigate the risk of being shut down, as NEMA has done to several other facilities.

**Some private actors are already involved in waste management in Isiolo, including private sector entities such as Ecoways and community-based organisations (CBOs) run by Isiolo residents.** As has been discussed with the Municipality, Isiolo can leverage existing CBOs to ensure that smaller communities also get included in the solid waste management process. These groups can help to emphasise the importance of good waste management in their communities. Other private entities are also needed to ensure the efficiency of different project segments and the municipality will need to develop a formalised operating framework to leverage such relationships.

**Obtaining buy-in from stakeholders is an important component for the success of the project.** The primary stakeholders of the SWM system include Isiolo residents, Isiolo's Municipality and County Governments and the private players already operating within the municipality. Secondary stakeholders for the proposed project include NEMA and other value chain actors that shall be potential partners in the waste disposal process. For the success of the project, approval and endorsement will need to be received from these entities to ensure compliance with regulations and that the collection, segregation, and disposal components of the SWM project are adopted.

## Impact Assessments

### Climate Change

**The SWM project is expected to have a net positive contribution to climate change from the waste recovery and recycling components of the project, offsetting the emissions expected from transportation.** The UN highlights the global consensus that the climate benefits of waste avoidance and recycling outweigh the costs incurred in waste management. The main negative contribution of ozone-depleting emissions is carbon emitted during waste collection. In particular, the benefits derived from reduced landfill emissions and the soil-sequestered carbon because of compost application will offset the effect of enhanced waste collection activities. **Accurate quantification of the**

**potential benefit of harnessing methane emissions will be undertaken by an environmental impact consultant once the facility design and waste management technologies to be employed are finalised.**

**The SWM project will act as a catalyst for better sanitation operations in the municipality while moving the municipality towards a circular economy.** With current sanitation services in the county underdeveloped, education and sensitisation programs can improve resident knowledge and best practices on environmental management. Isiolo municipality can support the project by working with local CBOs and Takanimali to educate the community organisations and community members on solid waste management, particularly around collection and recovery. Implementing recycling and composting segments will transition the municipality from the current "*make and dispose*" model into a "*recovery and reuse*" model, which is the foundational shift required to move towards a circular economy and support Isiolo's economic development.

## **Gender and Social Inclusion**

To foster social inclusion, the SWM project shall provide opportunities for Isiolo's disadvantaged groups by implementing labour and employment policies and strategies that take into consideration these groups and intentionally create employment opportunities for them. Some of the strategies include:

- Utilising a quota system to ensure that women, PWDs, and youth are employed throughout the project cycle. The project can use the current population demographic profile to establish the percentages or numbers they will need to employ based on gender and PWDs population demographics within the region.
- Human resource department to adopt policies that promote equality, e.g., implement equal pay for equal work policy to help address the gender pay gap. Additionally, the project to carry out sensitisation and building awareness among the local community to de-stigmatise women's work in the waste industry.
- Setting aside jobs that are appropriate and that do not require significant physical energy for persons with disabilities (PWDs). Such would include sorting and separation of wastes, cleaning recyclables and facilities, supervisions, and managerial positions.

The municipality will need to adopt guidelines to hold private operators responsible for the implementation of gender and social inclusion commitments, and to hold managers and employees accountable. Some guidelines to follow to ensure private operating partners promote gender and social inclusion include<sup>5</sup>:

- The private operator will need to sign a "GESI commitment letter" as part of the partnership agreement with the municipality. The commitment letter will outline how the private operator would meet the guidelines provided by the municipality.
- The municipality will also need to develop and implement specific gender quota policies and inclusion metrics that the private operator will need to fulfil as a condition for continued partnership with the municipality. The private operator will need to submit an annual report with an update on their compliance with the GESI guidelines. In cases of non-compliance, the municipality can either cancel their contract, or suspend the private entity's operating licences.

## **Income and Job Creation**

**Improving the solid waste management system will generate a positive environmental and social impact in Isiolo.** The levying of waste collection fees to residents and businesses as well as sale of compost and recyclable plastics after segregation suggests a path to revenue generation and sustainable operations in the long term. In addition, the project will improve the environmental sanitation in Isiolo, and is expected to have a positive impact on public health because of facility operations through offsetting the gaseous emission normally expected from open disposal and common management practices which involve open burning. Studies suggest that well-designed and operated solid waste facilities help reduce potential adverse health (cancer and non-cancer) impacts due to lower hazardous combustion-related emissions (such as dioxins/furans and heavy metals), compared to landfill or unsorted incineration<sup>6</sup> with the improved health outcomes driving better labour productivity.

**In addition to positive health benefits, the project will provide 28 direct and 73 indirect employment opportunities to local youth and residents in its first year of operations.** Most of the employment opportunities must be created early on in the project, since they include drivers, waste loaders, cleaners, waste sorters and composting staff hired by the municipality and private operating partners working with the municipality. As operations expand, the waste management system in Isiolo is expected to create around **200+ additional jobs** across the project segments by the tenth year of operations. The municipality can also partner with the Isiolo Technical Training Institute to train and build capacity in its employees and improve their ability to succeed at work.

**Improved waste management in Isiolo is expected to create investment opportunities in additional value creation projects.** In addition to using organic waste, which represents 50% of the waste proportion in Isiolo, to produce compost to be sold to farmers and landscapers, the estimated 15 tonnes of organic waste per day allow for the installation of an anaerobic digester to produce biogas.<sup>7</sup>

## Project Economics and Sustainability Analysis

**The improved waste management system is expected to serve approximately 4,500 of the 22,000 households and businesses in Isiolo in its first year of operation, representing a 20% coverage, which would increase to approximately 9,000 (36%) by the seventh year.** The project's financial projections show an ability to generate more revenue than operational cost, assuming this scale is reached. However, a minimum of 8,700 households and businesses are necessary to reach ongoing sustainability, which is defined as generating sufficient revenues to cover ongoing costs.

Based on the assumptions above, below are the projected financial outcomes of the project:

- **Income earned:** The municipality currently doesn't earn any revenue from waste management services, but by implementing the project, the collection process is expected to generate KES 18 million of income for the municipality in its first year from waste collection services, increasing to KES 113 million per year by the seventh year. Due to the high volume of organic waste in the municipality, the sale of compost to farmers, landscapers and other compost retailers is expected to be the main revenue driver, contributing approximately 60% of total revenues generated and up to KES 69 million in the seventh year. The other 33% of revenue is expected from service fees, and the final 7% through the sale of sorted plastic waste.
- **Costs incurred:** The project will incur KES 45 million in direct and indirect costs in the first year, projected to grow to KES 91 million by year 7. Salary expenses for the waste workers, and fuel costs for all the vehicles used in different segments of the waste management operations, are the main drivers for the direct costs. The main indirect cost driver is salary expenses for cleaners and for sanitation enforcement within Isiolo who will oversee guarding the landfill from unlicensed operators and scavengers as well as enforcing sanitation rules around the municipality.

**This project will require a total investment of KES 323 million in the first 3 years, primarily for capital expenditure.**

- **KES 209 million will be required in year 1** with 15 million allocated for the purchase of the land required, 133 million allocated for the construction of the landfill, KES 25 million for vehicles and equipment and KES 36 million to cover operating expenses.
- **KES 86 million will be required in year 2**, of which KES 35 million is allocated for the construction of the waste sorting and composting facility, KES 46 million for additional operating expenses and KES 5 million for additional vehicles and equipment needed. Eagerness
- **KES 28 million will be required in year 3** for the final set of vehicles and equipment needed, including the purchase of the integrated waste sorter.

**Of the KES 323 million total funding need in the first 3 years, the municipality has already budgeted for 22.5 million.** To operationalise this project, KES 47.5 million would be required in the first 3 years from grant funders such as the World Bank's Kenya Urban Support Programme and African Development Bank to help cover operating expenses before the project becomes cash positive (revenue covers ongoing expenses). The municipality contribution will then cease as the sorting facility becomes operational and the project becomes cash positive and self-sustaining.

In a scenario where fewer households are reached (<8,700 households) and revenues never cover costs, an additional KES 16 million per year would be required to maintain operations, which would be scaled down to match the lower demand. This is expected to be unlikely, given the benefit of the service to the community and the conservative service fee and household reach expectations,

Given the need for the project, the likely path to economic sustainability, and the important environmental implications, a number of funders are expected to be interested, including development organisations and programs with a focus on sustainable infrastructure development, given its capital-intensive nature and uncertainty around cost recovery. Some potential financiers who are likely to be interested in an investment opportunity like that of the SWM project include the World Bank's Kenya Urban Support Program (KUSP) which has already allocated KES 93m and KES 67m to Isiolo County in the 2019/2020 and 2020/2021 financial years respectively. The African Development Bank is another potential financier that may be interested in an investment opportunity like that of the SWM project in Isiolo given their

focus on investing in industrialisation in Kenya between 2019 – 2023 through increased private sector participation in value addition projects.

## 1.3. Conclusions and Next Steps

### 1.3.1. Conclusion

**The project offers a technically viable opportunity for the municipality to improve its waste management and an opportunity to potentially achieve economic sustainability by generating income through the recycling and sale of waste.** Technical viability is evidenced by comparing current designs and plans to similar operational projects such as the solid waste treatment centre commissioned by PETCO Kenya in Kajiado county.<sup>8</sup> The factors that will determine the project's operational and commercial success include:

- The successful initiation and commercialisation of collection and disposal services
- The purchase of the land on which the new landfill and sorting facility will be located
- The design, construction, and operation of the proposed waste sorting and disposal facility
- The municipality's ability to scale its operation of the waste management project, build out their operating team, establish a clear partnership framework between the municipality and proposed private operators for waste collection services.

SUED's support will be critical in supporting the municipality to design efficient project operations, develop documents to make a clear case to potential funders, identify and engage relevant private sector players for the project's implementation, and assist in the capital-raising process for the project. In addition to core technical feasibility, this project is well aligned with SUED's overall goal, particularly given its focus on mitigating climate change, municipal revenue generation, and improving the business environment.

**Listed below are some steps that the municipality will need to take to advance this project:**

1. **Develop a detailed implementation plan** taking into account each project 'layer' with a specific focus on a) Seed Fund support required (if any) and b) pre-conditions necessary from private sector actors or Municipal government to ensure the project implementation has a clear link to long-term sustainability. This plan will include expected timelines and roles to provide clear guidance on the role of the public sector, private sector, SUED, and other development partners. The municipality has limited capacity to develop an implementation plan and would benefit from support to complete the process. OCA will support the municipality with the development of an implementation plan, which will also provide guidance around the need to hire additional administrative team members to address the municipality's capacity constraints.
2. **Acquire the land needed for the new landfill and on which the sorting facility will be built.** The sorting facility, new landfill, and composting facility will play a vital role in waste disposal and monetisation. The Isiolo County Government has submitted a financing request to the Isiolo County Assembly in their 2021/2022 budget and is waiting for approval to purchase the land for the new landfill. The municipality has identified three 7-acre plots 5 to 10 km from Isiolo CBD as potential sites for the landfill and sorting facility. The municipality has the capacity to purchase the land and is already in the process of doing so. Approval and purchase are expected to be confirmed by September 2021, with plans for design and eventual site construction for the landfill and sorting facility to commence in the following months and estimated to take 6 to 12 months.
3. **Establish a framework and operating model that will govern municipality relationships with private operators and residents.** Given the need to involve private sector players within the formalised SWM system, the municipality will need a formal operating partnership model with the private operators and the CBOs operating within the system. The municipality has the capacity to develop the framework and is already in the process of developing it. Some of the key considerations for this framework include:
  - Provision of fair renegotiation terms and timelines after the private partner has had time to assess the operations being taken over<sup>9</sup>
  - The introduction of an operating licence by the municipality for private operators and the sub-contracting of certain collection operations to the CBOs
4. **Assess residents' willingness to pay for collection services:** Consultations with private entities operating in Isiolo revealed that residents are currently paying amounts between KES 100 and 300 per month for household waste collection services, and businesses are paying up to KES 500 for waste collection services.



It will be important to get an independent evaluation of residents' willingness and ability to pay for collection services. The municipality team will continue to validate the estimated payments in the future as more households and businesses sign up for collection services.

5. **Establish market partnerships with off takers:** Once the sorting facility is established, it will be necessary to establish offtake agreements, structured as Memoranda of Understanding (MOUs), with the buyers of waste plastics and compost. These agreements will be developed by the municipality and will enhance the project's commercial viability by guaranteeing a minimum level of financial return for the private operator.
6. **Assess the CBOs and private actors to ensure they can deliver on the sensitisation program.** The goal of the sensitisation programme is to develop a change in behaviour in Isiolo residents for them to incorporate household segregation and to accept and adopt the formalised SWM project. It will be important to ensure that the private operator that will implement this program in Isiolo has a successful track record of working with local groups to run such educational programs that have led to behavioural adoption.
7. **Identify and engage private operators.** The municipality will have to identify and engage designers and facility implementors who will be involved in developing the waste sorting facility. These implementors include subcontractors and equipment providers to provide cost and timeline estimates for the construction and pre-testing activities required for the facility.
8. **Commission the construction of the facility.** Once designs are complete, the municipality will need to identify and work with a contractor to start the construction of the sorting facility. The municipality would need to collaborate with competent and interested operators to provide the necessary technical support during the planning and construction of the facility. The identification and selection of the operators would be done through a public procurement process by the municipality management.
9. **Build out the management team, filling identified gaps.** The municipality waste management team have started identifying competency gaps within the organisational structure and it will be important to consider the integrated nature of the proposed SWM to ensure the management team has the capacity to operationalise this project.

**Table 1: List of immediate next steps and proposed timeframes**

Project Action	Responsible Party	Expected Timeframe
Acquire land needed for the new landfill and on which the sorting facility will be built	Municipality	Q1 FY 2021/2022
Establish a framework and operating model to govern the municipality's relationship with private operators and residents	Municipality	Q1 FY 2021/2022
Assessing resident's willingness to pay	Municipality	Dependent on county budget allocation
Forge strategic partnerships with private operators and off-takers	SUED and Municipality	Dependent on the establishment of an operating model

## 2. Pre-feasibility Study Approach

### 2.1. Methodology

The pre-feasibility study evaluates the feasibility of formalising Isiolo's solid waste management system against a set of technical criteria, highlighting key financial, operational, economic, social, and environmental risks. The study also assesses the project's acceptability to the municipality, Isiolo residents and potential investors.

This pre-feasibility study was conducted by the SUED Investment Attraction Firm, **Open Capital**, and its consortium partners, ESF Consultants, and BE Associates. The three firms provided technical expertise due to their deep experience in providing investment advisory, environmental, social, safety, health assessments, legal and engineering and operations advisory.

*Figure 1: Organisations involved in conducting the pre-feasibility study.*



This study uses a mix of secondary research, primary analysis and consultations addressing critical questions focused on establishing key risks and any outstanding work that would need to be completed either as part of or before due diligence. The SUED IAF team relied on research publications by The World Bank, Kenya's Ministry of Environment and Forestry, The United Nations Development Program, and Isiolo's County Integrated Development Plan to obtain data on the state of waste management in Isiolo. Research conducted by the Investment Attraction Firm and its consortium partners also revealed potential avenues for formalisation, an estimate of the market gap that could be serviced by the proposed system, and an understanding of interventions necessary to ensure commercial viability. This was validated through consultations and the development of a financial model to validate the assumptions provided in the UEP and gathered from primary and secondary research.

### 2.2. Structure

Following this section, this report is structured as follows:

- **Section 3: Solid Waste Management Context in Isiolo:** describes the current waste operations in Isiolo and outlines the different private operators and CBOs carrying out solid waste management operations alongside the municipality.
- **Section 4: Proposed SWM Project in Isiolo:** describes the proposed structure and operations of the new waste management system, including collection, recycling, disposal.
- **Section 5: Enabling Environment Assessment:** describes the stakeholder factors surrounding the facility.
- **Section 6: Economic Impact Assessment:** describes the economic implications of the project.
- **Section 7: Environmental Impact Assessment:** describes the environmental implications of the project.
- **Section 8: Gender and Social Inclusion Assessment:** describes the gender and social implications of the project.
- **Section 9: Project Economics and Sustainability Analysis:** provides an analysis of the financial results of the project, highlighting the investment required, key revenue and cost drivers.
- **Section 10: Conclusions and Next Steps:** summarises the overall investment attraction potential of the project, including the status, and key next steps to implementation and due diligence.
- **Appendices:** includes the list of consultations.
- **References:** includes the citations of the sources of information used throughout the study



# 3. Solid Waste Management Context in Isiolo

## 3.1. Current Solid Waste Management Operations in Isiolo

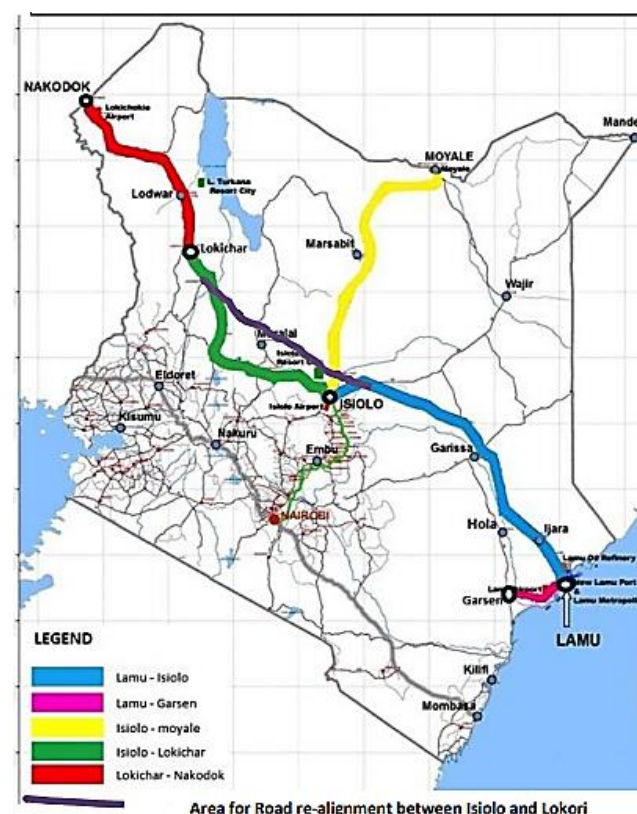
**Isiolo sits approximately 258 km North of Nairobi along the Addis Ababa transit corridor running from Nairobi to Addis Ababa.** Bordered by Samburu to the north, Laikipia to the east and south and Meru to the south-west, Isiolo plays a significant role in the development of the LAPSET Corridor Project and is set to benefit from the proposed interregional highways, railway lines and oil pipeline in addition to the recently completed A2 highway to the Ethiopian border. Isiolo has experienced rapid population growth from 46,500 in 2009 to 82,533 in 2018<sup>10</sup>, driven by its strategic location along the A2 corridor contributing to the urban sprawl.

**Waste management in Isiolo has followed the trends in other Kenyan urban centres and has been characterised by higher waste volumes than the municipality can collect and dispose of given current capacity.**<sup>11</sup> This challenge is primarily due to the poor waste collection infrastructure and the fragmentation of the current waste management system. Budgetary constraints and a nascent regulatory framework have also allowed illegal dumping to undermine efforts to improve the Municipality's business environment and climate resilience.

**Isiolo's current waste management activities are primarily undertaken by the municipality with limited private sector involvement.** Municipality workers currently collect waste within the CBD using an 8-tonne truck and a 6-tonne tractor-trailer that operates six times a week. The waste is then transported to the current dumpsite approximately 5 kilometres from the CBD, which also serves the military facility at Archer's Post. The municipality hires 35 cleaners responsible for general cleaning services around the municipality, 15 waste loaders, four drivers, and one supervisor for its operations. There are also private sector operators and CBOs providing waste collection services to households in the residential areas that the municipality does not cover. These operators charge between KES 100 and KES 300 per month to provide waste collection services for households across the municipality, which is then transported to the municipal dumpsite or disposed of illegally.

Based on the 2019 Kenya Population and Housing Census, Isiolo County has an estimated population of 268,002 residents, with Isiolo sub-county having 121,066 persons. The population in Burat, Oldo-Nyiro and Ngaremara ward is dominantly rural. Isiolo Municipality is comprised of Bulla Pesa and Wabera wards which have populations of 45,094 and 37,437, respectively, therefore estimating Isiolo's municipality's population at 82,533.<sup>2</sup>

**Figure 2: Image of Isiolo within LAPSET corridor highways**



**Table 2: Isiolo sub-county by population<sup>12</sup>**

Sub-County	Population
Garbatulla	99,730
Isiolo	121,066
Merti	47, 206
<b>Total</b>	<b>268,002</b>

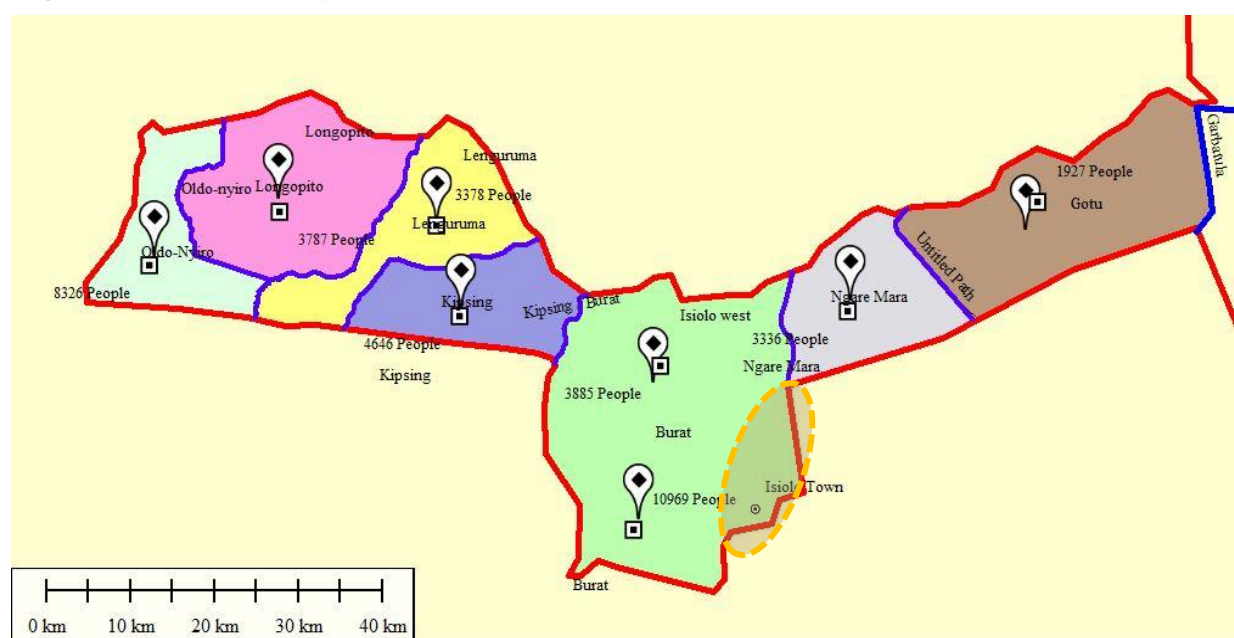
<sup>2</sup> Assuming a 5-person household

**Table 3: Isiolo sub-county by population by administrative wards<sup>13</sup>**

Sub-County	Population	Est. No of Households
Wabera	37,437	8,924
Bulla Pesa	45,094	9,018
Burat	10,969	2,742
Ngaremara	7,425	1,856
Oldonyiro	20,137	4,378
<b>Total</b>	<b>121,064</b>	<b>26,918</b>

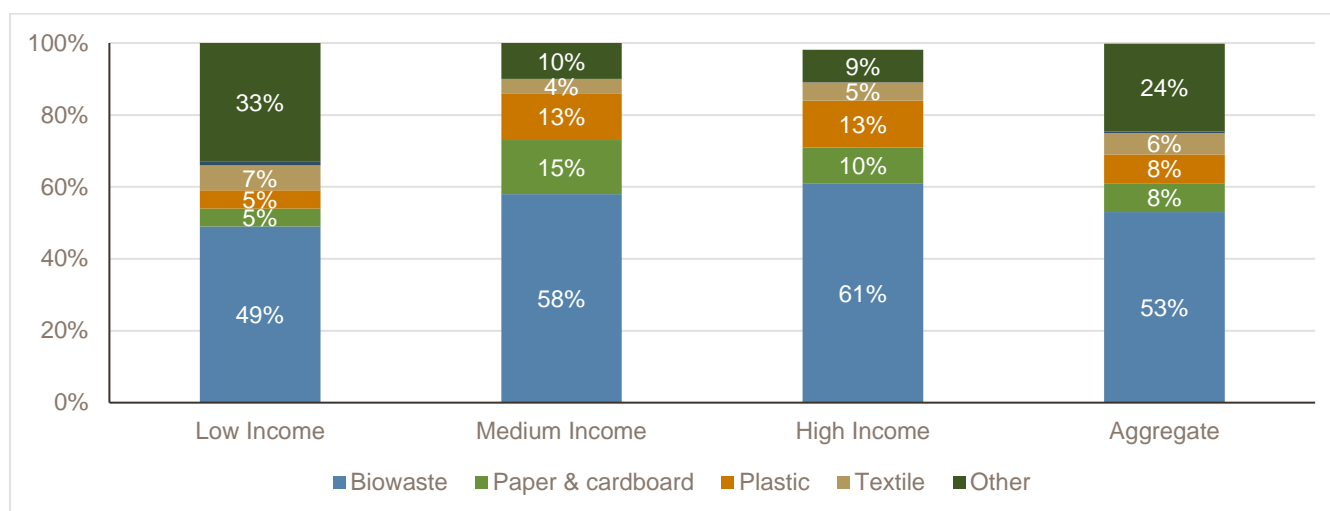
**Isiolo municipality's current dumpsite, sitting on 2.5 acres and located close to the CBD is almost at capacity.** The municipality is planning to acquire 7 acres of land to establish a larger and more secure site with sites already identified in Burat and Ngaremara Wards roughly 5 - 10km from the CBD and has requested KES 15 million in their 2021/2022 budget expected to be approved by June 2021 in the fiscal year. The land is expected to be purchased by September 2021.

**Figure 3: Isiolo Sub County Wards and Population**



**Waste management stakeholders in Isiolo have so far overlooked the income-generating opportunities from waste, such as recycling and composting.**<sup>14</sup> The municipality's budgetary constraints have hampered the development of an extensive waste collection operation, leaving most of the solid waste to be dumped or burned. Some of the more valuable products (plastic bottles and metal cans) are collected by pickers, but they on-sell to dealers at a very low price due to their inability to consolidate volumes (and compact into condensed blocks), as well as their lack of alternative outlets. As a result, significant value is being lost, and there is potential for a waste sorting facility that would improve incomes to operators, reduce dumping and contribute towards the costs of collection and clean-up operations. The following table illustrates the estimated composition of household waste in Isiolo Municipality:

Figure 4: Isiolo waste composition by demographic<sup>15</sup>



### 3.1.1. Existing Private Waste Management Entities

In addition to the municipality's waste collection team, there are three private entities and two Community-Based Organisations (CBOs) that carry out waste collection services. The municipality's budgetary constraints and limited provision of waste collection services have created an opportunity for private operators to provide these services in underserved residential areas.

Table 4: Private sector and CBO operators in Isiolo

Company	Year Established
Ecoways Cleaning Services LTD	2014
Dimao – CBO cleaning services	2014
Burqa Cleaning Services	2016
Ciltacho Holdings Ltd	2018
Solamente Emporia CBO	2019

These private entities operate autonomously from the municipality and are characterised by limited operational capacity and varying degrees of service delivery with their primary service being to offer waste collection services to households across the municipality for a fee and dispose of the waste at the dumpsite. Ecoways Cleaning Services a CBO turned private operator has the longest track record and had been contracted by Isiolo Municipality in 2019 to extend its coverage to the Central Business District. Under the terms of this arrangement, the municipality was to provide the trucks, fuel, and related maintenance while Ecoways provided operations personnel and supervision. Ecoways however elected to terminate the contract due to delayed payments from the municipality.

**Although these operators play a key role in collecting waste, the lack of a regulatory framework has resulted in uncoordinated service delivery to Isiolo's residents.** The National Waste Policy (2019) also notes that private operators tend to exhibit monopolistic tendencies and conflicts over contracts and operating zones, further undermining service delivery. With Isiolo municipality officials currently in discussion with the county assembly to develop a regulatory framework to govern the waste management space, private entities' integration will allow for a streamlined operation that would benefit all parties in the waste management space. Some types of incentives that may encourage private operator partnerships include:<sup>16</sup>

- Tax rebates for pollution savings
- Charge reduction based on proof of recycling or reuse in reducing waste requiring collection or disposal.
- Tax credits or allowances on property taxes to encourage investment in waste management improvements

## 4. Proposed SWM Project in Isiolo

Isiolo municipality is looking to formalise solid waste management activities within the municipality and integrate the private sector into its waste collection and management system at a total investment of KES 256 million. Through the proposed solid waste management project, the municipality expects to improve cleanliness across the town, create new job opportunities, and increase residents' income. The proposed solid waste management system will serve the 25 formal and informal settlements in Isiolo town, the Central Business District (CBD), and the military training facility (School of Combat Engineers) at Archers Post, which collectively generate approximately **13,500 tonnes of waste annually**.<sup>17</sup> The proposed SWM system will increase the municipality's ability to cater to a growing population's needs and the increasing waste volumes.

The new SWM being developed will have the municipality charge residents and businesses directly for collection services to address the municipality's budgetary constraints and partner with a private operator who will manage the sorting and composting activities. The concept of a waste collection charge will be new for most residents, therefore an assessment of resident's willingness to pay, combined with an explanation of the importance of collection services will be required as part of a sensitisation program.

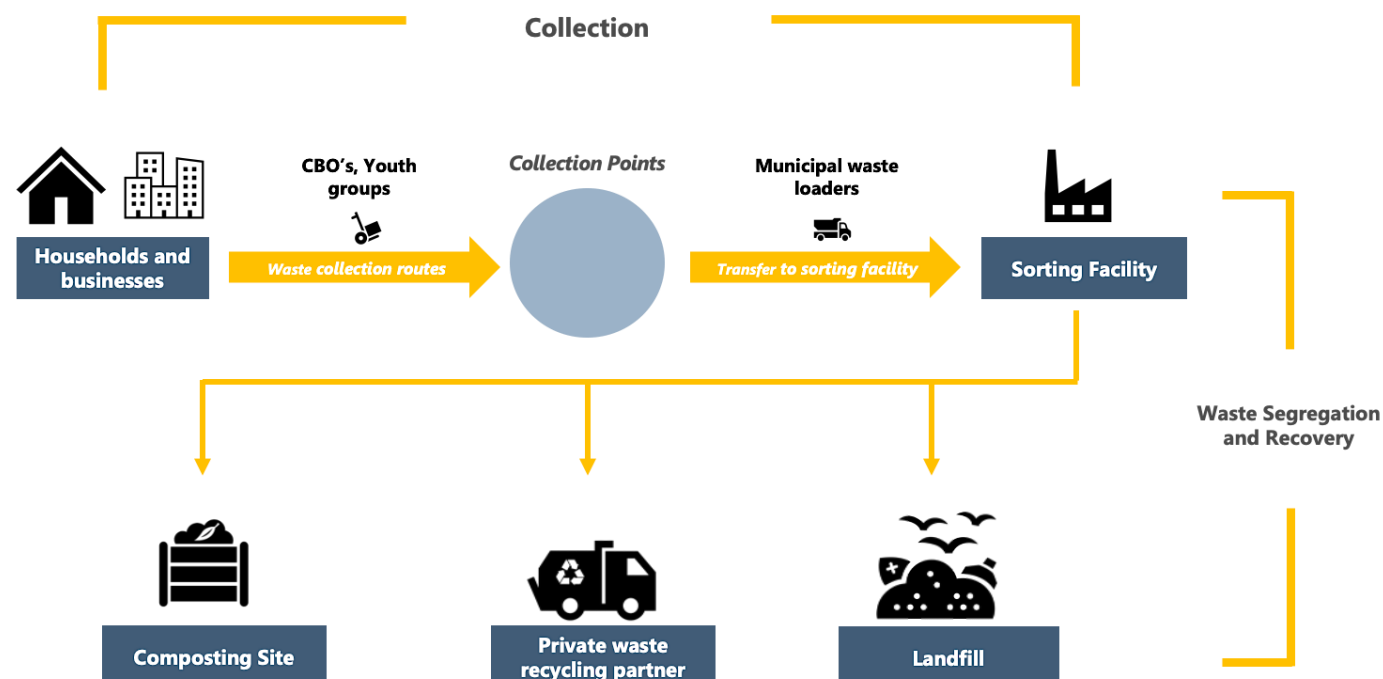
With the municipality population projected to reach 109,000 by 2023<sup>18</sup> from the current population of 82,533, the waste system's formalisation will be an important component of the resilient business environment that Isiolo municipality aims to establish. This will provide an opportunity to create a positive impact in Isiolo by capturing lost value, helping to improve Isiolo's climate resilience and driving future investment opportunities to the municipality. This section outlines the formalised SWM project's operational aspects focusing on the operational process, team structure, and the potential ownership structure.

The project operations outlined in this section were developed based on consultations, including those of potential implementers, as well as reviews of similar projects. They represent the author's best understanding for how this project may be operated but are a function of many assumptions which may shift and involve many stakeholders whose interests must be aligned in implementation.

### 4.1. Overview of the Operational Process

The proposed SWM system will address two components of the waste management process – **collection and waste segregation and recovery**. The first component will focus on improving and commercialising the waste collection segment, while the second component will focus on establishing and commercialising the waste segregation and material recovery segments.

*Figure 5: Summary of the operational process for the SWM project*



For waste collection, the municipality will provide waste collection services alongside private actors like community-based organisations (CBOs) to collect household waste. The municipality will also work with private sector players like Takanimali, among others, to educate and train households and businesses on waste collection practice, including how to correctly identify different types of waste to be segregated at the household and business level. The municipality will also provide households and businesses with the liners required to segregate the different waste types. The sensitisation activity will be carried 2 months of each year, in the first 3 years of the project and is projected to cost approximately KES 13 million.

For the waste segregation and recovery, the municipality can work with private-sector players, such as Sanergy who has expressed an interest in developing waste-to-value projects in different municipalities across Kenya. This will present an efficient waste management plan that will enable Isiolo to deal with its waste.

The success of the proposed operational process is contingent on the purchase of a new piece of land that would be used to establish a waste sorting facility and a composting site for the commercialisation of waste into value and the development of a well-managed landfill. Two potential parcels of land have already been identified, with the final site to be selected based on an assessment taken by the National Environment Management Authority (NEMA).

The first phase of the project will be implemented over two years (expected 2021-2023). The planning, design, and construction of the new landfill will begin in year 2 and made available in year 3 as well as the integration of the waste sorter into the material recovery facility. Below is a detailed overview of the different segments of the proposed solid waste management project:

#### 4.1.1. Household Segregation

Household segregation will start with an education and sensitisation component. For households to understand how to segregate waste correctly, they will need to be educated about the type of waste they have and how to dispose of them. As households in each sub-county become educated, different coloured liners for each respective segregated waste type will be provided to households by the municipality – one for recyclable waste and the other for non-recyclable waste. Integrating waste segregation at the household level makes the eventual process of recycling easier, reduces the volume of waste that goes to landfill and improves public health protection, especially with Health Care Waste (HCW). These programmes will be managed by the municipality but run by hired private actors that specialise in driving community engagement through sanitation programs, and CBOs who already have ties to the Isiolo community. The CBO's will support the private actors by engaging with Isiolo residents and explaining the importance of household segregation and its critical role in ensuring the success of the new integrated waste management project.

#### 4.1.2. Collection

CBOs will collect household waste twice a week and take it to collection points located strategically along the waste collection routes, where municipality workers will collect the waste. Municipality workers will collect business waste five times a week with the municipality collection trucks. Loaders with the collection trucks will pick the waste from these collection points and transport it to the landfill for manual sorting. High-quality waste will be sold to off-takers, and the rest of the waste will be transported to the landfill for disposal. In year 2, organic waste will also be separated and transported to the composting facility.

The municipality and private waste collectors will need to identify and allocate clear waste collection routes around the residential areas, the Industrial Cluster, the CBD, and the Isiolo airport. The following will also need to be considered for the collection process:

- I. **Collection fee:** A collection fee will be charged to households and businesses for the waste collection services provided and garbage liners. Consultations with both public and private sector actors in Isiolo indicate a demonstrated willingness for households to pay KES 200-300 per month and for businesses to pay up to KES 500 per month.<sup>1920</sup>
- II. **Collection method:** Consultations with private operators currently operating in Isiolo revealed a strong customer preference for the door-to-door collection system<sup>21</sup>. This involves having waste collectors' access households to collect the refuse bins and returning the bin once waste has been collected and disposed of. The formalised system will adopt this approach but have the CBOs carry out the direct collection from the households with the municipality workers carrying out collection directly from business premises and collection points.
- III. **Strategic collection points:** These collection points will be located in designated areas along the waste collection route and will act as central aggregation points. The CBOs will collect waste from households and



businesses in their assigned areas and deposit it in the large bins located in these collection points. Municipal waste collection trucks will then collect the waste from the collection points for transportation to the dumpsite.

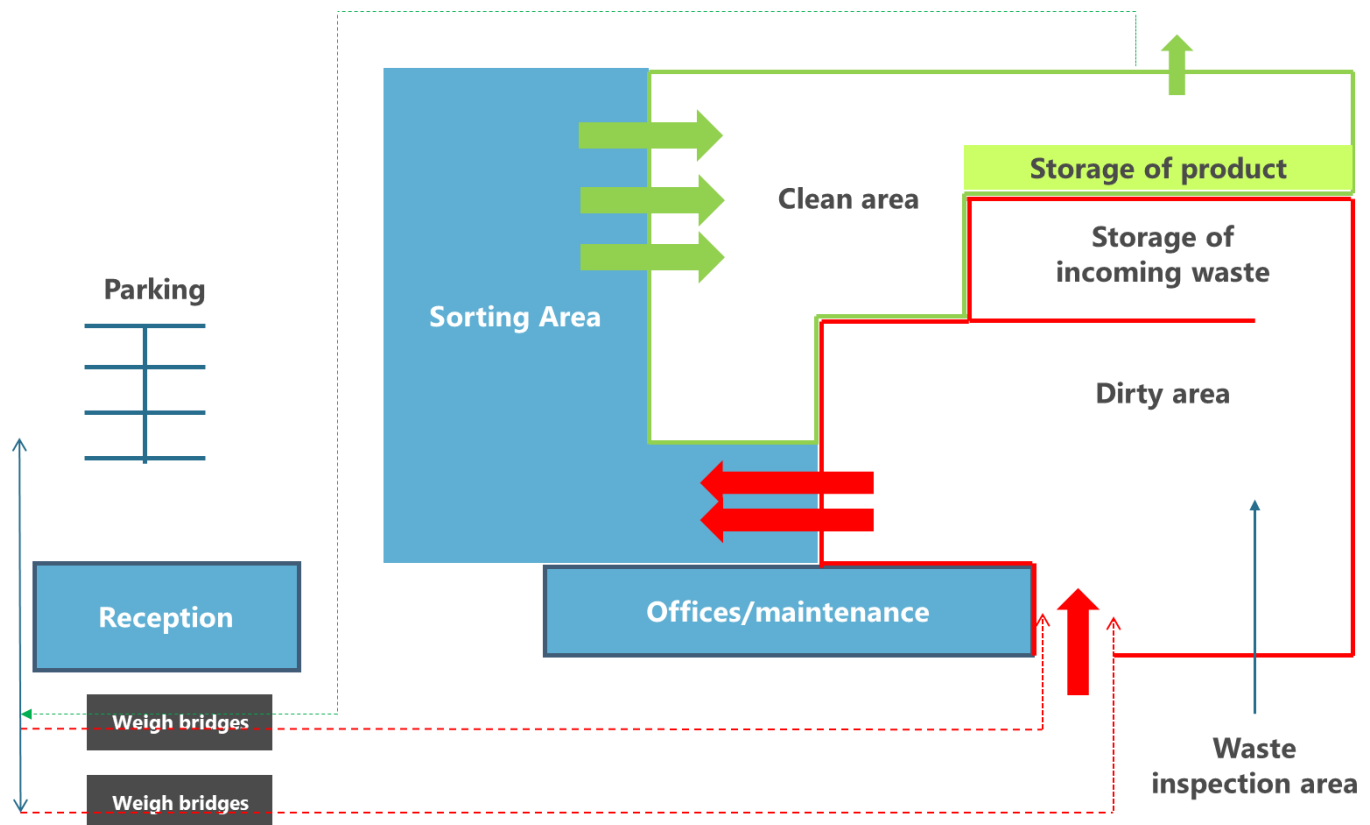
#### 4.1.3. Waste Sorting

The current waste sorting process involves an unsystematic and unreliable sorting method by waste pickers who scavenge for recyclable materials in the heavily contaminated dumpsite, giving room for exposure to diseases.<sup>22</sup>

Waste sorting and material recovery provide an opportunity for a new income stream through the sale of high-quality organic and recyclable waste to interested parties. This process can either be manual or done through a waste sorting facility with an integrated waste sorter. Either of these systems can carry out waste sorting using a positive or negative approach. A positive waste sorting approach involves the removal of the primary product to be recycled, like recyclable plastics, from the waste pile fed into the system. In contrast, the negative approach removes the waste to be transferred to the landfill for final disposal from the pile first. The positive waste sorting approach results in the recovery of high-quality materials but at the cost of efficiency, while the negative sorting approach tends to recover lower-quality materials given its focus on removing non-recyclable products from the collective waste pile. For this project, the positive waste sorting approach will be used.<sup>23</sup>

The waste sorting facility will be constructed on a 7-acre parcel of land purchased by the municipality. Initial sorting will be done manually, after which an integrated waste sorter will be incorporated to provide the opportunity to recover higher-quality materials and improve sorting efficiency.

**Figure 6: Sample layout of the proposed waste sorting facility<sup>24</sup>**



Below is a detailed overview of the waste sorting process with the integrated waste sorter:<sup>25,26</sup>

- I. **Reception and feedstock preparation:** The waste collected from the collection points is received at the waste reception area of the sorting facility and fed into the waste sorting machine. The waste is then transported through a plastic waste feeder, where large plastic pieces are sorted out. After this stage, the waste passes through the conveyor belt to the manual sorting platform.
- II. **Classification and sorting:** At the manual sorting platform, the waste is sorted by physical properties such as size, shape, and density, then by the quality of materials. The rest of the waste will then be conveyed to a magnetic separation machine, where iron materials will be sorted out from non-ferrous waste. The rest of the waste will then be transported to the final sorting platform for quality control.
- III. **Quality control:** In this final round, trained sorting workers will perform quality checks and sort waste into three main piles - non-organic waste to be taken to the landfill for disposal (which include soiled plastics, cartons,



paper, and cardboard)<sup>27</sup>, organic recyclables (which consists of food scraps and other waste to be used to create compost) and quality plastics to be sold to off-takers.

#### 4.1.4. Disposal

After separating the waste into piles, the sorters will prepare the different piles to be collected and stored ahead of being transported to their designated disposal locations to be recycled, used as compost inputs, or transported to the dumpsite for final disposal. Below is a detailed overview of the different disposal methods:

- I. **Recycling:** An estimated 10% of the solid waste produced in Isiolo is high-quality recyclable plastics<sup>28</sup> that are poorly sorted, collected by pickers, and sold at below-market prices in Isiolo's current waste management scheme. Incorporating a recycling component presents a potential revenue source of KES 35 million over the first ten years of the project, assuming an average resale price to private companies KES 12 per kg<sup>29</sup>. The high-quality plastics are collected from the sorting facility once every week by a private recycling operator and transported to their recycling plant. As the volume of waste generated in Isiolo Municipality increases, there is an opportunity to commercialise other components of the waste value chain e.g., glass, paper and textiles, whose current volumes are not yet sufficient to support off-take agreements.
- II. **Composting:** Compost is a form of agricultural fertiliser developed from raw organic waste, including leaves, non-animal food scraps, unsoiled tissues, cotton balls, and wood by-products such as shavings and sawdust. An estimated 50% of the waste in Isiolo is organic. This consists of food waste from households, businesses and markets, papers, wood, and yard waste. Once segregated, the organic materials are transported from the sorting facility to the composting site where the waste inputs are mixed and added in composting pits and left to decompose naturally for 6 – 8 months. The waste can also be heated for a shorter processing time. The production of compost in Isiolo will be facilitated by a private operator, managed by a composting site supervisor, and overseen by site staff. The compost will then be sold to farmers and landscapers in Isiolo and across the country as organic soil conditioners, providing an additional revenue source for the municipality and Isiolo residents at an average price of KES 25 per kg<sup>30</sup>.
- III. **Landfill:** An estimate of 40% of the waste collected in Isiolo is non-recyclable. Once segregated from the recyclable materials, this waste will be filtered out of the pile, and transported to the landfill to be burnt in the open air or left to naturally decompose.

## 4.2. Equipment and Infrastructure Required

There are key equipment and infrastructure needed at different segments of the project to ensure its commercial viability. These include:

**Waste sorting facility:** The municipality will purchase a 7-acre piece of land to establish the waste sorting facility, alongside the landfill and composting site. The facility will include a weighing scale, waste sorting machine, a storage area and an office for the facility supervisor and administrative staff. The facility will require an annual processing capacity of at least 100 MT of waste per week to process the quantity of waste generated in Isiolo.

Based on research carried out by the International Solid Waste Association (ISWA), the process of developing a waste sorting facility entails several elements and decisions that need to be considered. Below is an overview of key elements that will need to be considered when constructing the Isiolo waste sorting facility:

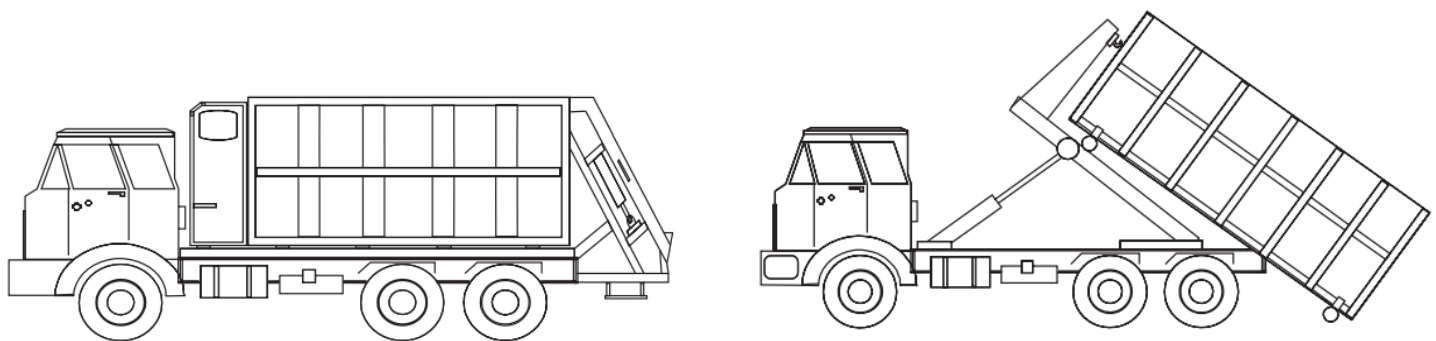
- I. **Site selection:** For Isiolo, the waste sorting facility will be located on the same 7-acre plot of land to be purchased for the new landfill, 5 km away from the municipality centre.
- II. **Facility design:** The waste sorting facility's design will primarily be driven by the quantity of waste -estimated at 250 tonnes - to be processed through the facility and the outputs required from the sorting process. A waste sorting machine will also be incorporated into the facility design and extract plastic and organic waste to be sold to off-takers and used to create compost, respectively.
- III. **Facility operation:** The sorting facility will incorporate the following:
  - a. A facility operating schedule to determine what days the facility will be operating.
  - b. Signs with a description of the waste components to be sorted and procedures for diverting certain types of waste should be made available
  - c. Operating methods for each of the sorting facility's components, including weighing procedures, waste screening methods, storage, and on-site clean-up procedures
  - d. Health and safety provisions and instructions for staff
  - e. Emergency plans

- f. Employee training
- g. Record-keeping procedures

IV. **Maintenance:** A sorting facility with an incorporated waste sorting machine will require regular maintenance. The description of the maintenance schedule and procedures for the integrated waste sorter will be made available to all staff.

**Vehicles:** Different types of vehicles will be needed at each point of the waste management system. CBOs will collect waste from the households using a pushcart. Once full, the cart will be emptied at the identified collection point. The municipality driver will collect the waste from the collection points using rear-end loaders with a 9m<sup>3</sup> capacity and transport the waste to the landfill and sorting facility. The rear-end loader is the most feasible, given its capacity and ability to operate on Isiolo's roads. After sorting, the non-recyclable and organic waste will be transported to the composting site and the dumpsite, respectively, using a roll-on roll-off vehicle. At the composting facility, a bulldozer will be used to periodically turn the compost over the time it takes to process.

**Figure 7: Sample vehicles for SWM project: Rear-end loader and Roll-on roll-off vehicle<sup>31</sup>**



**Designated parking structures:** The facility will require designated parking spaces for municipality-owned and private entity-owned waste collection vehicles and transport trucks. These vehicles will be used for waste collection from households and businesses, transportation of recyclable materials to be sold to recycling partners, and organic waste for composting to the designated composting pit.

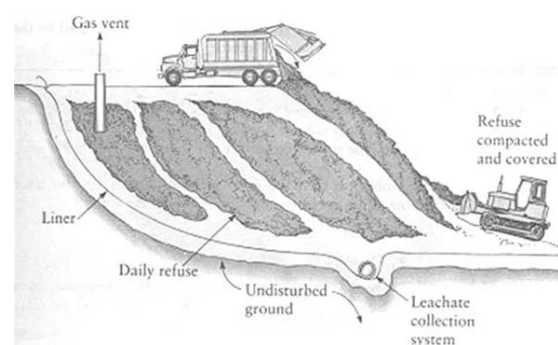
**Waste transportation routes:** For efficient navigation across the municipality for waste collection and transportation to the landfill and sorting facility, waste collection routes will be developed to run through the residential and business areas. Research shows that daily collection routes should be well connected to the already existing road networks and planned to maximise waste vehicles capacity.<sup>32</sup> It is also important to establish regular collection routes and inform households of this schedule to ensure that they prepare their waste for collection ahead of designated collection days and times.

**Waste collection points:** These will be stations where waste collected from households by sub-contracted CBOs will be accumulated in large garbage collection bins that cost approximately KES 150K each, before being picked up by the municipality waste loaders and transported to the sorting facility. These collection points are yet to be identified but will be located at strategic points along the collection routes across the municipality. Two main factors to consider when selecting the waste collection points include proximity to households and road access for waste collection trucks.

**Landfill:** The current landfill in Isiolo municipality sits on an unfenced 2-acre parcel of land which is almost at full capacity and guarded by only two security guards, which is not enough workforce to guard the space against collectors from neighbouring towns who scavenge for broken bottles, camel bones, and other solid waste materials to recycle.

For a longer term and more sustainable approach, the new landfill will cover 5 of the 7 acres of land being purchased and will require bulk excavation for depth. The flooring will be covered using thick clay soil liners, a concrete layer of asphalt and gravel drainage to prevent liquid impurities from seeping into the soil underneath, making the landfill environmentally

**Figure 8: Proposed landfill structure**



safe, following specific factors important to follow when building out municipal solid waste facilities. Some other general siting criteria for SWM facilities include<sup>33</sup>:

- Ground and surface water protection
- Land use compatibility
- Hauling distance to other SWM facilities
- Existence of public buffers between the public and the facility
- The proximity to waste generators as well as schools, churches, hospitals, and other public facilities

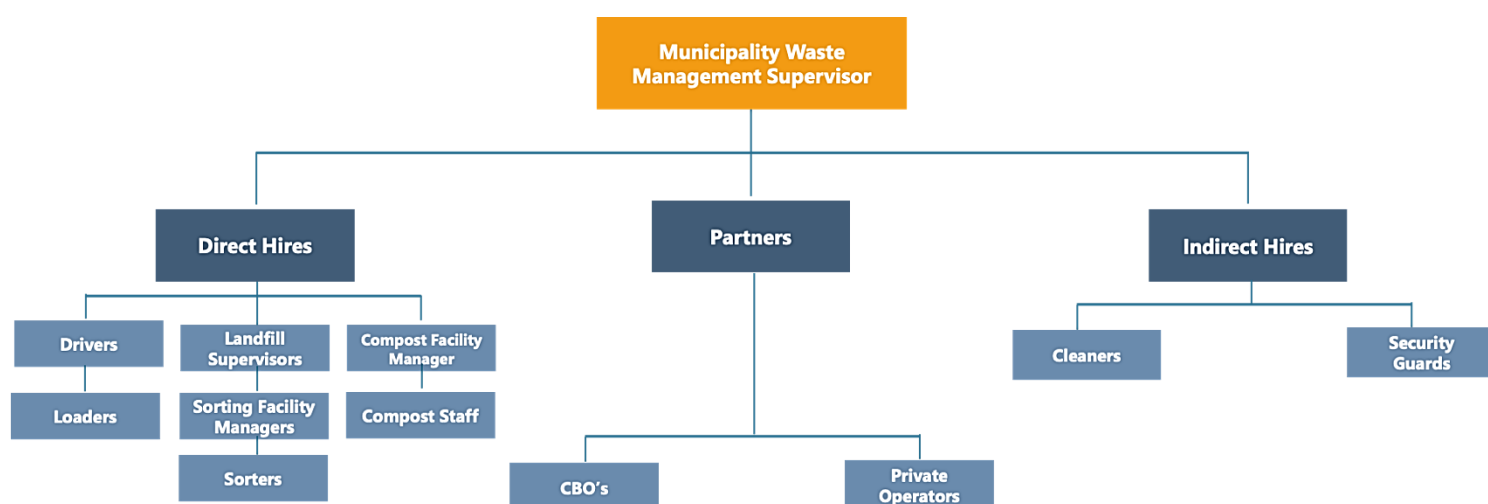
The new landfill is to be located 5 to 10 km from Isiolo, on a 7-acre plot of land, budgeted for KES 15 million. This amount is included in the municipality's budget, which is expected to be passed and made available in the 2021/2022 municipal cycle.

**Energy infrastructure:** The area around the sorting facility should have easy access to a dedicated 315kVA 11/0.4kV transformer suitable for large-scale industrial enterprises. The transformer will need to be fed via an 11kV line from Isiolo town, which would provide sufficient grid access to the sorting facility to power traditional lighting, cleaning, and the waste sorting machine. The facility will also require back-up power, a solar panel with an inverter) to supplement the power supply from the main grid in case of electricity outages.

### 4.3. Organisational Structure

**The waste management project will be operated by 81 direct and 112 indirect municipality and private operator hires over the first 3 years.** The direct hires, whose jobs are within the direct operation process include drivers, waste loaders, landfill supervisors, sorting facility managers, waste sorters, and composting site managers. Indirect hires, who are needed in the waste management system but are not directly associates with waste management operations consist of cleaners and security personnel. The municipality already has 35 full-time staff employed for its current operations in the CBD. Additional staff will be hired over the first 3 years as different segments of the new solid waste management system are implemented, and over the projected years, as operations grow.

**Figure 9: Organogram outlining key roles and partnerships in the waste management system.**



### 4.4. Potential Operating Structure

Isiolo Municipality's Department of Environment, Public Health and Sanitation will manage overall control and oversee the proposed new system. Alternatively, they may choose to outsource various operational steps in the waste management value chain. The municipality would be responsible for building the structures to house the sorting facility and the dumpsite. However, operationally, there are two ways in which this new system can potentially be implemented:

- 1. Fully municipality led:** The municipality will purchase the land required for the landfill, having already identified several suitable plots in convenient locations. The municipality will also be responsible for establishing the sorting

and composting facilities and running all steps of the operational value chain and hiring local employees needed to run different aspects of the implemented system. In return, the municipality would expect to receive revenue from managing the sorting facility and composting site and payment from residents for doorstep waste collection services from their businesses and households.

2. **Combination of the municipality and private operating partners:** The municipality will be responsible for purchasing the land required for the landfill, the sorting facility and composting facility but outsource the running of some of the steps in the operational value chain to private operators through a standard procurement exercise. In this process, the CBOs will collect waste from the doorsteps of households and businesses and take it to the collection points, where municipality waste collectors will collect the waste and transfer it to the sorting facility. The private operator managing the sorting facility will receive the waste, sort it, and transfer the waste to either sell to an off taker, to the composting facility to be processed or to the landfill to be disposed of. The private operators will pay the municipality a fee negotiated and agreed upon between both parties at a set frequency based on the respective segment of the project managed. This structure will require the identification of operators with a track record of running similar operations with demonstratable success. The operator's input will also inform the design and construction of a suitable sorting facility and composting site.

While having the municipality run the waste management operations would allow for full control, it may be a less attractive option given the current skills and resources needed that the municipality doesn't have. Partnering with private partners and CBOs that have the skills and resources in different segments of the business will help drive the operational efficiency of the project.

## 4.5. Summary of the Operational Assessment

The success of the proposed waste system will depend on the purchase of the land for the new dumpsite, the establishment and operation of the sorting facility, and the identification of suitable recycling partners to purchase the non-organic recyclable waste. It will be important to monitor the land purchase and encourage the county government to address potential bottlenecks that may delay the project's operationalisation. Another risk of the formalisation would be the displacement of unregistered scavengers that earn their livelihoods from illegal waste and plastic collection on the dumpsite. The additional operational risks identified below can be managed by the facility operators' proactive steps and collaboration with key stakeholders, as outlined below.

**Table 5: Risks and mitigation strategies for the SWM project operations**

Risk description	Risk level	Mitigation strategies	Residual risk
<b>Low willingness to pay for collection services by consumers</b> poses a risk to the waste management project as the success of the project is supported by projected fees from household and business collections	Severe	<ul style="list-style-type: none"> <li>The SUED team, with support from the municipality, would need to undertake primary research to gauge resident's willingness to pay.</li> <li>Low-cost waste management solutions like the use of renewable energy and alternative but durable construction materials for the landfill and facilities should be incorporated into the project to minimise cost of operationalisation</li> </ul>	Major
<b>Low recyclable waste volumes</b> would make it inefficient for private recycling operators to collect waste from Isiolo without charging additional collection fees <sup>34</sup>	Severe	<ul style="list-style-type: none"> <li>The municipality can explore the potential of partnering with neighbouring municipalities by collecting and segregating their waste to aggregate sufficient volumes of recyclable waste.</li> </ul>	Major
<b>Low compliance to legislation</b> leading to open dumping by residents and allowance for unlicensed private operators to provide the same service at a lower price, therefore undermining the project.	Major	<ul style="list-style-type: none"> <li>The municipality management will need to enforce partnership and sanitation regulations by sensitising the public about the new regulations and recruiting additional staff to support enforcement</li> <li>New regulatory framework to comprise fines to disincentivise the lack of compliance and ensure a level conducive playing field for private operators</li> </ul>	Moderate

<b>Lack of technical expertise and operational capacity</b> to advise on the technical design and construction of the sorting facility, as well as manage the overall waste management operations	<b>Major</b>	<ul style="list-style-type: none"> <li>The municipality would need to collaborate with competent and interested operators to provide the necessary technical support during the planning and construction of the facility. The selection of the operating partners will be carried out through a public procurement process.</li> <li>The municipality would also need to hire more staff at the senior level to increase its operational capacity in order to effectively manage the waste management project.</li> </ul>	<b>Moderate</b>
<b>Failure to secure the budget</b> to purchase the land needed for the new landfill, sorting facility and composting site.	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Given that the amount required has been captured in the 2021/2022 budget, the municipality would need to keep emphasizing the importance of acquiring the land for an efficient waste management system in the municipality</li> <li>Several potential sites have also been shortlisted to minimise delays once the funds are received.</li> </ul>	<b>Low</b>
<b>Low public perception of the project</b> poses a risk to the project's adoption and residents' participation.	<b>Moderate</b>	<ul style="list-style-type: none"> <li>The municipality, in collaboration with local CBOs would need to conduct sensitisation and education on the new waste management system.</li> <li>The municipality will also need to undertake a public participation exercise to gain community buy-in about the potential private sector involvement.</li> </ul>	<b>Low</b>
<b>Inadequate access to personnel with the training and knowledge</b> required to operate, maintain, and repair the equipment in the sorting facility	<b>Moderate</b>	<ul style="list-style-type: none"> <li>The operator can forge partnerships with Isiolo's technical institutes to deliver the necessary training to staff. Negotiation with equipment suppliers to include robust warranties and after-sales support to cover potential equipment breakdowns.</li> </ul>	<b>Low</b>
<b>Low demand for compost created</b> from composting facility and organic waste because of unknown brand, given a high barrier to entry <sup>35</sup>	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Market products through focus groups, local community organisations, and farmer groups to raise community awareness</li> </ul>	<b>Low</b>



## 5. Enabling Environment Assessment

**The formalised solid waste management system's success is influenced by stakeholder buy-in for the project and supportive regulations for business operations.** Following the devolution of roles and responsibilities from the national government to the county government, each county has made varying efforts to create an environment conducive to opening new businesses within their areas of jurisdiction. Isiolo county is developing a legislative framework to govern the county's operating partnership with prospective private waste operators. Municipal and county buy-in is necessary to minimise bottlenecks to the development and implementation of this project. This pre-feasibility has been developed in close conjunction with municipal and county stakeholders to ensure they are brought along in this process.

### 5.1. Laws, Policies, and Municipality Business Environment

**Kenya's Vision 2030 - the national long-term development blueprint for Kenya - is inspired by the principle of Sustainable Development and by the need for equity in access to the benefits of a clean environment.**<sup>36</sup> An estimated 22,000 tonnes of waste is produced daily across the country, with only half being collected and disposed of properly. The National Sustainable Solid Waste Management Policy was developed to move Kenya towards the realisation of the Zero Waste principle, as waste management is a prevalent problem in Kenya's urban areas.

**In 2010, the Integrated Solid Waste Management Master Plan (ISWM) was implemented,**<sup>37</sup> **which assessed the country's waste management issues and developed projects that would address said issues through public-private partnerships.** Following this, the Nairobi Solid Waste Management Act was passed in 2015<sup>38</sup> to "provide a legal framework for solid waste management function" and to "encourage public participation in the management, protection, and conservation of the environment." This legislation is important to municipalities characterised by an increasingly urban population, which is estimated to be growing faster than the country's overall population. Kenya's urban population grew from 5.4 million in 1999 to 12.5 million by 2009 and future projections indicate that around 50% of Kenya's population will be urban by 2030.<sup>39</sup> According to the Kenyan National Climate Change Action Plan, "the volume of solid waste generated across Kenyan urban centres increased from 4,950 tonnes per day in 2011 to 5,990 tonnes per day in 2014,"<sup>40</sup> a 6.3% CAGR that underscores the necessity of prioritising the development of a regulatory framework to govern this space. Despite the efforts put in by the government and the growing number of private sector players in the country, Kenya still has a waste management collection and disposal problem, which is visible across Kenyan municipalities and counties like Isiolo.

**Following the national trend, county governments, like Isiolo, have been developing a supportive and structured legal environment to address the waste management issues they have been facing.** This has been to make municipalities more conducive for the formalisation and operation of a waste management system and the facilities that come with it. Given that such a project may need to be done in collaboration with private entities, the municipality is in conversation about developing operating policies that would govern collaboration between private entities and the municipality. Different segments of the proposed formalised waste system will require several operational and construction licenses to be obtained from NEMA, the national agency charged with ensuring a clean and healthy environment for all citizen, National Construction Authority and Isiolo county.

The table below outlines key licences and approvals required on a national government and county government level to properly establish and operate the structures on a formalised waste management system in Isiolo.

**Table 6: Licences and approvals required for the construction of waste management facilities and supporting infrastructure<sup>41</sup>**

Licence/Approval	Issuing Authority	Description	Use stage	Cost (KES)
<b>Environmental Impact Assessment (EIA)</b>	<b>NEMA</b>	Assessment of the impact of the facility on the environment and steps required to mitigate adverse effects	<b>Construction</b>	<b>Waived</b>
<b>Construction site advert</b>	<b>Isiolo County</b>	Permit to display a construction notice during the construction of the processing facility	<b>Construction</b>	<b>10,000</b>



<b>Construction Permit</b>	<b>Isiolo County</b>	Registration of the construction project and inspection of the site of the processing facility with the NCA	<b>Construction</b>	<b>Waived</b>
<b>Green Card</b>	<b>Isiolo County</b>	Card required each time a county official visits the construction site	<b>Construction</b>	<b>1,000 per visit</b>
<b>Supervision Fees</b>	<b>Isiolo County</b>	Card required each time a county official visits the construction site	<b>Construction</b>	<b>1,500 per visit</b>
<b>Engineering Report</b>	<b>Isiolo County</b>	Assessment of the building plans	<b>Construction</b>	<b>7,500</b>
<b>Site Inspection Report</b>	<b>Isiolo County</b>	Report summarising risks and hazards identified and preventive controls in place at the processing facility	<b>Construction</b>	<b>5,000</b>
<b>Site Visit</b>	<b>Isiolo County</b>	Inspection and assessment of the site of the SWM facility	<b>Construction</b>	<b>5,000</b>
<b>Completion Certificate</b>	<b>Isiolo County</b>	Certifies that the sorting facility has been constructed according to approved building plans and all mandatory standards have been maintained	<b>Construction</b>	<b>7,500</b>
<b>Effluent discharge</b>	<b>NEMA</b>	Satisfies NEMA's standards on treatment and disposal of water and gives the facility permission to dispose of their wastewater	<b>Operation</b>	<b>105,000</b>
<b>Private operating licence</b>	<b>NEMA</b>	Certifies that the private entities are registered under NEMA and satisfy operational and sanitation regulations to operate	<b>Operation</b>	<b>8,000</b>
<b>Fire Safety Inspection</b>	<b>Isiolo County</b>	Certifies that the facility has been inspected and complies with the county's fire safety and prevention requirements. Requires annual inspections	<b>Operation</b>	<b>4,000</b>
<b>Certificate of Occupation</b>	<b>Isiolo County</b>	Certifies that the sorting facility is following applicable building codes and other laws, and indicating it to be in a condition suitable for occupancy	<b>Operation</b>	<b>4,000</b>

## 5.2. Security Status

While Isiolo has not been directly targeted in terror attacks, the county faces the challenge of a perceived presence of extremism and radicalisation characterised by media reports highlighting the recruitment of over 200 Isiolo youth since 2013 into violent extremist group al-Shabaab in Ethiopia.<sup>42</sup> Despite the county's distance from Somalia's borders, Isiolo's location is considered strategic for recruitment and radicalising. According to the Institute for Security Studies, youth are targeted and drawn in through social media, which is said to be one reason why the government's response to deploy anti-terrorism police has not been effective in reducing recruitment. Another factor is police corruption by officers taking advantage of the anti-terrorism campaign to solicit bribes from youth despite their terrorism involvement. The increasing use of drugs by the youthful population is also linked as a means to recruit youth as drug dens in Isiolo are also hotspots for radicalisation<sup>43</sup> and the target on the youth is a direct attack on the eligible workforce for the formalised waste management system.

In response to this threat, Isiolo County Action Plan on Prevention and Countering Violent Extremism (ICAP) 2018 – 2022 was developed to build resilience towards violent extremism.<sup>44</sup> ICAP outlines a plan to create awareness of the terrorism influence and radicalisation of youth into extremist groups. It also outlines plans to deradicalise those already involved through education and re-integration into society. The county also plans to invest KES 583 million in their five-year Cohesion and Peace Building Programme to promote social cohesion and a culture

of peace in the county's communities. Through this programme, the county intends to 1) establish an early conflict warning and response system, 2) enact an Isiolo County Cohesion and Integration Act, and 3) create forums (Peace Clubs) that facilitate peacebuilding and reconciliation among the different ethnic communities in the county. Through these measures, the goal is to build a safer and more secure living environment in the county, providing a safer environment to catalyse economic growth.

### 5.3. Mapping of Key Stakeholders

**The complexity of waste management systems creates roles for different types of companies in the space.** As national policies that guide the country's waste disposal system are being developed, local governments control the overall management of waste in their specific areas, leading the United Nations Environmental Program to identify the cleanliness of a city as an “indicator of good governance”.<sup>45</sup> In order to successfully formalise the waste management system in Isiolo, the approval of key stakeholders within the already existing system is required. The stakeholders who play a role in the success of Isiolo's waste management system are discussed below.

#### 5.3.1. Primary Stakeholders

**Isiolo's residents are key stakeholders in the success of this project, as they are the primary users of the service.** Being the primary waste producers and the beneficiaries of a waste management system in the municipality, it would be important to get general buy-in from Isiolo's residents, especially in commercialising collection by charging a flat fee and on the location of the new landfill, sorting facility and composting site. Given that some private entities already carry out collection services, leveraging their system to build upon the rest of the county would be important in formalising the general waste system.

**Approval from Isiolo's County Government would be required for all key aspects of the project, including site allocation, private operator, and investor selection.** Continuous engagement with key players in the county government to ensure their buy-in at each stage of the project set up and operation and ensuring the project design addresses concerns around i) gender and social inclusion, ii) environmental implications, and iii) the concerns of the community it affects, would encourage buy-in at the county government level. The county government is keen to have the project implemented and is eager to provide all support required to ensure that the facility is built and operationalised without any undue delay.

**According to Isiolo's municipality manager, there are three private entities and two CBOs currently operating in the municipality, collecting waste across the 27 informal settlements, and disposing of the waste in the current dumpsite.** Given that these entities are already an integral part of the current waste operations, it would be important to integrate all entities into the formalised system to enable SUEC to leverage the successful transportation links and community relationships these entities have already built. CBOs drive the importance of waste management in their communities in a way that current institutions cannot, as they do not have the incentive or buy-in from these small communities to encourage such environmentally friendly behaviour. Working with community-based organisations is important to ensure that smaller communities are included in the formalisation process.

#### 5.3.2. Secondary Stakeholders

**The National Environmental Management Authority (NEMA) is the main regulatory agency governing waste management in Kenya.** NEMA approval would be necessary for the land selection and the establishment of the landfill and sorting facilities, and regular engagement would be needed to ensure continued operations. This approval usually takes 40 to 45 days to obtain. Potential operators also need to demonstrate adherence to health and safety regulations to mitigate the risk of being shut down as NEMA has done to several similar facilities.

**Other value chain actors act as partners in the waste disposal process.** Potential partners would ideally be engaged in recycling and composting services to minimise the volume of waste sent to landfill and align with the Zero Waste policy. Some of these private players that have a track record in carrying out waste management operations across several municipalities in Kenya include Sanergy, Ecoways, Mr Green Africa, and TakaTaka Solutions. The municipality will carry out a standard procurement exercise to determine the right private partners to work with. There would need to be operational synergy and structure alignment with the proposed project that will mutually benefit the parties.

## 6. Economic Empowerment Assessment

**This section covers the expected economic benefits that the formalised waste management systems are expected to create for the municipality in the form of jobs and potential future projects.** The sorting facilities and partnerships with private sector operators can stimulate economic empowerment in Isiolo by spurring job creation within the different SWM segments and developing additional projects along the waste management value chain and adjacent industries such as agriculture and clean energy. This would benefit the municipality by creating more jobs and improving the standard of living within the municipality.

### 6.1. Jobs Created

Formalising Isiolo's waste management system would create employment opportunities for community members across the value chain. Informed by a combination of research, and the proposed operational model, while taking into consideration the current state of affairs in Isiolo, **81 direct and 112 indirect jobs will be created over the first 3 years of the project**, as different project segment are operationalised. As the scale of operations grows, the waste management system in Isiolo is expected to create around 200+ **additional jobs** across the project segments by the tenth year. Below is a breakdown of some of the additional jobs to be created in the first 3 years:

1. **Drivers:** Isiolo currently has four drivers that operate the two trucks that pick-up waste in the CBD. With the expansion of the municipality's route to include household collection, 3 additional waste collection trucks are needed by year 3 to cover the additional waste collection routes, one wheel-loaders to move segregated waste, and a bulldozer to turn the compost. This would bring the total vehicles needed to 5 new vehicles, and with one head driver needed per vehicle and an additional relief driver for each vehicle, that would bring the total to 10 new drivers, creating **10 new jobs**.
2. **Waste loaders:** Waste loaders work alongside waste truck drivers to collect waste along the collection routes with the waste truck drivers. With the formalisation, two waste loaders would be needed for each waste collection truck. The addition of 3 new waste collection trucks with 2 loaders needed per truck, this brings the total new loaders to 6, creating **6 new jobs**.
3. **Sorting facility staff:** In the sorting facility, waste sorters separate recyclable waste from non-recyclable waste, and further into organic and non-organic recyclables to sell to third-party partners and to be used to create compost. To manage the operations of the sorting facility, two supervisors are needed to work on alternating shifts to manage the 10 sorters required to operate the facility for every 1,500MT of waste collected. By year 3, an estimate of 4,300 MT of waste will be collected annually, resulting in the need of 29 waste sorters by year 3, creating an additional **29 jobs** in Isiolo.
4. **Compost facility staff:** Compost created in composting pits take an average of six months to mature, with the pit needing to be turned once a week. To manage composting operations, which shall come online by year 3, two composting facility managers would be needed to work on alternating shifts, supervising 5 composting staff for every 1,000 MT of organic waste collected. 2000 MT of waste is estimated to be collected by year 3. This would require 11 composting staff, creating a total of **13 composting jobs** in Isiolo.
5. **Enforcement officers:** There needs to be enforcement on parties that flout waste management regulations across the municipality and at the dumpsite. The municipality currently has 2 security officers that manage the current dumpsite, but the municipality manager estimates the need for 10 additional security officers in the dumpsite and within the municipality to ensure compliance within the municipality. The guards at the dumpsite would focus on keeping scavengers from accessing the dumpsite, while the guards within the municipality will be enforcing compliance to the new regulatory framework, especially the edict on illegal dumping. This will create **10 additional security jobs**.

The construction phase of the project will create additional jobs in the short term as the contractor will hire staff from within the municipality.

### 6.2. Potential Projects Unlocked

**Organic waste, which is the largest proportion of waste produced in Isiolo can be used as inputs for a biogas digester to produce energy for the municipality.** An estimated 40% of Isiolo's waste is organic and made up of raw foodstuff from homes and markets. In addition to using the organic waste to manufacture compost to be sold to farmers and landscapers, some of the waste can be used as raw inputs, converted into biogas, and used to provide

electricity to the municipality using an anaerobic digester. An anaerobic digester that processes 15 tonnes of organic waste a day, based on Isiolo's current generation estimates, could generate approximately 12MWh of energy per day.<sup>46</sup> This would require authorisation by the Renewable Energy Subsector of the Energy and Petroleum Regulatory Authority (EPRA) of Kenya.<sup>47</sup>

### 6.3. Benefits to the Municipality

**Improvement in waste management can drive increased demand for a better standard of living in the form of better sanitation operations and improvement of the local business environment.** Current sanitation services in Isiolo are underdeveloped. The municipality can leverage community-based organisations to provide training and informational services to community members while also investing in municipality-funded sanitation services and training the youth to get involved from the two technical colleges in Isiolo county. The commercialisation of SWM will also improve the business environment in Isiolo, as commercialisation would drive interest for more local businesses to open in the municipality, therefore providing more jobs. Sanitation practices will alleviate periodic public health challenges characterised by outbreaks of cholera, such as in 2017 and 2018, estimated to have caused 76 deaths in 2017.<sup>48</sup>

# 7. Environmental Impact Assessment

This section discusses the various effects the facility would have on the environment and proposes details on how negative effects can be minimised. With current sanitation services in the county underdeveloped, education and sensitisation programs can improve resident knowledge and best practices on environmental management. The project is not expected to have a large negative effect on the surrounding environment. Where there are negative implications, the actions required to mitigate them are feasible through the combined efforts of the facility, local government, and the wider community.

## 7.1. Climate Change

**This project is expected to positively contribute to climate change mitigation due to net waste reduction from waste recovery and recycling.** Implementing recycling and composting segments will transition the municipality from the current "*make-and dispose*" model into a "recovery and reuse" model, which is the foundational shift required to move towards a circular economy and support Isiolo's economic development. This project would drive the collection of waste that would otherwise end up in open dumpsites where organic matter decomposition significantly contributes to climate change due to methane generation and emission. However, the project does not have a "Zero Carbon footprint," as GHGs are expected to be generated primarily from waste management processes such as transportation of waste and machinery emissions at the facility.

In addition to GHG emissions, climate change has the potential to affect waste management processes and facilities in several ways, including:

- Increased disruption of the support infrastructure such as roads from extreme weather conditions, i.e., heat stresses may affect the project's operations. Extreme conditions such as floods may make roads impassable or lead to surface water contamination through leachate.
- Reduced worker comfort due to extreme weather conditions resulting in reduced productivity through lost workdays.

The waste processing facility has minimal water and other climate reliant resource requirements. As such, the project is reasonably resilient to climate change.

**Transportation is a big component of waste management and can contribute to the production of ozone-depleting gases.** Assuming the trucks to be used for the project have an axle configuration of 4 x 2, a truck uses 32.3litres of fossil fuel for every 100km. Using 15km as an estimate of the round-trip waste collection transport route for the project, then one truck would produce 22.23kg of CO<sub>2</sub> per trip. Emissions can be controlled/minimised by ensuring that the vehicles are serviced regularly and use of low sulphur diesel. Purchasing modern version machinery (such as sorting machines, shredders, conveyor belt, motors, back-up generators) and vehicles should prefer modern versions employing improved technologies with low carbon output specifications where budgets allow.

**Additionally, the project involves spatial planning to determine efficient waste collection routes that result in less net vehicular mileage and reduced accident risks in the event of floods.** Waste collection schedules for waste collection early in the morning when there are few vehicles on the road/routes and temperatures are low to ensure waste operators' comfort and productivity. The project design should construct a storm drainage system within the facility to ensure proper draining of surface run-off to avoid possible flooding and contamination of water sources.

## 7.2. Land Use

**Isiolo's topography is made up of higher grounds on the southern and south-eastern fronts, and relatively low lying and flat grounds on the northern front.** As a result, rainy spells, especially in the higher ground towards Mt. Kenya, usually result in flooded zones in and around the town. Given this, poor facility siting and management of solid waste could result in increased flooding as waste is washed into existing stormwater infrastructure, causing blockages. Haphazard storage of the waste streams during the project's operation phase could potentially lead to the blocking of storm drainages. Open storage areas provide little containment from winds, especially for light material such as paper or polythene. This has contributed to environmental pollution and surface water pollution, especially during rainy seasons, given that Isiolo is prone to flooding. Flooding events will interrupt and delay service delivery, especially waste collection and transportation. Additionally, severe cases of floods may cause fatality and financial losses in the waste processing facility.

**The waste management facility would need to be in an area outside of designated flood zones.** The location is to be determined against a flood risk map to ensure that construction is undertaken on safe grounds that do not



experience flooding or risky surface movement of water. Design engineers will also need to consider aspects such as slope, wind, soil type and land access when siting the facility. Additionally, the design of the waste facility will need to incorporate raised site construction and levees to protect against flooding. The project design should also incorporate rainwater harvesting techniques to reduce the amount of stormwater run-off. This will not only reduce flooding incidents but provide additional water supply to the facility. This avoids scenarios of stormwater washing waste piles into neighbouring land parcels and into surface water regimes. The waste segregation facility should as well have bounding walls and drainage channels outside of the wall to ensure that any stormwater is adequately diverted from the facility.

In addition, solid waste storage in transfer stations and sorting stations would need to be undertaken in a well-prepared area within the sorting facility installed with liners. Liners are the first line of defence that reduces the chance of leachate from contaminating soil and groundwater. Storage areas should be constructed to secure waste from strong wind movements. Sorting and segregation of waste should be efficient to match the rate of input material, facility capacity and final disposal timelines. This would reduce the amount of time waste material stays in the facility, and by extension, the amount of material that is stored there at any given time.

### 7.3. Electricity and Water Use

**The waste sorting facilities are expected to increase demand for electricity supply by about 50- 60kW depending on the equipment's type and efficiency.**<sup>49</sup> As the facility will be located around Isiolo town, it will have close access to grid supply. However, Isiolo town occasionally experiences blackouts and power fluctuation due to inadequate power and system instability from the National Grid and an ever-increasing demand due to the increasing population. An increase in energy demand by the facility will increase demand for more power supply to the county, and inadequate supply frequently results in system imbalance and power outages. This is likely to require the use of diesel generators as a back-up, which will, in turn, have a negative impact on the environment due to increased carbon output.

**The project design will consider the recovery of organic waste to generate biogas.** Where volumes of organic waste are sufficient, the facility will consider the institution of a hybrid system consisting of biogas that will generate sufficient energy to replace the grid connection, which would then be used as a back-up. This will offset the cost of grid electricity. A waste-to-energy (biogas) assessment should be undertaken to consider the viability of this approach and take advantage of an already existing resource.

**Water demand will likely come from facility sanitation and cleaning of recycled waste at the sorting facility.** Cleaning recyclables before they are sold to off takers may require that the wastewater be treated, creating additional demand for the sorting facility. Isiolo county currently experiences water shortages due to a higher demand than supply, coupled with a prolonged drought. This has resulted in regular rationing by IWASCO. Based on the WASREB Impact Report, IWASCO can only provide a limited supply of 5,000m<sup>3</sup>/day against a demand of 10,000m<sup>3</sup>/day,<sup>50</sup> for 15hrs/day<sup>51</sup>. This is because of underdeveloped infrastructure within the county, with only 39% of its population having access to the municipal water supply.<sup>52</sup>

**To reduce the project's pressure on the existing public water supply, the design will consider alternative sources such as boreholes to minimise its reliance on public water supply.** Average borehole yields in Isiolo range from 5m<sup>3</sup>/hr -18m<sup>3</sup>/h<sup>53</sup>. The project shall incorporate water conservation systems in the facility's water reticulation system to allow for recycling and reuse of water where possible. As an example, greywater can be reused for flushing toilets. The facility should also employ rainwater harvesting to buffer water supply. It is estimated that about 52.2m<sup>3</sup> of rainwater can be harvested, assuming the facility's roof catchment area is 100m.<sup>2,54</sup>



## 8. Gender and Social Inclusion

**Women make up approximately 48% (128,483)<sup>55</sup> of Isiolo county's population yet are more vulnerable to poverty compared to men due to cultural practices that limit their ownership and control of assets** in Isiolo. Traditional practices and socio-economic beliefs act as bottlenecks to gender equality in Isiolo. Women often remain at home to attend to household chores and are married off at an early age with high illiteracy levels, making it hard for them to develop skills that would help them to find gainful employment.<sup>56</sup>

Youth, on the other hand, make up 41% (108,000)<sup>57</sup> of Isiolo's population, yet 70% are unemployed due to high illiteracy levels coupled with a lack of skills<sup>58</sup>, with only 10% receiving post-secondary education. Persons with Disabilities (PWD) account for about 1% (2,562) of the county's total population, with 78.4% recorded to have had difficulty in engaging in economic activities in the region.<sup>59</sup> This is due to limited supportive infrastructure and prejudiced community attitudes that perceives them as dependants who cannot add economic value to the development of the region.

This section outlines the key gender and social inclusion impacts that have been identified as possible outcomes from the formalisation of the waste management project.

### 8.1. Social Inclusivity of the Project

**The Solid Waste Management project provides an opportunity for Isiolo's disadvantaged groups: women, youth, and PWDs to benefit from employment opportunities.** To foster social inclusion of marginalised groups, the project would need to put labour and employment policies and strategies that take into consideration disadvantaged groups and actively seek to include them in the project. This includes:

- Human resource department to adopt policies that promote equality, e.g., implement equal pay policy for equal work done to help address the gender pay gap. Additionally, the project to carry out sensitisation and building awareness among the local community to de-stigmatise women's work in the waste industry.<sup>60</sup>
- The project should adopt proper wages and provide employee benefits similar to other industries. A major limiting factor facing female waste sector workers is the stigma related to such tasks and the overall idea of "dignity of labour." Adopting competitive wages and providing employee benefits goes a long way in removing the stigma, not only to women but to all.<sup>61</sup> This can be coupled with providing flexible working hours where possible to allow women to balance household duties with their work at the Material Recovery Facility.
- Incorporating designs for outdoor environments accessible by PWDs such as access routes, paving, illumination level, and protection from the weather will allow for their involvement in tasks such as source separation and waste handling on equal terms with able persons. Similarly, providing inclusive indoor infrastructure such as power doors with sensors and ramps that PWDs can easily access all required sections of the Material Recovery facility as they carry out their responsibilities.
- Setting aside jobs that are appropriate and that do not require significant physical energy for persons with disabilities (PWDs). Such would include sorting and separation of wastes, cleaning recyclables and facilities, supervisions, and managerial positions.
- Human resource policies to incorporate all requirements for environmental/occupational health and safety to create a safer and conducive workplace. This includes providing appropriate protective gear, footwear, masks, gloves that will reduce the likelihood of physical harm and accidents cognisant of gender needs. Ill-fitting protective clothing and equipment can also mean that women entering certain 'non-traditional' fields will be unable to efficiently perform the job's given tasks.<sup>62</sup>
- Utilising a quota system to ensure that women, PWDs, and youth are employed throughout the project cycle. The project can use the current population demographic profile to establish the percentages or numbers they will need to employ based on gender and PWDs population within the region.
- Campaigns focused on inclusion of women in the waste industry should be carried out as part of the education and training for household segregation. Given that women mostly perform household waste management, creating women-centred campaigns will help create a positive behaviour change. They can also be relied upon to share such awareness within their social circles, family members, and children.<sup>63</sup>

The project will ensure that women's participation is inculcated throughout the project cycle, including project design stages, planning stages, policy formulation so that their views and opinions are incorporated.

The municipality will also need to adopt guidelines to hold private operators responsible for the implementation of gender and social inclusion commitments, and to hold managers and employees accountable. Some guidelines to follow to ensure private operating partners promote gender and social inclusion include<sup>64</sup>:

- The private operator will need to sign a “GESI commitment letter” as part of the partnership agreement with the municipality. The commitment letter will outline how the private operator would meet the guidelines provided by the municipality.
- The municipality will also need to develop and implement specific gender quota policies and inclusion metrics that the private operator will need to fulfil as a condition for continued partnership with the municipality. The private operator will need to submit an annual report with an update on their compliance with the GESI guidelines. In cases of non-compliance, the municipality can either cancel their contract, or suspend the private entity’s operating licences.

## 8.2. Social Acceptability of the Project

**There is a high likelihood for the formalised waste system to be received positively, given the existing waste management situation in the Isiolo and the low quality of living it provides.** The demand for improved waste management is high, and the municipality government's critical challenge is coordinating effective waste collection and management.<sup>65</sup> The project would help address this issue by improving waste collections services, providing safe working conditions to waste operators, and deriving economic benefits from selling recovered recyclable. Given that the project will require behavioural changes at a household level with household segregation, sensitisation programs will be carried out across the municipality to educate residents on sanitation best practices. The project will be a source of steady income to waste operators employed by the project. The project will also integrate waste scavengers and operators in the county as they often have the technical skills of seeking out high-value recyclable items<sup>66</sup>. All these measures would go a long way in building buy-in for the project as it seeks to address the most pressing issue of waste management in the town.

**A collaboration of the project with the County Government will enhance efficiency and burden- sharing, hence reduce the cost of waste collection for residents.** Community collaborations would encourage information sharing and training to enable the public to participate in the waste management process through proper source separation and waste disposal. In Isiolo, many workers are employed in low-wage jobs<sup>67 68</sup>, which necessitates affordable service for waste collection to enhance buy-in for the project. According to UN-Habitat's Third Global Report on Water and Sanitation in the World's Cities, sustainable and affordable tariffs for waste service range between 0.03% and 2% of household income. This estimate translates to a range of KES 118 - 350 per month on an estimated KES 206K average annual household salary.<sup>69</sup> The current monthly charges for municipality residents of KES 800 are around 4.6% of household income. Therefore, with the implementation of this project, the municipality should ensure that its residents' waste management services are affordable and accessible by considering subsidised service fees for residents who may be interested in but cannot afford the SWM services.

## 9. Project Economics and Sustainability Analysis

### 9.1. Introduction

This section provides details on estimated waste volumes collected and disposed of, sale prices, operational expenses and the resulting performance projected over 7 years of the new system through a surplus and deficit statement, balance sheet, and a cash flow statement. The projections indicate that the systems and facilities will require a total investment of KES 323 million in debt, grant, and municipality financing for the first 3 years to launch different segments of the SWM operations. This amount includes an upfront private investment requirement of KES 253 million to develop the landfill and sorting facilities and acquire the vehicles and machinery needed to manage the new waste volumes. An additional injection of KES 70 million will also be needed from the municipality in tranches over the first 3 years to purchase the land needed for the new landfill, the sorting facility and composting site, as well as to cover the project's operating expenses.

The numbers and estimates outlined in this section are based on inputs from consultations and analysis and rely on numerous assumptions that may shift as project implementation occurs. The intent of this section is to provide initial estimates to be further tested during the due diligence stage.

### 9.2. Overview of the Financial Projections

#### 9.2.1. Projected Income

The proposed SWM project estimates income of KES 18 million in its first year of operation projected to grow to KES 113 million by year 7. The main driver is the growth in the number of businesses and households that sign up for the waste collection services, which increases the volume of recyclable plastics sold to off-takers, and the volume of organic waste converted to compost and sold to farmers and landscapers in Isiolo and surrounding towns.

**Figure 10: Household and business signup growth**

Municipality Sign-up Assumption	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Isiolo urban population	82,533	84,184	85,867	87,585	89,336	91,123	92,946
Number of households	17,942	18,301	18,667	19,040	19,421	19,809	20,206
Number of businesses	4,500	4,590	4,682	4,775	4,871	4,968	5,068
Number of new businesses sign-ups	900	459	94	96	97	99	101
Number of new household sign-ups	3,588	1,830	373	381	388	396	404
Total number of business signups	900	1,359	1,453	1,548	1,646	1,745	1,846
Total number of household signups	3,588	5,418	5,792	6,173	6,561	6,957	7,361
Total Signups	4,488	6,777	7,244	7,721	8,207	8,702	9,208

To estimate projected revenues, the project assumes approximately 18,000 households and 4,500 businesses in Isiolo Municipality growing at an annual rate of 2% respectively, and consequently increasing the amount of waste generated over the years. The improved waste management system is expected to serve an estimated 3,500 of the 18,000 households and 900 of the 4,500 businesses in Isiolo in its first year of operation, representing a 20% coverage, which would increase to approximately 7300 households and 1800 businesses respectively, representing a 36% coverage by the seventh year, taking into consideration population growth in the region. 10% of the waste collected is recycled through sale of plastic and 50% through composting at an average price of KES 12K and KES 25K per tonne, respectively. Households will be charged KES 300 for collection while businesses will be charged KES 500.

**Figure 11: Projected Income (KES)**

Surplus & deficit statement	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Income							
Disposal	-	4,892,400	59,703,340	63,628,748	67,632,665	71,716,659	75,882,334
Waste collection	18,318,209	27,660,495	29,566,322	31,510,265	33,493,086	35,515,565	37,578,492
Total income	18,318,209	32,552,895	89,269,661	95,139,013	101,125,751	107,232,224	113,460,827

### 9.2.2. Projected Direct Costs

The direct costs associated with the formalised waste system include:

- The recurring cost of liners purchased at KES 10 each and provided to Isiolo residents at their households and businesses every month.
- Salary expense of staff working directly within the formalised systems. These staff include drivers, waste loaders, landfill supervisors, sorting facility managers, waste sorters, composting site manager and composting staff.
- Fuel costs at KES 105 per litre for the waste transportation vehicles, the bulldozer, the wheel loader and the lorries.

The total cost of liners will grow from KES 3.5 million in the first year to KES 7.2 million by year 7 as the number of businesses and households signed up for the new waste collection system is expected to grow gradually. The salary expense for direct staff is projected to grow from KES 10 million in year 1 to KES 21 million by year 7, while salary expenses for indirect staff is projected to grow from KES 13.1 million in the first year of the project to KES 25 million by year 7. As the project grows, more staff will be needed to handle the increased amounts of waste, leading to increased employment in the municipality.

### 9.2.3. Projected Indirect Costs

The key indirect cost assumptions included are:

- Indirect personnel expenses are expected to grow from KES 13 million in the first year to KES 25 million by year 7, to cover cleaners and enforcement officers' salaries. The number of cleaners is expected to grow as the project expands into new regions within the municipality, while the number of enforcement officers are not expected to increase.
- Utility expenses for the waste sorting facility, which will be driven by waste collection volumes and charged at market rates for an industrial operation.
- Fuel costs are projected to grow from KES 7 million in the first year of operations to KES 13 million in year 7, as more vehicles are purchased to cover the growth in operations.

## 9.3. Summary of Financial Outputs

### 9.3.1. Projected Profit and Loss

The following is the projected Profit and loss for the first seven years of operation.

**Figure 13: Summary of projected Profit and Loss (KES)**

Profit and loss summary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Income	18,318,209	32,552,895	89,269,661	95,139,013	101,125,751	107,232,224	113,460,827
OPEX	13,140,000	23,782,934	33,550,449	35,690,852	37,668,863	39,844,834	42,039,124
EBITDA	(22,799,314)	(29,831,518)	14,648,094	20,438,678	21,994,833	23,465,071	26,819,274
EBIT	(27,719,314)	(36,751,518)	4,671,899	9,962,483	11,018,638	11,988,876	15,343,079
Net surplus/deficit	(36,999,625)	(47,781,829)	(6,358,412)	(1,067,828)	(11,673)	958,565	4,312,768

### 9.3.2. Balance Sheet Statement

The following is the projected balance sheet for the first seven years of operations.

**Figure 14: Summary Balance Sheet statement (KES)**

Summary balance sheet	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Current assets	3,219,898	5,731,271	19,552,038	33,790,956	49,957,059	67,594,032	93,438,895
Fixed assets	192,580,870	240,660,870	248,746,625	243,270,430	237,294,235	230,818,040	219,341,845
Total assets	195,800,768	246,392,141	268,298,663	277,061,386	287,251,294	298,412,072	312,780,740
Current liabilities	2,299,522	3,172,724	3,375,708	3,206,259	3,407,840	3,610,054	3,665,953
Non-current liabilities	132,575,870	157,575,870	157,575,870	157,575,870	157,575,870	157,575,870	157,575,870
Total liabilities	134,875,392	160,748,594	160,951,578	160,782,129	160,983,710	161,185,924	161,241,823

### 9.3.3. Cashflow Statement

The following is the projected cash flow statement for the first seven years of operations.

**Figure 15: Summary of Cashflow Statement (KES)**

Cash flow summary	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Cash from operations	(23,570,821)	(31,298,264)	5,527,774	19,364,221	21,212,293	22,663,481	25,851,293
Cash from investments	(197,500,870)	(55,000,000)	(18,061,950)	(5,000,000)	(5,000,000)	(5,000,000)	-
Cash from financing	221,220,559	86,469,689	17,031,639	(1,030,311)	(1,030,311)	(1,030,311)	(1,030,311)
<b>Net cashflows</b>	<b>148,868</b>	<b>171,425</b>	<b>4,497,463</b>	<b>13,333,910</b>	<b>15,181,982</b>	<b>16,633,170</b>	<b>24,820,983</b>
Ending cash balance	148,868	320,293	4,817,756	18,151,666	33,333,648	49,966,817	74,787,800

## 9.4. Assessment of Investment Needs

The formalised waste management system will require a total investment of KES 323 million over three years, aligning with the timelines for when the different project segments will come online. This amount includes:

- An investment of KES 70 million from the municipality to purchase the land needed for the new landfill, the sorting facility and composting site as well as to cover the project's operating expenses.
- An investment of KES 253 million from private and donor funders to develop the landfill and sorting facilities and acquire the vehicles and machinery needed to manage the new waste volumes.

Below is a breakdown of the capital expenditure requirement for the new system's implementation over the first 3 years. The costs below were derived from research and consultations with waste management and construction experts to determine the accurate costs for the construction of the facilities and the purchase of the equipment and vehicles needed different segments of the project.

**Table 7: Breakdown of private investment need**

Property, Plant & Equipment	Item	Year	Cost (KES)	Quantity	Total	Source
	<b>Land and landfill construction</b>					
	Landfill Construction	1	132,575,870	1	132,575,870	Debt
	<b>Waste Sorting Facility</b>					
	Waste sorting facility	2	25,000,000	1	25,000,000	Debt
	Waste sorting machine	3	7,061,950	1	7,061,950	Grant
	<b>Equipment and Vehicle</b>					
	Large garbage collection bins	1	150,000	5	750,000	Grant
	Waste collection trucks (9m <sup>3</sup> )	1, 2	5,000,000	3	15,000,000	Grant
	Wheel loader	1	9,000,000	1	9,000,000	Grant
	Weighing equipment	1	600,000	2	1,200,000	Grant
	Compactor	1	4,000,000	1	4,000,000	Grant
	Composting setup and provision	2	10,000,000	1	10,000,000	Grant
	Bulldozer	2	11,000,000	1	11,000,000	Grant
	<b>Total</b>				<b>253,562,820</b>	

## 9.5. Overview of Potential Investors for the Project

Investment funds, development organisations, and programs focusing on sustainable infrastructure development are well suited to the project's investment needs, given its capital-intensive nature and uncertainty around cost recovery. The table below outlines two potential financiers who are likely to be interested in government and private-sector investment opportunities in Kenya's waste management sector and can provide either grant, debt or equity financing as required by the project.

**Table 8: List of potential investors in the municipality and private operating partners**

Investor	Funding Instrument	Average ticket size	Potential interest highlighted	Project suitability
African Development Bank	Debt/Grants	N/A	Between 2019 and 2023, has focused on investing in industrialisation in Kenya	High



Investor	Funding Instrument	Average ticket size	Potential interest highlighted	Project suitability
			through increased private sector participation in value addition projects	
World Bank: Kenya Urban Support Program	Debt/Grant	N/A	The program was developed to establish and strengthen urban institutions to deliver improved infrastructure and services in participating counties in Kenya	High
Japan International Cooperation Agency	Debt/ Grant	N/A	Under their ODA and JICA program, JICA invests in government of developing countries and international organisations that are carrying out some form of socioeconomic development	High
European Investment Bank	Debt/ Grants	N/A	Developed the Clean Oceans Project Identification and Preparation Programme (COPIP) which identifies and prepares projects in sub-Saharan Africa, including the Kenyan Coast, that contribute to reducing the discharge of plastics to the oceans	High

# 10. Conclusions and Next Steps

**The project offers a technically viable opportunity for the municipality to improve its waste management and an opportunity to potentially achieve economic sustainability by generating income through the recycling and sale of waste.** Technical viability is evidenced by comparing current designs and plans to similar operational projects such as the solid waste treatment centre commissioned by PETCO Kenya in Kajiado county.<sup>70</sup> The factors that will determine the project's operational and commercial success include:

- The purchase of the land on which the new landfill and sorting facility will be located
- The design, construction, and operation of the proposed waste sorting and disposal facility
- The establishment of a clear partnership framework between the municipality and proposed private operators for waste collection services

This project will require a waste commercialisation component to make waste operations in Isiolo more sustainable. The success of waste commercialisation activities will depend on i) the composition and volume of waste generated in Isiolo, ii) the resident's willingness to pay for collection services, and iii) the availability of a sustainable market for recycled or composted produce.

## 10.1. Next Steps

Listed below are some steps needed to advance this project:

1. **Develop a detailed implementation plan** taking into account each project 'layer' with a specific focus on a) Seed Fund support required (if any) and b) pre-conditions necessary from private sector actors or Municipal government to ensure the project implementation has a clear link to long-term sustainability. This plan will include expected timelines and roles to provide clear guidance on the role of the public sector, private sector, SUEP, and other development partners.
2. **Assess the resident's willingness to pay for collection.** Consultations with private entities operating in Isiolo revealed that residents are willing to pay an average of KES 300 per month for household collection, and up to KES 500 a month for business collection services. It will be important to get an independent estimate that considers residents earning potential to determine the private operator's earning potential. The municipality team will continue to validate the estimated payments in the future, as more households and businesses are signed up for collection services.
3. **Assess the CBOs and private actors to ensure they can deliver on the sensitisation program.** The goal of the sensitisation program is to develop a change in behaviour in Isiolo residents for them to incorporate household segregation and to accept and adopt the formalised SWM project. It'll be important to ensure that the private operator to implement this program in Isiolo has a successful track record of working with local groups to run such educational programs that have led to behavioural adoption.
4. **Establish a framework and operating model that will govern municipality relationships with private operators and residents.** Given the need to involve private sector players within the formalised waste system, the municipality will need to establish a formal operating partnership model with the private operators and the CBOs operating within the formalised system. Some of the key considerations for this framework include:
  - Provision of fair renegotiation terms and timelines after the private partner has had time to assess the operations being taken over.<sup>71</sup>
  - The introduction of an operating licence by the municipality for private operators and the sub-contracting of certain collection operations to the CBOs
5. **Acquire the land needed for the new landfill and on which the sorting facility will be built.** The sorting facility, new landfill, and composting facility will play a vital role in waste disposal and monetisation. The Isiolo County government has submitted a financing request to the Isiolo County Assembly in their 2021/2022 budget and is waiting for approval to purchase the land for the new landfill. The municipality has identified two 7-acre plots, both 5 km from Isiolo town, as potential sites for the landfill and sorting facility. The approval and purchase are expected to be confirmed by June 2021 with plans for design and eventual site construction to commence in the following months.

6. **Commission the construction of the facility.** Once designs are complete, the municipality will need to identify and work with a contractor to start the construction of the sorting facility.
7. **Establish market partnerships with off takers.** Once the sorting facility is established, it will be necessary to establish offtake agreements with the buyers of waste plastics and compost. These agreements will enhance the project's commercial viability by guaranteeing a minimum level of financial return for the private operator.
8. **Commission the construction of the facility.** Once designs are complete, the municipality will need to identify and work with a contractor to start the construction of the sorting facility. The municipality would need to collaborate with competent and interested operators to provide the necessary technical support during the planning and construction of the facility.
9. **Identify and engage private operators.** The municipality will have to identify and engage designers and facility implementors who will be involved in developing the waste sorting facility. These implementors include subcontractors and equipment providers to provide cost and timeline estimates for the construction and pre-testing activities required for the facility.
10. **Carry out additional due diligence on the selected operator:** This will include conducting a robust review of the potential operator to fully understand their ability to successfully implement this project, their financing need, and their capacity to absorb external financing. This would allow the project to pre-empt the key concerns that an investor would raise and support the operator to implement the relevant mitigation.
11. **Conduct detailed climate change and GeSI assessments as part of due diligence.** This project provides a great opportunity to improve the value chain processes to adapt to climate change and ensure the desired gender and social inclusion. This will also increase funding opportunities for the project with possibilities to tap into climate funds and other impact investment funds. This assessment will be carried out by the municipality as part of the due diligence process.
12. **Support initial investor outreach:** Building on and refining the initial list of potential investors highlighted in this pre-feasibility assessment, the municipality and select operators would need to align on a list of investors and prioritise them for engagement according to their fit with the project goal's. The municipality and operator will then be supported to develop relevant investor facing materials such as the financial model, investor teaser, and investor memorandum. Following this, the municipality and operator would engage these investors sharing details around the investment opportunity, including potential investment size and instruments, time frame of when the investment is needed, and the impact their investment would have through the project. This will allow the entities to gauge their appetite and collect further information on their investment process and requirements. Hopefully, this will lead to transaction conversations and eventually, financial close.

### 10.1.1. Additional Stakeholder Consultations to Conduct

Some additional consultations will be required to assess interest to invest in or operate certain aspects of the solid waste management approach to advance this project. Some initial organisations identified for additional consultations include:

Archetype	Organisations considered for future consultations
Ecosystem support	<ul style="list-style-type: none"> <li>Kenya Investment Authority</li> </ul>
Potential Investors	<ul style="list-style-type: none"> <li>African Development Bank</li> <li>World Bank - Kenya Urban Support Program</li> <li>Japan International Cooperation Agency</li> <li>European Investment Bank</li> </ul>

# 11. Appendices

## 11.1. People and Organisations Consulted

	Organisation	Archetype	Name	Role
1	GSMA	Innovator	George Bauer	Senior Advocacy Manager
2			Jisa Lemasagari	Senior Market Engagement Manager
3	Ecoways	Private Sector Operator	Sammy Kariuki	CEO
4	Sanergy	Sector Expert	David Auerbach	Co-founder
5	Isiolo County Government	County Officials	Osman Bagaja	Acting Director, Environmental Department
6			Halake Osman	Municipality Manager
7			Mr. Abdikadir Koricha	County Chief Officer
8			Hon Yusuf Dahir	CECM, Lands and Urban Development
9			Mr Osman Mahad	Director, Department of Environment
10	TakaTaka Solutions	Sector Expert	Daniel Paffenholz	CEO
11	Mr Green Africa	Sector Expert	Keiran Smith	CEO
12			Emily Mutua	Head of Strategic Sourcing
13	Sanivation	Sector Expert	Effie Akinyi	Project Development Lead
14			Jim Lane	Technical Lead
15	TakaNiMali	Sector Expert	Eliezer Mabwai	CEO
16	EMBU County	County Official	Dr. Nicholas Ngece	County Official
17	Wecyclers	Sector Expert	Jonathan Kola	Co-founder, Ex CTO
18	Bins Nairobi Services Ltd	Private Sector Operator	Mark Muga	General Manager
19	Zimmerman Youth Group	CBO	Irene Ng'ang'a	Founder
20	Independent	Sector Expert	Harrison Kwach	Waste Management Consultant

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