Radarweg 60
1043 NT Amsterdam
The Netherlands

www.tno.nl

T +31 88 866 50 10

Development of a waste stream-specific roadmap for the circular economy of Malawi.

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Sub report Output 2
Baseline assessment and analysis of existing circular economy initiatives and key players in Malawi

Date	26 April 2022
Author(s)	Andrew Chinyepe Naomi Montenegro Navarro Chandi Mutubuki Makuyana Milou Derks Paul van den Oosterkamp Raymond Obare Ombega Ebenezer Alenga Amadi Dennis Kiplagat Ton Bastein
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Executive Summary

A sound waste management system in Malawi is far from being implemented. It is not the policies lacking but the practical implementation of these policies, partly due to a lack of appropriate funds for setting up a sound waste system. Consequently, Malawi faces several challenges in waste management, with several uncontrolled and unmanaged waste dump sites of which none has properly engineered environmental protection measures implemented. Particularly people in low-income areas are impacted as they sometimes fall outside of the formal waste collection system, and residents do not have the financial means to participate in the first place. The collection of separated waste is even less common. The waste characterization study reveals that organic waste forms a significant proportion of the waste generated. 82% of solid waste generated by households is organic, followed by plastic (7%), paper (4%), glass (3%), and metals (~1%), respectively. Other types of waste, including textiles, electronic waste, and diapers, contribute about 3% to the total waste.

Malawi's local authorities are responsible for waste management; however, it remains a challenge, particularly in metropolitan regions. The waste build-up is a problem in Lilongwe, Blantyre, Zomba, and Mzuzu, as it is in many other fast urbanizing cities worldwide due to urban population expansion and insufficient resources that limit public services. According to data obtained, the capital Lilongwe and the city of Blantyre generate the most waste, with 180,000 metric tonnes and 192,720 metric tonnes, respectively. With around 70% of municipal solid waste not formally disposed of and just 4% waste recycling, it is reasonable to conclude that Malawi's present waste management strategy is mostly linear, with plenty of room for improvement in the transition to a circular economy. The study acknowledges that data was collected during COVID, when movement was restricted, which may have influenced the data acquired. Several factors, including consuming patterns and regular stays at home, have been recognized as potentially influencing the findings. Nonetheless, the numbers were not expected to change significantly. Nonetheless, great effort was taken to guarantee that the information was correct. The study's purpose was to fill one of the scientific holes: the time gap. As a result, while considering changes in waste creation, population change is a factor to consider.

The availability of waste collection vehicles affects the potential collection coverage and frequency of domestic solid waste collection. On average, waste is collected once a week in the three cities (Lilongwe, Blantyre, and Mzuzu) in Malawi – but only from planned settlements. Blantyre, Mzuzu, and the smaller Mangochi have the highest potential waste collection coverage, of approximately 30%. Lilongwe only has a maximum potential of covering 25% of its residential areas.

The value chain for plastics is well-developed. The majority of the effort is focused on data collection and consolidation. There iore action in the case of plastic recycling (although not on a very large scale). Plastics have more established value chains than metal, glass, and paper. For waste collected by local authorities, there is no separated waste collection. 20 percent to 44 percent of households recognized waste separation for reuse or transportation to private waste collectors. Plastic waste is collected separately by several private collectors, who then send it to aggregators or recycle it directly.

The value of organic waste turned into biogas, compost, and fertilizer continues to be low. Organic waste valorization has the potential to generate energy, particularly biogas production and other forms of energy harvesting mentioned in Malawi's policies. The Nationally Determined Contribution (INDC) recommends waste reduction, landfill bio-gas recovery and use, controlled waste incineration, and composting for organic manure as technological approaches to mitigate GHG emissions in the waste sector. The National Environmental Policy (NEP) requires waste collectors to separate residential and agricultural trash at the source to encourage recycling and use appropriate technologies to dispose of residual waste. Though a sound biogas infrastructure is currently absent, the preconditions seem promising.

A focus on separating biomass may improve living conditions in urbanized areas and working conditions at dump sites since biomass leads to undesirable emissions. This could support the informal waste sector to improve its livelihood. Also, organic compost production could be achieved; however, this expansion of the organic composting market seems to be hindered due to fierce competition from subsidized chemical fertilizers.

There is more activity visible in plastic recycling (although not on a very large scale) even though the waste stream is much smaller (7%). As plastic is relatively easy to separate and store, some players actively collect and process, both from the formal and informal sectors. As not many plastics are exported, the current market for recycled plastics is mostly domestic. Activities on other waste streams are hampered because of the lack of a domestic downstream value chain and hence the market. The metal, glass, and paper value chains are less developed than plastics and show relatively little collection and formal recycling activity. Although most collected metal is exported, there is quite some informal trading activity for metal. The exception is steel, for which there are several established recyclers in the country, so quite some activity can be detected domestically.

The Constitution is the basis for other laws and sets the pace in establishing laws, regulations, and policies. The acknowledgment of environmental protection as a right indicates that waste management is key to ensuring this right. Despite the obligations and rights in the Constitution, there is environmental degradation and threats to health in Malawi due to low levels of commitment to stick to the developed urban planning blueprint.

The National Environmental Policy (NEP) of 2004 promotes waste separation at the source, recycling, and waste disposal using appropriate technologies. It is excellent that the policy emphasizes that waste management privatization should be encouraged. Waste is viewed as a business in the policy orientation. Like any other policy, NEP reflects the government of Malawi's commitment to private sector growth, although there is minimal interaction and private sector participation in waste management. Furthermore, the policy does not encourage other waste management strategies such as waste reduction, reuse, and recovery. According to the study's findings, much of Malawi's waste is not yet being sorted at the source, recycled, or planned to be reused, with the remainder being disposed of in lined landfills. Nonetheless, there are several areas in the policy in which the country can take advantage of integrating circularity in plastic waste management. Environment Management (Waste Management and Sanitation) Regulations. 37 of 2008 provides for the waste recycling business and stipulates that any recycling business requires a license to operate and develop solid waste reduction and recycling plans and annual reports. This is a great path to enabling the private sector's involvement and investment.

Plastic bags with a thickness of less than 60 micrometers were prohibited from being imported, manufactured, traded, or distributed commercially (Environmental Management (Plastics) Regulations, 2015). Given the success of Single-Use Plastic (SUP) restrictions in neighboring countries such as Rwanda and Kenya, the Malawian government has been pushing to enact a stricter plastic bag ban. Plastic waste is currently valued in Malawi, but policy consistency and alignment must be intentional if appropriate and effective stakeholder engagement is to be achieved. It is necessary to strengthen enforcement. Gaps in the transition to circularity were also discovered throughout the research, such as the inability to prioritize the most serious environmental issues using a risk-based approach. Circularity is only slowly being implemented into current policy due to a lack of public awareness and involvement. Participants in the informal sector have low engagement in policy formation. Low recycling uptake in packaging, limited acceptance of the Extended Producer Responsibility program, funding the transition to a circular economy for plastics, and incentives for Circular Economic Trailblazers are all factors to consider.

List of Acronyms

CBOs	Community-Based Organisations
CTCN	Climate Technology Centre and Network
EPR	Extended Producer Responsibility
EU	European Union
E-Waste	Electronic Waste
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HDPE	High Density Poly Ethylene
KEPSA	Kenya Private Sector Alliance
LCC	Lilongwe City Council
LDPE	Low-density polyethylene
MCC	Mzuzu City Council
MOU	Memorandum of Understanding
MSW	Municipal Solid Waste
MSWM	Municipal Solid Waste Management
MTP	Medium Term plan
NDCs	Nationally Determined Contributions
NDE	Nationally Designated Entity
NGO	Non-Governmental Organisation
ODK	Open Data Kit
PET	Polyethylene Terephthalate
PP	Polypropylene
SDGs	Sustainable Development Goals
SIB-K	Sustainable Inclusive Business
SNV	Netherlands Development Organisation
SWM	Sustainable Waste Management
SWMU	Solid Waste Management Utility
TA	Technical Assistance
VNR	Voluntary National Review
WASH	Water Sanitation and Hygiene
IWPs	Informal Waste Pickers

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1 Introduction

Malawi faces complex and interrelated environmental challenges, mainly driven by population growth and climate change[1]. Population growth places enormous demands on natural systems. It leads to increased waste generation, with more land converted to agriculture and more forests harvested for the wood fuel supply. The country has 18.6 million people; Malawi's three major cities (Lilongwe, Blantyre, and Mzuzu) have 1.5 million people and generate over 1000 tons of solid trash per day[2]. In 2019, the capital city of Lilongwe alone was producing approximately 250 metric tonnes of waste per day[3]. According to research, Malawi's waste management infrastructure and public awareness are insufficient to handle the volume of waste produced[4]. As Malawi's population expands, the country becomes more urbanized, and the economy evolves to include more people in the middle class, these issues will only worsen. The country has two municipal landfills, no publicly managed waste incinerators, and only a few waste transfer stations. Based on these tendencies, waste generation is expected to triple by 2050[5].

For years, waste in the country has been a pressing topic, causing environmental degradation, rising GHG emissions, severe health problems, and loss of resources that could otherwise be valorized. Malawi has low waste collection rates and a plethora of uncontrolled and unmanaged waste dump sites, none of which have appropriately constructed environmental protection measures. Furthermore, collection systems are underdeveloped, with most cities having only a 30 percent[6] capability to collect. Separated trash collection is much less typical. People in low-income communities are particularly affected since they frequently fall outside of the regular waste collection system, and inhabitants lack the financial resources to participate in the first place. As a result of governments' other problems in delivering fundamental services, waste management is rarely a top priority[7]. With approximately 70% of municipal solid waste not officially disposed of with a 4% waste recycling rate, it is legitimate that the current waste management model is unsustainable[8].

Accelerated economic growth and the circular economy framework are crucial for long-term development, notably for SDGs 1 No Poverty, 3 Good Health and Well-being, 5 Gender Equality, 6 Clean Water and Sanitation, 8 Decent Work and Economic Growth, and 12 Responsible Consumption and Production. The transition from a linear to a circular economy must be inclusive and collaborative in every way, encompassing both men and women. Taking a comprehensive approach to the transition to a circular economy, including but not limited to a gender-inclusive strategy, opens up new avenues. Furthermore, the behavior of a community helps the change by adopting acceptable best practices in waste disposal. To support this transition, Malawi filed a request with CTCN for a Technical Assistance (TA) project on a circular waste system to tackle the challenges of waste and loss of resources and take dedicated steps towards a more circular economy. The ultimate goal of the TA project was to develop a waste stream-specific national roadmap for a more circular management system, including the conceptualization of a pilot project.

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1 World Bank.2019. Malawi Country Environmental Analysis

2 Turpie, J., Letley, G., Ng'oma, Y., & Moore, K. (2019). The case for banning single use plastics in Malawi. Report prepared for UNDP on behalf of the Government of Malawi by Anchor Environmental Consultants in collaboration with Lilongwe Wildlife Trust.

3 Kamakanda, 2019 in https://wasteaid.org/wasteaid-and-iccm-tackling-waste-in-malawi/

4 Turpie, J., Letley, G., Ng'oma, Y., & Moore, K. (2019). The case for banning single use plastics in Malawi. Report prepared for UNDP on behalf of the Government of Malawi by Anchor Environmental Consultants in collaboration with Lilongwe Wildlife Trust.

5 World Bank. 2018

6 Barré (2014), Waste Market in Urban Malawi: Source: https://stud.epsilon.slu.se/7550/1/barre_j_150107.pdf

7 WasteAid, Community waste management in Malawi: a feasibility study - WasteAid

8 Chipofya et al. 2018. Comparison of Pollutant Levels in Effluent from Wastewater Treatment Plants in Blantyre, Malawi

1.1 Scope of the study

The research focused on the waste sector, emphasizing specific waste streams: domestic inorganic waste (plastics, metals, glass, and paper); organic waste (household waste, market waste). Hazardous waste, industrial waste, wastewater, and e-waste were all excluded. The study's objectives were to help with waste stream prioritization, provide a roadmap with recommendations and paths for waste system development for the selected stream, and identify a potential pilot project within this prioritized waste stream.

The specific objectives of the study were as below:

1. Assessment of the status quo of waste management practices for the six waste streams (plastics, metals, glass, paper, household waste, agricultural waste), identifying and developing an up-to-date guide to key stakeholders, existing public and private sector initiatives as well as policies and insights in waste generation and processing.
2. Identify potential opportunities and barriers to shifting to a more circular waste management system executed for each waste stream.
3. Selection of a prioritized waste stream showing the highest potential for transition to a more circular management system. This was done based on the comparative analysis of objective two and a dedicated assessment matrix.
4. The development of a detailed strategic national roadmap for the selected waste stream serves as a management tool for the implementation phase, creating new businesses, innovation, and technology transfer.
5. The conceptualization of a pilot project will include potential benefits in economic, social, institutional, and environmental terms.

1.2 The circular economy framework

This research aimed to analyze the possibility of circular economy routes for Malawi's waste system, the Technical Assistance Report adopts the following definition of the circular economy:

A circular economy is a closed-loop economic system in which raw materials, components, and products lose as little value as possible, renewable energy sources are utilized, and adopted central systems thinking[9]***.***

The Ellen Mac Arthur Foundation has developed a well-known framework (also known as the butterfly model[10]) outlining the various pathways within a circular economy, from the perspective of organic materials and resources (left-hand side of the 'butterfly') and non-organic, technical materials, and resources on the right-hand side of the 'butterfly.' The various arrows present the different pathways or activities that can be deployed to retain value or recover value from products or materials after their economic lifetime. As this project is explicitly focused on waste streams, the focus will be on recovering or retaining as much value from these (organic and non-organic) waste streams as possible, following the circular economy principles. The circular economy however is much more extensive than waste management alone, targeting among other the reuse or repurposing of products before they become waste and the regeneration of ecosystems.

[9] Circular economy: a definition and most important aspects (hetgroenebrein.nl)

[10] https://www.ellenmacarthurfoundation.org/circular-economy/concept

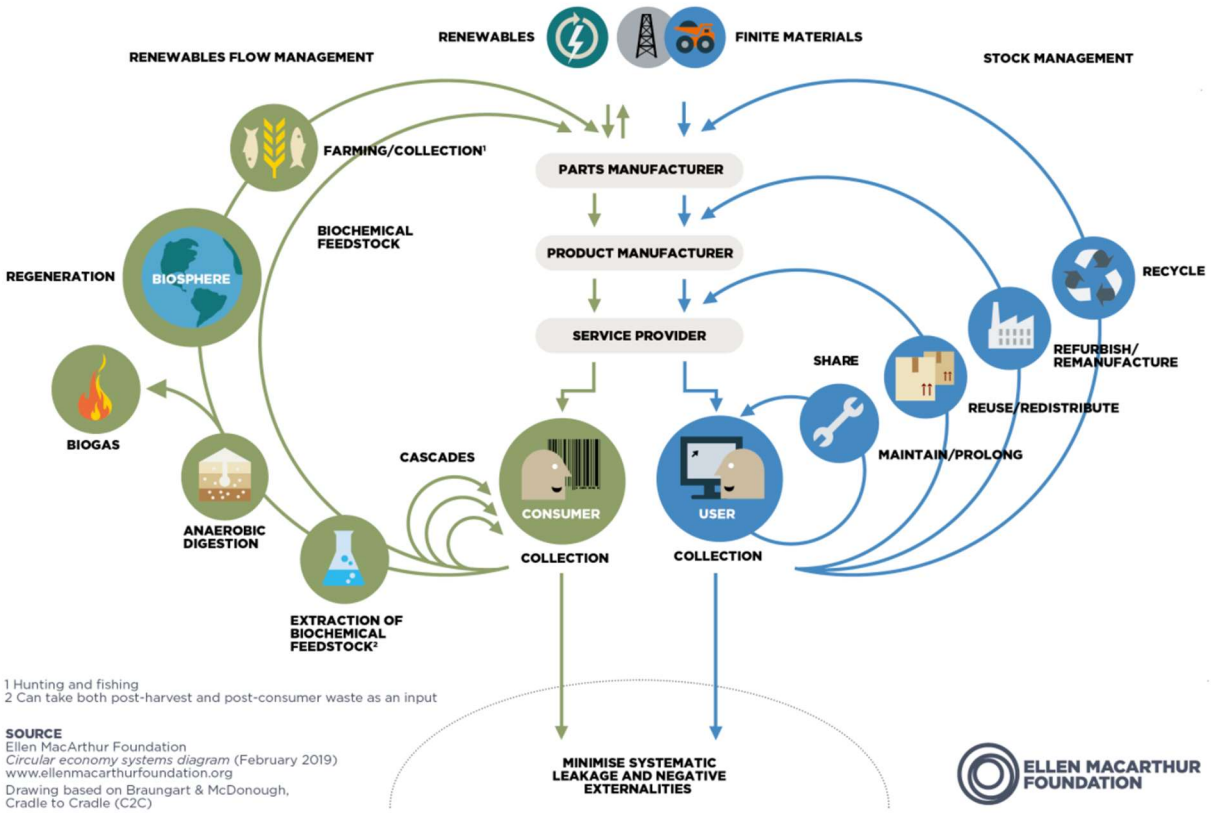

Figure 1 The Circular Economy Butterfly Diagram, Ellen Mac Arthur Foundation

1.3 Guide to the report

This report offers a baseline evaluation of Malawi's waste system, concentrating on the six waste streams mentioned in the scope. This report provides information on the volumes and types of waste created, the collection, separation, and processing process, and a qualitative description of the waste system's active participants and who performs what. Chapter 2 highlights the study's methodology by defining the approach, sampling methods, and data collection. The methodology is detailed in Chapter 3, and the findings are discussed in Chapter 4. The subsequent chapter looks at the value chains for each waste stream and who the important stakeholders are for the specific value chains. Chapter 6 examines the present policy and regulatory environment, while Chapter 7 summarizes past and ongoing circular economy and waste management projects. Conclusions are detailed in Chapter 8. The findings of this sub-report serve as the foundation for the rest of the Technical Assistance, assessing the gaps and possibilities in the present waste system.

2 Demographic and economic context

Malawi is a landlocked country in Southern Africa that shares borders with Mozambique, Zambia, and Tanzania. It occupies a short, twisting strip of territory along the East African Rift Valley and is known for its magnificent mountains and large lakes. The country's population is 18.6 million (as of 2019), and it is expected to triple by 2038. Figure 2 depicts the history of the country's population development. Malawi is split into three regions, each of which has 28 districts. Malawi's two biggest cities are Lilongwe and Blantyre. Lilongwe has a population of 989,318 and an annual growth rate of 4.3 percent, while Blantyre houses 800,264 people and has a 2.8 percent annual growth rate (Census, 2008) [11]. The Chewa, Nyanja, Lomwe, Yao, Tumbuka, Sena, Tonga, Ngoni, Ngonde, and Lambya/Nyiha are the ten primary ethnic groups traditionally linked with contemporary Malawi.

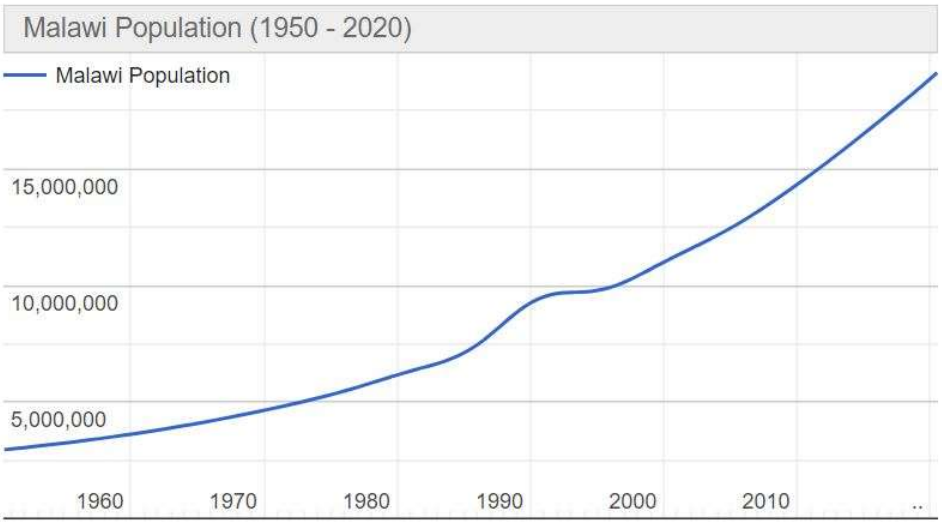

Figure 2 The population development of Malawi [12] (Source: Odorometer)

Despite major economic and structural reforms to sustain economic development, Malawi continues to experience challenges with its economy. Agriculture employs over 80 percent of the population, making the economy sensitive to external shocks, particularly climate shocks. Moreover, recent poverty rates in the country continue to be high, with a national poverty rate of 50.7% in 2019/2020[13]. The literacy rate in Malawi is 62%.

Malawi's GDP is $7.2 billion[14]. The Malawi Growth and Development Strategy (MGDS), a collection of five-year plans, guides the Malawian economy. The current MGDS III, titled "Building a Productive, Competitive, and Resilient Nation," lasts through 2022, focusing on education, energy, agriculture, health, and tourism. Malawi 2063 Vision, published in January 2021, aims to transform the nation into an affluent and self-sufficient industrialized 'upper-middle-income country. Malawi's economy suffered significantly as a result of the COVID-19 outbreak. Growth was expected to be 1.0 percent in 2020, down from 4.8 percent the previous year, with a rebound of 2.8 percent expected in 2021; As a result of growing social distancing policies and conduct, economic activity was expected to suffer and domestic demand anticipated to fall.

[11] https://microdata.worldbank.org/index.php/catalog/study/MWI_2008_PHC_v01_M_v02_A_IPUMS
[12] https://www.worldometers.info/world-population/malawi-population/
[13] World Bank Country Overview Malawi, Malawi Overview: Development news, research, data | World Bank
[14] "World Economic Outlook Database, October 2019". *IMF.org*. International Monetary Fund. Retrieved 22 January 2020.

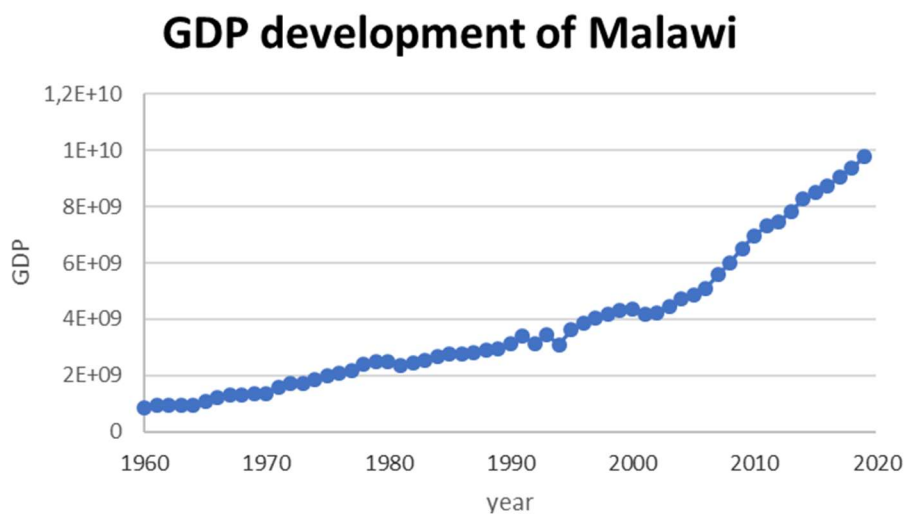

Figure 3 Development of GDP (in constant US$) for Malawi[15]

Given a growing budget deficit, public debt stock continued to rise, owing mostly to high-cost domestic debt. The fiscal deficit grew due to decreased tax collection due to the COVID-19 epidemic and increased expenditure constraints from the pandemic response, debt servicing expenses, and unbudgeted arrears. Malawi has a high risk of overall debt distress and a moderate risk of external debt distress, with little room for shock absorption. In 2019, urban regions and cities accounted for 17 percent of Malawi's overall population. Figure 4 shows Malawi's change in the level of urbanization.

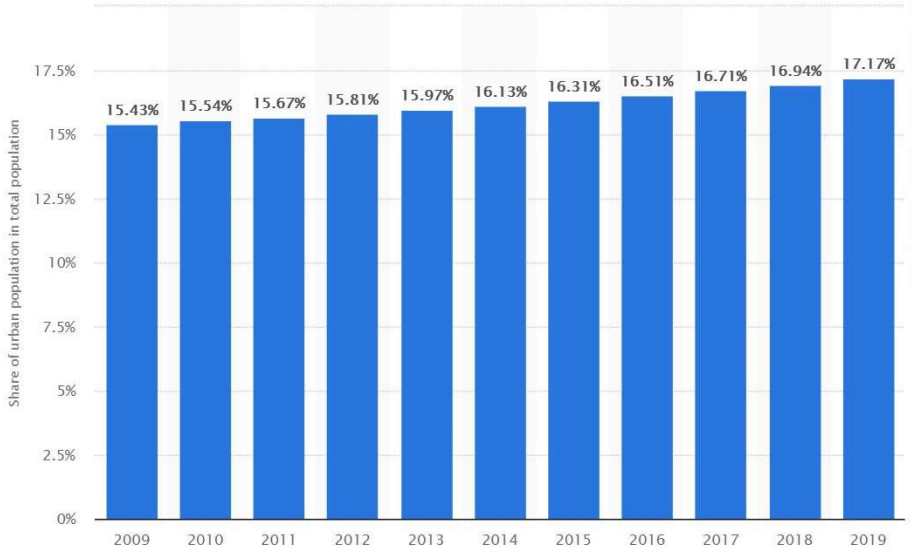

Figure 4 Urbanization rates in Malawi (Source: Statista)[16]

The economy is mostly agricultural, with over 80 percent of the population residing in rural regions. Even in urban areas, many agricultural practices can be identified. The border between urban and rural areas is much less clear than in surrounding countries such as Zambia and Zimbabwe. Agriculture contributed to almost one-third of GDP [17] and approximately 80% of export earnings in 2017.

[15] https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2019&locations=MW&most_-recent_year_desc=false&start=1960&view=chart
[16] https://www.statista.com/statistics/520601/urbanization-in-malawi/
[17] https://www.cia.gov/the-world-factbook/countries/malawi/

3 Methodology of the study

3.1 Methodology

The project adopted a cross-sectional approach that uses mixed qualitative and quantitative approaches. Primary and secondary data were collected through desk research, key informant interviews, and focal group discussions. This chapter provides an overview of the methods used for the various activities in the project.

3.1.1 Sampling Method

Cluster and purposive sampling were used to identify key stakeholders for informant interviews and questionnaires. The project plan defined stakeholders into five categories/clusters (national government and agencies, local governments, waste companies/enterprises, civil society groups, and academia). The list of all the consulted stakeholders is in Appendix 1. Targeted stakeholders were purposefully selected to represent all the waste streams; domestic inorganic waste (plastic, paper, glass, metal), and organic (agriculture and domestic) waste. In addition to the adoption purposive sample, the influence-interest analysis was employed to narrow down specific stakeholders. The study considered the United Nations- N-ESCAP guidelines in sampling[18]. A total of 546 stakeholders were consulted by the study, as highlighted in Table 1 below:

Table 1 Sample Size

Category	Tools Used	Sample Size
Government Ministries and Institutions	Interviews	3
Local Authorities (City Councils, Municipalities and Districts)	Interviews/ Questionnaires	10
Companies/ Entrepreneurs	Interviews/ Questionnaires	45
Civil Society Organizations	Interviews/ Questionnaires	5
Academia	Interviews	3
Household Waste Samples collected and characterized (* Used Data Collectors)	Waste Sampling and Sorting Kits	180
Household questionnaires administered (*Used data collectors)	Questionnaires	300
Total		**546**

3.1.2 Data collection

Online and in-person interviews and questionnaires were conducted. Households in each city were categorized as high, medium-income, and low-income sectors. Data was collected from a sample of households in Mzuzu (a medium-sized city in Malawi's northern region), Lilongwe (the Central Region's capital city), and Blantyre (the commercial and second-largest city in the southern region). In addition, a convenience cluster and random sampling were used to survey a sample of households in the Dowa, Chikwawa, and Nkhata Bay Districts to confirm the secondary waste generation and composition data acquired from key stakeholders. Nkhata Bay is in Malawi's Northern Region, Dowa is in the Central Region, and Chikwawa is in the Southern Region. Waste generation and composition data were collected from randomly selected households in the selected clusters. The household questionnaire was designed so that gender-related issues were captured.

[18] UN-ESCAP. 2010. Guidelines for solid waste management assessment (baseline survey) in secondary cities and small towns in Asia and the Pacific.

Table 2 Sample of residential areas where household questionnaires and samples were collected

City/District	High Income areas	Medium Income Areas	Low income area
Lilongwe	Area 3, Dubai	Area 49, Area 4 and Falls	Chinsapo 1 and 2
Blantyre	Kabula	Namcholi	PA Mango
Mzuzu	Chimaliro	Hilltop and Mchengautuwa, Chibavi	Magomondo and Area One B Ching`ambo
Dowa	Chinyama	Wenela	Kakonkhwe
Chikwawa	Chikhambi 3	Mwita	Julius
Nkhata Bay	Chikale	Matayilosi and Makomboniu	Kalambwe and Majiga

The data was collected during COVID, when movement was restricted, which might have impacted the data collected, according to the research. Several factors have been identified as having a potential impact on the findings, including consumption habits and regular stay at home. Nonetheless, it was not expected that the statistics would differ considerably. Nevertheless, significant care was taken to ensure that the data was accurate. The study's goal was to close one of the research gaps: the time gap. As a result, population change is a component to consider when evaluating changes in waste generation.

3.2 Characterization of waste

The characterization of household waste was carried out, and it comprised two parts: household surveys and waste categorization. The surveys were carried out to assess waste storage and handling at the source, validate current solid waste management expertise and evaluate (the quality) of waste management services. At the home level, 300 surveys were distributed. The number of residents in each participating residence had to be calculated to assess the rate of waste generation.

To validate secondary waste production and composition data received from key stakeholders, sample households were polled. Households were divided into three groups (High Income, Medium Income, and Low Income). In each cluster, a random sample of home surveys was distributed. A total of 180 waste samples from randomly selected houses in each of the three clusters were collected and categorized. Before sorting, the sample was weighed and recorded. After that, the sample was divided into organic, paper, plastic, glass, metal, textiles, and other categories. Waste fractions were separated into containers and weighed separately on hanging scales (which could weigh up to 25 kg and were accurate to 0.1 kg). The weight of each fraction was then recorded, and the data collectors made certain that the scales were always set to zero before weighing the fractions.

4 Baseline assessment of the waste management system in Malawi

This chapter will first provide a general background to the waste management system in Malawi, predominantly based on literature, substantiated with results from the interviews, focus group discussions, and waste characterization.

4.1 Background to the waste management system

As in most developing countries, Malawi's responsibility for waste management lies with local governments. However, waste management remains problematic for local authorities, particularly in urban areas. Lilongwe, Blantyre, Zomba, and Mzuzu, like many other rapidly urbanizing cities around the world, are confronted with waste accumulation due to urban population growth and inadequate resources (mostly financial) that limit public services. As a result, there are no lined municipal landfills, no publicly maintained trash incinerators, and just a few waste transfer sites. Despite efforts to address these issues, waste management systems and public awareness are still insufficient to deal with waste in general. Financial constraints, insufficient service coverage, operational inefficiencies, ineffective equipment, an insufficient landfill, and minimal use of recycling activities have been identified as difficulties in Malawi's waste management infrastructure. These gaps in service are caused by a lack of infrastructure and resources for operations and maintenance. Despite major economic and structural reforms to sustain economic development, the main driver is the economy's slow growth contributed to by low literacy compared to other countries in the region, and an over-reliance on rainfed agriculture, which is vulnerable to climate change impacts. Moreover, policy incoherence can be a key reason for the functional fragmentation evident in local government and sectors at the local level and the vague mandates and overlapping jurisdictions that characterize local government[19]. In terms of government effectiveness, Malawi was reported at -0.74 in 2019, according to the World Bank collection of development indicators[20].

Consequently, residents and companies illegally dump or burn waste. The National Statistics Office reported in 2020 that most urban households dumped untreated solid waste in uncovered places such as open pits, gardens, and local dumps, while some households turn to either burning or burying. These informal activities create major sanitary consequences and severe health and environmental effects, such as smoke pollution, disease outbreaks, and methane leakage[21]. Moreover, waste accumulates in such large amounts that it hinders the national power supply; the accumulation of waste in the river leads to power outages across Malawi[22].

City councils have enacted a variety of bylaws and ordinances to address the growing waste management challenge. Yet these restrictions are rarely implemented due to a lack of resources, financing, and infrastructure, resulting in dumping waste and increasing out of control. And although the issues with waste management in Malawi are already severe today, based on the expected population growth and urbanization trends, waste generation is expected to triple by 2050[23], making the problem even more pressing.

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19 Tam O'Neil et all, 2014: Fragmented governance and local service delivery in Malawi

20 Malawi - Government Effectiveness: Estimate - 1996-2019 Data | 2021 Forecast (tradingeconomics.com)

21 Mkwambisi, David Dalison. *Urban agriculture in Malawi: poverty reduction, waste management and institutional barriers*. Diss. University of Leeds, School of Earth and Environment, Leeds, GB, 2007.

22 WasteAid, Community waste management in Malawi: a feasibility study - WasteAid

23 World Bank. 2018.

4.2 Waste generation

4.2.1 Waste generation from the local authorities' perspective

The local authorities interviewed provided estimates on how much waste is produced in their area of jurisdiction. According to the estimations of the respective local authorities, the capital Lilongwe and Blantyre cities have the largest waste generation of 180 000 metric tonnes and 192 720 metrics tonnes, respectively. The data provided by the local authorities consists of the figures from the weigh-bridges where available and estimations based on the number of track trips transporting waste to the dumpsite/landfills (see Figure 6 in the section on waste collection).

Table 3 Estimated waste generation (local authority data)

Local Authority	Waste generated (tonnes/year)
Lilongwe City	180,000
Blantyre City	192720
Mzuzu City	37,263
Zomba City	21,014
Liwonde Town	3,000
Kasungu Municipality	7,200
Mangochi Municipality	24,000
Kasungu District	No data
Zomba District	No data
Mmbelwa District	4,800

Figure 5 depicts the waste generation rates for Malawi's three major cities based on waste generation statistics acquired at the household level. The study produced waste generation estimates from the waste characterization data by comparing the weighted waste from the household to the population. Lilongwe's high-income regions generate the most waste per person per day, at 0.61 kg per person per day, followed by Blantyre, at 0.51 kg per person per day. The pattern suggests that higher-income areas generate more waste. An increased propensity to spend may result in more purchases and, as a result, more waste. During interviews, it was revealed that high-income areas had a high rate of food waste generation compared to low-income areas. It was also discovered that in the low-income areas, there is a high rate of reuse of commodities that would have been deemed waste, such as plastic containers or bottles.

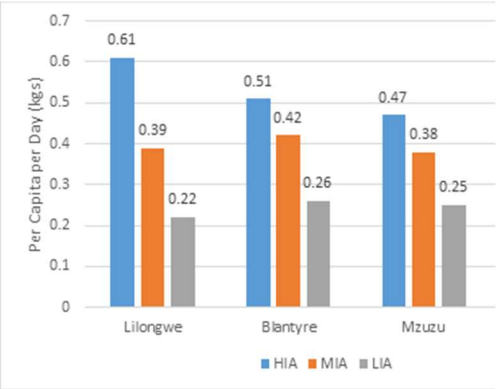

Figure 5 Waste generation rate in major cities per income level (High income, Middle income, Low income)

However, as stated, waste generation information provided by the local authorities is based on estimations, as poor waste collection levels and lack of weighbridges in local authorities cause data to be poorly available. Table 4 gives an overview of the per capita waste generation estimated in six of Malawi's cities and towns.

Table 4 Overview of per capita waste generation in six Malawi cities, municipalities, and towns

Cities	Per Capita (kg)	Towns/ Municipalities	Per Capita (kg)
Mzuzu	0.479	Liwonde	0.6
Lilongwe	0.5	Kasungu	0.25
Mangochi	0.6		

Table 5 Average waste generation rate per income area

Income Area	Waste Generation Rate (per/capita/day)
High Income Areas	0.58
Medium Income Areas	0.38
Low-Income Areas	0.23

The average waste generation rate in Malawi is lower than the average waste generation of SSA, around 0.61 kg per person/ per day. Table 5 shows that high-income households had the highest waste generation rate, with a national average of 0.58 kg/per person per day. The medium-income areas had the second-highest generation rate at 0.38 kgs/ person/ day, and low-income areas had the lowest waste generation at 0.23 kg/person/day.

When looking at the difference between waste generation between cities and towns in Malawi[24], it can be concluded that there is no significant difference in kg/capita waste generation. This is different from the neighboring countries (Zimbabwe and Zambia), where cities produce significantly more waste than towns. This is most likely explained because the people's livelihoods in Malawian cities and towns are quite similar. Both have a lot of large unplanned settlements, while the distinction between rural and urban areas is much less distinct, with a lot of small-scale agricultural practices to be found in urban areas as well.

4.2.2 Waste composition in urban areas

The exact composition of the waste generated by households differs per region and income level. Still, in general, organic waste is the most voluminous stream in Malawi; more than 82% of solid waste is organic, followed by plastic (7%), paper (4%), glass (3%), and metals, respectively.

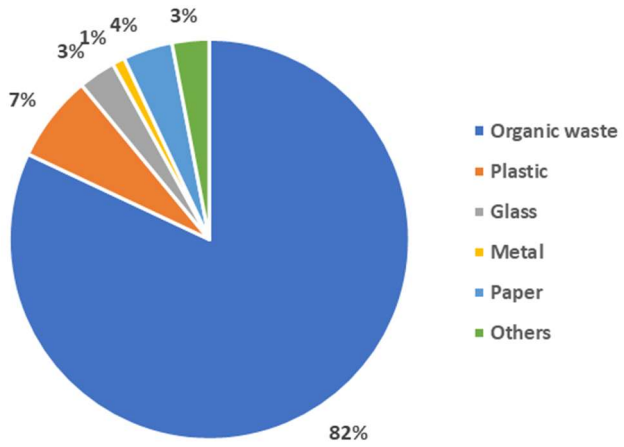

Figure 6 Overall domestic solid waste composition

[24] Based on an ANOVA analysis.

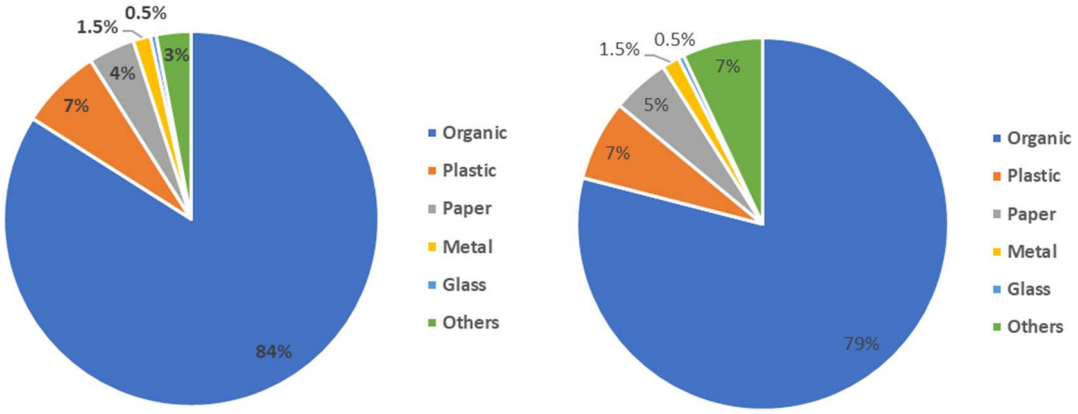

Figure 7 Waste composition in Lilongwe (left) and Blantyre (right)

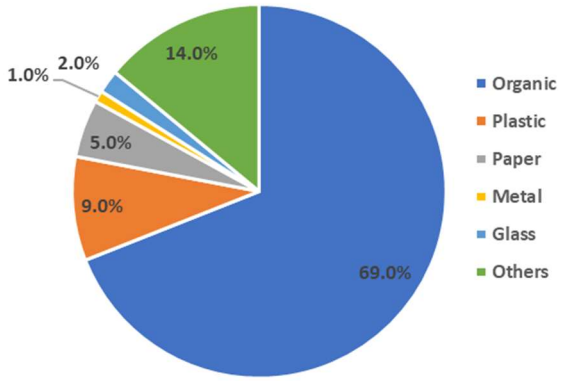

Figure 8 Waste composition in Mzuzu

On average, plastic is the second-largest stream, albeit still small at 7% (increasing rapidly). During interviews and meetings, it was established that plastic is far less than organic in terms of volume but more problematic because of its persistent nature in the environment. In terms of total waste composition, paper, glass, and metal also take up a relatively small part of domestic waste in major cities. In this study, the category of 'Other' is another major component of the waste in Malawi (on average 3%), predominantly consisting of ash, textiles, and diapers. As this project's scope does not include those streams, these are excluded from further analysis. However, it could be interesting to look at potential circular pathways for both streams in future projects. Organic waste also dominates waste composition in smaller cities, towns, and districts. Districts are smaller urban areas in administration, economic activities, population, and infrastructure development (see Figure 9).

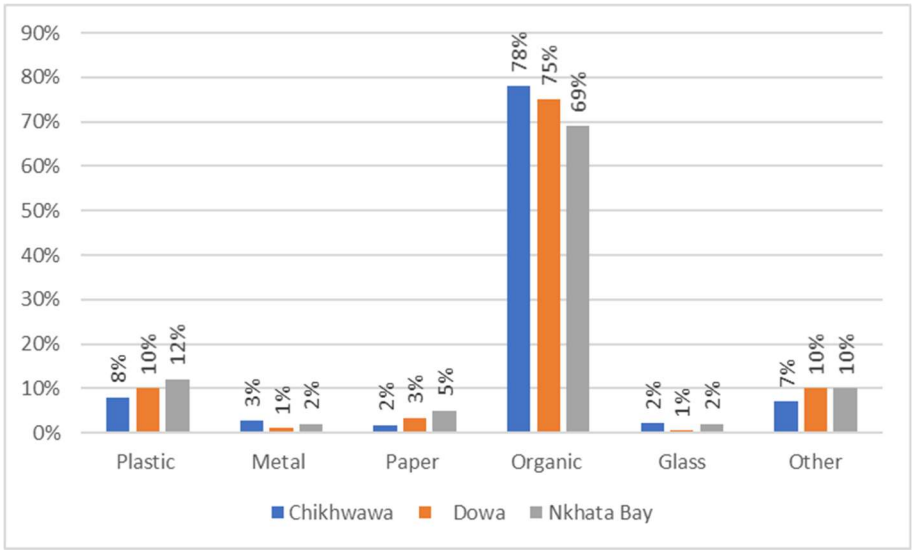

Figure 9 Waste composition in Chikhwawa, Dowa, and Nkhata Bay

Both private and public authorities collect and manage waste. Nonetheless, record-keeping remains challenging. There are very few records in which waste collected is determined by the type, let alone a specification (e.g. PET or PP for plastics or aluminium or iron for metal). This has influenced the potential to specify further the data collected into waste types; hence only the main categories are included.

4.2.3 Waste composition in rural areas

Findings from the study show that the domestic rural waste composition trends are similar to urban areas in that it is skewed towards organic waste (although even higher at +/- 86%). In contrast, the other waste streams, such as plastic, glass, and metal fraction, are much smaller than in the urban areas ( ). Most waste comes from food, crops, livestock (cattle, chicken, and goats). Organic waste is much higher at harvest; other waste streams such as plastic and paper mainly come from product packaging. Generally, much organic waste produced by small-scale agriculture is used again as feed, mulch, or composted.

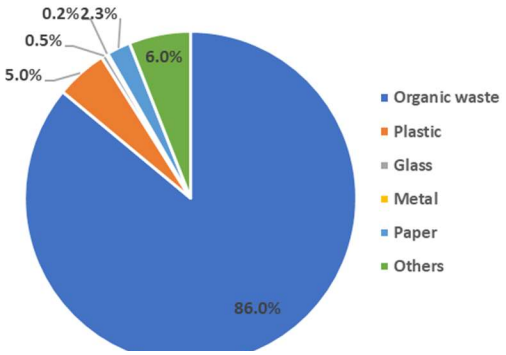

Figure 10 Estimated waste composition in rural areas

4.2.4 Differences per income level

For the four major cities (Lilongwe, Blantyre, Mzuzu, and Zomba), the assessment of the waste composition was broken down to reflect the various income levels. Three income levels, High-Income Areas (HIA), Medium Income Area (MIA), and Low-Income Areas (LIAs) were assessed. Generally, low-income groups live in high-density areas, mid-income people live in medium-density areas, and high incomes live in low-density areas. The results in **Error! Reference source not found.** show that organic waste is the dominating waste stream in all income areas. In the high-income areas, the fraction of plastic, glass, and paper is also higher than in the low-income areas. Metal and glass take up a relatively small part of the waste composition of all income areas. However, in the medium and low-income areas, plastic and paper are the main waste streams after organic waste with a relatively low fraction of metals and glass. In contrast, these two streams show higher numbers in high-income areas.

Cities	Organic			Plastic			Paper			Metal			Glass			Other		
	HIA	MIA	LIA	HIA	MIA	LIA	HIA	MIA	LIA	HIA	MIA	LIA	HIA	MIA	LIA	HIA	MIA	LIA
Lilongwe	72.7	91.4	90.7	9.6	4.5	4.5	10.6	2.1	2.1	3.3	0.94	0.2	1.1	0.52	0.19	9.9	4.7	4.3
Blantyre	69.7	78.2	89.7	10.9	6.2	2.8	10.4	2.6	1.2	2.7	0.9	0.3	1.2	0.4	0.2	9.7	7.8	5.7
Mzuzu	68.4	64.5	74.4	7.9	10.1	6.3	4.7	8.3	2.7	1.9	0.8	0.6	1.8	1.3	1.2	15.7	16.4	15.3
Zomba	87.5	90.9	88.3	5.3	3.6	3.7	5.9	2.7	2.9	0.3	0.1	0.1	0.8	0.3	0.3	3.4	4.2	8.1

Figure 11 Waste per income level

4.3 Waste collection and separation

4.3.1 Waste collection

In Malawi, waste collection is a function of the local authorities. Nevertheless, as most local authorities have severe issues with organizing the necessary infrastructure and capacities to manage the waste collection, private parties are contracted by the local authorities to provide the collection of household waste. However, these private parties are mostly active in high-income areas, while the waste collection is neglectable in low-income areas.

On average, waste is collected once a week in the four cities (Lilongwe, Blantyre, Zomba, and Mzuzu) of Malawi – but only from planned settlements. Figure 11 shows that Blantyre and Mzuzu, and the smaller Mangochi have the highest potential waste collection coverage, of approximately 30%. Lilongwe only has a maximum potential of covering 25% of its residential areas. The level of potential collection coverage and frequency of domestic solid waste collection is affected by the availability of waste collection vehicles. During consultations, it was established that Blantyre City has more functional vehicles than Lilongwe City. Blantyre city has 14 solid waste management vehicles, 2 tractors, and 28 skips, of which most are not operational. Lilongwe, in theory, has 13 solid waste management vehicles, 1 tractor, 2 graders, and 38 skips located in various markets and communal collection points. Still, most of them were not operational during the study. In most small urban setups such as Dowa, Chikwawa, and Kasungu districts, their councils have very low to no waste collection coverage.

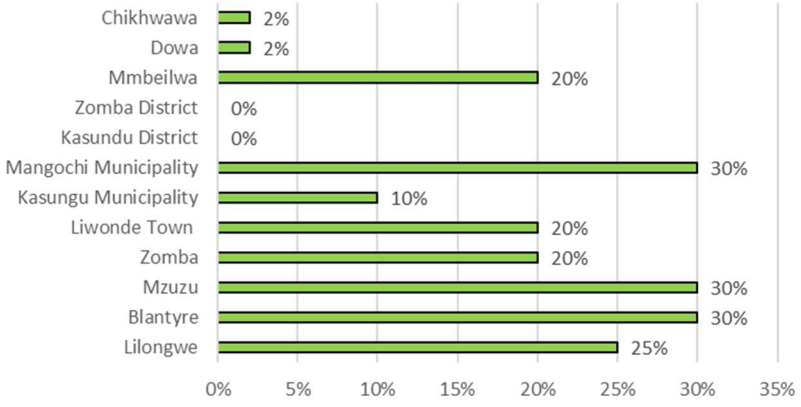

Figure 12. Maximum potential coverage per municipality/ city council

In general, most of the collected domestic waste comes from high-income areas. Low-income areas, including unplanned settlements, are the most affected as they are generally least serviced. One of the reasons is the lack of infrastructure to and in those areas, meaning waste trucks gain access as roads are lacking, or only in the form of inaccessible dirt roads. Formally, city authorities in Malawi are at least meant to provide waste bins in unplanned settlement areas. In addition, these bins remain uncollected for weeks, sometimes months, due to vehicle shortages or neglect.

This means garbage from the bins overflows, creating dumps, and residents turn to burning the waste in bins to create more space. Moreover, local authorities do not collect door-to-door in some cities but have set up Waste Transfer Stations. Households can bring their waste to these stations, and the local authorities pick it up from there (for example Mbelwa Council).

Table 6 provides a picture of how the collection is organized throughout Malawi.

Table 6 Overview of waste collection methods per city, town, and municipality for the areas that are serviced

Cities	Waste Collection Methods
Mzuzu City	Currently, the council depends fully on private waste collectors who go door to door to collect waste at a fee.
Zomba City	Households store their waste in bins or sack bags, and the council vehicle goes door to door in planned areas. Skips/waste bankers are strategically put in unplanned areas, and collection is done from such points. However, this is not done consistently.
Lilongwe City	Households provide litter bins for temporary storage whilst waiting for collection by either private waste collectors or the city council. After collection, the waste is transported to the disposal site.
Liwonde Town	Conducts a routine waste collection once a week. Households bring their waste to a collection point where a municipal vehicle picks up the waste to be brought to the dumpsite located about 5 kilometers away.
Kasungu Municipality	Most municipal waste is generated at markets at the household level. Very few households leave their waste at collection points where the public authority comes to collect and bring it to the dumpsite. The private waste collectors are involved in waste collection.
Mangochi Municipality	In high-density locations, households usually bring waste to centralized designated communal waste receptacles (concrete bins) located within their areas. Using a tractor fitted with a 5 tonner trailer, the council collects from the receptacles to the 'landfill'. The collection is irregular, sometimes going over two weeks. In the medium and low-density areas, the households store waste in waste bags/bins, which can be left on the roadside on the collection day. The council tractor collects from door to door and deposits at the landfill. The collection is formally once a week for each location.
Kasungu District Council	Currently, there is no waste collection in markets or any other settlement within the jurisdiction.
Mmbelwa District Council	Domestic waste at the household level is stored in plastic bags or waste bins, and gathered at a common waste space. Once it has accumulated, the council truck collects and transports the waste to a designated disposal site which is fenced and locked.
Zomba District Council	There is no evidence of collection by the local authority or private parties. Residents and marketplaces dispose of waste in rubbish pits or by burning.

City councils and municipalities are struggling to provide effective waste management services. During consultations with local authorities, one of the most cited challenges is the lack of capacity to collect and dispose of all the domestic waste adequately. Limited capacities include the lack of financial and technical resources. As a result, private players, including households, play a big role in waste

collection. Table 8 shows the proportion of domestic waste collected by different service providers in sampled urban areas. How private companies operate depends on the city structure and regulations. In Lilongwe, most of the waste is collected by private players, while in Blantyre the city council collects the bulk of the solid waste. The local authorities contract the companies that collect waste in Blantyre and obtain their revenues through the city councils. The private players involved in the waste collection are mostly small to medium enterprises and companies and registered non-governmental organizations. These include Waste Management, DDK Cleaning Services, YODEV Waste Management, and Hope Cleaners. Big players include Shore Rubber and Plan International Private Limited. Some operators are registered as non-governmental organizations like players like Intelligent Waste solution, Innovative Green, and Our World International. According to the interviews, Lilongwe city has a waste collection model which relies greatly on private players to collect waste.

Table 7 Waste collection and disposal by service providers

Service Providers	Lilongwe	Blantyre	Mzuzu	Dowa	Chikhwawa
Council	25%	74%	20%	3%	5%
Private Operator	68%	20%	35%	2%	1%
Household Self	7%	6%	15%	95%	94%

In Mzuzu, waste companies work with households directly and only collect where people pay fees. This also explains why the collection is predominantly organized in high-income areas, as these are the only regions where people can pay the fees. Regarding organic waste from markets, this is usually collected by local authorities. For example, at Limbe market in Blantyre, the City Council collects waste when the skips are full, and transports the waste from the market to a composting facility directly where it's turned into organic compost. This is then sold on to consumers again. Private players such as the CBO Matandire also use organic waste from markets to develop compost.

4.3.2 Source separation

In Malawi, local authorities in urban areas do not collect separated waste. All local authorities reported that waste is not separated at the source. Only some households supported by private players separate their waste. This usually relates to separating organic waste from inorganic waste for composting. However, household consultations revealed that a significant number of households, approximately 32% in Lilongwe, 44% in Blantyre, and 23% in Mzuzu, practice some form of waste separation.
They reported that because of local authorities' poor to no waste collection, some of them are forced to separate and compost organic waste or burn plastic waste. Table 10 shows that there is some waste separation in smaller districts, like Nhkata Bay and Dowa.

Table 8 Household waste separation

Household Separation	Lilongwe	Blantyre	Mzuzu	Nkhata Bay	Dowa	Chikwawa
Yes	32%	44%	23%	20%	30%	40%
No	68%	56%	77%	80%	70%	60%

A major drawback is that even when households would offer their waste separately when collected by the local authorities, everything is put together nonetheless. The authorities do not have the capacity or processing facilities to properly collect and manage the waste separately. Private operators also face challenges in transporting waste from households. Where waste is separated, it is mainly separating organic from inorganic waste. In Lilongwe, the city council promotes composting, meaning some targeted organic waste is taken to an intermediate Waste Transfer Station (instead of to the dumpsite first) to allow for composting. However, this is all still on a very small scale.

A large difference can be seen in in-house reuse and recycling between low and high-income areas. In lower-income areas, there is an economic necessity to execute circular practices, such as reusing and recycling usable products or materials and avoiding spillage, predominantly of food. Generally, the streams that are reused most are plastic (such as food waste plastic containers) and glass (glass bottles etc). Hence, if this reuse did not occur, the share of these streams in the total waste volume would logically be much higher, but it shows that there is internal, in-house usage of these streams. This is very different for higher incomes, where analysis of the waste shows that there is much more wasting of relatively valuable things, such as food (e.g., whole bread in the bin, half-finished fish).

Some separation of organic waste is organized by companies that use waste as input for their own production processes (biogas, compost, fertilizer). Sometimes by directly incentivizing waste separation by households. The companies then collect the separated waste from households themselves. These forms of direct private collection only take place in high-income areas. Approval for the waste collection is based on a license agreement with the local authorities (so not working as a subcontractor). Some other organic waste processers reported even collecting unseparated waste. They then separate the organic waste from the mixed waste to extract their desired feedstock. The remaining waste streams are mainly transported to the dumpsite, although some companies like Plan International Pvt, Innovative green, and Our World International.

The picture is again different for rural areas, as there is no waste collection at all, and hence source separation for collection purposes is not a relevant issue. Nevertheless, rural households separate waste to a great extent to reuse and valorize mainly organic waste streams for either composting or feeding their cattle. This is further elaborated in the next section.

4.4 Waste disposal and recycling

4.4.1 Mixed waste disposal

Malawi has no lined landfills and instead relies on open dumpsites. There are no sanitary or environmental control mechanisms at an open dumpsite. Thus, leakage, pollution, and health hazards can arise uncontrollably. Nonetheless, they are official garbage disposal places. Every city has at least one open dumpsite. After the garbage has been collected from the cities, it is transported to a single dumpsite.

Lined landfills, also known as engineered landfills, are constructed with a composite or plastic liner to prevent leakage into the soil and preserve groundwater (although these landfills still have a significant environmental effect because they lack mechanisms to filter and handle escaping gases). Efforts were made to construct an engineered landfill in Msilo, Mzuzu, but only phase one of the project was completed.

Due to the severe lack of formal waste collection infrastructure, households have to dispose of waste themselves. Especially in low-income areas, only the uncollected waste that has no value is disposed of. The households use anything that has some value, showing rather high levels of circular activities such as reuse and repurposing. Yet still, quite some products are discarded as waste. Uncollected waste in Malawi is usually dealt with in two ways: dumping on illegal dumpsites or burning. Many Malawians have large rubbish pits outside their homes and routinely burn built-up waste. This includes plastics, organics, to all forms of hazardous and toxic materials, consequently releasing pollutants and greenhouse gases, causing damage to the environment and health effects such as higher levels of respiratory illness. Waste that isn't burned is dumped in local communities, rivers/water systems, farmed land or tossed out of moving cars' windows as litter. Waste thus accumulates in water systems, attracting vermin and posing serious health, safety, and environmental threat to Malawians.

Open dumpsite in Nhkata Bay

Open dumpsite in Lilongwe

Figure 13 Dumpsites at Nhkata Bay and Lilongwe

4.4.1.1 Waste activities at the dumps and landfills

At the municipal dumpsites, waste separation is done mainly by informal waste pickers, who separate the valuable waste from the non-valuable wastes, often focussing on streams such as plastics (PET, HDPE, PP), metal, and cardboard. Each waste picker picks an average of 9kgs, a maximum of 20kgs of plastics, and an average of 8 kgs of metal waste per day. There are over 400 waste pickers in Blantyre and Lilongwe, and over 53% of them recover plastic from the dumpsites[25]. For many of the pickers, their activities provide for a very basic income. However, margins are very low. After picking waste, they wash/clean in nearby water bodies (rivers) and sell to intermediaries who then sell to the recyclers. On average, IWPs in the plastic recycling industry make a profit of MK392 per day, which is way below the minimum wage for Malawi at MK962 per day. The social status of these pickers is low, too, as there is a stigma associated with waste picking. Generally, the waste pickers cannot aggregate sufficient volumes to sell on the market directly. In Malawi, an intermediary sector has emerged of Waste Transfer Centres (aggregators of waste) from which many of the recyclers buy. Waste transfer stations are industrial facilities where municipal solid waste, or MSW, is temporarily held and sorted before heading to a landfill or official waste disposal sites. Garbage trucks that run city routes drop off their trash here before it's loaded onto larger vehicles and shipped off.
Examples of Waste Transfer Stations are the two in Area 24 and Area 25 in Lilongwe. As a result, the pickers are reliant on these middlemen, waste aggregators, who buy various waste streams and store them until a significant volume can be sold. These purchasers frequently take advantage of the waste pickers' low social position and informal character by demanding exploitive prices that fluctuate without notice. Waste pickers also sometimes sell directly to the industry. However, this does not often happen as big companies do not buy small quantities of waste. Industries buy plastic based on type of plastic they produce. Starplex Industry, for example, buys plastic waste made of high-density polyethylene (HDPE) and low-density polyethylene (LDPE) to make plastic household utensils. Atomic Industry purchases PETE plastic bottles and containers to make packing containers. Rainbow Industries acquires many types of plastic recyclables, such as LDPE, HDPE, and PETE, to manufacture various goods, including household items and packaging materials.

The working conditions these pickers are relatively locked in, as to improve their business opportunities and professionalize their activities, financial capital would be required to purchase transport equipment such as push carts and bicycles, to construct storage facilities to generate greater volumes to avoid cases of market fluctuation and attract high prices, as well as to buy proper clothing and detergents etcetera to protect themselves from health hazards. However, their dependence on the aggregators and the low margins on waste hinder their opportunities to accumulate any wealth. Moreover, there is

[25] Kasinja,C; Tilley, E. Formalisation of Informal waste pickers` cooperatives in Blantyre, Malawi; Feasibility Assessment

no formal area where they can work besides the dumps, as no land allocated for waste picking and sorting businesses.

4.4.2 Waste disposal in rural areas

There are no dumps or landfills in the rural areas, and people have to provide solutions locally. However, people in rural areas that practice subsistence farming often demonstrate very high levels of circularity in terms of reuse and repurposing of waste and nutrients by composting used to grow their own food, extracting waste as animal feed, etcetera. Often, NGO's play an important role in training and enabling rural residents to compost and burn that which remains in a safe manner. Post-harvest waste from small-scale farmers are either composted, used as mulch, used as cattle feed, or in some cases (partially) burned when the volumes are very large. See top pictures for some examples. For the waste that cannot be composted or used directly (similar to the reuse practices that can be seen in low-income urban areas), dedicated burning pits are used (Figure 7a) burn but cover the pits with soil and open a new one. In other cases, they use pits and fill this with organic waste and then plant bananas on top of the filled pits as in Figure 7b.

Figure 7. a) Examples of the use of waste pit in rural and urban areas. b) bananas planted on former organic waste pit

Quite a lot of rural small-scale farmers also own cattle, which leads to manure production (mainly from cows and chickens).

4.4.3 Waste recycling and current markets

17 private players, including companies and enterprises, were consulted for this study. Organisations and companies were interviewed that are active in waste management, either collection, aggregation, recycling and/ or manufacturing companies. Twelve companies and enterprises and five NGOs participated in interviews.

Table 9 Overview of interviewed parties

Private Player	Activities	Types of waste					Products
		Plastic	Paper	Glass	Organic	Metals	
KCHKNA Pvt Ltd	Renewable energy and technology						Waste Management services
Vegan Africa waste solutions	Waste collection and recycling						Eco-bricks made from plastic waste
Malawi Fertilizer Company	Blending and Rebadging of Fertilizer						Fertilizer
EcoGen Limited	Provide biogas technology for people to make cooking gas and bio-fertilizer from organic waste						Biogas systems, bio-fertilizer, biogas, bio-pesticides
Our World International	Waste collection and recycling into various environmentally friendly products. Knowledge dissemination and awareness raising with various stakeholders such as communities, religious institutions, schools, the media						Fire briquettes, biogas, compost manure Glass Powder
OG Plastic 2008 Ltd	Involved in the production of plastic products since 2008. Use approximately 24% of its raw materials from waste. Recycle 6-7 tonnes of domestic waste. Have machine that can wash 100kg/hour of plastic waste in the wash line.						PVC pipes and fittings. HDPE pipe and fittings PET preforms, bottle, jars and closures. Household & molded furniture products like plates, Plastic & polythene bags and sheets. Woven sacks Plastic water tanks
Four Seasons	Gardening company, involved in production and purchasing and selling of compost since 2009. Collects > 800tonnes of organic waste/year						Produces > 280tonnes of compost per year. Much of the compost is used in its nurseries and some sold
Shore Rubber Ltd	Collects and recycle plastic waste. Involved in production of LLDPE, HDPE and LDPE products. Do recycle 15-20MT a month of waste at a cost of MK200 per kilo.						Plain & printed bread bags, snack packages, carrier bags, flour packs, clear oil and water pouches
Moyo Farm	Collection and processing agriculture waste Develop cook stoves from metal waste Produce cook stove fuel pellets from agricultural farm waste (such as maize stalks, maize husks and groundnut shells). The cook stove model is called Zipolopolo MK 25000 (US$31.25)						Produce and sell cook stoves using pellet fuel
Malawi Waste Advisors	Research, consultancy, knowledge dissemination, composting pilots, plastic projects						5 Research projects and 3 Consultancy projects including Assessment of the Solid Waste Value Chain for Lilongwe and Improving the circular economy of solid waste management in Blantyre and Lilongwe
Innovative Green	Waste collection and recycling						Selection of the reusable. Education and awareness raising.

Save the Future Foundation	To raise awareness on proper waste disposal and management. To carry out cleanup activities in areas with most improperly disposed wastes						Kamtoletole Initiative
Plan International Malawi Pvt Ltd	Waste collection and management						Waste collection Services
Go Green Malawi	Waste collection and Advocacy for improved waste management/ environmental management						Waste Collection Services and awareness
Chifuno Changa	Advocacy for improved waste management/ environmental management						Knowledge on waste management
Intelligent Waste Management Solutions	Advocacy for improved waste management/ environmental management						Knowledge on waste management

Table 9 shows the distribution of waste types that the companies were involved in. Out of the companies interviewed, most were involved in organic waste. Predominantly when looking at manufacturers/ processors (companies involved in processing waste), it showed that there is quite some activity only for organics and plastics compared to the other streams, indicating that there is a domestic market. For plastic waste, three companies involved in recycling/manufacturing of plastics were interviewed, and the rest are involved in the collection and disposal of plastics. Plastics companies are involved in recycling plastic into making bricks, PVC and HDPE pipes and fittings, PET preforms, bottles, jars, plates, pavers, and closures. Even though this number of companies does not provide a statistical result, the spread in activities and markets of these parties does reflect the current status of the market for waste and recyclables in Malawi, which was confirmed by the interviews and literature study. Most private companies are interested in organics and plastic. Malawi is distinctively different from neighboring countries such as Zimbabwe and Zambia, as there is more interest in organic waste than in other countries. This is expected because the Malawi economy as a whole is much more agricultural, and there are much more agricultural activities in and near the cities, which make large-scale organic collection and processing possible (wide availability of feedstock). The market shows potential for compost, fertilizer, biogas. On the other hand, there is a limited domestic industry for inorganic waste such as glass and metal. With hardly any companies which collects or processes paper and glass. Metals are mainly processed through a black market. For these streams, it will be more challenging to move towards circularity.

Organic waste

As previously noted, Malawi has a lot of activity with organic waste, both from households and markets. In Malawi, organic waste can be disposed of in a variety of ways, including: When no collection is organized, organic waste is mixed with other waste streams and ends up in landfills and dumps, or is dumped or burned; (2) organic waste is picked up separately by contractors, who bring the organics to Waste Transfer Centers, which aggregate sufficient volumes and then sell to companies that use organic waste. Malawi has more organic waste value chain players than other Southern African nations such as Zimbabwe and Zambia. Even though much of the organic waste has yet to be collected, there is a home market for compost and fertilizers. However, much of the organic waste created is still not treated. Less than 20% of organic waste is reused at the home level, and over 66% of households do not compost organic waste. Local governments and other stakeholders are working feverishly to deal with organic waste through different waste-to-wealth projects.

For example, Lilongwe City Council partnered with Four Seasons Private Company, Lilongwe University of Agriculture and Natural Resources, and local communities such as Mtandire and Msiriza on waste to wealth project. The project is about generating value from organic waste by producing compost. With the assistance of Waste Advisors, Blantyre Council established a composting facility that aims to valorize organic waste and is establishing a waste-to-energy plant. However, a major drawback for the scaling of organic compost production is that chemical fertilizers are heavily subsidized, and many large players are involved. It is difficult to compete with this for organic fertilizers and compost.

Plastics

Plastic is the second largest waste stream after organic waste in Malawi in terms of composition, however, it is a more problematic waste type in Malawi because of its persistence in the environment. Waste pickers sort the plastics that end up in landfills or dumps into different polymer types (on the dumps, there is a lot of competition for PET bottles (especially drinking water bottles) between waste pickers and sellers (a Malawian fermented beverage made from maize, millet, or sorghum flour) who reuse PET water bottles directly for packaging). Different types of plastics are purchased by intermediaries and industries, depending on the things they manufacture. It's then baled and sold to Waste Transfer Centres, which collect it in large enough quantities to sell the plastics to recycling organizations. Except for dyed plastic bags, aggregators typically buy all forms of plastics (most plastic recycling industries do not buy or recycle common plastic bags because it contains a variety of polymers and other materials such as metals, paper, pigments, ink, and adhesives are used during manufacturing). Plastics from small aggregators are sometimes also sold to middlemen, or sold to small manufacturers that, for example, melt plastics, mix it with sand and make bricks of it. The aggregators at times also wash the plastics before sending them to the recycling companies, such as OG Plastic and Shore Rubber. Recycling companies wash the plastics to remove further contaminants, shred, melt, then produce pelletized granules. There are many players, including waste pickers, companies, entrepreneurs, and NGOs in the waste plastic value chain. These include Intelligent Waste Solutions, Plan International Malawi Pvt Ltd, DDK Cleaning Services, Smart Waste, Hope Cleaners, and Vegan Africa. The majority of the players are more active in the waste collection side compared to the recycling side. Waste aggregators sell their products to the plastics industry in the country, which buys plastic pellets based on the type of plastic they produce, as explained above as well (e.g. Starplex Industry buys only plastic recyclables that are made from high-density polyethylene (HDPE) and low-density polyethylene (LDPE), Atomic Industry buying plastic bottles and containers made with polyethylene terephthalate (PET), and Rainbow Industries buying a mix of types of plastic recyclables which includes LDPE, HDPE, and PET.

It should be noted that the waste recyclers active in Malawi that are able to process plastics could, in essence, recycle more than they currently do. The company OG for example, has as a main focus the processing of agricultural waste but also processes plastics that they separate from the mixed waste they collect. In essence, they would be able to recycle much more plastics than they receive now *if* this were collected and disposed of separately. However, when compared to Zimbabwe, Malawi has less manufacturers of plastic and activities are less developed. Nevertheless, each year Malawi imports virgin plastics as well. So even though the technical requirements for secondary plastics as a substitute for primary plastics are high, there is quite some potential for increased use of secondary plastics and reducing import costs and economic dependencies.

Metals

In Malawi, informal garbage pickers collect metal scrap from garages, metal workshops, bottle stores, and dumpsites. In addition to recovering metal scraps from dumpsites, 67 percent of informal workers purchase metal from private individuals. As metal is great in demand and value, it is rarely thrown away by homeowners. Households frequently hoard valuable metal scraps to sell to waste buyers. When it comes to determining what type of metal is recovered, the price is the most important issue. Aluminium is the most collected metal due to its low cost (K450 per kilogram) and availability, whereas

steel is the least collected metal due to its poor financial gains (K30 per kilogram). Because of this, aluminum is widely available[26]. Other metal waste streams are of higher value but very scarce in domestic waste composition. These include copper and lead. The market for metals, of which a large part is a thriving black market, mostly revolves around aluminium waste cans. There is no recycling of metals such as lead, aluminium, copper, and brass in Malawi, only recycling exists for steel. Several parties recycle steel within Malawi, such as Agrimo Industries. Generally, steel is not exported because steel scraps do not generate high revenues, and Malawi as a country has a domestic steel demand. The other recovered metals are exported to either South Africa or Tanzania where they are recycled. Pickers who solely depend on recovering waste from dumpsites miss the opportunity to acquire the higher quality metal scraps, which are only available from households directly, but require[27] financial capital (i.e., cash in hand) to purchase, which makes the scrap metal trade more difficult to achieve for some very low income workers[28]. On average, a single waste picker can recover 10 kg of metals a day. Several companies involved in buying and crushing cans, in order to export the bales of crushed cans to South Africa where 30 tonnes of waste cans can generate a profit of $6500. Malawi does not produce metal and can reduce the importation of metal by promoting local recycling.

Glass

The first regards a beverage deposit system promoted by the beverage industry, where households and bars pay a small fee for each bottle which they get back when they return the empty bottles. Glass cannot be recycled within the country (apart from artisanal uses), and according to a study by Kasinja, glass is not worth exporting. Glass as domestic waste stream is small in Malawi. For glass, there are two common forms of reuse. If the households are not purchasing another beverage, some participating depots such as supermarkets give vouchers for grocery shopping instead of exchanging for more beverages. The customers get a discount on their next purchase. In some instances, the bottles are collected by bottle vendors who move from household to household, buying the bottles, then reselling them to depots. There is no manufacturing or recycling in Malawi; glass cannot be recycled within the country (apart from artisanal uses) and is not worth exporting.

Paper

There is only small-scale paper recycling in Malawi. There are a number of routes for paper waste. Paper waste is often mixed with other waste streams and ends up at the dumpsite, waste pits, or disposed of in unofficial open spaces such as roadsides and river banks. Secondly, households burn their own waste paper, or it is used as fuel for cooking when no collection is organized. Thirdly, paper waste is picked up separately by contractors, which bring the paper to Waste Transfer Centers, which aggregate sufficient volumes and then sell to companies using paper waste; and lastly, paper waste is picked up separately from households and markets by processing companies directly for recycling, but this does not occur very frequently. The main challenge with paper is that it should not mix with organic or liquid waste as it can get wet and spoiled, making it very difficult to reuse or recycle. The majority of private players involved in the collection and disposal of waste paper do this in combination with other types of waste, such as plastic and organic waste (without separation). Waste paper in Malawi is mostly recycled into briquettes or into toilet paper. Companies such as Dynamic Recycling Malawi, Ltd ventured into collecting paper-based trash and processing it into egg trays to support the large Malawian egg businesses. The paper waste can also be used to manufacture other packaging goods. However, the market for products from waste paper such as briquettes is not yet fully developed, and some NGOs have been trying to develop this activity for a decade. Still, it never got onto a bigger scale.

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[26] Kasinja,C & Tilley. E; Formalisation of Informal Waste Pickers` Cooperatives in Blantyre, Malawi: Feasibility Assessment

[27] Kasinja, C., & Tilley, E. (2018). Formalization of informal waste pickers' cooperatives in Blantyre, Malawi: A feasibility assessment. *Sustainability*, *10*(4), 1149.

[28] Sustainability | Free Full-Text | Formalization of Informal Waste Pickers' Cooperatives in Blantyre, Malawi: A Feasibility Assessment | HTML (mdpi.com)

4.5 Gender assessment of the waste system

There is significant participation of men and women in the waste sector of Malawi, but there are some gender dimensions that were noted. Both women and men are equally represented in the waste business for plastics. Tasks in plastic processing are divided by gender: women are solely responsible for the washing process, while men separate the plastics and operate the machinery. However, in both situations, women were only seen washing the plastics, while men were in charge of sorting the plastics and operating the machinery. It was concluded that men and women do not work together and often do not have the same tasks and that there is gender segregation in the sense that men and women do not work together for cultural or traditional reasons.

Another observation made was that when women are supported, for example, by an NGO or a specific project, they can thrive. The program “Waste for Wealth” funded by UNDP, is a good example. The project aimed at promoting the empowerment of women and trained 52 women to be compost entrepreneurs[29]. The women were supplied with tools, some land, and a shed to sort and compost waste. They were also linked with a market, and they sold the compost to a local nursery and earned US$50 per month each. Some were reported to have built houses and sent children to university from the proceeds of the compost businesses. Moreover, women tend to work more in the informal sector and CBOs where a large part of the waste management activities occur. It was observed that waste pickers were mostly women and children. They go directly to the industries sites to sell the plastics to companies such as Plastico Industry in Blantyre. During the household surveys in Nkhata Bay, the study observed that women were indeed involved in the informal industry. For example, plastic bottles were collected, cleaned, and reused to package local drinks made of baobab fruit powder. See the photos below showing a woman with a wheelbarrow with plastic bottles collected, selling the baobab fruit powder drink.

Figure 14 Informal waste reuse by a woman (Source: Moffat Kaunda Go Green 2021)

Because the majority of these operations occurred in the domestic market and were sold at marketplaces, they are not frequently visible or quantifiable. I t is not immediately clear what activities the women in the waste industry conduct. Women are more likely to work in the informal sector and non-governmental organizations, where a major portion of waste management operations take place. According to the Ministry of Gender, Children, and Social Welfare, appropriate policy and regulatory support exists to achieve gender equality in all industrial sectors. Women are encouraged to start their own enterprises.

Both men and women have limited skills to support the management of proper businesses in the waste industry, with women faring worse. Even though laws and regulations are accessible, they do not address specific areas such as trash. Due to a lack of education, they have little awareness of the sorts

[29] Barré, J., Waste Market in Urban Malawi - A way out of poverty?. 2014. Swedish University of Agricultural Sciences - Faculty of Natural Resources and Agricultural Sciences. https://stud.epsilon.slu.se/7550/1/barre_j_150107.pdf

of high-value trash-related companies they may engage in, particularly manufacturing using garbage. To manage a competent waste business, both men and women must be adequately trained. There is a particular need for capacity development in terms of access to relevant technology that is also useable and adapted to the needs of women, such as processing equipment. According to government policy, women should be permitted to hold at least 40% of the posts in all areas of production/activity. On the other hand, women describe challenges like lack of awareness of the law, legislation, and regulations, a greater risk of harassment, and so on. Women continue to have a low representation in positions of power (about 25%). Another factor influencing female participation in the garbage industry is a lower literacy rate of 58.6 percent compared to 72.9 percent for men.

During the study, some additional gender trends were observed. For example, women were more active and empowered in the Lilongwe Waste for Wealth Project than men. Female entrepreneurs in the waste business in Mtandire and Area 24 in Lilongwe could have tangible resources that they had purchased using proceeds from compost sales. More women are actively involved in Community-Based Organisations (CBOs) (for example, women in Mtandire involved in composting of organic waste). Yet most women are still in the lower levels of the waste value chain. Women are well represented on the waste pickers level and at group level litter groups, as small aggregators, but not at large scale aggregators level. The disadvantage is that their incomes are lower because, at those levels, they cannot sell directly to recyclers – small aggregators do not achieve the required quantities to sell to recyclers (usually, at least a tonne per type of product). Thus, there is a need for improved coordination in the waste sector of local authorities, households, and private players. For gender parity, each gender should be represented equally which means the participation of women needs to increase to at least 50%. So, this study concluded that the first important step for achieving gender parity in high-value chains in waste, especially in waste streams that women are not ordinarily in, is awareness-raising on possible projects they can do. This would need to be followed with access to appropriate equipment, business premises, and technical skills.

5 Overview of the key stakeholders and waste value chains

The goal of this project was to create a roadmap for a specific waste stream that would allow Malawi to move toward a more circular waste system. It was vital to understand who the major stakeholders in the waste system are and the value chains of the various waste streams. This section provides an overview of the key players identified for Malawi's waste system, as well as a visualization of the value chain for each of the waste streams based on the previous chapter's results, with a concise qualitative assessment of the gaps and opportunities within each of these value chains, as well as an overview of the waste-specific key players involved.

5.1 Overview of key players in the waste system

The stakeholders involved in this project were based on the predefined categories of stakeholders as defined in the project plan. They were either interviewed or surveyed (see the Appendix for sample sizes). In addition to this list, desktop research and a list shared by the NDE were used to identify other key stakeholders in the waste system in Malawi.

In addition to identifying, surveying, or interviewing the key groups and stakeholders per group, an Influence-Interest analysis was conducted based on the Influence-Interest methodology. The level of influence and interest was estimated (see Appendix B for a more detailed description of the method). The methodology helped identify and cluster relevant stakeholders based on their level of influence relating to a specific topic, project, or company, in this case, the waste sector. For the stakeholder analysis and engagement throughout the project, it was decided to exclude stakeholders that would not have an impact in line with achieving the objective of the waste assessment study (low-interest, low influence). By taking this approach, it was possible to inform the selection of the appropriate stakeholders to assess their role in and relation to the waste management system and the circular economy, as well as the related management approach.

Table 10 gives a (non-exhaustive) overview of the key players in the Malawi waste system.

Table 10 Overview of the key players in the waste system

Stakeholder Group	Relevant Key Stakeholders	Interest and Commitment to CE Concepts
National Government	**Ministry of Forestry and Natural resources** • Malawi Environment Protection Authority	Regulation of water and sanitation, water quality monitoring, including but not limited to regulation of the petroleum and energy sector
	Ministry of Education	Development of curricula on waste
	Ministry of Industry, Trade, and Tourism • Malawi Bureau of Standards	Development of Standards and enforcement of Standards as well as promotion of investments in waste management
	Minister of Local Government • Malawi Local Government Association (MALGA • City, Municipal, Towm, and District councils	Waste management service provision and operation of dumpsites, public awareness, formulation of by-laws, including the development of waste management infrastructure
	Ministry of Finance and National Planning • Malawi Revenue Authority	Responsible for the allocation of financial resources for various developmental activities throughout the country. Collection of taxes and provision of tax incentives.
Private Sector Business ✓ **Companies** ✓ **Enterprises**	• KCHKNA PRIVATE LIMITED • Vegan Africa waste solutions • Malawi Fertilizer Company • Eco-Gen Limited • 'Our World International • Innovative Green • GARBMAN LTD • Shore Rubber • OG Plastics • Malawi Waste Advisors • Mayo Fam • Malawi Association of Manufacturers (MAM) • Waste Recyclers Association of Malawi • Dynamic Recycling Malawi, Ltd • Randera Company • Kumilonde Modern Agriculture • Ask Enterprises • R&G Agriculture • Fajo Investments • Farmers Organization Limited • Limbe Agriculture Trading Company • MS Trading	Coordinating industry activities in as far as waste minimization is concerned

Stakeholder Group	Relevant Key Stakeholders	Interest and Commitment to CE Concepts
	• DDK Cleaning Services • Smart Waste • M&D Cleaners • Agrimal Limited • Ashan Steel • Auhud Steel • Key Waste Management Services • YODEV Waste Management Services • Golden Plastic	
Development Partners/ Non *Governmental* Organisations (Civil Society)	• UNDP • Foundation for Community Support Services (FOCU) • Malawi Waste Advisors • Namati • Save the future Foundation • Empower Malawi • Adventist Relief Agency • Malawi Human Rights Resource Centre (MHRRC) • African Development & Education Foundation (ADEF) • • Intelligent Waste Management Services • Go Green • JICA • IFC • European Union	Have a role in the education of communities, advocacy for a clean environment, supporting of waste management initiatives
Learning and Research Institutions (Academia)	• Mzuzu University • Malawi University of Science and Technology • Blantyre International University • Lilongwe University of Agriculture and Natural Sciences • University of Malawi • Malawi University of Business and Applied Sciences	Research and training. Development of appropriate technology; development of courses in waste management

5.1.1 The informal sector

The informal sector also plays a pivotal role in managing waste in Malawi. In almost all major dumpsites in Malawi, there are Informal Waste Pickers (IWPs) – at least 40 at each dump. The activities of waste pickers help to reduce the amount of waste disposed at dumpsites and the use of virgin materials for manufacturing. These individuals (men/women), groups, or unregistered micro-enterprises collect, sort, process, and transform recyclable materials. However, IWPs are not financed or recognized by solid waste authorities. Main challenges waste pickers face are that they lack protective equipment and are exposed to injuries and diseases at the dumpsites. They are not well resourced and experience low material prices with exploitative price fluctuations, negative public perception, and a lack of transportation. In an effort to assess the feasibility of formalizing waste pickers, a study was conducted in Zingwangwa, an unplanned settlement in Blantyre, to understand whether the formalization of IWPs into cooperatives could be effective and/or accepted as a way of managing Municipal Solid Waste in unplanned urban settlements in Malawi. It was discovered that it is difficult to formalize waste pickers into cooperatives because of fear of decreased income, conflicts during proceeds sharing, free-riding behaviours, and an attachment to their independence.

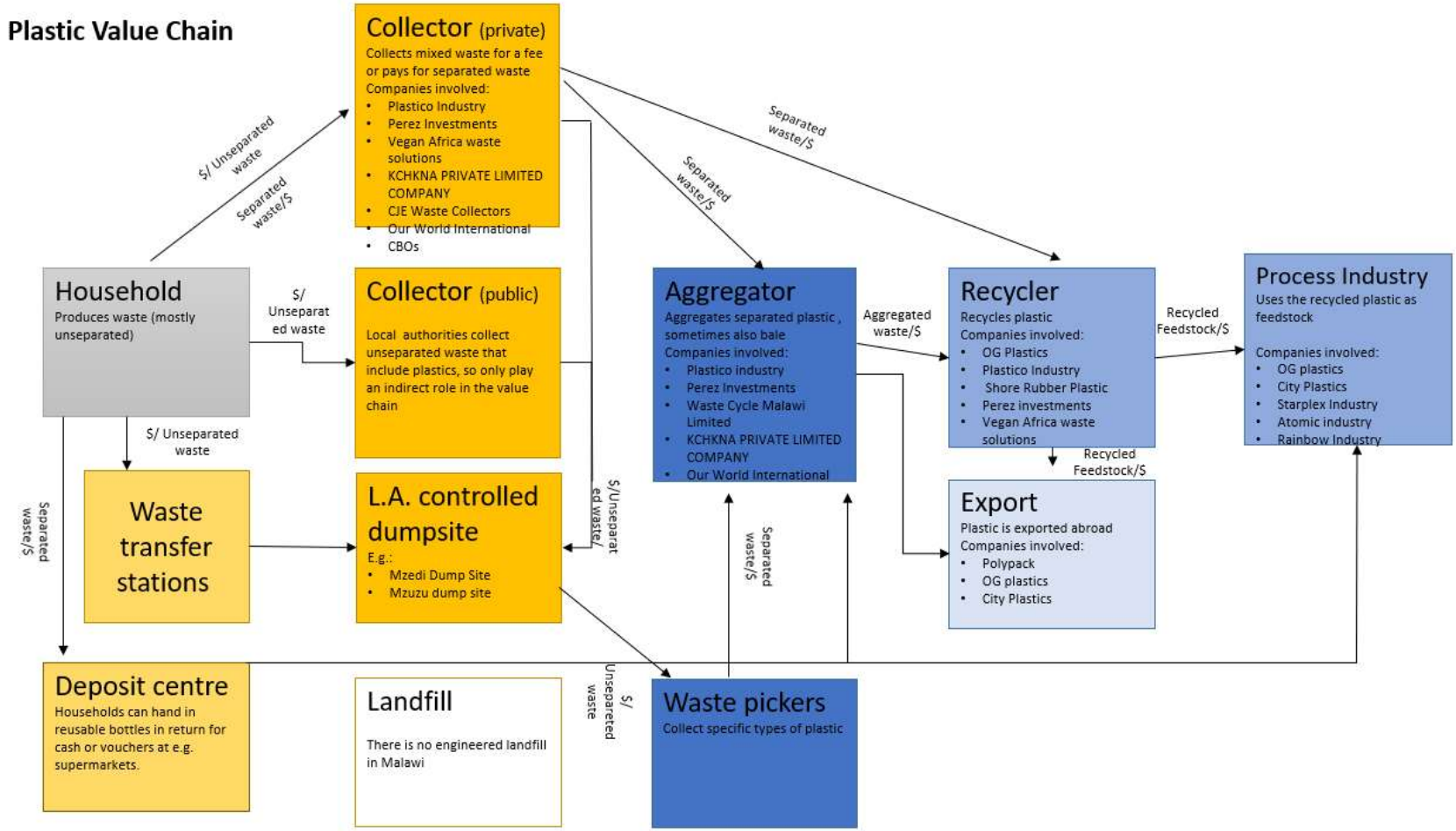
Even though waste pickers play a critical role in the value chain of waste management, they also pose a challenge because they are neither regulated nor organized. As a result, their operations are hazardous and not hygienic (they lack protective clothing and do not follow any safety or hygienic procedures). Some of them consume or sell expired food items, and at times they interfere with the proper operations of local authorities at dumpsites. Therefore, for waste management to be sustainable and inclusive, the informal sector waste management should be considered in planning any waste management initiative in Malawi.

5.2 Overview of the value chains per waste stream

Below, the value chains for the different streams are presented. The color scheme indicates the following:

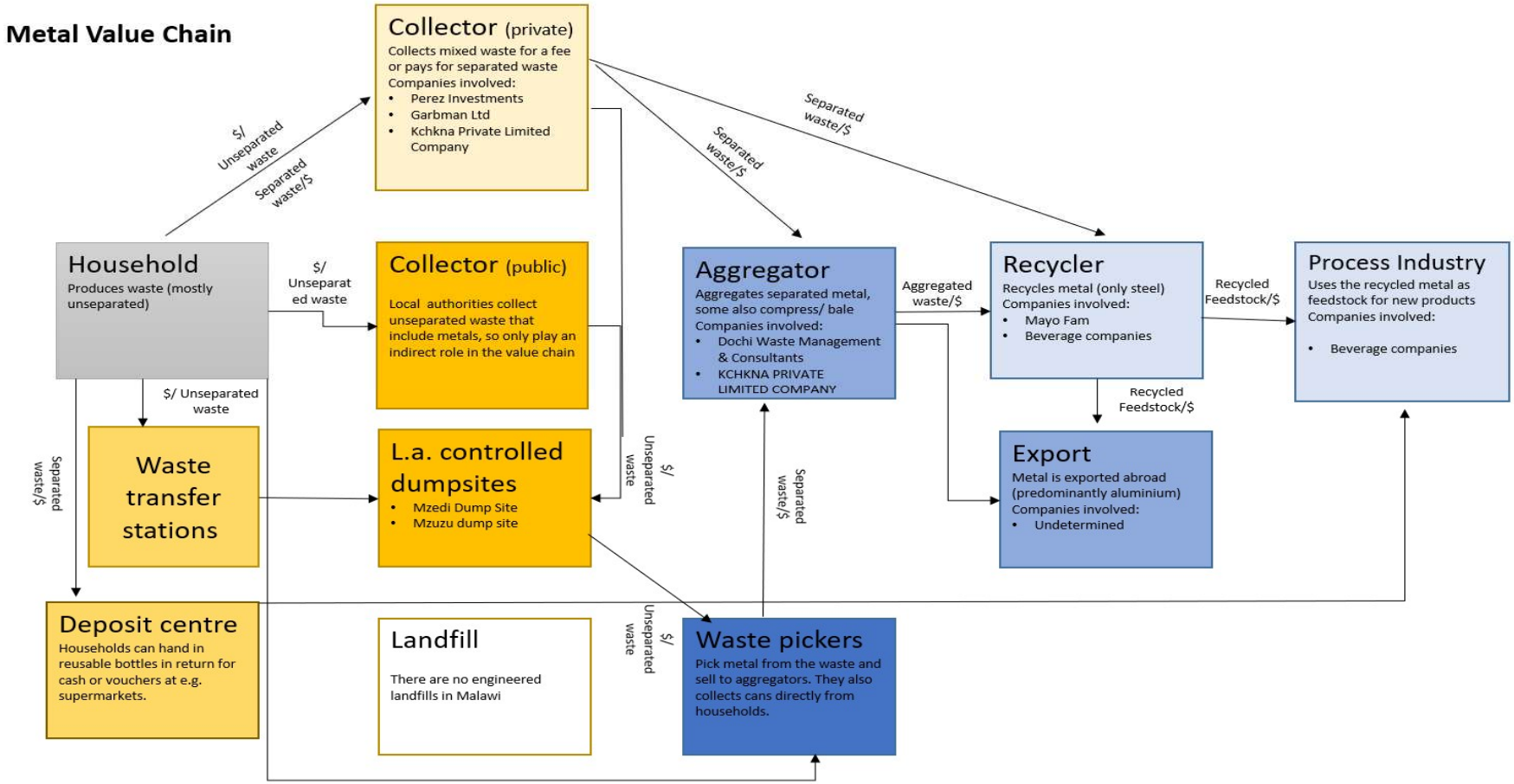
Many (players) available	Many (players) available	No (players) available
Some (players) available	Some (players) available	
Very few (players) available	Very few (players) available	

Examples are given of some of the most important players in the boxes. These name lists are non-exhaustive. Yellow indicates all activities from waste generation to disposal. Blue indicates all activities aimed at value recovery or addition (from picking and aggregation to processing).



Findings

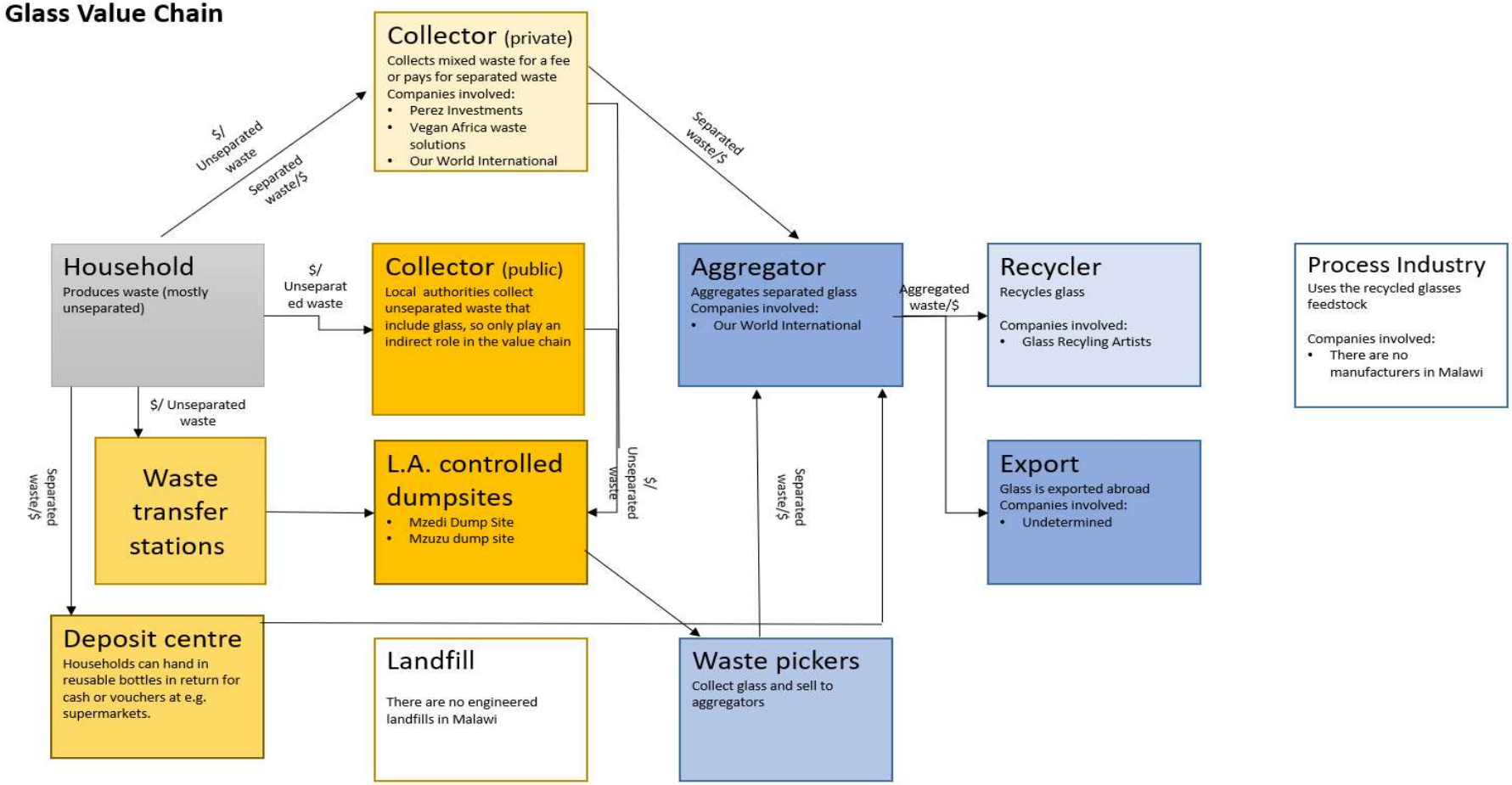
- The plastics value chain is rather developed. Most activity resides around collection and aggregation.
- Many private collectors collect plastic waste separately, that sometimes goes to aggregators, often directly to recyclers.
- There are many waste pickers and informal aggregators active in the picking and collection of plastic waste.
- There are quite some recyclers of plastic who shred and pelletize. Some recyclers also produce new products; others sell to producers.
- There are some plastic producers in Malawi.
- The market is largely domestic, with not much plastics being exported.



Findings

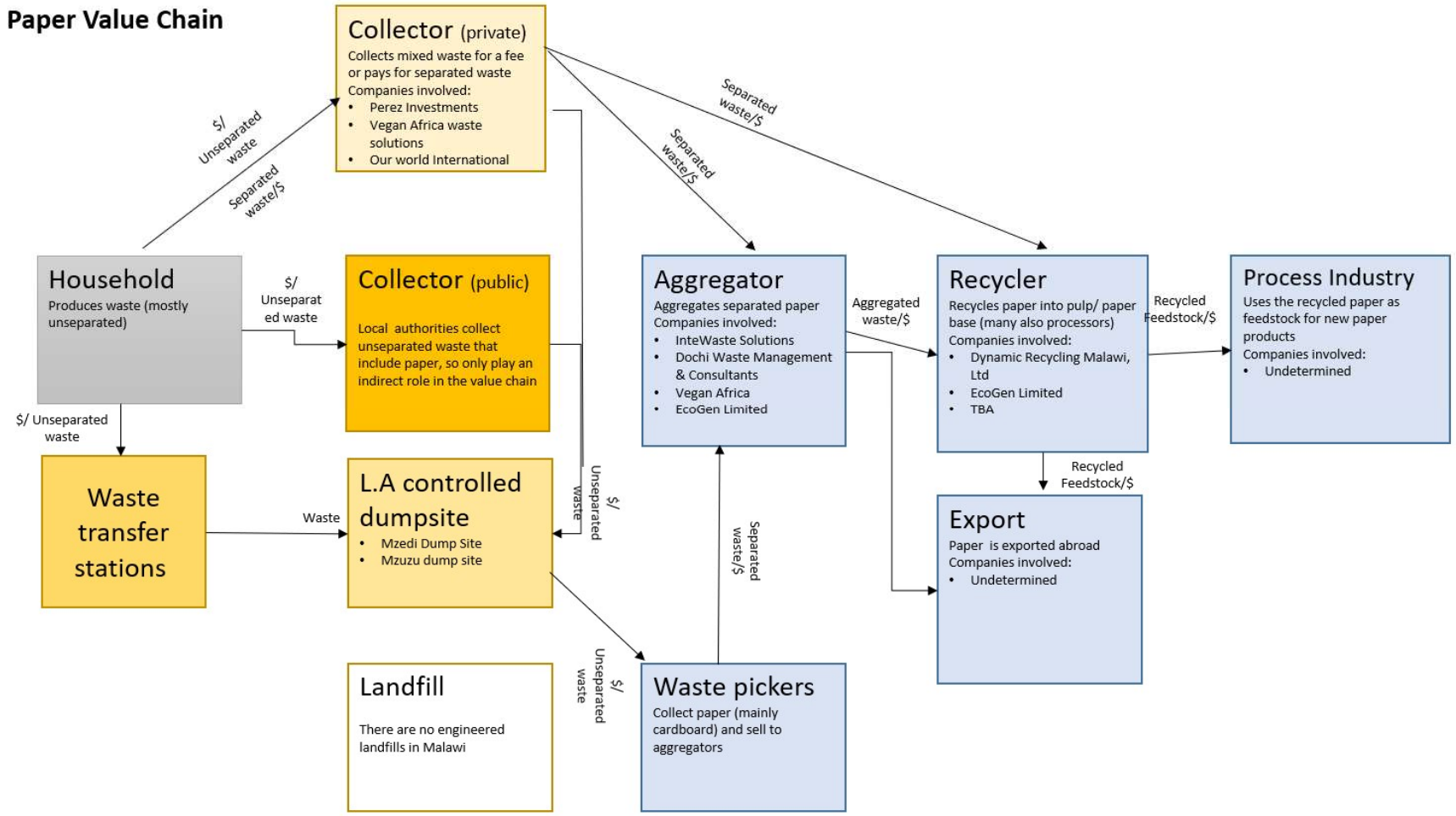
- Quite some metal is collected from households directly for a fee by informal players who sell to aggregators.
- There are a few formal private players active in the separate collection of metal waste from households. Most of the metal waste is exported to South Africa or Tanzania.
- There is more metal waste from industrial activities. However, this is not included in the scope.
- There current domestic market for metal waste is relatively small. Most metal waste is exported.
- There are only a few metal recyclers (only for steel).

Glass Value Chain



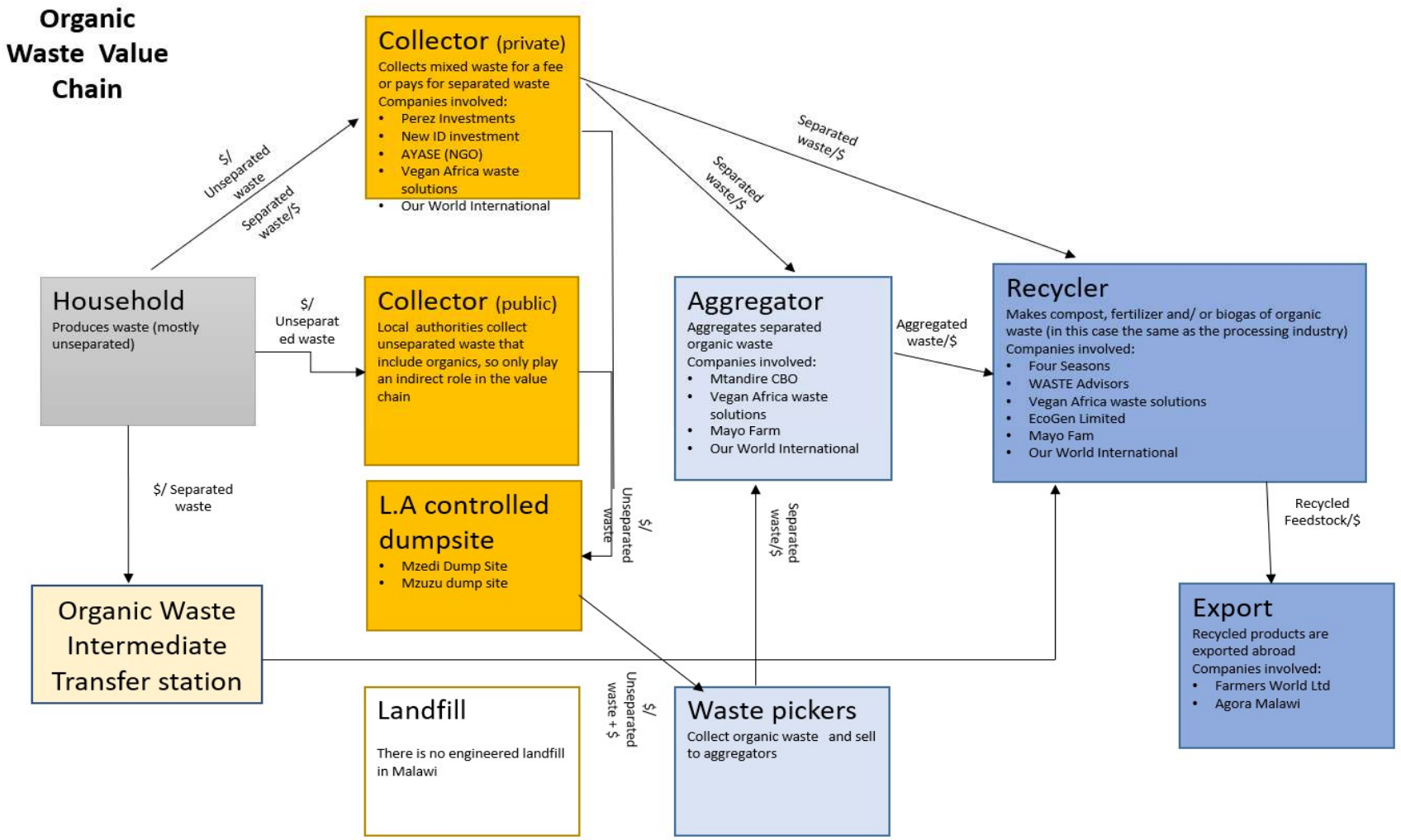
Findings

- There are very few players active in the separate collection of glass waste. Bottles are deposited by households themselves and non-bottle glass is usually mixed with the residual waste.
- There are only a few glass recyclers
- There are no glass manufacturers in the country.
- Deposited bottles are aggregated and exported for refilling with beverages (mainly in South Africa).



Findings

- Due to the low awareness among the citizens there is a lot of paper contamination resulting in not many companies collecting paper separately.
- There are also few waste recyclers for paper.
- There are only a few paper manufacturers.



Findings

- There are many players active in waste collection. Most of them are in the separate collection of organic waste.
- Due to the nature of the waste (organic, smelly), there are not many aggregators or waste pickers involved.
- There are only a few pilot projects and initiatives on composting, but not many private parties are active in composting and producing fertilizer. There is some activity on biogas production.

6 Policy and regulatory landscape

6.1 Policies and regulations

This section describes and assesses Malawi's policies on waste management and climate change pertaining to the CE. Inconsistencies and gaps are described that occur between CE principles and Malawian waste and climate policies and formulated targets implemented by its directives and regulations. As in most countries, there has not been a full implementation of a CE strategy in Malawi. Most efforts reported below relate to waste treatment and recycling, with the overall goal to reduce the amount of waste in both nature and landfills.

Several major policies in Malawi are directed at the circular economy (though not expressly mentioned), including the Waste Management Policies, other environmental policies, energy, climate policies, and the NDCs (see for a more detailed description in the next section). Although the main objectives of these policies vary, all of them make explicit reference to one or more building blocks of the circular economy.

Table 11 summarizes all identified relevant policies and regulations in place.

Table 11 Overview of policies in relation to the circular economy and waste management

Policy, Legislation/ Statutory Instrument (SI) or National Strategies	Description
The National Constitution of Malawi (1994 as amended)	The Constitution of Malawi (1994, as amended) recognizes that responsible environmental management can contribute to achieving sustainable development, improved standards of living, and conservation of natural resources. The Constitution states that the environment of Malawi should be managed to: • Prevent the degradation of the environment. • Provide a healthy living and working environment for the people. • Accord full recognition of the rights of future generations by means of environmental protection.
Malawi Vision 2063	According to Malawi's Vision 2063, the country aspires to be an industrialized upper-middle-income country that primarily finances its own development needs. The vision identifies 3 pillars Pillar 1: Agricultural Productivity and Commercialization; Pillar 2: Industrialization; and Pillar 3: Urbanization. The vision is relevant to the waste sector because it employs the following among its strategies. 1. Ensuring the provision of clean water, sanitation, and hygienic services at the household and community level; and 2. Provision and promotion of the use of improved and accessible sanitation facilities in all public places and improving the management and disposal of liquid and solid waste. The Vision is concretized in the First Ten Years Implementation Plan (MIP-1). **MIP-1 aims to meet two key milestones:** i. to raise the country's income status to a lower-middle level by 2030 ii. to meet most of the **Sustainable Development Goals (SDGs**) whose end-line target is 2030. It is primarily guided by the need for the country to create wealth for financing its own development needs and alleviating the country's current massive debt, by building capacities towards efficient utilization, tracking and recovering the resources generated and mobilized by the country towards the development agenda.
National Environmental Policy (NEP) 2004[30]	The National Environmental Policy was produced in 1996 and revised in 2004. According to NEP, every person in Malawi has a right to a clean and healthy environment and a duty to maintain and enhance the environment. Women should effectively participate in policy, program, and project design and implementation to enhance their role in natural resource use and management activities. The policy stipulates that in order to promote urban and rural housing planning services that provide all inhabitants with a healthy environment and sustainable human settlements, among other strategies, Malawi should; • Improve water-borne sanitation systems and solid waste disposal using appropriate technology and proper design, selection, and licensing of disposal sites and routes. • Facilitate adoption of systems that sort industrial, clinical, domestic, and other waste at source to facilitate recycling of materials

[30] National Environmental Policy of Malawi. 2004. http://www.ead.gov.mw/storage/app/media/Resources/Policies/Malawi%20National%20Environmental%20Policy.pdf

Policy, Legislation/ Statutory Instrument (SI) or National Strategies	Description
	wherever possible. • Facilitate privatization of waste management.
Environmental Management Act, 2017[31]	According to the EMA Act, every person shall take all necessary and appropriate measures to protect and manage the environment, conserve natural resources, and promote sustainable utilization of natural resources. PART III of the Act also establishes Malawi Environment Protection Authority (EPA), the principal agency for protecting and managing the environment and sustainable utilization of natural resources. PART VII on Environmental Standards, the Act stipulates that the Authority shall, in liaison with relevant lead agencies among others, establish; 41(d) guidelines for the disposal of any waste in the soil, the optimal utilization of any soil, identification of the various soils and practices that are necessary to conserve soil and prohibition of activities that may degrade the soil and for monitoring and control of soil degradation PART VIII — Management of The Environment and Natural Resources The Authority shall, in liaison with lead agencies and operators; (a) formulate such measures as are necessary to regulate the collection, storage, transportation, reduction, and safe disposal of waste; (b) promulgate such rules or formulate criteria and standards for the classification and analysis of waste and shall determine the method or methods for safe disposal of waste; € control the handling, storage, transportation, classification, importation, exportation and destruction of waste; (d) control the reduction of waste; a€(e) monitor any waste disposal site and direct the control of any such site if its continued use as a waste disposal site A person shall not handle, store, transport, classify or destroy waste other than domestic waste, or operate a waste disposal site or plant, or generate waste except in accordance with a license issued under this section. The Act allows those who want to carry on the business of handling, storing, transporting, classifying, destroying, or disposing of waste to apply for a license.
Environment Management (Waste Management and Sanitation) Regulations. s. 37 of 2008[32]	The regulations stipulate measures that encourage circularity of waste Part III and Part IV regulates General or Municipal Solid Waste, Solid Waste Recycling and Recycling Facilities According to the regulation; Any person who generates or collects solid waste shall sort out the waste by separating hazardous waste from the general or municipal solid waste. The general or municipal solid waste shall be further sorted out into categories of wastes that can be recycled or reclaimed and waste that is earmarked for disposal A local authority or private contractors that it may assign shall be responsible for collecting the general or municipal solid waste in its area of jurisdiction. This shall be done at such a frequency as to prevent waste piling. Waste separation should be maintained during collection,

[31] http://www.ead.gov.mw/resources/document-library
[32] Environment Management (Waste Management and Sanitation) Regulations.S37. 2008

Policy, Legislation/ Statutory Instrument (SI) or National Strategies	Description
	transportation, and offloading at the respective waste disposal sites or recycling facilities. The law instructs recyclables to be delivered only at any recycling facility licensed for that purpose under these Regulations and not to a waste disposal site or plant. According to the regulation, the following materials may be recycled: paper; plastics; metals such as aluminium foil, beverage cans, metal, food cans; tyres; and leaf and yard waste and other organic materials, including agricultural solid wastes. The regulations encourage and provide for waste recycling business. Any waste recycling business to operate with a license and develop solid waste reduction and recycling plan and annual reports.
National Waste Management Strategy	The Strategy provides information on the regulatory and institutional infrastructure, the status of waste management in Malawi, and different types of wastes as well as tools to enable regulatory bodies, generators of hazardous waste, including the public, and recyclers and operators of facilities to enable them to minimize, recycle, treat and dispose of waste in an environmentally sound manner for the sustainable development of Malawi. The strategy prioritizes; 1. FormulatIon policies and enact legislation to reduce waste generation; (b) promote responsible public behaviour on waste management; 2. Promotion waste segregation at source; 3. Reduction, Reuse, Recycle, and Recover energy from the waste; 4. Promote waste treatment 5. Establish environmentally sound infrastructure and systems for waste management
National Sanitation Policy (2008)	The National Sanitation Policy provides a vehicle to transform the Sanitation and Hygiene services in Malawi. It provides oversight and guidance on sanitation and hygiene services implementation at all levels in Malawi. The target was to ensure all Malawians have access to improved sanitation; safe hygienic behavior is the norm; and recycling of solid and liquid waste be widely practiced leading to healthier living conditions, a better environment, and a new way for sustainable wealth creation by 2015. The policy advocates for the improvement of sanitation and hygiene and the recycling of waste.
Local Government Act of 1998	Local Government Act of 1998 assigns the municipalities to be responsible for solid waste management (this law is presently under review).
Malawi National Environmental Action Plan (NEAP) in 2004	The first Environmental Action Plan was developed in 1994, which provided the framework for integrating environmental protection and management in all national development programs to achieve sustainable socio-economic development. The Action Plan was used as a reference document to guide planners, developers, and donors and sought to document and analyze environmental issues. It was also aimed at identifying measures to alleviate them, promote the sustainable use of natural resources, and develop an environmental protection and management plan, such as To minimise waste from source;

Policy, Legislation/ Statutory Instrument (SI) or National Strategies	Description
	• ensure that households in areas not covered by a refuse collection service have rubbish pits; • introduce the separation of different types of waste before disposal. Improve waste collection and transportation of municipal wastes. • improve the solid waste collection services, by e.g. introducing rubbish banks in traditional housing areas including squatter areas; • ensure that master plans for their sanitation programmes are developed; • intensify public education on rubbish disposal. Improve conveyance and disposal of wastes. • practice sanitary waste disposal methods at landfills; • ensure that siting of landfills and sewage treatment plants should take into consideration hydrological and soil characteristics as well as proximity to human settlement; • sensitize the general public on the dangers of scavenging at refuse pits.
National Climate Change Management Policy 2016	The National Climate Change Management Policy (2016) is a key instrument for managing climate change in Malawi. It is a guide for integrating climate change in development planning and implementation by all stakeholders at local, district, and national levels in order to foster the country's socio-economic growth and subsequently sustainable development.
Nationally Appropriate Mitigation Actions (NAMAs)	Malawi's NAMA was developed in 2015 to promote country-driven and voluntary mitigation actions in the country. Sectoral NAMAs are planned for development depending on the country's priorities, capacities, resources, and other support interventions. Waste management is one of the prioritized areas in NAMA. The recommended technological approaches to mitigate GHGs in the waste sector are waste generation, use of landfill biogas, controlled incineration, and composting for organic manure. It is estimated that the total reduction in GHG from municipal waste reduction, composting, and conversion of wastes to energy to be 2,792.5 Gg of CO_2 eq. between 2015 and 2030.
Local Authorities By-Laws e.g., Local Government (Blantyre City Council) (General Cleanliness) (Refuse and Rubble Disposal) By-Laws under s.103. G.N.16/2003[33]	Every owner or occupier of premises shall provide and maintain for use at his premises at least one receptacle for depositing refuse. Every occupier of premises shall cause all refuse from his premises to be deposited in his refuse receptacle and not elsewhere for collection by the Council's refuse collection service. The city councils/ municipalities are responsible for collecting waste from the waste receptacles to the waste disposal site. Not all authorities have By-laws.
Gender Policy (2015)[34]	The purpose of the policy is to strengthen gender mainstreaming and women empowerment at all levels to facilitate the attainment of gender equality and equity in Malawi. Malawi will not succeed in addressing waste change challenges if women do not play a key role in all the waste streams and waste value chains. The following policy statements were developed to address gender disparity in environmental issues (waste management included) and economic development; • All gender groups value and own natural resources and their environment.

[33] Blantyre City Council General Cleanliness (Refuse and Rubble Disposal) By-Laws under s. 103 G.N. 16/2003

[34] National Gender Policy. 2015

Policy, Legislation/ Statutory Instrument (SI) or National Strategies	Description
	• Gender is mainstreamed in natural resources and the environment. • Gender issues are mainstreamed in all poverty reduction and economic empowerment initiatives • Women's participation in economic empowerment initiatives is increased and strengthened The National Gender Policy promotes alternative energy, women's involvement and participation in natural resource management, environmental degradation, and climate change mitigation.
Environmental Management (Chemicals and Toxic Substances Management) Regulations (2008)	According to Part 11; no person shall engage in business of manufacturing, repacking, importing, exporting, transporting, distribution sale or other handling of chemicals and toxic substances without licence.
National Energy Policy (2003) Public Health Act	The policy envisions improving access and affordable modern energy services and mitigating environmental, safety, and health impacts of energy production and utilization. The policy is meant to transform the country`s energy economy from one that overly depends on biomass (93%) to one with high modern components in its energy mix.
Public Health Act CHAPTER 34:01 (1992)[35]	According to PART IX, on sanitation and housing, Section 59 'No person shall cause a nuisance, or shall suffer to exist on any land or premises owned or occupied by him or of which he is in charge, any nuisance or other condition liable to be injurious or dangerous to health.' According to the Act, nuisance is any of the following among others; any collection of water, sewage, **rubbish, refuse,** ordure, or other fluid or solid substances which are offensive or which are dangerous or injurious to health or which permit or facilitate the breeding or multiplication of animal or vegetable parasites of men or domestic animals, or of insects or of other agents which are known to carry such parasites or which may otherwise cause or facilitate the infection of men or domestic animals by such parasite. Section 60 says it shall be the duty of every local authority to take all lawful, necessary, and reasonably practicable measures for maintaining its area at all times in clean and sanitary condition, and for preventing the occurrence therein of, or for remedying or causing to be remedied, any nuisance or condition liable to be injurious or dangerous to health and to take proceedings at law against any person causing or responsible for the continuance of any such nuisance or condition. Solid waste is not clearly defined in the public health Act but is imbedded in the categories of nuisance. In respect of nuisance, waste included, the emphasis is on avoidance and removing the waste.

[35] Public health Act. 1992

6.1.1 Gaps identified in the current policy and regulatory landscape

It is encouraging that Malawi policy and institutional frameworks relating to environmental management are diverse and elaborate. Malawi has developed and put a number of legislative frameworks and strategies that address environmental protection. Environmental protection is enshrined in the Constitution and was quoted as a long-term objective in Malawi's Vision 2020 document. The country developed public policies and private initiatives to advance toward integrated waste management and a circular economy, including regulations, programs, and initiatives that have established a framework for waste management and promoted recycling.

However, some policy statements are not backed by practical strategies of how to translate policy into practice, for example, in the National Environmental Policy. Even though pieces of legislation and policies promote components of solid waste management, there are glaring gaps as far as addressing circularity in the waste sector. There are no policies on extended producer responsibility, incentives for circular economy or investing in the waste-related business, and quality standards for recycled products. There are no policies that promote boosting secondary raw material markets. Gender mainstreaming is missing in most of the analyzed policies and pieces of legislation. There is a gender policy whose purpose is to strengthen gender mainstreaming and women empowerment at all levels to facilitate the attainment of gender equality and equity in Malawi. Gender should be mainstreamed in natural resources, the environment, and economic empowerment initiatives. However, in terms of implementation, there is a need for clear, practical strategies that are enforced to attain gender balance and equity.

According to the country environmental analysis carried out by World Bank, Malawi has the necessary legislation to make waste management work, but there is a chronic lack of resources, especially finance, to manage waste effectively[36]. Moreover, implementation is hindered due to resistance from interest groups, low organizational capability, and limited coordination of institutions and intra-ministerial arrangements to address multi-sectoral environmental challenges[37]. Thus, even though policies are in place, enforcement continues to be lacking.

Another contributing factor is that although the Environment Management Act of 2017 decided upon the development of the Malawi Environmental Protection Authority, an autonomous body under the Ministry of Natural Resources, this Authority is now operational but not yet fully capacitated. This means enforcement and supervision on the national level of solid waste management are not really embedded in the institutional system of Malawi, and responsibilities continue to be dispersed.

Moreover, in some cases, policies or regulations are not enforced due to a lack of understanding among stakeholders, lack of specialized facilities, inadequate expertise, and lack of appropriate budget allocation[38], such as the Local Government Act. According to the National Environmental Policy, domestic and agricultural waste should be separated at the source and facilitate recycling, and appropriate technology should be used to dispose of the remaining waste. It is commendable that the policy states that privatization of waste management should be facilitated. The policy direction sees waste as a business area. A number of the private sector and civil society initiatives are rising up. However, like any other policies NEP expresses commitment by the government of Malawi to private sector development, yet there is limited engagement with the private sector and limited private sector participation in waste management[39].

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[36] World Bank.2019. Malawi Country Environmental Analysis

[37] Bridges and Woolcock. 2017. How (Not) to Fix Problems that Matter: Assessing and Responding to Malawi's History of Institutional Reform. Policy Research Working Paper.

[38] https://africancleancities.org/assets/data/Organization/Malawi_EN.pdf

[39] World Bank.2019. Malawi Country Environmental Analysis

The development of policies is not backed by practical strategies of how to do it in practice. In addition, the policy is not clearly promoting other ways of waste management such as reduce, reuse and recovery. This is similar for the NEAP, which communicates a linear model of waste management with a narrow focus on waste disposal. No Actions are defined on waste avoidance, minimization, recycling, or recovery. The importance of waste separation at the source was identified as one of the action points, but it is not clear if and how this waste should be transported and disposed of. No actions are defined to increase the number of households covered by the municipal refuse collection. A similar pattern can be identified for the Local By-Laws, which also encourage a linear waste management model. It does not encourage waste separation, reuse and or recycling.

Regarding the National Climate Change Management Policy, the waste sector is embedded in the mitigation policy statement '(i) promoting greenhouse gas emissions reduction. However, the Policy does not layout out the sectors that generate GHGs, nor does it make any recommendation on how the GHGs can be reduced. The climate change adaptation policy statements outline that women, girls, and other vulnerable groups to be engaged, but the mitigation sector where waste is covered is silent on gender inclusion.

A policy framework exists that could play a positive role in contributing to Malawi's transition to a more sustainable society. Still, technology, human, and financial resources' capacity should be strengthened for proposed policies to be fully implemented. Moreover, translation into concrete action plans for operationalization is lacking and an integral focus on the principles of a circular economy. This is substantiated by the overview presented in Table 12.

Table 12 Assessment matrix of policies and parameters of circularity

Whether policy addresses issues on:	Name of Policy / Law/ national initiative									
	National Constitution of Malawi (1994 as amended)	National Environmental Policy (NEP) 2004	Environmental Management Act, 2017	EM (Waste Management and Sanitation) Regulations. s. 37 of 2008	Malawi's First INDCs	Local Authorities By-Laws	National Climate Change Management Policy	Public Health Act34:01 (1992)	Nationally Appropriate Mitigation Actions (NAMAs)	Local Government Act of 1998
Separation of waste	No	Yes	No	Yes	No	No	No	No	No	No
Retaining waste materials as raw materials	No	Yes	No	No	Yes	No	No	No	Yes	No
Gender Inclusion	Yes	Yes	No	No	No	No	No	Yes	No	No
Extended producer responsibility	No	No	No	No	No	No	No	No	No	No
Solid waste management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recycling	No	Yes	Yes	Yes	Yes	No	No	No	No	No
Reusing	No	No	Yes	Yes	Yes	No	No	No	Yes	No
Boosting secondary raw materials market	No	No	No	No	No	No	No	No	No	No
Waste to energy	No	No	Yes	No	Yes	Yes	Yes	No	Yes	No
Creation of job opportunities	No	Yes	No	Yes	Yes	No	No	No	Yes	No
Opportunities for Innovation	No	Yes	No	No	Yes	No	Yes	No	Yes	No
Financing & investment for waste management	No	Yes	Yes	No	Yes	No	No	No	No	Yes
Incentives for waste management / CE	No	No	No	No	No	No	No	No	Yes	No
Fees, Fines & Penalties for waste	No	No	Yes	Yes	No	Yes	No	Yes	No	Yes
Quality Standards for recycled materials	No	No	No	No	No	No	No	No	No	No
Monitoring of waste management targets	Yes	No	No	Yes	Yes	No	No	Yes	Yes	No
Awareness raising of waste	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No

6.2 Relation to the Malawi NDC and SDG

6.2.1 Relation with INDCs

The Government of Malawi has described its climate actions and the INDCs in the National Climate Change Management Policy[40]. The Nationally Determined Contributions or NDCs embody the efforts that each country has committed in order to reduce national emissions, in line with the Paris Climate Agreements of 2015[41]. The report on the INDC expects the total annual GHG emissions to increase from the level of approximately 29 Mton CO_2 equivalents in 2015 to approximately 42 Mton Gg CO_2 equivalents in 2040. Depending on the development path (as a least-developed country) of the economy and the international capacity building, Malawi estimates that approximately 15 Mton CO_2 equivalents can be saved by 2030, i.e. a reduction of about 35% in 2030.

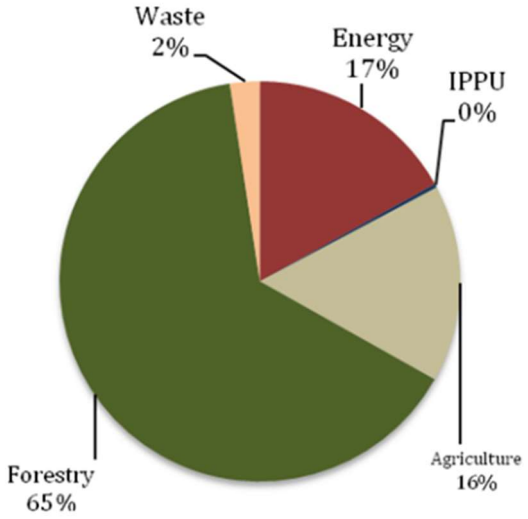

Figure 15 Estimated sectoral emissions in Malawi in 2030

The INDC states that “Management of municipal solid wastes (MSW) is a big challenge to existing and new urban establishments, resulting in the emission of GHGs.” In that respect, the TA Project may decrease the uncontrolled emission of greenhouse gases, although its contribution may be small: the contribution attributed to waste is estimated to be 2% of the total emissions.

The potential to decrease waste-related emissions originates from the recovery and use of landfill bio-gas, controlled waste incineration, and composting for organic manure. The potential of such measures is estimated to be around 0.4 Mton CO_2 equivalent by 2025, provided sufficient external support is available. Concrete measures that are given in the INDC related to waste are the following:

- Construct a controlled landfill for biogas recovery to generate up to 240 GWh of primary energy (95 GWh of electricity) per year
- Process municipal solid wastes into fertilisers
- Install waste-to-energy incinerators to generate up to 250 GWh of electricity per year.

These measures directly relate to the activities that are undertaken in this TA project.

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[40] REPUBLIC OF MALAWI INTENDED NATIONALLY DETERMINED CONTRIBUTION - https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Malawi%20First/MALAWI%20INDC%20SUBMITTED%20TO%20UNFCCC%20REV.pdf

[41] Nationally Determined Contributions (NDCs) | UNFCCC

Very recently (end 2020), the Malawi government has undertaken activities to revise and update these nationally determined contributions[42]. The outcome of that process is not yet published.

6.3 Contribution to SDGs

The VNR (Voluntary National Review) reports general progress on all SDGs, but a specific focus is given to Health (SDG)3, Education (SDG 4), Gender (SDG 5), Clean Water and Sanitation (SDG 6), Sustainable Cities (SDG 11), Climate Change (SDG 13) and Strong Institutions (SDG 16). Of the SDGs mentioned as the core attention of this TA Project, only SDG13 is specifically mentioned. The focus of activities in and monitoring SDG13 is the prevention of casualties caused by natural disasters and improving the data infrastructure and warning systems. No specific activities related to (bio)waste management and landfills are mentioned.

The SDGs are implemented through the country's overarching medium-term national development strategy known as the Malawi Growth and Development Strategy (MGDS) III. Though the TA focus is on the contribution to SDGs 9,12, and 13, Malawi's activities in the framework of the SDGs focus on other SDGs indicated above. Some of these SDGs and supporting activities are linked with the purpose of this TA Project, stimulating a circular economy on a number of prioritized waste streams.

Activities related to SDG12 are not specifically reported. In itself, the position for SDG12 is understandable: as the Malawi economy will develop (and thus improve on several SDGs, such as SDG1), it can be expected (and even hoped for) that this will lead to significant increases in the domestic material consumption, thereby counteracting target 12.2: By 2030, achieve the sustainable management and efficient use of natural resources. Of course, in due time, the management of resources will play a bigger role as does the prevention of waste, but currently, the priorities lie elsewhere. The VNR specifically points to the relations between SDG12 and a number of other SDGs; e.g.:

- SDG2 Zero Hunger: reduce harvest and food losses along the supply chain
- SDG3: Good health and well-being: preventing (toxic) waste improves the state of health
- SDG11 (Sustainable Cities and Communities) mainly aims to improve the living conditions in the slums that emerged as a consequence of fast urbanization. In order to achieve this, one of the indicators is set up to monitor the "proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated by cities". As the VNR states, the current regular collection and decent disposal level is about 30%. Therefore, the activities leading to progress on SDG12 include policies to increase "demand for recycled goods and waste through investment in waste-to-energy projects." And improving the poor waste handling in urban areas, amongst others to improve public-private partnerships.

SDGS 9, 12 AND 13

The Sustainable Development Goals are described by the UN (https://sdgs.un.org/goals) and comprise 17 goals that all-in-all show the forward for humankind. The TA Project for Zimbabwe focuses in particular on SDGs 9, 12 and 13:

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

SDG12: Ensure sustainable consumption and production patterns

SDG13: Take urgent action to combat climate change and its impacts

[42] http://www.ead.gov.mw/post/malawi-undertakes-revise-its-nationally-determined-contributions; 12 July 2021

7 Past and ongoing projects

A desktop search was carried out to identify past and ongoing projects and initiatives on Malawi's waste management and circular economy. This search included documentation from key government departments, local authorities, NGOs, companies, and business associations.

The full overview of the identified past and ongoing projects in Malawi can be found in the Appendix. The overview contains 24 (government) programs, initiatives, and projects, among which 5 were industry-led. Most (10) projects were general and aimed to improve general awareness of waste and waste management. The other projects focused on treating and valorizing separate waste streams, among which treatment of organic waste (generally aimed at composting) received the most attention (5 projects) followed by treating plastics (3 projects). However, several reported activities were strongly connected ("Four participants were involved in this activity; one large scale gardening company Four Seasons Nursery, a small scale company Perez investment also involved in residential waste collection, one CBO created in 2009 by a UNDP project in Mtandire, a poor informal area of Lilongwe (CBO's members are 52 women from Mtandire), and a NGO in Blantyre.") and reported in the thesis "Waste Market in Urban Malawi - A way out of poverty? by Juliette Barré in 2014, who already then concluded that there is an attractive market that experiences "obstacles such as the price of fuel, the access to densely populated areas and the lack of interest from the authorities. "

The overview currently lacks examples of recent projects. Still, it can be speculated that the situation has not changed dramatically since the publication of the mentioned thesis.

8 Conclusion

It can be concluded that the circular economy is not purposefully developed in Malawi. There are very few policies or incentives that steer towards value retention processes, nor are there many activities for more end-of-pipe solutions such as recycling and energy recovery. The circular economy has relatively naturally developed amongst low-income households, who demonstrate high levels of reuse and repurposing due to economic necessities. However, with the high levels of waste dumping leading to myriad and severe negative effects such as pollution, disease, and the hindrance of power supply in Malawi (due to the clogging of waterways of hydro), moving towards more sustainable waste management is paramount for the country. Particularly given the expected increase in population and income level (leading to more waste generation), this challenge becomes more pressing by the day. Moving towards more circularity, increasing reuse in the higher-income areas, and fostering recycling and recovery of valuable materials from waste can contribute to the economic and resource independence of the country and provide opportunities for job creation. However, before any well-developed recycling or recovery for the waste streams can be set up, it is paramount to also establish a proper collection and separation infrastructure, allowing for the harvesting of the waste. At this moment, collection only is already a major challenge in Malawi, with all local authorities struggling to provide the necessary services, even when supported by private parties. Within a novel system, it is paramount to include and address the activities of the currently informal waste workers, as they play a key role in the separation of waste that is currently happening post-collection.

Regarding the current institutional context, it is visible that there is quite some policy surrounding proper waste management in Malawi. However, this is not backed up by practical strategies on how to translate national policy into practice. Malawi has the necessary legislation to make waste management work, but there is a chronic lack of resources, especially finance, to manage waste effectively. As there are no policies on extended producer responsibility nor any (tax) incentives for the circular economy, the public means to acquire the necessary budgets are limited. This also hinders local authorities from roll-out out or improving the collection and separation infrastructure. There are also no policies aimed at investing in a waste-related business. Although policy states as a priority the privatization of waste management and sees waste as a business area, there is little engagement with the private sector, and also here policies are not backed up by practical strategies on how to do so.

All in all, a policy framework exists that could potentially play a positive role in contributing to Malawi's transition to a more sustainable society. Still, capacity in terms of technology, human, and financial resources should be strengthened to propose actions to be fully implemented. It should be redesigned with an integral focus on the principles of the circular economy.

A Detailed description of used research methods

A.1 Research instruments and Tools description

- Interview guides – Interview guides were used to ensure that all topics are covered during stakeholder consultations. Guides were used so that all interviewees covered similar discussion topics therefore allowing comparison and analysis of results.
- Matrices – Matrices were adopted to show relationships between study determinants. For example, a matrix was used to show the level to which waste management policies address gender.
- Questionnaires – Questionnaires were used to collect information from respondents, where applicable. Questionnaires had a mix of close-ended and open-ended questions. Open-ended, long-form questions offered the respondent the ability to elaborate on their thoughts. The data collected from a data collection questionnaire were both qualitative and quantitative. In line with COVID19 restrictions and social distancing requirements, applicable, online platforms like Google Forms were used to administer the questionnaire.
- Case studies – These were used as examples to highlights on innovations that are related to Circular Economy and are within the selected waste streams.
- Registration forms for stakeholders – During stakeholder consultations and workshops / webinars, stakeholders were asked to complete registration forms with their details including names, organizations, contact details, position in organizations and type of organizations as well as their role in Circular Economy. This information was updated often to develop and keep for referencing a database of organizations.

Identification of stakeholders

The overview of stakeholders included in the report is based on predefined waste streams categories of stakeholders as defined in the project plan. See the table below for the overview of all included groups and their relation to the waste management system.

Table 13 Overview of stakeholder groups approached and their relation to the waste management system

Category	Relation to the waste management system
National Government & line Agencies in Environment Sector	The Government Ministries are involved in the development of policies and regulations as well as assessing investment opportunities in the waste sector, therefore, have a broad understanding of the sectors. The expertise of the ministries benefited the study by providing policy recommendations for the adoption of circular economy measures.
Local Authorities	As provided by the law, local authorities are responsible for waste collection and disposal
Companies	Targeted businesses included recyclers, producers, logistic partners in the waste management value chain. Overall, the parties form the Company' group which focuses on the bigger organizations rather than SMEs. These parties are part of the waste value chain and therefore crucial pins in the potential transformation to more circularity.
Enterprises	Enterprises regard the smaller and medium parties that are involved in waste management. Many of these are also part of the informal sector as they are not formally registered. Nevertheless, they play a crucial role in the waste value chain.

B Waste characterization data

B.1 Waste characterization data

B.1.1 Waste characterization methodology

Wastes are materials or objects that are discarded, disposed of, or intended for disposal. Solid wastes could be garbage or discarded substances and objects gotten from industrial, commercial, mining, agricultural, or general day-to-day activities. Most of the commonly known discarded wastes which make up the day today items being disposed by the general public are known as municipal solid wastes (MSWs), and it includes all substances or objects thrown away as products of packaging, lawn cuttings, furniture, clothing materials, bottles/glasses, food scraps, electric appliances, newspapers, paint, and batteries, etc. The selection and proper application of suitable methods, management policies and technologies to achieve specific waste management objectives is termed as integrated solid waste management (ISWM). For this system to be successful, waste characterization studies have to be carried out. Waste characterization is very important for appropriate MSW collection, selection of transportation equipment, energy transformation and its recovery, recovery of reusable matter, as well as the proper design and implementation of optimal disposal routes and methods. The changes in the trends of MSW generation and its composition have been a result of the differences in the consumption behaviours of people coupled with rapid technological advances in the last decades. The quantity and composition of MSW also differs from one country to another country, from one region to another region, from one neighborhood to another, and even from one community to another. The differences could either be a result of income level, socioeconomic distribution, consumption habit, or disposal habits of people . The practice as executed by DOE in US give a good overview of the best practices in waste characterization: Webinar: Best Practices for Waste Characterization - YouTube

Waste characterisation is the process by which the composition of different waste streams is analyzed. Waste characterization plays an important part in any treatment of waste that may occur. For the further development of new waste technologies, the developers of these technologies must consider what exactly waste streams do consist of to fully treat the waste. The biodegradable element of the waste stream is vitally important in using systems such as composting or anaerobic digestion.

Waste characterization is a manual process carried beside waste management plants in a process that consists of taking samples, in our case mostly at the household level, than, upon collection, separate and weighing the individual fractions of household waste or Municipal waste (MSW).
In the waste characterization studies carried out on household level in Zimbabwe, the waste streams the waste characterization methods for the collection were applied, and samples were commonly broken down into the following constituents:

- Plastics (LDOE, HDPE, PET)
- Ferrous metals
- Non-ferrous metals
- Glass
- Other" any remaining items which do not fit (e.g. textile)
- Paper & carboard
- Organic/food waste
- Agricultural green waste
- Fines (items below a certain screen size).

C Policies, strategies, and regulations

Analysis of policies, strategies, and regulations relating to waste management were analyzed and understood in relationship to circular economy principles. Desktop research was carried out to assess policies, past and ongoing projects, and initiatives on waste management and the circular economy in Zimbabwe. This included an online search of information from key government departments institutions such as the Environmental Management Agency, local authorities, NGOs, companies, and business associations. Strategic documents projects report were reviewed with an aim to assess the status quo in relation to waste management, scope, effect/ impact, stakeholders involved, and roles of sector players in supporting the transition towards circularity. Policies were assessed, keywords or parameters were grouped in thematic areas corresponding to the different conceptual components of the three circularity principles:

A Recycling targets – the extent to which the policies promote recycling through targets by a specific year.
B Reuse targets – preparing for reuse targets for municipal solid waste
C Separation of waste at source – specifically in relation to household waste at the household level. The assessment sought to find out whether the policies promoted the separation of waste at source. In addition, the review investigated whether policies addressed the collection of separated household waste.

Other policy targets that have been included in the study are :

1. Monitoring of targets: the study was keen to assess if national targets are set regarding waste management and how the national government conducted monitoring through its agencies.
2. Gender and inclusion of women: the ambition to ensure inclusion is key for every policy document, and for this reason, the analysis of policies sought to understand how gender parity would be addressed in the sector.
3. Job creation opportunities – the study sought to assess the creation of decent jobs and whether the policies have targets for the CE, the waste management sector, or other sectors. This analysis explored the extent to which Zambia policies recognize the potential for job creation in waste management as it relates to CE, and whether there are specific targets that the country aims to achieve.
4. Opportunities for eco-innovation: Innovations are key drivers to change in the sector and an essential part of ensuring quick wins. The study assessed the spirit behind policies in Malawi to support the adoption of innovations in managing waste.
5. Fees, fines, penalties for poor waste management: Setting fees and fines are considered a critical path to encourage behavior change. The assessment did look at the practical aspect of implementing the set fines, fees, and penalties for poor waste management.
6. Incentives for developing good waste management incentives – the study investigated whether the existing policies broadly encouraged pay-as-you-throw systems, fiscal incentives for food donations, deposit-refund schemes, ending fossil fuel subsidies, taxing virgin materials, and lower VATs on recycled, repaired, remanufactured, or refurbished goods.

D Overview of past and ongoing projects and programs

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
Government/ Government Institution Initiatives/ local Authority						
Malawi President dials up ban on thin plastic[43]	To ban manufacturing, distribution and use of thin plastics to keep Malawi clean.	The initiative was nationwide ban. President Lazarus Chakwera has thrown his weight behind the nationwide ban on thin plastics. The President dialed up the prohibition during a weekly press briefing at Kamuzu Palace in October 2020. He stated: "I am especially keen to see that the ban on thin plastics is fully implemented for Malawi to regain its beauty.	The ban is yet to yield significant results, but having the backing of the President, it means a lot in terms of policy support, implementation of legislation and efforts by responsible government institutions. According to Association of Environmental Journalists Association, His Excellence President Chakwera becomes the first Head of State to back the crackdown opposed by plastic manufacturers contrary to the Supreme Court ruling.	Association of Environmental Journalists in Malawi, President of Malawi, Citizens and residents of Malawi	Government of Malawi	Plastic
National Cleanup Day[44]	A national clean-up day set to ensure wanton waste disposal is contained in highly populated areas such as markets, locations including offices. To ensure a healthy environment for all Malawians as enshrined in the constitution	National Cleanup Day was launched on 11th November 2020, in Lilongwe by his Excellence the President of Malawi the focus was to encourage every person in Malawi to contribute to the initiative by cleaning up their environment.	Participation of the President showed of political will to issues of environment and providing solutions to waste challenges rocking the nation. According to Prof David Mkwambisi 'Any problem that attracts the highest office on the land also attract greater citizen participation'[45].	Government of Malawi Local Authorities. All residents in Malawi	President launching Government department	All waste streams

[43] http://www.aejmalawi.org/news/?malawi-president-dials-up-ban-on-plastics-707958f9f66354499b4c4cb7bb48edb2
[44] http://www.aejmalawi.org/news/?president-chakwera-to-grace-clean-up-day-launch-18c1fe21335900ba2a2c034898a00f1b
[45] http://www.aejmalawi.org/news/?president-chakwera-to-grace-clean-up-day-launch-18c1fe21335900ba2a2c034898a00f1b

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
Waste Management Strategy of 2017-2022						
Malawi Vision 2020	The Vision 2020 was launched in year 2000 as a long-term development agenda for Malawi. It is a framework for national development goals, policies, and strategies this year (2020).	Vision 2020 articulated the long-term development perspective for the country. Among other things, Vision 2020 emphasizes the need for integrating social and economic issues in sustainable development. On issues of climate change, it urges the Government of Malawi to ensure that GHG emissions into the atmosphere are monitored and reduced. The Vision is due for revision	Since its launch in year Malawi has made gains in terms of economic and human development. However, more than 20 years since its launch, more than 50% of people living in urban areas are not connected to proper sewerage and waste reticulation systems, waste is dumped in unlined dumpsites, backyards, and waterways	Government of Malawi Private Sector NGOs (International and local), CBOS, and communities	Government of Malawi is leading the implementation, Private Sector NGOs (International and local), CBOS, and communities participating	All waste streams
City Council Waste Management Bi-Laws e.g Local Government (Blantyre City Council) (General Cleanliness) (Refuse and Rubble Disposal) By-Laws G.N 16/2003	City councils have introduced a number of by-laws and policies to combat the growing waste management crisis.	By laws were introduced by City and Town councils to cover all the waste streams outlining waste	Due to a lack of resources, funding, and waste disposal infrastructure, these regulations are rarely enforced, and waste continues to be dumped and is escalating beyond control. In addition, the bi-laws encourage linear model of waste management in the cities, they emphases on waste collection and disposal	City Councils	City Councils	All Waste Streams
Organic Fertilizer from agriculture market waste in Limbe[46]	To develop organic manure from vegetable market	The city council transports the waste from market to a composting facility where it is turned into rich, organic	Income-generating project for city council and reduction of waste in the environment	Limbe	City Council implementing	Organic waste

[46] https://www.engineeringforchange.org/news/circular-economy-can-solve-food-water-problems-rajasthan-malawi-world/

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
		compost. This is then sold to consumers.				
Keep Blantyre Clean and Green Initiative [47]	To clean and green the city of Blantyre.	Keep Blantyre Clean and Green campaign was launched by Mayor Councilor with support from the then First Lady Madam Getrude Mutharika. The initiative mobilizes support from corporate world, academia, civil society, and local communities to clear waste and plant trees	The campaign resulted in the waste collection and cleaning of streets in the city of Blantyre. Waste collection bins were installed along the roads. Making the city clean was embraced by the youth as well as demonstrated by the enthusiasm from students who have come forward to support the campaign by engaging in sweeping exercises. The initiative contributed to behavior change.	City of Blantyre Stakeholders (NBS Bank, Malawi Savings Bank, Larfage Cement Company, Phalombe Hardware, Puma Malawi Ltd, Candlex Limited, Rab Processors Ltd, FDH Holdings, CDH Bank and Malswitch and Polytechnic students).	City of Blantyre Project implementer All other stakeholders	All waste streams
Green Investment Opportunities in the waste sector[48]	The Government of Malawi, through the Ministry of Natural Resources, Energy and Mining, in the Environmental Affairs Department (EAD), launched the Greenhouse Gas Inventory System (GHG-IS) to monitor and report national emissions across all economic sectors and report business investment opportunities	Greenhouse Gas Inventory System (GHG-IS) publishes investment opportunities in the waste sector	Through improved data collection and management processes, the GHG-IS generates more complete information about waste management in Malawi. This information is helping potential investors to identify opportunities and recognize practices that enhance sustainability and lower emissions	Government through the Environmental Affairs Department (EAD) USAID	Government, through the Environmental Affairs Department (EAD) implementing USAID resource support	Organic waste

[47] https://bccmw.com/project/keep-blantyre-city-clean-and-green/
[48] Green Investment Opportunities for Malawi`s Energy Sector

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
Non-Governmental Organizations and Community Bases Organizations (CBOs)						
WasteAid and ICCM tackling waste in Malawi 2021	To find the best ways to build the capability of waste managers/ champions in local communities	WasteAid has partnered with a Malawi-based organization, ICMM to undertake a feasibility study on community waste management	The study identified groups, individuals, organizations, and private waste operators who are turning waste into commercial opportunity/income in both rural and urban areas.	ICCM, Waste Aid, Corra	Corra WasteAid and ICMM implementing	All Waste streams
Assessment of the Solid Waste Value Chain for Lilongwe	To advise World Bank on possibility for PPP with Lilongwe City Council	Waste Advisors with support from World Bank carried out the study in Lilongwe City	Created opportunities for PPP between Lilongwe City and private players	World Bank, Lilongwe City Council, Waste Advisors	Waste Advisors Implementing. IFC funding	All
International Conservation and Clean-up Management Waste Recycling initiatives	To facilitate the improvement of healthy and clean environments in rural and peri-urban communities in Malawi, through schemes that reduce, reuse, and recycle waste to provide social and economic improvements to livelihoods.	The organization set up a number of urban and peri-urban recycling points to aid communities in Lilongwe in achieving a circular economy with their waste.	The initiatives demonstrate waste management best practices. The practices are helping participating communities waste legislation compliance and duty of care whilst promoting Malawian practical skills and knowledge sharing. The initiatives created jobs to help encourage positive behavior change and reduce poverty.	ICCM	ICCM Waste collection vendors	All waste streams
UNDP Malawi Accelerator lab Drivers and solutions of unmanaged waste[49]	Using issue mapping to explore drivers of unmanaged waste with a diverse and inclusive selection of local stakeholders.	Held three workshops over a period of a week, with each workshop targeting a specific group; to understand the real issues that are influencing unmanaged waste in Malawi, and to brainstorm broad solutions that can help reduce this challenge.	UNDP managed to connect with several players in the circular economy, appreciated the issues around waste management, and unearthed categories of broad potential solutions to be tested and scaled up, in collaboration with various stakeholders.	UNDP Government departments, statutory institutions, the private sector, non-governmental organizations, and community members from high and medium density communities in Lilongwe	UNDP, with the support of stakeholders	All waste streams

[49] https://www.mw.undp.org/content/malawi/en/home/presscenter/articles/2019/leaving-no-one-behind-in-understanding-waste-management-challeng.html

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
Waste Advisors` Circular Economy of solid waste initiative in Lilongwe and Blantyre	To improve the circular economy of solid waste management in Blantyre and Lilongwe -	The project is developing and improving PPPs in the waste value chain, promoting behavior change amongst disposers and develop a national composting standard	9 WTS with new and improved business activity 2 Composting Facilities treating 8000t of waste per year Improved Legislative framework A National Composting Association MBS Compost Certification	Waste Advisors, Blantyre and Lilongwe City Councils, local communities	Waste Advisors leading implementation, European Union Delegation – Odran Hayes Financial and Technical support	Organic waste as the main waste stream
Association of Environmental Journalism in Malawi initiatives	Among other objectives AEJM' s objectives are: - To act as a watchdog on environmental concerns. - To take a lead in promoting desirable attitudes towards sustainable care and maintenance of the environment. - To raise awareness among partners, patrons, editors, news managers, publishers, and other key decision-makers in the media on the value and importance of environmental news reporting.	The members report on environmental issues relating to broader areas of sanitation, energy, agriculture, climate change, forestry, disaster management, and fisheries. Waste problems, waste management awareness, initiatives, campaigns, and advocacy are covered under the sanitation division	The Association raised awareness on solid waste management and other environmental issues.	AEJM, Local stakeholders	AEL	All waste streams
	Small scale business development and community mobilization					

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
	for healthy and clean urban slums'					
Chifuno Changa Green Initiative	Was created to lead in combating waste and environmental challenges faced throughout Malawi by engaging with communities.	In 2020 the organization embarked on a cleanup campaign aimed at raising funds and awareness to help enforcement of proper waste disposal. The organization initiated 21 kilometer run challenge to raise funds to help enforcement of proper waste disposal in Dedza district and restore its tourist attraction.	The initiative was attractive positive attention and forcing District Council to act. The District identified a new dumpsite and was appealing to residents not to continue dumping waste in Dedza mountain. Unfortunately, local authorities were still focusing in linear model of waste management, that is, depositing waste in dumpsite.	Chifuno Changa Green Initiative Dedza Rural District Council	Chifuno Changa Green Initiative fund raisers Dedza Rural District Council implementers	All waste streams
Organic recycling business initiatives for refugees	Solid waste management study and composting plant in Dzaleka Refugee Camp					
Waste for Wealth (W4W) Composting project by Community Based Organization CBO Mtandire (2012)	To produce composite manure from organic waste for vegetable gardens and marketing	CBO Mtandire is a community initiative of 52 women who came together and ventured into the business of organic waste collection and composting. They supply the composite to Four Seasons Nursery and local farmers. They use some in their vegetable gardens	The community-based initiative has created income for women. The project collected approximately 2500 tons of waste and produced approximately 840 tons of composite in a single year, at the same time managing organic waste	CBO Mtandire Four Seasons Nursery Local farmers	CBO Mtandire as a producer of composite, Four Season Nursery, and Local farmers as recipients	Organic waste
Waste to Wealth Compositing production project by AYASE	To produce composite manure from organic waste for vegetable gardens and marketing	AYASE is an NGO that collects organic waste, composite it and sell it to local farmers in Blantyre.	Community-based initiative has created income for women. The project collected approximately 2500 tons of waste and produced approximately 840	AYASE Local farmers	AYASE as producer of composite, and Local farmers as recipients	Organic waste

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
			tons of composite in a single year, at the same time managing organic waste			
Companies/ Enterprises						
Four Seasons Nursery gardening and composting initiative since 2009	To produce organic fertilizer using composting technology for their nursery garden and selling	Collects organic waste from gardening activities, restaurants, and coffee shops, compost for itself, but has started to produce and sell compost since 2009	Waste to wealth, for example, a company produces over 200 tons of composite from organic waste per year.	Four Seasons, Restaurants, coffee shops	Four Seasons as project implementer	Organic waste
Waste collection and composting in Malawi project by Perez Investment 2012	To collect household waste and use the organic part of waste to make composite	Collects domestic waste, separate and composite organic waste	Waste to wealth, converts organic waste to make an average of 36 tons of composite per year	Perez investment Households	Perez Investment	All waste streams
Plastico Industry recycling of Plastics initiative in Blantyre 2011	To recycle plastic waste as a substitute of virgin plastic	Collects plastic from waste pickers and recycle. In 2011, due to a rise in exchange rates, purchasing virgin plastic abroad became way too expensive. Recycling plastic waste became cheaper even if they have to buy it from waste pickers	Recycle over 500 tons of plastics per year. The company created employment for over 700 people, 45% of them women	Plastico Industry Waste Pickers	Plastico Industry responsible for waste recycling Waste pickers supply waste	Plastics
Waste Paper Recycling project By Dynamic Recycling Malawi Ltd[50] 2013	To develop eggs trays from paper waste	paper-based trash and processes it into egg trays, which it sells to most of the large Malawian egg businesses.	Reduction in paper waste Local manufacturing benefits not just the economy but also the environment in a small, landlocked country like Malawi. Job creation. A further benefit to utilizing waste paper for recycling is that it would often otherwise be burned, emitting	Dynamic Recycling Malawi Ltd	Dynamic Recycling Malawi Ltd	Paper

[50] https://www.inclusivebusiness.net/ib-voices/way-forward-recycling-malawi

Initiative/ Projects	Aim	Scope	Effect/ Impact	Stakeholders involved	Roles	Waste Stream
			carbon dioxide and polluting the air.			
Formalization of Informal Waste Pickers' Cooperatives in Blantyre, Malawi: A Feasibility Assessment[51]	Recently, Informal Waste Pickers (IWPs) have been incorporated into waste management cooperatives by formalizing their operations as a strategy to improve the quality and efficiency of waste management in such areas	This study was conducted in Zingwangwa, an unplanned settlement in Blantyre, Malawi, to understand whether the formalization of IWPs into cooperatives could be effective and/or accepted as a way of managing Municipal Solid Waste in unplanned urban settlements in Malawi.	Furthermore, a fear of decreased income, conflicts during proceeds sharing, free-riding behaviors, and an attachment to their independence mean that IWPs are unlikely to form a cooperative on their own though some would be willing to join if a third party initiated the formalization process	University of Malawi Waste Pickers Cooperative	The University of Malawi for feasibility assessment	Plastics and metals
Shore Rubber Plastic Recycling project in Lilongwe	To recycle plastic waste as a substitute for virgin plastic	Collects plastic from waste pickers and recycle. In 2011, purchasing virgin plastic abroad became way too expensive due to a rise in exchange rates. Recycling plastic waste became cheaper even if they have to buy it from waste pickers	Waste to Wealth Recycle over 500 tons of plastics per year. The project created jobs for over 600 people, 50% of them women	Shore Rubber Plastic Waste Pickers	Shore Rubber Plastics responsible for waste recycling Waste pickers supply waste	Plastics

[51] Kasinja & Tilley. 2018. Formalization of Informal Waste Pickers' Cooperatives in Blantyre, Malawi: A Feasibility Assessment. https://www.mdpi.com/2071-1050/10/4/1149/htm