PLASTIC WASTE MANAGEMENT IN RWANDA

FIELD VISIT REPORT

December 2021 - January 2022

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1. PLASTIC WASTE MANAGEMENT IN RWANDA

Rwanda is a rapidly urbanizing country experiencing major economic transformations and a major consequence of urbanization which is also linked with increasing volumes of municipal solid waste. Because of their light weights, plastics are widely used in different areas, hence more waste is found in various areas including residential, commercial (shops, offices, markets, restaurants, bars), industrial (small and agro-processing), street sweepings, and health care. This chapter will present the current status of plastic waste generation and municipal solid waste in Kigali City in general, as well as waste collection, transport, treatment, and disposal. The chapter will also introduce the enabling environment for waste management in Rwanda.

1.1. Current plastic waste management

Overall, waste generated by households and commercial entities is collected and disposed of at the Nduba landfill site without going through any segregation. Among the wastes compiled at the Nduba landfill, 70% are organic wastes, approximately 13% are non-recyclable, 5% are plastic (including plastic bottles), around 5% are cartons, 1% are metals, 1% are electronic wastes, and the rest 1% are hazardous wastes. Plastic wastes contain plates, straws, stirrers, balloons, and sticks for balloons, food containers, cups for beverages, beverage containers, packets and wrappers, wet wipes, and sanitary items.

The collected wastes are rarely segregated at the Nduba landfill without formal recycling of non-biodegradable wastes and reprocessing of biodegradable waste. The market for recyclables and reprocessed wastes is also nascent, with little wastes being reprocessed and returned to the material cycle. Waste collection is entirely privatized.

Currently, 14 waste companies deal with Municipal Solid Wastes (MSW) collection and transportation in the three districts of the City of Kigali and dump them to the Nduba landfill which is an open dumpsite managed by the City of Kigali.
Segregation of wastes at source is still a big challenge for the waste management system in the local community.

The segregation is not fully committed to practices of separating biodegradable and non-biodegradable (Rajashekar, 2019). In 2008, a system of segregating waste was introduced, but it failed. The level of recycling waste is still unpopular. According to (the Office of the Auditor General of State, 2016), the official waste recycling rate for the City of Kigali is only at 2%. Since then, the City of Kigali has noted poor solid waste management practices as a key impediment to sustainable development. There is a strong need to revolutionize the solid waste management system. In the City of Kigali, approximately 232,870 tons of municipal solid waste is generated per year.

Plastic wastes are easily littered in the environment and can lead to environmental pollution in several ways, including environmental deterioration, entanglement, and death of aquatic organisms, sewage system blockage in towns and cities especially in developing countries, reduction in water percolation, and normal agricultural soils aeration thus causing reduced productivity in such lands. Microplastics are major contaminants that can bioaccumulate in the food chain after ingestion by a wide range of freshwater and marine lives, thereby leading to a public health risk.

Human consumption of animals that were exposed to microplastics and plastic additives can be detrimental. Bio-monitoring studies on human tissues have shown that plastic constituents persist in the human population through the measurement of environmental contaminants. Plastic additives in the human body cause many diseases including estrogen mimics, ovarian disorder, thyroid hormone interference, possible neurological and reproductive damage, carcinogen, and testosterone interference, etc.

1.2. Plastic policy and regulatory frameworks

Current policy, laws, and regulations banning the use of plastic products have attempted to mitigate the negative effects of plastic pollution. The enabling environment provides policies, strategies, laws, ministerial orders, and regulations for plastic waste management.

The Government of Rwanda established the National Environmental Policy in 2003, which was reviewed in 2018, to add policies related to climate change. The new policy has actions related to waste management within the policy objective 5: Improving environmental well-being for Rwandan and the policy statement number 2: Prevent and promote integrated pollution control and waste management.

- Promote the use of economic incentives to manage waste.
- Promote the establishment of facilities and incentives for cleaner production, waste recovery, recycling, and reuse (Reduce-Recycle" 3Rs ") countrywide.
- Develop a profile of all categories of waste in Rwanda.

The current policy values waste and encourages the transformation of waste into other materials. In response to the growing number of problems concerning plastic pollution, the Government of Rwanda introduced a ban on plastic bags in 2008. The law was reviewed in 2019 and included the ban of single-use plastics. The law is related to the prohibition of manufacturing, importation, use, and sale of plastic carry bags and single-use plastic items in Rwanda 2019.

The Law No17/2019 of 10th August 2019, relating to the prohibition of manufacturing, importation, use, and sale of plastic carry bags and single-use plastic items in Rwanda was established (RoR, 2019). This law stipulates the definition of its purpose; prohibition and control; collection, recycling, and inspection. The law also defines the administrative sanctions and provides transitional and final provisions.

In some rare cases, the law regulates that the manufacturing, importation, use, or sale of home compostable plastic items or woven polypropylene is allowed, subject to prior authorization from the competent authority. And imported goods packaged in plastic material or single-use plastic items are subject to an environmental levy in accordance with relevant laws.

In this regard, the Rwanda Environment Management Authority (REMA) has elaborated guidelines on procedures and conditions of eligibility to grant exceptional permission to manufacture, use, and import or sell single-use plastic items or park goods in single-use plastics (REMA, 2019).

- According to these guidelines, the application related to the plastic material for packaging purposes is eligible if all conditions below are met: The product must be produced in Rwanda.
- The product must have no alternative to plastics as packaging material on the local or international market
- The lack of packaging material should have a direct and negative impact on the quality of the product.

The application related to single-use plastic items is acceptable for items exclusively meant for medical use; agriculture and forestry use; waste collection and sanitation use; use in the construction industry; industrial use and use in printing houses.

The Government of Rwanda designated two entities for plastic waste management: Rwanda Environment Management Authority (REMA) and National Fund for Environment in Rwanda (FONERWA). The two Institutions, among others, are governing waste management in Rwanda and draw most of their authority from the Environmental Law.

REMA established the laws and regulations on plastic items and FONERWA helps in implementing the polluter-pays principle and in collecting fines from illegal use of plastic items that are tracked in the FONERWA account.

There are other Institutions such as Rwanda Utility Regulatory Agency (RURA), which provides licenses to waste collection companies and fix fees related to waste collection. The City of Kigali also provides guidelines on managing waste at the household level and managing the landfill.

2. POLICY GAPS, CHALLENGES, AND OPPORTUNITIES FOR PLASTIC WASTE

This chapter discusses challenges and opportunities for plastic waste management practice in Rwanda. Particularly, opportunities include the summary of the site visits to plastic waste recycling companies in Rwanda to introduce the best practices from a private sector, as well as the potential project intervention area that can further facilitate the private sector engagement in terms of the plastic waste management sector.

2.1. Challenges

2.1.1. Behavioral Change at the Household Level for Waste Sorting

Waste sorting is still a challenge at household level. Most households do not sort waste due to various reasons.

- First of all, communities are not aware about sustainable waste management practices.
- Another reason, waste collection companies are not commending the households to sort waste as organic and inorganic before the collection company comes to collect the waste, meaning that the final destination which is the dumpsite receives all mixed waste without segregation.
- Currently in Rwanda, collection companies collect both organic and inorganic waste on the same day, they collect waste on different dates, one day for organic waste and another day for inorganic waste.
- There is a need to increase awareness on Sustainable waste management and introduce circular economy approaches in the waste value chain, to recycle waste and minimize waste going to the dumpsite.

2.1.2. Acquiring Accurate Data for Waste Generation and Treatment

Although there are a number of studies or assessment reports on waste management strategy at the municipal or sub-national level in Rwanda, no precise data on waste composition could be located.

The waste composition statistics currently available in Kigali or Rwanda are projections based on what is typically found in a low-income nation (Kabera, 2019:3). This lack of data seriously limits the potential for project interventions because it hinders comprehensive planning in the initial stage, whereby baseline data and future performance cannot be thoroughly identified. Furthermore, without accurate data in the system, waste management authorities are not able to enhance transparency in waste management.

This is because the proper collection of either data or information with regard to monitoring the waste amounts and types can provide relevant authorities with greater access and control over how much each individual or private entity is responsible for waste generation, thereby establishing an impartial levy system. This sort of levy system is quintessential for securing financial resources for managing wastes and inducing people's voluntary participation, as well as reducing the waste generation at source.

2.1.3. Financing for Waste Management

While financing for business-as-usual waste management practices has typically required funding from municipalities as well as revenue determined by the fee structure for waste collection services, the circular economy model enables the extraction of resources to increase the profitability and sustainability of the sector. Financing where willingness-to-pay is low is also a challenge that requires additional processing and resource extraction (e.g., urban mining for e-waste) to increase the sustainability of waste collection services.

2.2. Opportunities

2.2.1. Practice of Private Sector in Plastic Recycling Companies (Case Study)

The GGGI Rwanda Team conducted site visits to the wastes recycling companies in Kigali and Huye district in order to understand the current practice and identify management gaps. The site visits also aimed to identify potential areas for green investment mobilization in the waste sector and raise awareness on circular economy approaches to private companies working in the waste sector.

Moreover, building networks with those engaged in the waste recycling sector is one of the primary purposes of this site visit. The project team visited three plastic wastes recycling companies in Kigali on December 9th, 2021, and two facilities in the Huye district between January 26th – 27th, 2022. The field visit was guided by the site engineers or factory managers of each company, with a detailed explanation with regard to the overall recycling procedure and the manufacturing of final products. Followings are summaries of the site visits and attendees are elaborated in [Table 1].

Table 1. Site Visit Attendees from GGGI

Michelle Defreese	Senior Officer, Green Growth
Juvenal Mukurarinda	Senior Officer, Sustainable Waste Management
Ange Irutingabo	Intern, Sustainable Waste Management
Grace Ingabire	Intern, Sustainable Waste Management
Sunghwan Park	Korea-Africa Foundation (KAF) Young Professional

Table 2. Visited sites

Site	Location	Contact	Date
1. Mageragere Incinerator	Nyarugenge District	Pascal Gatete	09/12/2021
2. EcoPlastic (Plastic waste recycling)	Nyarugenge District	Pascal Gatete	09/12/2021
3. Jardin Meuble	Kicukiro District	Wenceslas Habamungu	09/01/2021
4. Agroplast	Kicukiro District	Ndulu	09/01/2021
5. Ba Heza General Services	Kicukiro District	Therese Uwimana	19/01/2022
6. Electromax	Huye District		26-27/01/2022
7. Waste collection company	Huye District		26-27/01/2022
8. E-waste collection center	Huye District		26-27/01/2022
9. GreenCare Rwanda (organic waste composting)	Huye District	Noel Nizeyimana	26-27/01/2022

1. Mageragere Incinerator

Figure 1. Mageragere Incinerator

Mageragere Incinerator was originally built as a government-owned bio-medical incinerator and was in the end privatized to a private company. It is now owned by Depot Kalisimbi, a company specialized in disposing of bio-medical wastes. The company is also venturing into the recycling of plastic wastes collected by themselves from the Nduba dumping site. The company had produced hexagonal roadblocks and pavers from plastic wastes mixed proportionally with sand. The production process starts with heating the plastic wastes at more than 400 °C in order to liquefy them. The liquid plastic wastes are then mixed with sand to be pressured into a hexagonal shape and go through a cooling process to be used in the road construction or pavement.

Figure 2. Hexagonal Paver

Figure 3. Road made with recycled plastic wastes

If the plastic wastes are bulky, e.g., computer, fridge, etc., the pulverization process is added before entering the heating procedure. The more the sand is mixed, the rougher the product's surface becomes. The site engineer also showed the ongoing activities to construct a state-of-the-art industry for plastic waste and it was reported that the factory will be operational early next year. However, the attendees were not able to witness the block-making process and the guide didn't know how much it costs to produce one.

2. ECO Plastic

Created in 2011, ECO Plastic is one of Rwanda's leading companies in plastic recycling and the production of new plastic products. The company receives used plastic from a number of suppliers, including waste collection companies, individuals, airports, and hospitals. After sorting out, cleaning, and drying the used plastics, the plastic wastes go through a recycling process and become raw materials, with which new plastic products are produced for numerous purposes, e.g., tubing for agriculture, roofing plastic for construction, plastic bags, rubbish bags, etc.

Approximately ten tons of plastic waste are coming in each month and most of the plastic wastes are from commercial areas, hospitals, and beverage companies such as Blarirwa. The recycling process starts with classifying the plastic wastes, followed by the cleaning process as presented in [Figure 5].

Figure 4. ECO Plastic

Figure 5. The cleaning process for the classified plastic wastes

The water they use for cleaning is usually provided by WASAC, which results in a huge amount of water fee. The wastewater is released into nature without undergoing any treatment procedure. The cleaned plastic wastes are sun-dried and then pulverized into tiny bits as in [Figure 6] and [Figure 7]. These tiny bits go through a heating process and are made into noodle-like strings. These strings are cooled in water as in [Figure 8] and then pulverized into tiny bits again. These bits are the raw materials [Figure 9] for producing a plastic product.

Figure 6. Drying the plastic wastes

Figure 7. Pulverized plastic wastes

The raw materials go through the shaping process by exerting heat, which makes them elastic like a rubber band as suggested in [Figure 10]. Certain color additives are added in the process depending on the usage of the final product.

For the quality of the final product, imported raw materials are used along with the raw material made from recycled plastics when manufacturing the final products.

Figure 8. Plastic strings made from pulverized plastic bits

Figure 9. The raw material is made by pulverizing the plastic strings

Figure 11. Final products

Figure 10. Shaping

Collection → Classification → Cleaning → Drying → Pulverizing ①

↓

Making plastic strings out of pulverized bits ← Pulverizing ② (raw material) ← Shaping ← Final products

Figure 12. Recycling Process of ECO Plastic

3. Agroplast

Agroplast also receives plastic wastes from diverse sources, including the Nduba landfill site. The process is almost similar to other recycling factories, i.e., collection, classification, cleaning, sun-drying, pulverizing, and heating to make the final product. As its name implies, Agroplast is a plastic waste recycling company specialized in producing plastics for agricultural use. When it comes to the circular economy aspect, the company promotes the continuous recycling process, whereby recycled plastic items can go through a series of recycling processes once they are used and brought back to the company.

The workers in the factory are trained by the USAID program and what's noteworthy about the recycling process is that the company uses rainwater as much as possible when cleaning the plastic wastes in order to prevent excessive water consumption and utility fee [Figure 12]. Although the company uses water from WASAC, it is only during the dry season when there is not enough rain. The contaminated water from the cleaning process goes through a special treatment procedure to be reused again for the cleaning process later.

Figure 13. Cleaning stand with waste filtration facility

Figure 14. Shaping Collection

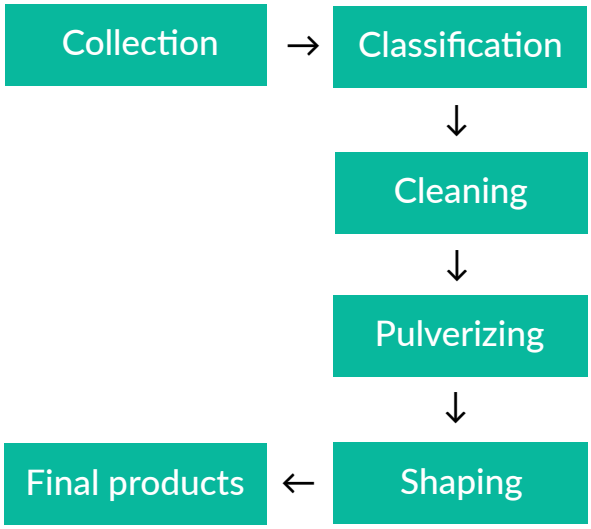

Figure 15. The recycling process of Agroplast

The company also has a very ambitious plan for producing a building block using plastic wastes, as is presented in [Figure 16]. This can be used for decorating a shower room or kitchen area, where there is a lot of usage of water.

However, the company appealed for additional help in terms of technology transfer and financial assistance to be able to mass-produce the products for market purposes.

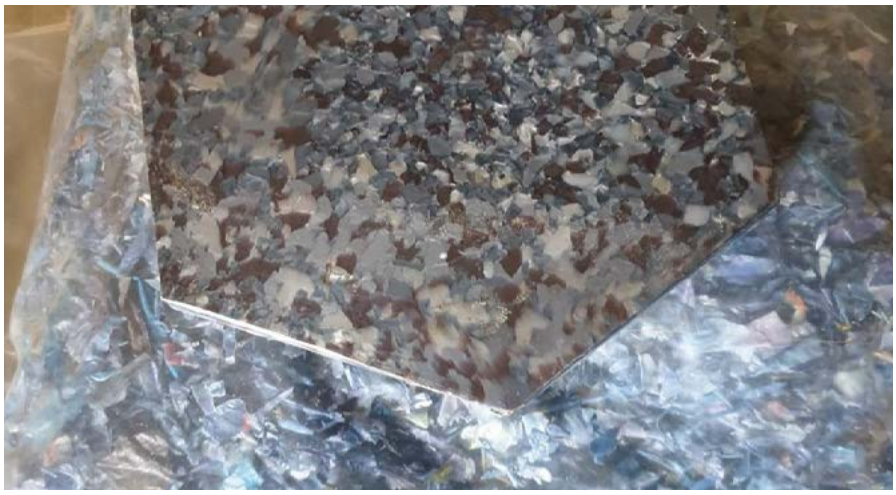

Figure 16. Sample of a building block made from plastic wastes

4. Greencare Rwanda

Greencare Rwanda Ltd., located in Huye District, is a company specialized in waste management services (e.g., waste collection and valorization, etc.) and organic fertilizers production. It was co-founded by young entrepreneurs as of 2015 and officially registered in 2016 by Rwanda Development Board.

The company collects all sorts of wastes from each household and industrial facility in Huye District, as well as nearby neighborhoods, but the most prevalent type of waste is organic waste, which accounts for more than 65% of what they collect.

2.2.2. Site visit observation

Most of the companies visited this time are equipped with proper capacity & machinery and network with the waste-collecting entities.

However, there are a few points that need to be reinforced or complemented to establish a fully sustainable waste management practice.

1. **Lack of Integrated Value Chain in Collection and Delivery of Plastic Wastes**

The majority of the companies purchase plastic wastes from various sources, such as individuals, local cooperatives, and private collection companies, etc. Therefore, the quality of the plastic wastes (the degree to which how dirty the wastes are) varies too much, increasing the operational burden of wastes classification and cleaning. This is because the separation process is currently absent in the Nduba landfill site, which is the most common and biggest source of plastic wastes in Kigali, thereby creating a complex and decentralized collection & delivery network. The dirtier the plastic wastes, the more expensive the cleaning becomes to make them appropriate for recycling. Therefore, the companies should always receive clean wastes without significant irregularities in terms of quality to reduce the production cost. This will eventually affect the marketability of recycled products against normally produced plastics.

2. **Occupational Health and Safety Issues and, Pollution at Factory Areas**

Some workers were not wearing a mask or glove when dealing with the plastic wastes. This is highly dangerous for the health of workers. Therefore, periodical training about personal safety and health measures should be put in place. Furthermore, Eco Plastics is not implementing any treatment process when releasing the wastewater used for cleaning the plastic wastes.

This poses serious environmental risks around the natural landscape, as well as undermines the sustainability of the plastic recycling process itself. Additionally, the water used for cleaning requires a huge amount to fully operate the facility, increasing the overall cost of the recycling process. Thus, coming up with ideas concerning sustainable and efficient water use (e.g., reusing treated wastewater) for the cleaning process is highly recommended.

3. **Lack of consideration for Greenhouse Gas (GHG) emission and air pollution**

It is also important to take into account GHG emission factors when operating a facility in order to abide by the NDC and SDG 2030 Agenda. However, none of the facilities tracked records of GHG emissions from their operation. Also, PM2.5 released during the pulverizing process is not tracked and duly managed, causing a potential respiratory disease of those who work for this process. Installation of an air filter or the supply of a PM 2.5-resistant mask to workers is highly recommended.

Based on the observation from the field visit, the following measures can be suggested to the GGGI Rwanda office to further strengthen the ecosystem of sustainable waste management practice in Kigali.

1. **Knowledge-Sharing & Capacity Building Workshop**

Most companies followed the safety and health measures in terms of the plastic wastes recycling process but there are still some knowledge gaps to be complemented in certain areas so as to ensure better environmental sustainability. For example, in the case of Eco Plastic, the wastewater used for cleaning the plastic wastes is released into nature without undergoing any physical or chemical filtration. In this respect, sharing ideas and practices from other companies and exchanging a site visit would be advantageous to the existing companies. Furthermore, safety and health measures for PM2.5 levels and GHG emission monitoring can be reinforced through a series of capacity-building workshops, as well as technical and financial assistance.

2. **Waste Separation Center at the Nduba Landfill Site**

Being the largest source of plastic wastes for recycling companies, it seems necessary to establish a separation facility in the Nduba landfill site to simplify the flow of plastic wastes. This can be achieved through the ongoing RW21 waste to resources project, which will conduct separation and valorization of organic and plastic waste to minimize waste landfilled. Additionally, it is recommended to create an online platform where verified stakeholders share the current status of recyclables they have, through which recycling industries find it much easier to establish a more wide-ranging recycling network and steady supply chain of plastic wastes.

3. **Strengthening of Institutional Regulatory Framework Against Plastic Wastes Recycling Companies**

Since there are a number of waste recycling companies that are already in operation, GGGI Rwanda may work with relevant regulatory authorities (e.g., REMA) to draft a guideline for waste recycling companies. The guideline shall include the operational framework to confirm whether a company follows a strict environmental and social standard in their business operation to ensure an environmentally sustainable recycling mechanism.

3. POLICY INTERVENTION: RW21 Waste to Resources Project

This chapter will introduce the current project in the GGGI Rwanda Country Program concerning sustainable waste management & the waste valorization sector funded by the Government of Luxembourg. This project serves relevant to the current situation of waste management in Rwanda as it deals with some urgent matters in waste separation and valorization.

3.1. Project Rationale and Outline

The Government of Rwanda through the Ministry of Environment embarked on a collaborative agreement with the Government of Luxembourg to develop a project to improve sustainable waste management practices in Rwanda. The cooperation between the two governments was facilitated by GGGI as the implementation partner for the project.

As an intergovernmental, international organization, GGGI serves as a neutral advisor to host governments, identifying best practices and lessons learned from its network of partners in the area of green growth. The project aims to improve municipal solid waste and hazardous waste management, with interventions designed to increase the amount of organic and plastic waste being processed through circular economy practices. The project also aims to increase the amount of e-waste being collected in Rwanda's Six secondary cities and in the capital city, Kigali.

3.2. Expected Outcome

The Waste to Resources Project has two primary impact-level anticipated outcomes. These include the reduction of GHG emissions and green investment mobilized with a target of 20M EUR.

The project includes interventions designed to increase the amount of organic waste and the plastic waste being processed over three years through the addition of sorting and separation equipment at the City of Kigali's dumpsite called Nduba. The project also aims to employ a public awareness and behavior change communication strategy to increase the amount of waste being sorted at sources at both households and high-occupancy buildings.
Capacity building and knowledge sharing are also incorporated into the project to improve the ability of actors within the waste sector to adopt circular economy practices based on best practices in the region and in Luxembourg. The project combines equipment with awareness, capacity building, and investment mobilization as an initial investment in the skills, infrastructure, and behavior foundational to the adoption of circular economy waste management practices.

3.3. Activities Related to Plastic Wastes

GGGI Rwanda, through the Waste to Resources Project, planned activities related to increasing awareness on sustainable waste management, proper sorting of solid wastes including organic wastes, plastic wastes, medical and hazardous wastes, effective transportation, effective disposal of wastes, and encouraging the private sector to invest in circular economic approaches such as recycling, reusing and recovery.

The project is also planning to upgrade Nduba Landfill and install facilities that will help in sorting waste. To reduce the amount of waste dumped at the Nduba landfill and the cost of cleaning wastes before undertaking the process of recycling, promoting the sorting of waste at the source point would bring a sustainable solution. Against this backdrop, the waste to Resource project wishes to establish an online circular economy marketplace, with an aim to track plastic wastes which can be used as raw materials to industries and companies.

The circular economy website will be created to facilitate those who have plastic waste to make online requests for collection and facilitate recycling companies to know where to collect those plastic wastes as raw materials. The platform will play a key role in linking producers of plastic waste and investors in recycling plastic waste.

4. CONCLUSION & RECOMMENDATION

The site visits conducted to all recycling companies and waste collection companies gave a picture of plastic waste management in Rwanda. 9 sites were visited including Mageragere Incinerator, EcoPlastic (Plastic waste recycling), Jardin Meuble, Agroplast, Ba Heza General Services, Electromax, Waste collection company Huye, E-waste collection center, GreenCare Rwanda (organic waste composting). Following are proposed solutions based on the gaps identified during site visit.

It was observed that plastic waste collected to recycling facilities most of the time are in bad quality, mixed with organic waste and this affects the quality of recyclable materials. There is a need to separate waste at source point so that recycling companies that need plastic waste as raw materials should get them in good quality without being mixed with other waste or requiring a lot of water for washing.

Another observation, recycling companies do not have sufficient equipment such as machines to recycle all tons of plastic waste collected in their yards, a small percentage of plastic waste is treated, and a big percentage remains without being treated.

Recycling companies have low capacity to treat all plastic waste collected at their facilities. This is a problem but can be a potential area for green investment in the waste sector.

Some recycling companies such as Agroplast, Depot Kalisimbi and Greencare Ltd have started to make plastic pavers from plastic waste. This is a good solution of turning plastic waste into other useful materials, however, the way it is done causes a lot of pollution. There is a need of conducting a study to know how this could be done properly without open burning and causing air pollution.

To conclude, plastic waste management in Rwanda is still at a low level and there is a need to develop laws supporting recycling processes and develop extended producers' responsibilities guidelines to support efficient collection of plastic waste and recycling.

Also, awareness is very needed to make people understand that waste can be used as resources and learn to sort waste properly as a key point to promote circular economy approaches such as reuse, recycle and recovery.

The Global Green Growth Institute

19F Jeongdong Building, 21-15, Jeongdong-gil,
Jung-gu, Seoul, Korea 04518

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