



THE GOVERNMENT  
OF THE GRAND DUCHY OF LUXEMBOURG



# WASTE TO RESOURCES

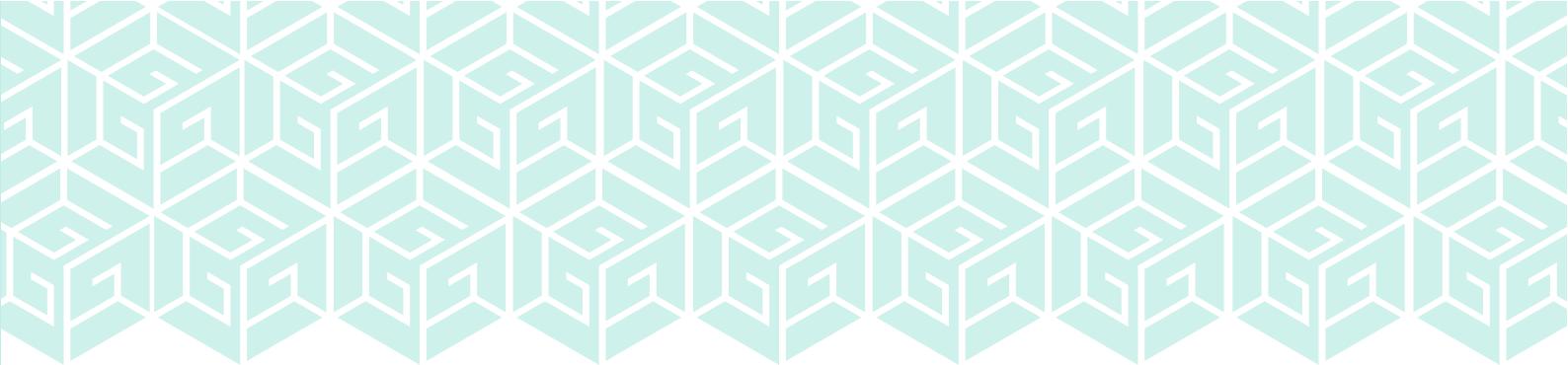
## IMPROVING MUNICIPAL SOLID WASTE AND HAZARDOUS WASTE MANAGEMENT IN RWANDA

### TRAINING REPORT

Nairobi, Kenya - March 2022







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# EXECUTIVE SUMMARY

The Government of Rwanda's vision is to transform the country into a knowledge-based economy, to reach upper middle-income status by 2035 and to become a high-income country by 2050. To align with such aspirations, there is an urgent need to move to more sustainable Solid Waste Management (SWM) which requires new management systems, improved green and cleaner technologies and waste climate resilient management facilities.

Rwanda has prioritised the waste management sector for both medium and long-term National Development Agenda due to its vital role it plays in preventive health care and quality of life. Its core vision for waste management is the use of waste as resources with increased value extraction, recycling, recovery, and reuse, while minimising waste both at the source and dumpsites. Hence, the Ministry of Environment is leading a Waste to Resources Project: Improving Municipal Solid Waste and Hazardous Waste Management in Rwanda and it is funded by the Grand Duchy of Luxembourg. The project is implemented in collaboration with Global Green Growth Institute (GGGI)<sup>1</sup> as an executing entity.

The project will be implemented over a course of three years from June 2021 up to July 2024. It has three outcomes namely 1) Separation and valorization of organic and plastic waste to minimise waste disposed at Nduba dumpsite in Kigali, 2) Improve collection rate and management of e-waste in Kigali and secondary cities and, 3) Improve policy and regulatory environment and enhanced capacity through skills development and knowledge exchange.

To achieve the project goals, GGGI in collaboration with Sanergy<sup>2</sup>, environmental organisation based in Kenya, organised a waste to resources training for key Government of Rwanda technical staff and stakeholders from various government institutions to learn the best practices and challenges for sustainable waste management and waste valorization which can be applied in the Rwandan context as part of the work streams of the waste to resources project.

The training aimed at strengthening knowledge and skills of the Government counterparts for sustainable waste management across the value chain. The training was conducted from 7 March to 11 March 2021 in Kenya. During the training, stakeholders had the opportunity to interact with Kenyan counterparts – both public and private to discuss and share solutions for waste management challenges.

The Rwandan delegation had the opportunity to visit various ongoing initiatives for municipal solid waste management in Kenya including organic waste valorization using Black Soldier Fly, Biogas systems and plastic waste treatment among the others and had quite good bilateral meeting with Kenya counterparts to mention Ministry of Environment, Ministry of Industrialization, Trade and Enterprise Development, National Environment Management Authority. Private sector included Kenya Association of Manufacturers (KAM) and Kenya Private Sector Alliance (KEPSA), Flexi Biogas, and Mr. Green Africa.

The waste to resources training in Kenya was successful and the delegation learned a lot that can be taken up in the Rwandan context. The findings show that there are enabling environments in Kenya that the Government of Rwanda can may develop to ensure sustainability of the sector including Green Incentive Policy, and the Extended Producer Responsibility. Private Sector is the one driving and advocating for changes for the resource efficiency and waste management sector.

Rwanda should also embrace the waste treatment technologies especially those dealing with organic waste since it is the main content (70%) of generated waste. To mention among the others cost effective technologies to target include industrial scale of using Black Soldier Fly to decompose organic materials and biofuel production technologies.

1. GGGI is a treaty based inter-governmental international organisation, dedicated to support, and promote strong, inclusive sustainable economic growth into developing countries and emerging economies. <https://gghi.org/>

2. Sanergy builds healthy, prosperous communities by providing sustainable non-sewered sanitation solutions in Africa's urban informal settlements - <https://www.sanergy.com/>

# CHAPTER ONE

## INTRODUCTION

Rwanda is facing significant challenges in relation with municipal solid waste (MSW) management across the value chain due to its rapid urbanisation and population growth especially in the City of Kigali. With rapid economic growth, Rwanda's waste generation per capita is expected to grow as the country aims to become a middle-income status by 2035 and high-income country by 2050.

However, the country is not fully equipped with necessary facilities and infrastructures to cope with generated quantities and composition of waste streams in a sustainable manner, thereby causing nation-wide environmental and health-related issues. The waste management sector is also challenged by both limited financial capacity and limited professionals capacities for waste management.

Moreover, the Government of Rwanda has prioritised the sanitation - waste management sector for both medium- and long-term National Development Agenda due to its vital role it plays in preventive health care and quality of life. Therefore, different initiatives are ongoing countrywide ensuring protection of the environment and public health. In 2019, the Ministry of Environment of Rwanda and the Ministry of the Environment, Climate and Sustainable Development of the Government of the Grand Dutch of Luxembourg signed the Memorandum of Understanding (MOU) to reinforce the cooperation and financial assistance for establishing a sustainable value chain of waste management in Rwanda while contributing to GHG emission reduction.

By virtue of this MOU, the Grand Dutch of Luxembourg financed the Waste to Resources Project: Improving Municipal Solid Waste and Hazardous Waste Management in Rwanda to reduce Greenhouse Gas (GHG) emissions and integrate circular economy approaches into current waste management in both City of Kigali and Secondary Cities. The project is led by the Ministry of Environment and implemented by Global Green Growth Institute (GGGI).

The Rwandan delegation had the opportunity to visit various ongoing initiatives for municipal solid waste management in Kenya including organic waste valorization using Black Soldier Fly, Biogas systems and plastic waste treatment among the others and had quite good bilateral meeting with Kenya public and private sector counterparts to mention Ministry of Environment, Ministry of Industrialization, Trade and Enterprise Development, National Environment Management Authority. Private sector included Kenya Association of Manufacturers (KAM) and Kenya Private Sector Alliance (KEPSA).

The project will be implemented over three years from June 2021 up to July 2024. It has three outcomes namely

1. Separation and valorization of organic and plastic waste to minimise waste disposed at Nduba dumpsite in Kigali,
2. Improving collection rate and management of e-waste in Kigali and secondary cities,
3. Improving policy and regulatory environment and enhanced capacity through skills development and knowledge exchange.

To achieve the project goal, GGGI in collaboration with Sanergy, environmental organisation based in Kenya, organised a waste to resources training for key government of Rwanda technical staff and stakeholders from various government institutions to learn the best practices and challenges related to sustainable waste management and waste valorization which can be applied in Rwandan Context as part of the closed loop work streams of the waste to resources project.

Sanergy runs the largest waste recycling and treatment facility in East Africa, specialised in treating organic wastes at the municipal scale to create valuable agricultural products including organic fertilisers, animal feed for livestock and briquettes. Kenya is also quite advanced in terms of enabling environment, private sector participation in waste management and treatment part of waste management.

Thus, it was highly recommended to organise a training on waste recycling and treatment. The training occurred from 7th March to 11th March 2022. The main objectives of the training were to:

1. Facilitate knowledge sharing through a series of presentations, site visits and stakeholders' engagement during the training.
2. Obtain valuable insights and lessons in relation to observing sustainable waste management paradigm
3. Strengthen the network with the waste management authorities and the private sector in Kenya
4. Assess the feasibility of duplicating similar waste management mechanisms in the Rwandan context.

## CHAPTER TWO

# WASTE TO RESOURCES TRAINING PROCEEDING

### DAY ONE

On the first day the delegation had a chance to meet with Sanergy for quick introductions and bilateral meetings with the Ministry of Industrialization, Trade and Enterprise Development, Ministry of Environment, and Kenya National Environmental Management Authority.

#### 1.1. Meet and Greet with Sanergy

During the meet and greet, Sanergy team presented their work on municipal solid waste and faecal sludge management. Municipal solid waste management is a profit side while human excreta (faecal sludge) management is community development not-profit part of the organisation.

Sanergy was founded back in 2011 by two colleagues at Massachusetts Institute of Technology (MIT) who were tasked to develop a solution to a poverty challenge facing 1 billion people or more around the world. Harnessing their experiences working in the developing world and in growing cities, they developed a full value chain approach to address the sanitation crisis, offering a sustainable solution for urban slums.

The Sanergy accessed seed funds from Bill and Melinda Gate Foundation (BMGF) to implement the project in Nairobi, Kenya. The project started with faecal sludge management in slums as a non-profit and over the course of years Sanergy expanded their activities into municipal solid waste management and are now running the state of art valorization of organic waste centre.

The solid waste management plant has the capacity to treat between 300 to 500 tons of organic waste per day. Currently, it is treating 200 tons of organic waste per day using Black Soldier Fly (BSF<sup>3</sup>) technology.

The organic waste is collected at the hotels, Nairobi County offices, markets, fresh life toilets and transported to the transfer stations for a second sorting and segregation before being taken to the treatment facility to be processed.



Figure 1: GMO staff taking notes

Please, refer to day four for more details for the processing of organic waste using Black soldier fly. Sanergy is involved across the value chain from waste collection, transport, treatment, and disposal.

With BSF technology, Sanergy can produce organic fertilisers, briquettes, and animal feed. The organic fertilisers are sold at 20 USD/50 kg, 36 USD/30 kg of animal feed while briquettes are burnt to produce heat that regulates the plant temperature for larvae.

Sanergy has quite a good relationship with the Government and private sector, it is working with the Ministry of Environment to support circular economy approaches in the waste sector. With the private sector, Sanergy is a member of Kenya Association of Manufacturers (KAM), and Kenya Private Sector Alliance (KEPSA).

#### 1.2. Bilateral meeting with Ministry of Industrialization, Trade, and Enterprise Development

The meeting was chaired by the Head of External Trade at the Ministry of Industrialization, Trade and Enterprise Development who started the meeting by thanking the Government of Rwanda for having thought of Kenya to learn the best practices for waste management that can be replicated in the Rwandan context.

<sup>3</sup>. Black Soldier Fly is a species originating from South America. Nowadays it is cosmopolitan, present across temperate climates in the Americas, Europe, Africa, and Asia. They can eat almost any organic waste, making them perfect for dealing with discarded food or agricultural wastes.

The Head of External Trade started by sharing key challenges and considerations while tackling waste management issues.

The highlighted key consideration to check is the city characteristics by disaggregating into High-, middle-, and lower-income households, industries, Markets and Commercial zones, institutions, and Hospitals. Such categorization can help to identify the main waste producers and draw solutions accordingly.

The shared challenges include the urbanisation rate, depleted infrastructure (transportation and road issues), lack of designated transfer stations, issues of structures for waste management (turnover issues), lack of community participation (around waste sorting), lack of ownership at all levels, low level of investment across the sector, poor system of waste management (especially for special waste), low level of recycling, delays in repairs (operation and maintenance issues), delays in procurement process for waste management , lack of PPP models, and there is an enormous use of plastics with no alternatives.

The challenges and barriers are significant, but so are the opportunities. The shared opportunities include implementation of the transfer stations, business recovery centres, construction and operation of incinerators, waste to energy, composting facilities, animal mills factories and scrap metal factories.

These opportunities are emerging to all developing countries where waste management has been lagging compared to other sectors. For instance, in Rwanda especially City of Kigali where urbanisation rate is increasing and in near future may turn into metropolitan combining outskirts peri-urban areas, transfer stations must be prioritised into different corners of the city to ensure maximum waste diversions to avoid pressure to the disposal. At these stations, it is where different waste valorization activities take place.

To intervene in waste management, the Government should prioritise waste streams given their level of pollution and quantities. The most waste streams that are problematic in developing countries include organic waste, plastic waste (PET), paper, glasses, and rubber.

These interventions may be done through selection of recycling investment, feasibility studies, Project development and planning, and of course monitoring and evaluation for ongoing activities. The mandate of the Kenya Ministry of Industrialization, Trade and Enterprise Development for waste management includes identification of the best practices for promotion and acquaint external investor to come do business in Kenya. The Ministry helps to advocate for tax exemption of waste equipment and technology, and reduces prices for industrial electricity used waste treatment.



### **1.3. Bilateral meeting with the Ministry of Environment and Forestry and, National Environment Management Authority**

The meeting with Ministry of Environment and Forestry<sup>4</sup> was supposed to be conducted separately but due to conflicting agenda on the side of the ministry officials, it was combined with a meeting with Kenya National Environmental Management Authority (NEMA).

The meeting was chaired by the Director General of NEMA who provided opening remarks with emphasis on the country's movement from linear to circular economic development starting from adoption of National Waste Management Policy with shared responsibilities between government and citizens.

He recalled that Kenya, especially the capital city of Nairobi, can learn from Kigali's journey toward being a clean city. Devolution of environmental management mandate to counties and establishment of county environmental management committees is part of the transformational approach to waste and environmental management.

The ministry is committed to facilitating the enabling policies, legal and regulatory reforms for promoting sustainability of the environment and forest resources, while at the same time, mitigating the effects of climate change. The first National Waste Management Policy was adopted during the United Nations Environment Assembly (UNEA) meeting. This policy will be followed by undertaking a Sustainable Waste Management bill and now has been submitted to parliament for review and passing.



Figure 3: Representative from Ministry of Environment delivering key notes on the mandate of the Ministry of Environment

In his short presentation, the representative of the Ministry of Environment recalled that the devolved waste management responsibilities are for households' level waste while other wastes including hazardous waste management remains in the national government responsibilities. He added that the move from linear to circular economy means there is a need for fund mobilisation to support the national treasury.

NEMA is a principal instrument of Government for the implementation of all policies relating to the environment. It was established under the Environment Management and Coordination Act (EMCA) to exercise general supervision and coordination over all matters relating to the environment. It is further mandated to be the principal instruments of Government in the implementation of all policies relating to the environment. NEMA services include registration of Environment Impact Assessment (EIA) experts, issuance of Environment Impact Assessment Licenser, Issuance of certificate of variations, transfers, and surrender, review of Environmental Audit reports submitted to NEMA, issuance of approval with conditions to the Policies Plans Program (PPP) Owner, issuance of licence to transport waste, Issuance of licence to recycle, compost waste and waste transfer stations, and issuance of license for incinerators, landfills, and controlled dumpsite/ tipping sites.

NEMA is represented in all 47 counties across the country and is championing the inception of the Extended Producer Responsibility (EPR) and Circular Economy Approaches into waste management. It runs continuous awareness programs through communication (using live talk shows, media, and public meetings), dissemination of the new laws for a specific time (mostly 6 months) before starting enforcement and, curriculum development with contents examinable at primary and secondary schools.



Figure 4: DG of NEMA opening the bilateral meeting

4. The Ministry of Environment and Forestry was created in 2018 by the organisation of the Government of Kenya. It is mandated to undertake National Environment Policy and Management, Forestry development Policy and Management, Development of re-afforestation and agroforestry, restauration of strategic water towers, protection and conservation of Natural Environment, Pollution Control, Lake Victoria management program, Kenya meteorological department and training, conservation and protection of wetlands and climate change affairs. <http://www.environment.go.ke/>

## DAY TWO

The delegation started this day with a field visit to Mukuru Kwa Njenga where Sanergy is operating both a transfer station for municipal solid waste and a pit for faecal sludge management (FSM). After the field visit, the team attended a bilateral meeting with Kenya Association of Manufacturers (KAM), and Kenya Private Sector Alliance (KEPSA). Sanergy transfer station and pit for Faecal Sludge Management (FSM)

Sanergy secured a land for transfer station to handle sorting and separation of municipal solid waste in Mukuru kwa Njenga. The separated organic waste is cut into small pieces and put in drums and transported to Kinanie for further processing to the organic waste valorization centre using Black Soldier Fly. Other non-biodegradable Materials particularly plastics, are sorted and sold to local plastic recycling companies.

Still in Mukuru kwa Njenga, behind the transfer station, there is a common pit with capacity to hold 20,000 Litres of faecal sludge (human waste) from slums. In Kenya slums, most of the people rely on the pit latrines and when these pit latrines fill up, digging a new pit is not an option, space is a luxury in the densely populated slums.

Users are usually faced with the difficult task of having their pit emptied. Sanergy has constructed a pit where the emptied faecal sludge is poured and pre-treated using separation methods. Sludge is retained as suspended materials which are removed from inlets, dried to minimise volume, incinerated, and buried to disposal site.



Figure 5: Pit Emptier loading fecal sludge

The liquid waste undergoes certain retention time to comply with pre-treatment parameters before being discharged to the public sewer. This assistance to the slum dwellers operates under the non-profit wing of Sanergy.

Sanergy has as well introduced public container-based sanitation systems called Fresh Life toilets. These systems separate urine and faecal matter. These are public toilets installed across public areas serving those households or individuals living without pit latrine. The toilets are run by local business people who charge 10 Kenya Shilling per use and at the end of the month pay Sanergy 800 Kenya shilling per one Fresh Life toilet. This amount is paid to pits emptier as a salary.

The Fresh Life toilet separates liquid waste to solid waste. The liquid is directed into the public sewer while the solid is transported to Kinanie waste treatment plant to feed BSF larvae mixed with other organic waste especially market wastes. This is part of the for-profit wing of Sanergy.

### 2.1. Bilateral meeting with Kenya Association of Manufacturers

The meeting was headed by the Deputy Head Policy, Research and Advocacy who welcomed everyone to the Kenya Association of Manufacturers (KAM). The Association was established in 1959 as a representative of manufacturing and value add industries in Kenya. It has grown into a dynamic, vibrant, credible Association that unites industrialists and offers a common voice for business.

KAM has been driving fact-based policy advocacy towards the formation of industrial policies to strengthen and support the country's economic development. Through fact-based advocacy, KAM partners with the Government and its associated agencies to ensure a dynamic and flourishing manufacturing sector in Kenya, to realise a double-digit contribution to GDP.



Figure 6: Group photo with KAM management

After the Ban of Single Use Plastics in 2017, plastic manufacturers were not happy since no alternatives were available. KAM stood on behalf of the manufacturers and worked with various public institutions to find solutions for the single use plastics. KAM signed a loose MoU with National Environment Management Authority, National Treasurer and Kenya Bureau of Standards to introduce a standard for plastic that can be reused, more than once, and a levy for plastic waste management.

In 2019, KAM launched the Kenya Plastic Action Plan which integrated the circular economy into plastic waste management. This has led the Ministry of Environment to revise the existing policy to integrate circular economy approaches and came up with the National Waste Management Policy. This policy was launched during the UNEA-5 meeting conducted in March 2022.

The national sustainable waste management bill is under revision by the Parliament. NEMA is also leading the development of the Extended Producer Responsibility (EPR) which is under parliament for revision. EPR proposed non-profit Producer Responsibility Organizations (PRO) that will be co-run by the Government Agency. The PRO are established to support the Waste collection and recyclers association whose main role is to ensure that each used product is returned into the production system, recycled, or sustainably disposed of.

The EPR proposed 5 PROs including Plastic Producer Responsibility Organization, Hazardous Producer Responsibility Organization, E-waste Producer Responsibility Organization, Automobile Producer Responsibility Organization and Textile Producer Responsibility Organization. KAM has been quite instrumental for the development of these enabling policies. These are good examples of the PROs that can be reflected/referred to ongoing initiatives for Extended Producer Responsibility led by Rwanda Environment Management Authority (REMA) and Feasibility study for plastic waste and Circular Economy Action Plan under the Rwanda Ministry of Environment. KAM has been part of the different other initiatives including advocating for waste recyclers, skills development across the value chain.

It worked with the National Industrial Training Authority (NITA) to develop a curriculum for proper waste management for TVET institutions. KAM is also working with the Kenya Ministry of Environment and Kenya Ministry of Finance to develop the Green Incentive Policy for all green initiatives. It is also working with different counties to create recycling hubs where capacity of all respective recyclers can be strengthened, research and development, and circular economy are mainstreamed.

Rwanda Association of Manufacturers (RAM) under Private Sector Federation, should learn from the experience of KAM and start coordinating the manufacturers as well as responsible institutions to enhance business opportunities.

## 2.2 Bilateral meeting with Kenya Private Sector Alliance

Kenya Private Sector Alliance (KEPSA) is the apex body of the private sector in Kenya. It brings together local and foreign business associations, chambers of commerce, professional bodies, corporates, multinational companies, start-ups, micro, small and medium enterprises (MSMEs) from all sectors of the economy in the country, representing over 1 million businesses under one umbrella, to enable them to speak in one voice when engaging the Government, development partners and other stakeholders on cross-cutting policy issues affecting private sector development.

KEPSA supports businesses with opportunities for training, networking, financial linkages, mentorships & coaching, access to markets, value chains and investment opportunities while working closely with many partners from across the world.

The bilateral meeting was chaired by the Program Manager of the Sustainable Inclusive Business. Sustainable Inclusive Business (SIB) Kenya was established under the KEPSA foundation through a fruitful partnership between MVO

Nederland and KEPSA and is supported by the Embassy of the Kingdom of the Netherlands. SIB Africa supports businesses to become Sustainable and Inclusive and helps them improve their practice by encouraging them to take responsibility for their full business impact. It also promotes, supports, and pushes to make businesses thrive and make the world a better place. It also believes that every business can contribute to a sustainable economy that has a positive impact on people, planet and profit.



*Figure 7: Delegation following the presentation on the role of Private Sector in sustainable waste management*

SIB Kenya raises awareness, shares knowledge, bring networks together and facilitates processes of change through knowledge sharing, business scan, training, research and market advice for business with sustainable inclusive business DNS, Conference, match making and business linkages, fruitful partnerships, business development missions/tours, workshops and roundtable discussions, project and program initiation, implementation, facilitation and management, events on hot SIB business topics and sectors and engagement on mainstream and social media.

The selected initiatives supported under the SIB Kenya include COAST (Creating Opportunities and Alleviating Poverty through Sustainable Trade), PRO (Extended Producer Responsibility Organization and KPP (Kenya Plastic Pact). KEPSA has played critical roles in business, economic and political reforms. Some of the KEPSA's role in business reforms i.e., Public-Private Dialogues for business reforms (policy, legislative and institutional reforms) include Presidential Round Tables (PRTs); Ministerial Stakeholder Forums (MSFs); Speaker's Round Table: both Senate and National Assembly; Council of Governors Round Table; Chief Justice Forum; and Attorney General's forum.

## DAY THREE

Day three was spent on the process of biogas production, and waste to energy from municipal solid waste management that is undertaken by Biogas International Limited and Seureca respectively.

### 3.1 Biogas Production from Municipal Solid Waste by Biogas International

The training for biogas production was provided by the Founder and CEO of Biogas International Limited or BIL. It is a limited liability Company founded in Kenya in 2011 and operates in Nairobi. BIL designs simple appropriate technology tools to alleviate daily challenges on the typical rural farm. BIL has over 15 years of experience in research and development, and its products have gone through rigorous development stages to guarantee sustainability.

BIL has various biogas solutions that are clean, green, and most affordable and sustainable, portable, and simple to operate. Their biogas products include large capacity systems (these are best applicable for schools, hotels, churches, children's homes, and any other institutions with high energy demand), flexi domestic systems (These are systems designed for lower energy demands for daily use. These systems can install in as few as 3 hours producing gas in as little as 3-5 days and run on any biodegradable material with no need for a cow), Bio-Sans Gas, (these systems provide a clean hygienic solution whilst producing biogas and a rich fertiliser bio slurry.



Figure 8: Touring the Ngong' market seeing how waste are collected

They are fabricated and assembled on site in a few minutes), bio slurry, this is a mineral rich organic fertiliser that is ready for use and works as an extremely effective pest repellent. BIL has a demonstration site where all these products are installed for education.

BIL has signed an MoU with Ngong' town to manage all waste generated to the modern Ngong' town market. These wastes are separated at source and transported to a dedicated location for further processing of producing biogas.

The process is done by first crushing organic waste into small pieces which can easily be broken down by microorganisms. Organic waste with high fibre contents, like banana peelings are kept aside and undergo composting to produce organic fertilisers. The non-organic waste collected as well sorted into value waste streams and sold to local recyclers. The remaining unwanted materials are incinerated. The bottom ash is mixed with crushed glass bottles to produce construction blocks.

The BIL CEO was free to highlight the best practices for effective and efficient production of biogas by using minimum amount feedstock. He explained that their models are built based on the livestock that produce significant amounts of methane as part of their normal digestive processes. However, one of the biggest challenges that BIL faces is compressing the produced biogas and package for distribution downstream to different users. However, the cylinders are quite heavy, and the cost of compressing would be higher. Hence, the cost for gas produced using this technique is high compared to the Liquified Petroleum Gas (LPG).



Figure 9: CEO of Biogas International explaining the process of biogas production

### 3.2 Presentation for Waste to Energy Project, Drainage and Municipal Solid Waste Management in Lusaka, Zambia.



Figure 10: The delegation attending the waste to energy presentation

This was also important for the team to understand other treatment technologies for sustainable waste management, thus a waste to energy solution was presented. Seureca was contracted by Kenya Electricity Generation Company (Ken Gen) to undertake a feasibility study for a waste to Energy plant in Nairobi City County.

The assignment was to perform waste quantities and characterization, Environmental Social Impact Assessment (ESIA), do site selection, design development, revise legal and regulation instruments, and financial and economic analysis. The proposed plant, modular systems, is to be developed under PPP concession for 20 years.

It will be able to produce 45 Megawatts and will incorporate two landfills for fly ash, leachate

treatment plant, water treatment plant and admin block. It will be able to electrify 11,000 Households. This technology selection was based on different criteria including existence (not new technology), Capex, OpEx, Capacity and social aspects. This project will be implemented in a PPP framework.

After this presentation, an experience on work done in Lusaka, Zambia was as well shared. It was found out that the waste management sector in Lusaka was lagging compared to other sectors. Seureca, under millennium funding, were tasked to develop a framework for regulation (tariff setting, etc), Data collection, Incorporation of Lusaka operation company, perform affordability studies for SWM, detailed engineering design for disposal site, assess quality of leachate.



## DAY FOUR

This was the last day for the training where the delegation had the opportunity to visit Sanergy's state-of-the-art valorization of organic centre and Mr. Green Africa company that is selling pre-processed recycling materials.

### 4.1. Sanergy Organic Waste Valorization Centre in Kinanie

As highlighted during the meet and greet, Sanergy collects human waste from sanitary toilets located in slum areas and other organic waste around the city, and transforms the waste into insect feed, organic fertiliser, and biofuel in its factory, using the Black Soldier Flies (BSF).

The plant has a capacity of treating waste at 200 tons/day. The direct cost for installation of such a plant was estimated to be 10M USD and on yearly basis can use between 3-4M USD of operation. 1 kg BSF is added to 1 ton/day if you extrapolate you need around 200 kg of BSF to transform 200 tons/day. Only 35% is turned into fertilisers, briquette, and animal fees at 15%, 15% and 5% respectively.

*Figure 11: The delegation posing in front of the Sanergy's organic waste valorization plant*

The remaining is wastewater challenged in facultative ponds for treatment. Bagasse is added to enhance the quality of fertilisers which are mixed using windrow systems and keep turning until the end of 6 months when fertilisers are ready. To produce briquettes, to increase their calorific value sawdust or coffee nuts and avocado are mixed with decomposed materials under BSF. These briquettes are used internally to regulate and maintain the working condition of BSF at a temperature between 25-30oC. This organic waste treatment plant is run using a solar system during the day and at night it is connected to the grid.

The problems of waste management and farming productivity are not limited to Kenya but are also present in many African countries, and Sanergy is preparing to expand its business to other countries starting in East Africa. The mandated institutions should investigate such technology since it does incur any cost from public institution rather it requests only partnership up to ten years to operate.

## 4.2. Visit to Mr. Green Africa

Mr. Green Africa is a tech-enabled plastics recycling company disrupting the current informal and exploitative plastic recycling sector in Kenya. Mr. Green offers an in-house end-to-end process for plastics waste recycling by purchasing directly from their sourcing agents or waste pickers, who are some of society's most marginalised people.

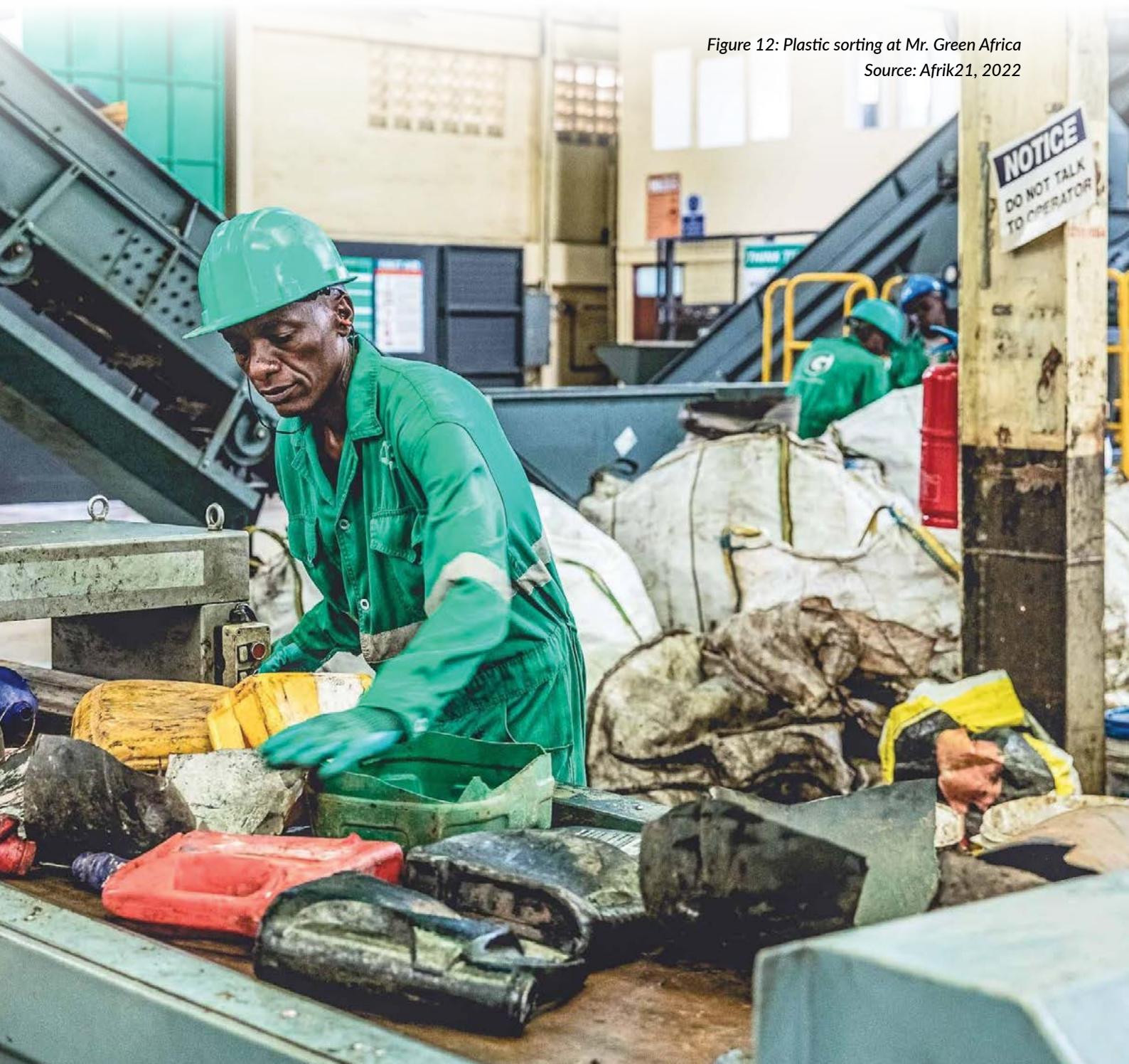
Mr. Green Africa owns and operates a series of trading hubs across Nairobi and Kisumu where they transact with their sourcing agents directly to purchase their collected plastic for onward transfer to Mr Green Africa's manufacturing plant.

The collected plastics are processed and sold as post-consumer recycled plastics to plastics manufacturers for use by large fast-moving consumer goods (FMCG) companies, such as Unilever.

The production process is done through sorting by types (7 waste streams), separated by colour (24 different waste streams), wet + drying (at 50C to remove fats) and then go through palletization for flex production. The company has about 180 staff with 29 average years and has a capacity to treat 400 tons/month. The total cost for installed machinery is around 8 million Kenya Shillings.

Figure 12: Plastic sorting at Mr. Green Africa

Source: Afrik21, 2022



# CHAPTER THREE

# KEY TAKEAWAYS AND RECOMMENDATIONS

The waste to resources training in Kenya was successful and the delegation learned a lot that can be taken up in the Rwandan context. The following are the key areas that Rwanda learned that can be possibly implemented to ensure sustainability of the waste management country wide.

## 3.1 Enabling Environment

The delegation realised that for a smooth transition of the business as usual of waste management to integrated solid waste management encouraging reuse, reduce and recycle, it is imperative that incentives and capacities of the private sector should be encouraged. The Government of Kenya is developing a Green Incentives Policy, which will give more light on the policy directives to promote the establishment of new green businesses or to encourage existing businesses to expand.

Through the private sector, Kenya is creating Recycling Hubs to build capacity of local entrepreneurs in the waste management sector. These are initiatives that Rwanda can tap into additionally to the existing well-designed medium- and long-term strategy guiding the sector to become a net zero carbon emission. This transition needs well defined roles and responsibilities among producers – private sector, users – community, and regulator – government most importantly it has to be understood and led by the private sector.

## 3.2 Private Sector Involvement in Waste Sector

The Rwandan delegation was fascinated to see how the private sector is driving and working together with the Government of Kenya. The Private Sector is leading the development of various enablers for waste management including development of Kenya Plastic Action Plan, Recycling Hubs, and Sustainable Inclusive Businesses.

The Private Sector is also heavily contributing to other ongoing policies and regulation development including the National Sustainable Waste Management, Green Incentive Policy and Extended Producer Responsibility and their related bills. The Private Sector Federation must take the lead in coordinating manufacturers and recyclers to find investments that create space for sustainable waste management by introducing different treatment technologies that turn waste into resources.

## 3.3 Waste Treatment Technologies

Most of the developing countries share similar challenges and barriers for the waste management across the value chain. In Nairobi on a daily basis around 22,000 tons of municipal solid waste are generated per day of which 60% to 70% are organic waste and 20% plastic, 10% paper and 1-2% medical. The Government of Kenya has been looking into investment to curb the waste management issues. Hence, Sanergy organic waste valorization treatment facility was introduced to contribute to the circular economy by translating the waste to resources.

These are investments that are fully private which do not need government contribution to operate. Sanergy business model requires only partnership with Government to avail conditions for the plant to operate including encouraging the sorting at source and a defined long term for the organisation to make return on the investment. Mr. Green Africa also operates in the same model for plastic waste recycling.

Rwanda is doing good for collection and transportation of waste part of the waste value chain but the treatment and disposal side of it has been a challenge. In terms of treatment, the Government should investigate the above solutions to be implemented in the country especially for organic waste which takes 70% content for generated waste.



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