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**TNO report**

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**Development of a waste stream-specific roadmap  
for the circular economy Zambia**

**Sub report Output 3**

**Identification of the perceived value of the circular  
economy and of benefits, weaknesses, opportunities and  
challenges in Zambia's waste sector**

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## Methodology

The goal of Output 3 is to prioritize a waste stream for which a roadmap and pilot plan will be developed in Output 4 and 5. The decision on the prioritized waste stream is based on a stakeholder meeting with the NDE, the project proponent and further participating stakeholders from the public and private sector that were identified in Output 2.

The methodology to make a well informed choice on the prioritized waste stream consists of four steps, which will be discussed briefly. Note that two small deviations were made from the TA response plan, in agreement with the NDE and CTCN: (i) the step to analyse of strengths and weaknesses was merged with the step to analyse of opportunities and threats in one combined activity. Activity 3.4 was placed before activity 3.2 and 3.3. to create a more logical storyline. In this report the results of the following activities are presented:

### Activity 3.1 Analysis of the perceived benefits

This activity provides a brief overview of the perceived benefits of the circular economy within the waste sector, based on interviews with key players in Output 2. Additionally, this activity discusses the products and by-products that can be made from waste that still have value. The economic, social and environmental benefits for the circular economy in general is discussed afterwards and the last paragraph focusses on the impact of circularizing waste streams on Zambia's nationally determined contributions (NDC) and SDGs. This first step will give the reader a general idea of how circularity in general can be useful for Zambia.

### Activity 3.4: Development of an indicator matrix: Multi-Criteria Analysis

This activity focusses on the generation of a qualitative matrix of transparent and comparable circular economy indicators on four levels, social, environmental, economic and institutional, for each of the six different waste streams. In consultation with CTCN and NDE 20 evaluation indicators were chosen. The evaluation of each indicator for each waste stream was based on a qualitative analysis of the results of Output 2 and additional stakeholder consultation

### Activity 3.2 & 3.3 : Analysis of strengths, weaknesses, opportunities and threats

This activity analyses the strengths, weaknesses, opportunities and threats for each of the waste streams. Strengths and weaknesses refer to the current system, and provide detailed information about the system AS IS. The opportunities and threats refer to the potential of circularity of each of the waste streams and what opportunities or threats might emerge when trying to make a certain waste stream more circular. These results followed from the MCA assessment.

### Activity 3.5: Stakeholder meeting on prioritization of waste streams

The last activity results in a choice of a prioritized waste stream. To make this choice, a meeting with the NDE, the project proponent and further participating stakeholders identified under output 2, is conducted. In this meeting, the results of the indicator matrix and the SWOT were presented and discussed. Together, one prioritized waste stream was selected that will be further investigated under Output 4 and 5.

# 1 Analysis of the perceived benefits

## 1.1 Perceived benefits of a circular economy

A circular economy is an economic system of closed loops in which raw materials, components and products lose their value as little as possible, renewable energy sources are used and systems thinking is at the core. The circular economy is much broader and more extensive than waste management alone, in essence regarding economic reform, in which business models and value creation are not aimed at selling as much products as possible, which is based on extensive resource use, but at creating value with minimizing and optimizing resource use, targeting among others reuse or repurposing of products before they become waste. As the scope of this project is explicitly focused on six household waste streams the focus will be on identifying how maximum value for these streams can be recovered or retained as possible, following the principles of the circular economy.

At this moment, Zambia is not yet fully exploiting the benefits that a more circular solid waste management system can offer. In Zambia 4,9 million tonnes of waste is generated annually, which is an average of 0.52 kg per capita per day. In urban areas, especially middle and high income areas, this number is much larger. In urban Zambia waste is collected by either the local authorities or by several private companies. On average, the public sector collects less than 10% of the waste, while the private sector collects almost 60% of the waste generated. Moreover, some parts are serviced by small Community Based Enterprises (CBE's) who collect waste in the low income areas. This does not mean that waste collection is always frequent and reliable. In rural areas, there is almost no collection at all. Additionally, separation at households is low and there is no separate collection by local authorities, who are normally responsible for waste management. Some private companies do collect separated waste and provide households with incentives to separate.

Some forms of circularity already take place throughout Zambia. Households normally separate waste that has economic value to them. Waste that is re-usable for other uses such as plastic bottles, jars and containers are also usually separated at source in low income areas. This also means that many of these streams that already have a direct reuse solution are less visible in the waste data as they do never enter the bin. In rural areas, there is virtually no waste collection, but also very few waste generation. Most waste is reused and if the waste truly has no value anymore, it is burned or buried. In urban areas, however, there are still large quantities of waste that end up in open dumpsites that harm the environment while still having economic value.

Thus, economic necessity leads to very high levels of circular behaviour. When economic circumstances improve, more waste will be generated since there is more financial room to acquire products. Additionally, the level of circular behaviour decreases, since the necessity of reuse is (partly) eliminated. This poses a challenge to developing and emerging economies to embed ambitious circularity targets. To avoid reforming waste behaviour after economic growth, circularity should be well embedded in policy education and capacity building programmes to ensure that when economic circumstances increase this will not strain the waste system.

A more circular waste system, including proper solid waste management, will allow Zambia to extract maximum value from the different waste streams, while reducing health and environmental risks that come with the current waste management practices.

## 1.2 Products from waste

This section presents a table with an identification of products that can be made from waste, that still have value, based on discussion with stakeholders and an analysis of current pilots and projects, which is documented

in Output 2. Note that this is by no means an extensive list, but it does give an indication about the options towards value products from waste that could be interesting for Zambia.

Waste stream	Products
<p><b>Plastic</b></p>	<p>Plastic can be shredded or smelted into recycled plastic base material. Depending on the quality of the plastic and the process, this recycled base material can then be used as base material for high quality plastic products (such as food-packaging).</p> <p>Low quality plastic can still be used to make plastic products like:</p> <ul style="list-style-type: none"> <li>• Recycling into Construction blocks</li> <li>• Garden furniture</li> <li>• Roofs</li> <li>• Traffic piles</li> <li>• Clothes</li> <li>• Construction elements via 3D printing</li> <li>• Recycled fabrics</li> <li>• Melting and pressing mixed plastics into bricks/tiles/cards</li> </ul> <p>Other options to valorise plastic are:</p> <ul style="list-style-type: none"> <li>• Reusing plastic bottles via deposit systems</li> <li>• Plastic as chemical- or refinery feedstock, such as torrefaction of plastic into charcoal, or PE (polyethylene) plastic as feedstock for steam cracker or Pyrolysis into oil as substitute for fossil oil</li> </ul>
<p><b>Metal</b></p>	<p>Metal can be reused in the primary process, this will require educating aggregators and manufacturers. Additionally, art can be made out of metal and sold as garden art or tourist souvenirs.</p> <p>Additionally, metal can be shredded or smelted to produce new base material or construction material, depending on the quality of the base material.</p>
<p><b>Paper</b></p>	<p>Paper can be shredded into recycled paper base material, depending on the quality of the paper and the process, this recycled base material can then be used as base material for new paper products such as curd boxes, egg trays, books or tissue boxes and tissue paper.</p> <p>Other non-conventional products that can be made from recycled paper include usage for insulation or building boards from paper.</p>
<p><b>Glass</b></p>	<p>Glass can be crushed or melted to use as recycled base material. Depending on the quality and colour various new products can be made. Mixed glass waste can be used to make base material for brown glass</p> <p>Different options to valorise glass waste is to:</p> <ul style="list-style-type: none"> <li>• Make fibre glass from glass waste</li> <li>• Make art from glass</li> <li>• Deposit systems to take back glass bottles for reuse</li> </ul>
<p><b>Organic</b></p>	<p>Organic food-waste can be reused as food for livestock or for food programmes if the food-waste is of sufficient quality.</p>

Waste stream	Products
	<p>Other ways to valorise organic waste are:</p> <p>Biogas:</p> <ul style="list-style-type: none"> <li>• Community biodigester (requires training and devices to utilize/transport gas)</li> <li>• Individual biodigester (requires training and devices to utilize/transport gas)</li> </ul> <p>Composting:</p> <p>Composting for cooking (making briquettes) and supply cheap cooking equipment to cook with briquettes, make fertilizer pellets or central composting sites in low-income areas, community owned composting</p>
Agricultural	<p>Agricultural waste has various options for circularity, because of these options, very little agricultural waste actually exists in rural communities.</p> <p>Some options are:</p> <ul style="list-style-type: none"> <li>• Community and individual biogas (requires training and devices to utilize/transport gas)</li> <li>• Composting for cooking, or to make fertilizer or for water collection</li> <li>• Use waste as animal food</li> <li>• Waste that can't be used can be burned and the ash can still be used to fertilize the land</li> </ul>

### 1.3 Economic, social and environmental benefit of circularity

The economic, social and environmental benefits of circularity are plenty. However, the exact benefit depends on the waste stream and on the chosen pathways per waste stream. Deliverable 3.2/3.3 and 3.4 will give a detailed overview of the economic, social, environmental and institutional benefits and barriers regarding implementation of circularity per waste stream. This chapter will discuss general benefits, independent of the chosen waste stream.

#### Economic

Circularity offers potential for the private sector to create profitable economic activities. With the right stimulants, increasing private companies might want to be involved, speeding up the circularity transition. However, if private sector involvement is difficult to create, then more public involvement is necessary, which is often more difficult to organize budget wise. Additionally, circularity offers potential for local businesses as well. Depending on the waste stream and pathway, the value from waste can create jobs for various activities taking place along of the value chain such as collecting, aggregating, recycling, exporting or processing. Local businesses focusing on collection, aggregation or basic recycling could create ample job opportunities for both low and medium income areas. Factors like market readiness, existing technologies per waste stream available within the country and capital investment potential, will largely influence the probability of reaching the aforementioned economic benefits.

#### Social

The social benefits of circularity in Zambia are plentiful. In urban areas, our questionnaires showed, that approximately 35% of households dump their waste illegally. Inadequate waste management activities such as open dumping, can lead to the spread of diseases such as cholera or diarrhoea. Additionally, our questionnaires showed that people do not like the looks of waste around their neighbourhood and the smell of waste. Better solid waste management can prevent this by regularly collecting and processing waste. However, circularity and better solid waste management might require significant behavioural changes of how waste is handled by households. Separation of waste will most likely be necessary to reach economy of scale for recycling and processing options. Additionally the acceptance of jobs in waste management needs to increase.

## Environmental

Benefits regarding environmental consequences of circularity in Zambia include climate mitigation and climate adaptation. Regarding climate mitigation, circularity and proper solid waste management will decrease greenhouse gas emissions. This is especially true for organic and agricultural waste streams, which realise plenty GHG emissions when not handled properly, while these waste streams hold great potential for non-conventional renewable energy generation (biogas). Additionally products from organic waste such as compost and fertilizer could help in climate change adaptation, since this might influence food security in Africa and will drive up the demand for compost and fertilizer.

### 1.4 Contribution to NDC and SDG

Note that in report WP2 an extensive analysis was done on how circularity might contribute to the NDC and SDG. In this section, we will give a brief recap of these contributions.

#### Relation with INDC's

The Government of Zambia has presented its Intended Nationally Determined Contribution ([INDC](#)) to the United Nations Framework Convention on Climate Change (UNFCCC)<sup>1</sup>. The Zambia's national determined contribution (NDC) is being represented by the NDE of Zambia. This project on circular economy was endorsed by Zambia's NDE as a project to contribute to the INDC.

The first NDC actions of Zambia focused on three mitigation programs: Sustainable Forest Management, Sustainable agriculture and Renewable Energy & Energy Efficiency. The agriculture program includes "implementing rural biogas plants and "Rural biomass electricity generating facilities", leading to reduced indoor air pollution. But interestingly, such conversion to biogas is a core activity in circular activities related to biotic waste. In other words, the INDC supports circular activities. Though not mentioned specifically the program focusing on renewable energy might also engage in the production of biogas and the production of electricity in waste incinerators.

This Technical Assistance Project is aimed to support Zambia in concretizing the potential actions that can be undertaken in line with the broader scope of Zambia's NDC. Depending on the chosen waste stream, it can contribute to some of the three aforementioned mitigation programs. Besides from supporting on the three mitigation programmes, this TA gives applicable recommendations on policy, collection, separation, technical development and business models on the short, medium and long-term, for one prioritized waste stream. The results of this project can significantly contribute to reducing formation and emission of greenhouse gases from landfills and energy harvesting from waste materials.

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<sup>1</sup> Zambia's intended nationally determined contribution (INDC) to the 2015 agreement on climate change - [www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Zambia%20First/FINAL+ZAMBIA%27S+INDC\\_1.pdf](http://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Zambia%20First/FINAL+ZAMBIA%27S+INDC_1.pdf)

## Contribution to SDG's

This TA project is set out to incorporate and support Zambia's commitments to the Sustainable Development Goals and in particular SDGs 9, 12 and 13.

Zambia's commitments can be extracted from the recent Voluntary National Review (VNR), published in June 2020. The VNR reports about progress on 14 out of 17 SDGs. However, reports on SDG 12 are left out, because of insufficient data. This position towards SDG12 is understandable, the focus of the government is on economic development for Zambia. Thus, it can be expected (and even hoped for) that the economic development of Zambia will lead to significant increases of the domestic material consumption, thereby counteracting target 12.2. The management of resources will play a bigger role in the future, as does the prevention of waste, but currently the priorities lie elsewhere.

The data reported on SDG9 exclusively demonstrate the development of cargo and passenger transport by rail or through air. The focus is on developing a basic infrastructure in Zambia as a prerequisite for further development. Developments in the framework of waste management and circular economy will -as other industrial activities will do- benefit from such developments, but they are not in the focus of development.

The data that show progress on SDG13 focus on data acquisition and warning systems at household level. The potential link between SDG13 and waste management lies in the generation of electricity and biogas from waste incineration and the instalment of biogas facilities.

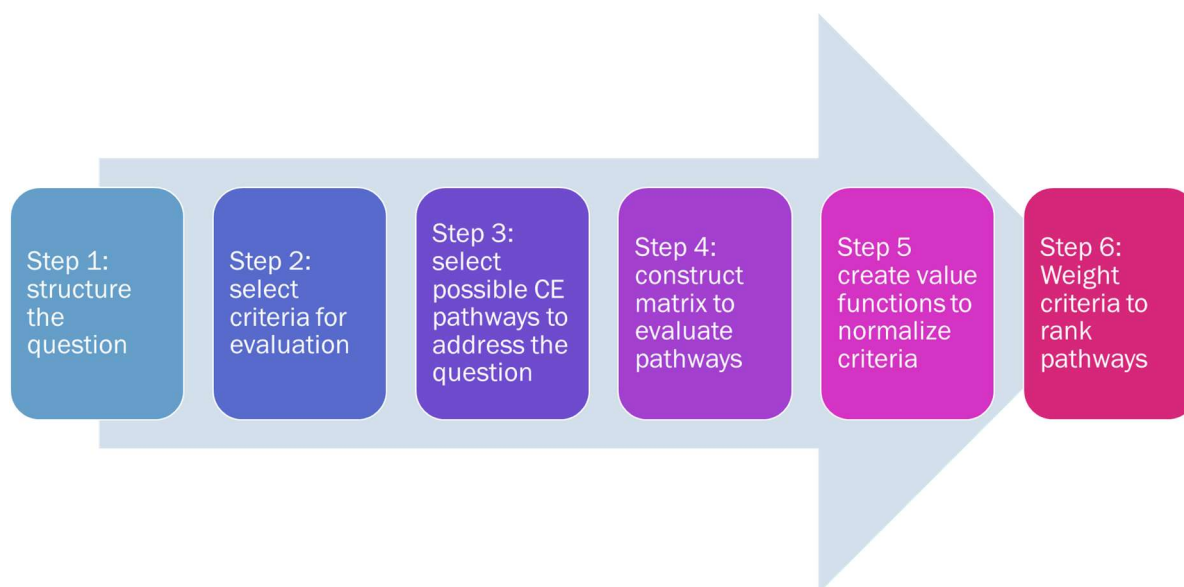
Though the TA focus is on the contribution to SDGs 9,12 and 13, Zambia's activities in the framework of the SDGs relate to a much broader set than these three. For instance, the VNR describes Zambia's activities on SDG15 Life on Land. Though activities are not yet identified, the VNR mentions "Pollution and poor waste disposal into ecological systems" as one of the challenges to be met by strengthening the relations between government and private sector.

Improved management of waste is specifically mentioned in the framework of activities related to SDG 6 – Clean water and sanitation. Among the required actions the following is mentioned: "Assess the effectiveness of private sector involvement in the sanitation sub-sector, vis-a-vis environmental concerns of waste disposal". The activities in this TA Project can support this action through assessing the potential involvement of the private sector in improved waste handling and thus in preventing unmanaged waste disposal.

Waste management is also integral part of Zambia's approach to SDG11: Sustainable cities and communities. Indicator 11.6.1 even explicitly mentions this ambition: "Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities".

## 2 Development of an indicator matrix (activity 3.4): Multi-Criteria Analysis

For the development of a transparent indicator matrix, the Multi Criteria Analysis methodology was chosen. Multi-Criteria Analysis explicitly evaluates multiple conflicting criteria in decision making and can be used to identify and compare different implementation options by assessing their effects on criteria such as performance, economic return, impacts and trade-offs. In a six step methodology, visualized below, the MCA decision matrix is constructed that weighs criteria for different options. We will now explain the six steps and the method that was taken per step.



### Step 1: Structure the question

The goal of an MCA is contribute on the decision-making process for a certain decision problem. This creates the necessity to have a clear question for which the MCA is developed. In this case the question was: “which waste stream should be prioritized in the rest of the project?”

### Step 2: Select criteria for evaluation

A set of 20 social, environmental, economic and institutional criteria was developed. Each criteria is based on the criteria in the response plan and important insights from Output 2 and agreed upon with the NDE.

### Step 3: Select possible CE pathways to address the question

The pathways were predefined in the project as six waste streams; plastic, metal, paper, glass, organic and agricultural waste.

### Step 4: Construct matrix to evaluate pathways

The matrix was constructed in Excel with on the y-axes the criteria including a description and on the x-axes the waste streams, including a description of why a certain waste stream received a certain score. Each waste stream is ranked per criteria on a qualitative scale from (---) to (+++). Herein (---) means that there is still a lot of change needed for that waste stream regarding that criteria to move towards circularity. (+++) means that regarding that particular criteria, the waste stream is ready to move towards circularity.

**Step 5: Create value functions to normalize criteria**

Each criteria has a weight, this represents the importance of each criteria to CTCN and the NDE. It was developed in collaboration with the NDE.

**Step 6: Weight criteria to rank pathways**

To arrive at a score per waste stream, the weights are multiplied with the numerical value corresponding to each score (---) equals 1, and (+++) equals 7. The total sum product is then normalized to arrive at a final score for each waste stream.

The results of this step-by-step MCA development can be seen in Appendix D.

A brief summary of the score of each waste stream is:

ZAMBIA	plastic	metals	paper	glass	organic waste	agricultural waste
Normalized Weighted Ranks	10,0	6,0	7,4	5,0	8,2	8,7

### 3 Analysis of Strengths, Weaknesses, Opportunities and Threats (SWOT) (activity 3.2 and 3.3)

The following report discusses the Strengths and Weaknesses of the current status quo of each of the six waste streams under study (plastic, metal, glass, paper, organic and agricultural waste). Additionally, the Opportunities and Threats regarding the potential of each waste stream are discussed. There are some key dynamics that play a role in the SWOT analysis for each waste stream, these are discussed below and aim to provide a brief summary of the key characteristics of Zambia's current waste system. For more information about the current waste system, we refer the reader to the WP2 sub report.

Zambia is a sparsely populated and resource rich land in the center of Southern Africa. Around 32% of Zambia's land is used for agriculture. Major crops include maize, sorghum and rice. The production of "traditional" food crops, particularly those that are less reliant on heavy rainfall, is an approach that has been heavily promoted as a means to "achieving sustainable food production and enhancing agricultural productivity". Zambia is experiencing a large demographic shift and is one of the world's youngest countries by median age. Its population, much of it urban, is estimated at about 17.9 million and is growing rapidly at 2.8% per year, partly because of high fertility, resulting in the population doubling close to every 25 years. This trend is expected to continue as the large youth population enters reproductive age, which will put even more pressure on the demand for jobs, health care and other social services. COVID-19 has negatively affected key sectors of the economy as well as the government potential to effectively implement the Economic Recovery Programme, which was intended to resolve most of the critical economic constraints—such as debt sustainability and stabilization of the macroeconomic environment—which could pose a high risk to Zambia's economy.

Zambia is estimated to produce around 3,6 million tonnes of waste annually. Waste in Zambia is primarily organic, comprising 51% of the total waste generated by households. Plastic is the second largest waste stream, varying around 14% of the total waste. Local authorities are mainly in charge of waste collection but face severe challenges doing so. Hence, the large majority of waste is collected by several private companies or Community Based Enterprises. In general, collection rates are low, especially in low income urban areas and rural areas. In the whole of Zambia there is only two engineered landfills. All the other locations are local authority controlled open dumpsites. Separation at dumps or landfills is done by informal waste pickers, who collect valuable components and sell to aggregators who then either export the waste or sell to Zambian recyclers.

Waste that is not collected is either burned, buried or dumped in the environment, which leads to land and water pollution from accumulation of waste and air pollution from burning waste. Proper source separation of multiple waste streams by households for waste collection is largely inexistent. The only source separation that seems to occur relatively frequently is the separation of organic waste for domestic composting and some separation of plastics.

### 3.1 Plastic waste

Table 1 SWOT analysis plastic waste

Status Quo	Potential
<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>– Relatively well developed downstream value chain with stakeholders at every juncture</li> <li>– Value of products from waste is relatively high</li> <li>– Large volumes that are expected to increase</li> <li>– Plastic ban law has given more attention to plastic waste</li> <li>– Growing number of people are creating income from products made from pre-used plastics</li> <li>– The market is largely domestic with not much plastics being exported</li> </ul>	<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>– Availability of a large young population, that is growing and has a high unemployment rate, can benefit from circularity of the waste i.e. employment, collection.</li> <li>– Business opportunities for woman and girls</li> <li>– Large Southern Africa Development Cooperation (SADC) market for export of valorised products</li> <li>– African Continental Free Trade Area (AfCFTA) will be able to accelerate trade between countries including valorised products</li> <li>– Separation of waste at the household level might spur more growth of the value chain</li> </ul>
<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>– Plastic is scarcely separated and often burned or disposed of in the environment</li> <li>– There is a modest internal industry focused on plastic recycling.</li> <li>– Inadequate waste management activities by the local and city councils</li> <li>– Inadequate capacity to quantify and create plastic waste inventory</li> <li>– Poor collection regime by the local authorities</li> <li>– It cannot be recycled repeatedly</li> <li>– Lack of knowledge on handling plastic waste</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>– Massive migration of young people to other countries, especially to South Africa</li> <li>– Inadequate government support might negate establishment of industries i.e. high taxes, bureaucracy etc.</li> <li>– Inflation (average over 10 % in 2005 – 2021 period) average likely to occur making cost of living high</li> </ul>

## Strengths

The volumes of plastic waste are relatively high compared to metal, paper and glass. Due to the growing population, urbanization and the growing middle class the volumes of plastic waste is expected to increase significantly over the coming decade. This offers vast opportunities for both the informal and private sector. Additionally, the value of scrap plastic is relatively high compared to glass and paper. There is a well-developed value chain with stakeholders at every juncture. Also, the plastic ban law has given more attention to plastic waste and the government has been working to ensure it is managed by establishing an EPR scheme. This creates a good platform to mainstream circularity in the plastic waste sector.

## Weaknesses

In current practice very few people are separating their plastic waste. Some plastic waste is collected and brought to dumpsites, while a lot of plastic waste is dumped in the environment. Plastic is also burned or buried, which poses both environmental and health risks, especially when the plastic is contaminated with toxic chemicals. This lack of separation at source has led to decline of plastic waste recycling due to contamination and mixing. Also, limited internal industry focused on plastic recycling leading to more exports as well as ineffective waste management activities by the local and city councils is a major weakness. An additional weakness in terms of business opportunities is that plastic cannot be recycled repeatedly since the quality of plastic decreases. Further, knowledge is lacking on the dangers of plastic waste handling and knowledge and technology for handling the different plastic streams is insufficient.

## Opportunities

The coming into force of ACFTA will accelerate market access for valorized products as well augment SADC to become a more effective and efficient market place. Additionally, due to the growing volumes and the relative high value and advanced international practices of plastic processing, there is high potential for the complete value chain from local businesses to informal workers to the private sector. All these parties have a different role to play in the value chain. Informal workers can collect plastic from households or from dumpsites, and sell it to aggregators (local businesses), who can then sell it to an internal private sector recycling industry for plastics. Other opportunities are to implement deposit schemes (e.g. for PET bottles), or other extended producer responsibility schemes regarding plastics. Also, the availability of a growing young population is a large opportunity, as they could provide sufficient employment for the jobs needed to transition towards circularity, particularly due to the currently high unemployment rates. These business opportunities are also accessible for women and girls and thus empower them.

## Threats

Recently there has been massive migration of young people to other countries, especially South Africa leading to loss of labor. This might pose a threat in the future when there is more need for jobs in circularity. Additionally, inadequate government support over time, such as high taxes and bureaucracy, might negate establishment of internal industries for plastic remanufacturing and recycling.

### 3.2 Metal waste

Table 2 SWOT analysis metal waste

Status Quo	Potential
<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>– The value of metal (especially copper and aluminium) is relatively high</li> <li>– Households are willing to separate and/or store metal</li> <li>– Enactment of scrap metal dealers act to streamline valorisation</li> <li>– Metal is easy to separate from other waste streams</li> <li>– Metal waste can be recycled frequently and retain a sufficient quality</li> </ul>	<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>– Enhance access to reliable energy to accelerate valorisation at home</li> <li>– Banning export of the waste until local demand is met</li> <li>– Enhance artisanal skills and training in vocation and polytechnics</li> </ul>
<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>– Continuous heavy metal contamination of soil and sediment</li> <li>– Lack of involvement of women and youth due to the nature of the waste</li> <li>– There are a few private players active in the separate collection of metal waste from households.</li> <li>– The current domestic market for metal waste is small</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>– Porous border may deny the government revenue from export</li> <li>– Gang wars associated with the control of the waste may bar investors from establishing industries to valorise the waste</li> </ul>

### Strengths

The global value per ton of metal waste is quite high, specifically for copper and aluminum. Especially when compared to waste streams such as paper, glass or organic waste. Because of this high value, households that have the storage space available, are willing to separate and store metal waste. Perception of metal waste as a resource by stakeholders is higher than all other waste streams. Also, the enactment of scrap metal dealers act to streamline efficiency in the metal waste usage.

### Weaknesses

There is no significant internal industry for waste metal processing within Zambia. This means that much metal waste needs to be exported, limiting the profit that can be made out of metal waste. Additionally, the metal waste stream in Zambia as of this moment is small and handling metal waste can be dangerous. Due to inadequate disposal, there are many cases of continuous heavy metal contamination of soil and sediment in Zambia. Because of the dangerous reputation of metal waste and the heavy weight of the material, as well as the fact that it is considered to be a man's job, the metal waste stream holds limited potential for gender equality.

### Opportunities

As Zambia develops, the metal waste stream is expected to increase in volume. For example second hand cars or large household appliances will increase in volume and at the end of their life this results in large volumes of metal waste. Additionally, metal is quite easy to separate and collect for waste pickers, so when quantities rise, opportunity increases as well. Lastly, handling metal waste properly, might reduce health risks associated with leakage of metal into the environment and the improper handling of metal waste. Also, enhancing artisanal skills and training in vocation and polytechnics will go a long way to increase knowledge on metal waste as well as amplify its utility negating dumping.

### Threats

Porous border may deny the government revenue from export as the metal waste business is marred with gang wars associated with the control. Also, the gang involvement might inhibit involvement of investors to the business due to the black market that is involved.

### 3.3 Paper waste

Table 3 SWOT analysis paper waste

Status Quo	Potential
<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>– Availability of small-scale recycling CBOs</li> <li>– Availability of large quantities of paper from households</li> <li>– Easy to recycle</li> </ul>	<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>– Activate and localize regional trade to enhance movement of this waste among neighbouring countries to encourage more exports</li> <li>– Integration of art and craft skills and training in vocational and training centers</li> <li>– Potential for gender equality</li> <li>– Volume and value will increase</li> <li>– Potential for local businesses, the informal sector and thus job creation, dependent on private sector</li> </ul>
<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>– Usage of paper as an alternative source of energy in households</li> <li>– Lack of separation at source results in contamination</li> <li>– Willingness to separate at household level is currently low</li> <li>– Non recycled products are cheaper</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>– Inadequate returns from recycling paper waste</li> <li>– Poor collection and managing of this waste result to end of life of most papers</li> </ul>

## Strengths

Availability of well-developed value chains with a good number of stakeholders involved in upstream valorisation has accelerated valorisation of the waste, increasing domestic markets and leading to export. Also, support from small-scale recycling CBOs has encouraged valorisation of the waste, especially from the households. There is enough volume of paper waste to sustain and expand the recycling businesses and paper recycling is not too difficult in terms of techniques and processes. It only needs to be separated at source and during transportation.

## Weaknesses

At this moment there is almost no separation of waste at household level and paper is often contaminated with organic waste, which reduces its value. Additionally there is only a small internal paper industry and much of the paper that is collected, is aggregated and exported. Inadequate basic infrastructure has contributed to poor collection of this waste as well as less involvement of players especially in the downstream value chain as compared to the upstream. Due to lack of reliable energy especially by rural households the waste has been continuously used as a subsistence source of energy (burning paper) leading to GHG production, consequently watering down the NDCs action points. Simultaneously using paper as an energy source lowers the incentive for collection and usage for recycling. Furthermore, the recycled products often cost more than non-recycled products, which gives a low economic incentive for recycling.

## Opportunities

Activation of ACFTA will enhance trade of this waste among neighbouring countries and encourage more exports, potentially earning the country some much needed revenue. Expanding financial resources to youth and women groups can grow small scale recycling, that seem to be the back-bone of private sector as around 60% of business are SMEs. This could potentially expand the local economy and contribute to further development of employment opportunities of both semi and unskilled citizens. Due to urbanization and a growing middle class, the amount of paper waste is expected to increase over the next decade. As of this moment, there is only a small internal paper industry (even decimated due to the burning of one of the key paper mills in the country), however, there is a huge potential since paper recycling is relatively easy and does not require large energy intensive and complicated processes (as is the case for glass and metal).

## Threats

Social stigma experienced by waste pickers, especially women and youth, might stifle their involvement due to the notion that waste collection of waste paper is a low-status job. Also, the lack of financial access for such groups might weaken their involvement in the management of this waste (i.e. some of the groups lack financial literacy to ensure their involvement has sustainable income generation).

### 3.4 Glass waste

Table 4 SWOT analysis glass waste

Status Quo	Potential
<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>– The supply side of the value chain is fairly well-developed</li> <li>– There is a market for recycled glass</li> <li>– Glass can be recycled perpetually if separated properly</li> </ul>	<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>– Enhance reliable energy to encourage recycling</li> <li>– Expand access to personal protective equipment (PPE) to encourage women and youth</li> <li>– Train women and youth on circular economy and how it can be harnessed for improving their quality of life</li> </ul>
<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>– Inadequate reliable energy to accelerate local valorization</li> <li>– Downstream players are mostly informal businesses in low informal settlements while upstream players are big multinational businesses</li> <li>– Inadequate involvement of women and youth due to the nature of the waste i.e. bulky, risky</li> <li>– Lack of data on glass imports and exports</li> <li>– There are very few players active in the separate collection of glass waste. Bottles are deposited by households themselves and non-bottled glass is usually mixed with residual waste</li> <li>– Non recycled products are cheaper</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>– Upstream players are mainly based in South Africa</li> <li>– Shortage of designated landfill to streamline management of this waste</li> </ul>

## Strengths

There is value in glass remanufacturing or recycling, although not as high as metal or plastic. The position of key stakeholders in the value chain has resulted to the growth of downstream players in informal settlements. Also, the well-developed supply chain in takeback schemes has enabled the reuse and refill of the bottles by employing the services of a CBOs. There is a market for recycled glass, in the construction sector or recycled products for households.

## Weaknesses

As of this moment there is a small internal industry for glass processing within the country. The limited amount of glass that is collected is mainly exported for recycling, mainly to South Africa. Additionally, the glass waste stream is small and difficult to handle, it can break easy and is quite heavy. This also leads to limited opportunities for gender equality, since working in glass might be too heavy for women. Separation and collection of glass is difficult for the same reason, and at this moment there is almost no separation or collection of glass. There are also 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 residual waste. Lastly, processing glass is highly energy intensive and does not offer much opportunity for climate mitigation or adaptation, since there is no leakage of GHG emissions at the end of life, and the stream is relatively small.

## Opportunities

As Zambia develops, the glass waste stream is expected to increase in volume. So better management of glass waste offers some potential for job creation. Energy expansion will encourage industries to establish more energy-intensive processes, such a favourable enabling environment is critical to fully attract the industries to set up shop in Zambia. Policy and regulations targeting glass recycling is vital for industries to develop and possibly even expand their activities to other countries.

## Threats

Upstream players are mainly based in South Africa, hence negating the much-needed impetus (employment, revenue) for Zambia to position itself in circularity. Also, the shortage of designated landfills to streamline management of this waste has led to refuse and dumping in most urban and peri-urban areas.

### 3.5 Organic waste

Table 5 SWOT analysis organic waste

Status Quo	Potential
<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>– Large volumes</li> <li>– Use of circularity products is normalized</li> <li>– NGOs and CBOs are also involved due to the waste negatively affecting health situations in informal community settlements</li> <li>– Households also practice small scale composting</li> </ul>	<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>– High potential for climate mitigation and adaptation and NCRE (Non-Conventional Renewable Energy Technologies)</li> <li>– Still lots of underused volumes</li> <li>– Potential for job creation, local businesses and the private sector</li> <li>– Potential for alignment of public and private agendas</li> <li>– Potential for gender equality</li> <li>– The proposed move towards green economy by the government could increase the demand for organic fertilizer</li> </ul>
<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>– Lack of infrastructure to separate waste at source</li> <li>– Lack of infrastructure to collect this waste especially in rural areas where it is largest</li> <li>– Poor handling of this waste by households resulting in diseases and water sources contamination</li> <li>– Generation of methane as a result of uncontrolled composting and dumping contributing to changing climate</li> <li>– There are only a few parties active in composting and producing fertilizer. The market is small.</li> <li>– Time sensitivity in handling the waste</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>– Limited knowledge on state-of-the-art technology</li> <li>– Without better collection and separation there will be no larger scale solutions possible</li> <li>– Relatively poor country, might pose challenges in ensuring sufficient investment capital</li> <li>– Food waste varies in type and quality, hindering the direct applicability to biogas production</li> </ul>

## Strengths

Existence of large volumes of this. There are some local businesses or private sector companies make fertilizer, biogas, compost or cooking briquettes out of organic waste. As the waste can negatively affect health in informal community settlements, the involvement of NGOs and CBOs has increased, leading to more activity with the waste such as the transfer of skills to augment the practice of household composting.

## Weaknesses

The biggest weakness of the current organic waste system is that there is virtually no separation or separate collection, meaning that all organic waste that households don't compost or sell to businesses themselves, is collected or dumped with other waste, making separation virtually impossible. Poor handling of this waste by households can result in diseases and water sources contamination. Also, uncontrolled composting and dumping lead to the generation of methane, contributing to climate change. Therefore, the waste must be handled within a certain time frame and cannot be stored long.

## Opportunities

The organic waste stream holds great potential for climate mitigation and adaptation as well as for generation of non-conventional renewable energy through biogas. Organic waste currently often finds its way to open dumpsites since there is insufficient separation and collection. When the organic waste decomposes it releases methane into the environment. Better circularity options for organic waste will thus contribute to climate mitigation. Additionally, there are still lots of underused volumes. Products of organic waste can either be sold in Zambia itself, e.g. organic fertilizer, where due to a growing population *and* growing middle class the market for products might increase, or can be exported abroad. This waste stream also holds potential for alignment of public and private agendas, since it can improve hygiene and prevent disease outbreaks, while also creating jobs, private sector involvement *and* contribute to climate change adaptation and mitigation. Lastly, since women are often the main person involved in creating and handling organic waste (as this mainly involves food and cooking activities), women can play a large role in this waste stream, proving opportunities for gender equality.

## Threats

Limited knowledge on state-of-the-art technology has hindered effective valorisation. This has been worsened by inadequate collection and separation in a relatively poor country, posing challenges in ensuring sufficient investment capital. Additionally, the varying character of the waste can make it difficult to use directly for biogas production (for which a relatively homogeneous input is needed).

### 3.6 Agricultural waste

Table 6 SWOT analysis agricultural waste

Status Quo	Potential
<p><b>Strengths:</b></p> <ul style="list-style-type: none"> <li>– Expansion of urban and peri urban farming enhancing availability of the waste</li> <li>– Availability of household pits to act as refuse collection points</li> <li>– Small scale composting at the rural household levels</li> <li>– Agricultural based economy accelerating production of the waste</li> <li>– Large number of rural population that is mainly engaged in agriculture</li> </ul>	<p><b>Opportunities:</b></p> <ul style="list-style-type: none"> <li>– High potential for climate mitigation and adaptation and NCRE</li> <li>– Still lots of underused volumes</li> <li>– Potential for job creation, local businesses and the private sector</li> <li>– Potential for alignment of public and private agendas</li> <li>– Potential for gender equality</li> </ul>
<p><b>Weaknesses:</b></p> <ul style="list-style-type: none"> <li>– Small land space competing with large quantities of agricultural waste</li> <li>– Uncontrolled composting and dumping results to emission of GHG hence leading to climate change</li> <li>– Poor waste disposal strategies among citizens</li> <li>– Inadequate industry to accelerate utilization of the waste</li> <li>– The nature of the waste (smell, wet) discourages collection</li> </ul>	<p><b>Threats:</b></p> <ul style="list-style-type: none"> <li>– Limited knowledge on state-of-the-art technology</li> <li>– Without better collection there will be no larger scale solutions possible</li> <li>– Relatively poor country, might pose challenges in ensuring sufficient investment capital</li> <li>– No proper regulations for the agricultural sector towards environmental issues</li> <li>– Much waste already processed in and on farms</li> </ul>

## Strengths

Expansion of urban and peri-urban farming has enhanced the availability of the waste and the easiness of collecting agricultural waste. Collection in rural areas is often difficult due to lack of (collection) infrastructure, however the establishment of household pits allow for refuse collection points. Small scale composting at the rural household levels has been amplified due the agri-based economy. Additionally the large number of people from the rural population engaged in agricultural activities means that there are large quantities of agricultural waste available per season, and much is not used to its full potential.

## Weaknesses

Burning agricultural waste has resulted in the emission of GHG's, contributing to climate change. Also, poor waste disposal strategies among citizens has resulted to contamination of this waste resulting to value loss. The nature of the waste (smelly, wet) discourages collection including discouraging women and youth from getting involved. The biggest weakness of the current agricultural waste system is that there is virtually no separation or separate collection, meaning that all agricultural waste that households don't reuse within their farm, compost or sell, is dumped with other waste, making separation and valorisation virtually impossible.

## Opportunities

The agricultural waste stream holds great potential for climate mitigation and adaptation as well as for generation of non-conventional renewable energy through biogas. Agricultural waste currently often finds its way to open dumpsites on the farms since there is insufficient separation and collection. When the agricultural waste decomposes it releases GHG emissions such as methane into the environment. Better circularity options for agricultural waste will thus contribute to climate mitigation. Additionally, since there are quite some volumes of agricultural waste not being used, it holds potential for job creation of both local businesses and the private sector. Products of agricultural waste can either be sold in Zambia itself, where due to a growing population *and* growing middle class the market for products might increase, or can be exported abroad. Furthermore, since large amounts of agricultural waste become available around the same time (after harvesting), this does hold potential for large scale collection also to rural areas that might be not economically interesting to reach for other types of waste collection. This waste stream also holds potential for alignment of public and private agendas, since it can improve hygiene and prevent disease outbreaks, while also creating jobs, private sector involvement *and* contribute to climate change adaptation and mitigation. Lastly, since women are heavily involved in practices in and around the farm women can play a large role in this waste stream.

## Threats

Limited knowledge on state-of-the-art technology as well dwindling budget allocations to local authorities have a negative effect on agricultural waste management activities, particularly as the rural areas are not served. The varying character of the waste, the timing of waste (depending on harvest season), and the fact that much of it is already being reused on the farms itself (munching, animal feed, composting) can also make it difficult to sustain a steady stream of quality and sufficient volume of the products for downstream valorization. Additionally, the current collection rate is a real threat to exploiting the potential of the agricultural waste stream. Currently, the agricultural policy does not include proper environmental regulations, giving low incentives to handle this waste stream better.

### 3.7 Conclusion

Zambia currently holds the greatest potential for a transition towards circularity in the plastic, organic and agricultural waste stream.

For plastics, the main reason for this high potential is that there is already a somewhat developed value chain for plastics to be built upon. Additionally, the stream is large and expected to increase and the value of plastic waste is relatively large. However, there is hardly any internal industry for remanufacturing or recycling and most plastics are exported. So if the plastic waste stream is chosen, developing the upstream value chain deserves attention as well as a proper collection system to increase volumes.

For the organic and agricultural waste stream, the high potential is mainly due to the high volumes of organic and agricultural waste that are being generated in Zambia.. However, for these waste streams there are some major weaknesses and threats that need to be considered. There is no adequate infrastructure for both separation and collection in both urban and rural areas, whereas agricultural waste is mainly generated in rural areas. Additionally, state of the art technology to develop high quality products from these waste streams is lacking and could hinder to market uptake.

That plastic, organic and agricultural waste currently hold the most potential for circularity, does not mean it is not worth considering boosting the other waste streams. All streams require attention and have to opportunity to be managed more circularly - it might thus also make sense to choose for metal, paper or glass. However, one should realize that more effort will be needed to develop these waste streams towards circularity in an economic attractive manor than for plastics, organic or agricultural waste. For both metal, paper and glass, development of the value chain within the country, creating proper separation and collection systems as well as securing sufficient capital and in-house knowledge for remanufacture or recycle should be a top priority.

## 4 Stakeholder meeting on prioritization of waste streams

### STAKEHOLDER MEETING REPORT

14<sup>th</sup> OCTOBER, 2021 AT PROTEA HOTEL LUSAKA, ZAMBIA



## 4.1 Introduction

This report is made in line with Activity 2 and 3 of the CTCN response to request by Zambia National Designated Entity on the Assessment of the current status of the circular economy in the waste sector for developing a waste stream specific roadmap in Zambia. The report was drafted by TNO in collaboration with Sustainable Inclusive Business-Knowledge Centre as the local consultants in the development of the response plan.

The meeting served as a validation workshop for Zambia stakeholders to deliberate on the status of waste management in the country as well as make a consultative decision on a particular waste stream that they would like to be developed for purpose of mainstreaming circular economy in the country.

The meeting was attended by 14 stakeholders drawn from civil society, government agencies, and private sector.

## 4.2 Opening Remarks

The meeting was opened by Mr. Njamba Makayi, the National Designated Entity for CTCN and the project focal point, giving a brief overview of the project as well as the work they have been doing in relation to scaling innovative technologies to accelerate climate change mitigation and adaptation.

Mr. Njamba also made a request to the stakeholders to be open and ready to engage with the facilitators of the sessions in order to enrich the process for the development of a consultative position going forward.

## 4.3 Presentation Overview of the CTCN Circular Economy Project and Progress to Date

The presentation was made by Mr. Paul Oosterkamp as the project manager (TNO) for the project assisted by Mr. Ebenezer Amadi, (SIB-K). They made presentation on the project timelines as well as the juncture where the project is at the particular time. As part of the presentation there was request by the Ministry of Local Government to be brought up to speed on the project because it is the Ministry responsible with waste management in the country under the local and city councils.

As part of strengthening stakeholder engagement and response specially from the already disseminated questionnaire there was a request for stakeholders to reach out if they would like to participate as there was still some room to expand data and information needed to enrich the results from Activity 2.

## 4.4 Summary of Activity 2: Analysis of household waste streams and circularity in Zambia

The summary of activity was facilitated by Chandi Mutubuki-Makuyana from Zimbabwe who is the local consultant in charge of the data collection in Zambia. The following is a summary of key issues identified from the primary and secondary data collected and analyzed. The data was collected in low, middle and high income areas in Kitwe, Livingstone, and Lusaka.

### 4.4.1 Key Highlights

- Household waste samples were collected and characterized using data collectors for 90 households in Lusaka, Kitwe and Livingstone. Household questionnaires administered using data collectors to 273 households in same cities.
- Waste composition: Organic is the highest with 51%, followed by plastics at 14%, then by others (nappies, ash, soil, etc.) at 12%; metals at 9%; paper at 6%; and glass and textiles at 4% each. This compares relatively well with World Bank (2012) estimates of 64% for organic; others 17%; plastics 8%; paper 5%; then metals and glass at 3%.
- High income areas produce more waste per capita than low- and middle-income areas

- Waste generated per person per day is 0.38kgs. Lusaka had the highest with 0.57kgs per person per day, and Kitwe, the lowest at 0.04kgs per day per person.
- There exist a waste dynamic that manifest as more waste is disposed during the weekdays as opposed to weekends (especially in the capital Lusaka) due to weekdays having more people come into the capital who move out during weekends.
- Household waste is generally collected weekly (49%). However, a significant portion (32.7%) indicated that waste is never collected.

#### 4.4.2 *Comments from the Stakeholders*

- There was a request by the Ministry of Local Government to hold a meeting with the team to know more about the project so as to participate meaningfully.
- There was need to consult the climate change network to expand the policy coherence of waste management in relation to climate.
- Zambia Institute of Environmental Management raised an issue on the dynamics of waste situation in Lusaka between weekdays and weekend that should be interrogated to inform more of the policy.
- There was consensus that the waste situation was representative of the country waste status including the decision to focus on the low, middle and high income areas.
- Also, there was concern raised by the representative from the Civil Society Climate Change Network that the country was in the process of enacting a climate change policy and the findings could inform the waste management as a contributor of GHGs.

#### 4.4.3 *Strength Weakness Opportunities and Threats (SWOT) Analysis*

As part of the programme, there was another session where Milou Derks (TNO) provided an overview of the SWOT analysis for the sixth waste streams. The session was consultative in set up (sticky notes used to gather comments from stakeholders), so as to enrich the information and data to and add to the validity and accuracy. The following comments were shared by the stakeholder during the session.

##### Plastic

- There is an opportunity to develop green bankable projects with solicited finding from Green Climate Fund and Green Environmental Facility
- Enhanced mobilization from the National Climate Change Funds
- The informal sector was mentioned as a key contributor accelerating effective management of this waste
- The waste presents the opportunity to develop safety nets for marginalized communities
- Inflation and low economic return were frequently mentioned as threat to accelerating circular economy of this waste.

##### Glass

- There is already development of safety standards associated with glass products
- Opportunities to invest in establishing high glass upcycling facility
- There is a gap in knowledge development in stakeholders recycling glass in the country
- There is limited awareness in handing glass waste among citizens.

##### Organic

- Has the potential for generation of energy supply
- Need to promote behavioural change to accelerate waste separation at source
- Its storage can become hazardous waste due to occurrences of fires
- Inadequate land to scale composting.

## Agricultural

- Opportunities to expand the waste to scale agricultural productivity
- There are opportunities to expand knowledge on small scale circular economy at the household level
- They can be used to feed livestock in the event animal feeds are not available
- This waste can be used as a fertilizer in the event organic fertilizer is not readily available.

## Metal

- Opportunities to position energy transfer with large multilateral agreements
- Expansion of synergies with SMEs will spur economic growth
- Threats of vehicle theft and wreckage will be high if the market for metal waste is expanded
- Abstract framework for disposing and recycling of vehicles wreckage
- Threats to expand cheaper metal from other countries if standards and certification is not developed.

## Paper

- There is a notion that waste is inexpensive hence not so many investors will be willing to invest the valorisation venture
- Big industries that are consumers of papers are going digital hence loss of valorised waste paper
- The waste has poor incentive model hence not able to attract both private and public attention
- Presents an opportunity to eliminate SUP especially in packaging materials.

## 4.5 Focal Group Discussions

During the afternoon focal group discussions were held where participants were separated into groups to discuss scenarios whereby the value chains would be fully sustainable and circular by 2035. The groups were separated into 3 categories each group handling one or two waste streams. The criteria used included (1) players active in the sector, (2) policy, (3) technology and (4) investments available. Several interesting ideas were developed:

### Glass

- Recapitalization of Kapiri Glass company to ensure that it recycles glass apart from manufacturing.
- Strengthening value chains by developing policy that enhances coherence and aligns with the needs of the market.
- Repurposing glass waste to be used in the construction industry.

### Agricultural and Organic Waste

- Improving rural infrastructure to ensure effective collection of waste management.
- Enhancing awareness and transferring easy technology to rural household to practice composting.
- Alignment of agricultural laws and environmental laws to ensure that agriculture is practice sustainably via incorporating green practices before, during and post-harvest.

### Plastic

- Need to streamline the value chain to ensure that stakeholders are able to meet the economies of scale for viable business models.
- There is need for effective implementation of the EPR to ensure that it meets its objective through effective implementation and budgetary allocation.

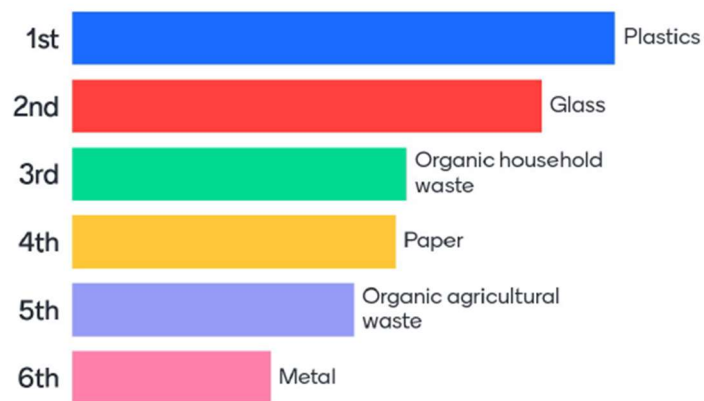
- Effective budgetary allocation to municipal councils to enhance effective waste collection as well as infrastructure to support separation at source.

#### 4.6 Prioritization of the waste streams

After the Focal Group Discussions a voting session was facilitated to get the views of the stakeholders in the room regarding the prioritization of the waste stream. After the voting session, plastics emerged as the most voted waste stream to be developed followed, by glass and organic waste respectively. Based on the group discussion the participants unanimously agreed on the relevance of plastics, although glass was also very much supported. In a separate meeting with the project implementation team the NDE focal point Mr. Njamba Makayi confirmed the to select plastic as the waste stream to be developed further.

*Results of the voting session:*

### What is your preferred order of priority for the waste streams?



## A Photo impressions



Stakeholders take a photo at the end of the workshop in Lusaka, Zambia




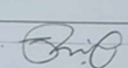
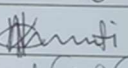
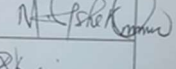
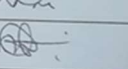

During one of the Focus Group Discussions







Naomi Montenegro Navarro facilitating one of the sessions





## B List of participants


  
 Stakeholder Workshop on the Development of a Circular Economy Roadmap in the Waste Sector in Zambia
   
 14<sup>th</sup> October 2021.

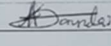
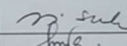



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Stakeholder Workshop on the Development of a Circular Economy Roadmap in the Waste Sector in Zambia
   
 14<sup>th</sup> October 2021.

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Stakeholder Workshop on the Development of a Circular Economy Roadmap in the Waste Sector in Zambia  
14<sup>th</sup> October 2021.

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## C Programme

### Programme stakeholder meeting CTCN Technical Assistance

*Assessment of the current status of the circular economy in the waste sector for developing a waste stream specific roadmap in Zambia*

14th of October 2021

Protea Hotel by Marriot Lusaka, Arcades Shopping and Entertainment Complex  
09:15 – 15:00

#### Agenda

- 09:15: Arrival and Registration
- 09:15: Coffee and Tea
- 09:45: Welcome and opening (Ben Makayi, National Designated Entity)
- 09:50: Opening of the day and introduction to the project (Paul van den Oosterkamp, TNO and Ebenezer Amadi, SIB-K)
- 10:15: Results of the baseline assessment – Analysis of household waste streams and circularity in Zambia (Chandi Mutubuki Makuyana)
- 11:00: Questions and discussion
- 11:15: Coffee/ tea
- 11:45: Presentation of SWOT plus discussion circularity routes per waste stream (Milou Derks, TNO)
- 13: 00: Lunch
- 14:00: Focal Group Discussions (Naomi Montenegro Navarro, TNO)
- 15:00: Closing of the stakeholder meeting (Paul van den Oosterkamp and Ebenezer Amadi)

# D MCA Analysis

Zambia	Criteria	Description	Weight	Plastic	Metals	Paper	Glass	Organic waste	Agricultural waste	Explanation
social	Household behavioural acceptance	The level of behavioural change that is required to move towards circularity. Note that this does not include separation, for separation there is a different criteria. If there is not a lot of behaviour change necessary (+++), then this will have a positive impact when trying to make a waste stream more circular. When there is a lot of behaviour change necessary (--), then there is still a lot of change needed. An example is a deposit mechanism requiring people to pay more for their product and returning the packaging to get their deposit back.	4	(+)	(+)	(-)	(+)	(-)	(+)	Plastic: in low income areas reused quite a bit when there is still use for the product, otherwise it is thrown out, so (+) is the score. Metal: in low income areas reused quite a bit when there is still use for the product, otherwise it is thrown out, so (+) is the score. Paper: people don't see much use for paper after it is used, so they just throw it away, so (-) is the score. Glass: in low income areas reused quite a bit when there is still use for the product, otherwise it is thrown out, so (+) is the score. Organic waste: small scale composting at rural levels, where there is less waste collected. In high income areas people are less willing to adjust their behavior, but have the financial means to contribute to a deposit system, so (-) is the score. Agricultural waste: in rural areas where there is less waste collection, people regularly compost their waste.
	Social status of waste workers	If the social status of waste workers working in a particular waste stream is low (--), then this might prevent both local businesses or informal sector workers to want to get involved in the waste stream. If the social status is high (+++), then this can result in an increase of people willing to work in the sector.	3	(-)	(-)	(-)	(-)	(--)	(-)	Plastic: Social status of waste workers is generally low, especially downstream (waste picking), the well-established value chain for plastic results in a bit of a higher status, so (-) is the score. Metal: Social status of waste workers is generally low, especially downstream (waste picking), Social status of waste workers is generally low, especially downstream (waste picking). For metal there is no developed value chain and the status is low, so (-) is the score. Paper: Social status of waste workers is generally low, especially downstream (waste picking), for paper there is a small scale recycling, but with low value, so (-) is the score. Glass: Social status of waste workers is generally low, especially downstream (waste picking), glass additionally is considered dangerous, so (-) is the score for glass. Organic waste: Social status of waste workers is generally low, especially downstream (waste picking), organic waste is furthermore considered dirty and smelly, so (-) is the score. Agricultural waste: Social status of waste workers is generally low, especially downstream (waste picking), however agriculture is a main activity in the country, so handling this waste has a better social status, so (-) is the score.
	Willingness to separate waste at source	Separation is key to a lot of solutions. If the willingness to separate a certain waste stream at source is high (+++), then this will positively influence circularity of that waste stream. If willingness to separate is low (--), then there is still a lot of effort (capacity building, incentives, others) needed to increase willingness to separate.	3	(+)	(+)	(-)	(-)	(-)	(+)	Plastic: currently it is not being separated, but plastic can be reused and thus holds value still, so people are willing to separate, so (+) is the score. Metal: Not actively collected at household level, but metal holds value so people are willing to separate, so (+) is the score. Paper: difficult to separate and low value of the waste lead to a low willingness to separate, so (-) is the score. Glass: difficult to separate and low value of the waste lead to a low willingness to separate, so (-) is the score. Organic waste: this waste is smelly and therefore people are not willing to separate at all (unless they can compost it), so (-) is the score. Agricultural waste: handling and separating this waste is more normalize, so (+) is the score.
	Opportunities for gender equality	If there are a lot of opportunities within a certain waste stream for women (+++), then this has a positive impact on the gender balance. If the waste stream does not hold a lot of opportunities for women (--), this will have a negative impact on the gender balance. Note that this criteria relates strongly to SDGs.	4	(++)	(-)	(++)	(-)	(+++)	(++)	Plastic: Women are already heavily involved in handling this waste stream, however more involvement can be achieved upstream in the value chain, so (++) is the score. Metals: This waste is considered to be heavy and dangerous and women are not much represented in this waste stream, so (-) is the score. Paper: Women are already heavily involved in handling this waste stream, however more involvement can be achieved upstream in the value chain, so (++) is the score. Glass: This waste is considered to be heavy and dangerous and women are not much represented in this waste stream, so (-) is the score. Organic waste: woman are mainly responsible for handling this waste stream (because men consider it dirty), so (++) is the score. Agricultural waste: Women are already heavily involved in handling this waste stream, however more involvement can be achieved upstream in the value chain, so (++) is the score.
environmental	Level of integration of NCRE	If there is a lot of opportunity (+++) for non-conventional renewable energy technologies to be deployed, then this can positively influence transitioning towards circularity. If there is not a lot of opportunity for NCRE then this can have a negative influence on transitioning towards circularity, since no synergy can be created with the energy transition.	2	(+)	(--)	(-)	(--)	(+++)	(+++)	Plastic: there is some possibility for pyrolysis, which at least will prevent open burning, so (+) is the score. Metal: There is no opportunity for energy generation and the internal industry is very small so not much potential to recycle and thus lower energy consumption to make products, so (--) is the score. Paper: There is no opportunity for energy generation and the internal industry is very small so not much potential to recycle and thus lower energy consumption to make products, however, paper is used as alternative source of energy in households, so (-) is the score. Glass: There is no opportunity for energy generation and the internal industry is very small so not much potential to recycle and thus lower energy consumption to make products, so (--) is the score. Organic waste: There is a lot of potential for biogas, so (++) is the score. Agricultural waste: There is a lot of potential for biogas, so (++) is the score.
	Potential for local businesses and informal sector	If there is a lot of potential for local businesses to create economic activity (+++), then this will have a positive impact when transitioning a waste stream towards circularity. If the potential is low (--), then this can hinder the transition to a more circular waste stream.	4	(+++)	(-)	(+)	(-)	(++)	(+)	Plastic: Very high potential for economic activity, the stream is of high value and voluminous, so (++) is the score. Metal: not much potential, since handling this waste is very energy intensive and there is not much internal industry, so (-) is the score. Paper: there is some potential for paper, since it is easy to handle and recycling and there is some small internal industry, so (+) is the score. Glass: not much potential, since handling this waste is very energy intensive and there is not much internal industry, so (-) is the score. Organic waste: Quite high potential since it voluminous and there are a lot of products you can make of it, collection from rural areas, however, will be difficult, so (++) is the score. Agricultural waste: Quite high potential since it is voluminous and there are a lot of products you can make from it, collection from rural areas, however, will be difficult, so (++) is the score.
	Impact on NDC regarding climate mitigation	If the waste stream holds the potential to impact the national determined contributions regarding climate mitigation is high (+++), then this will have a positive effect on transitioning towards circularity, since it will be prioritized by governments and it might make investment easier. If the contribution to the NDC regarding climate mitigation is low (--), then this might hinder transitioning the waste stream towards circularity.	4	(+)	(-)	(-)	(-)	(++)	(++)	Plastic: often plastic is burned, preventing this can reduce GHG emissions, so (+) is the score. Metal: as waste there is no additional GHG emissions from this stream and therefore there is not much potential for climate mitigation, so (-) is the score. Paper: as waste there is no additional GHG emissions from this stream and therefore there is not much potential for climate mitigation, so (-) is the score. Glass: as waste there is no additional GHG emissions from this stream and therefore there is not much potential for climate mitigation, so (-) is the score. Organic waste: a lot of GHG leak to the ground on dumpsites, resulting in a high potential for climate mitigation, so (++) is the score. Agricultural waste: a lot of GHG leak to the ground on dumpsites, resulting in a high potential for climate mitigation, so (++) is the score.
	Impact on NDC regarding climate change adaptation	If the waste stream holds the potential to impact the national determined contribution regarding climate adaptation is high (+++), then this will have a positive effect on transitioning towards circularity, since it will be prioritized by governments and it might make investment easier. If the contribution to the NDC regarding climate adaptation is low (--), then this might hinder transitioning the waste stream towards circularity.	3	(+)	(-)	(+)	(-)	(+++)	(+++)	Plastic: job creation and income from handling this waste stream can replace the jobs that will be lost due to a changing climate, so (+) is the score. Metal: not much potential for climate change adaptation, so (-) is the score. Paper: job creation and income from handling this waste stream can replace the jobs that will be lost due to a changing climate, so (+) is the score. Glass: not much potential for climate change adaptation, so (-) is the score. Organic waste: droughts and climate change will decrease agricultural yields and threaten food security, using this waste stream is important for food security and a higher agricultural yield, so (++) is the score. Agricultural waste: droughts and climate change will decrease agricultural yields and threaten food security, using this waste stream is important for food security and a higher agricultural yield, so (++) is the score.
	Impact on sdgs	If the waste stream holds the potential to have a high positive impact on the SDGs (+++), then this will have a positive effect on transitioning towards circularity, since it will be prioritized by governments, NGO and so on. It might make investment and prioritization easier. If the contribution to the SDGs low (-), then such benefits will most likely not exist. Focus is on SDGs 1, 2, 3, 5, 6, 8, 11, 13 and 15.	4	(++)	(-)	(-)	(-)	(++)	(++)	Plastic: offers great potential for job creation (also international pacts and partnership), so (++) is the score. Metals: the low volume of this waste stream and the danger in handling this waste stream offer not a lot of impact on SDGs, so (-) is the score. Paper: handling this waste better will not result in health gains, furthermore, paper has a low value, therefore there is a low impact on SDGs, so (-) is the score. Glass: the low volume of this waste stream and the danger in handling this waste stream offer not a lot of impact on SDGs, so (-) is the score. Organic waste: lot of potential for disease prevention and health improvement, so (++) is the score. Agricultural waste: lot of potential for disease prevention and health improvement, so (++) is the score.
	Volume of products and	If the volume of the products and materials then can be made of the waste is high (+++), then this can positively impact the transition towards circularity since economy of	5	(+++)	(-)	(+)	(-)	(++)	(++)	Plastic: value of products from plastic waste is high and the waste stream is voluminous and expected to increase, so (++) is the score. Metal: small volume and low value and not much internal industry or export opportunities, so (-) is the score. Paper: holds some opportunity, but the volume is small, so (+) is the score.

Zambia	Criteria	Description	Weight	Plastic	Metals	Paper	Glass	Organic waste	Agricultural waste	Explanation	
economic	materials from waste	scale benefits can be realized. Additionally, more value can be extracted since the stream is voluminous. If the volume of products and materials that can be made from the waste is low (---), then interest in this waste stream might be lower.								Glass: small volume and low value and not much internal industry or export opportunities, so (-) is the score. Organic waste: high volume and opportunity for making valuable products (biogas, fertilizer, cooking pallets), so (++) is the score. Agricultural waste: high volume and opportunity for making valuable products (biogas, fertilizer, cooking pallets), so (++) is the score.	
	Potential for private sector	If the potential for the private sector to create profitable economic activities is high (+++), with the right stimulation, lots of private companies might want to be involved, speeding up the circularity transition. If there is not a lot of potential (---), then private sector involvement, will be difficult to organize and more public involvement is necessary, which is often more difficult to organize budgetwise.	5	(+++)	(-)	(+)	(-)	(+)	(+)	Plastic: The high volume, value and internal industry of plastic holds great potential, so (+++) is the score. Metal: the low volume, lack of internal industry and the very resource intensive way of handling the waste offers not a lot of opportunity, so (-) is the score. Paper: some small-scale internal industry is, however the value of paper waste is low, so (+) is the score. Glass: the low volume, lack of internal industry and the very resource intensive way of handling the waste offers not a lot of opportunity, so (-) is the score. Organic waste: there is some potential, however lack of separation and collection might be an issue. Luckily, farming takes place close to urban areas, so lack of infrastructure will not always be a barrier, so (+) is the score. Agricultural waste: there is some potential, however lack of separation and collection might be an issue. Luckily, farming takes place close to urban areas, so lack of infrastructure will not always be a barrier, so (+) is the score.	
	Value of products and materials from waste	If the value still present in the waste stream is high (+++), then this can positively impact the transition towards circularity since money can be made out of collecting, aggregating, recycling, exporting or processing. If the value still present in the waste is low (---), then interest in this waste stream might be lower.	4	(+++)	(+)	(+)	(+)	(++)	(++)	Plastic: it is easy to use in new products, so the value is very high, so (+++) is the score. Metal: there is some value, but not much in internal industries and low streams, so (+) is the score. Paper: there is some value, but not much in internal industries and low streams, so (+) is the score. Glass: there is some value, but not much in internal industries and low streams, so (+) is the score. Organic waste: opportunity for multiple products; fertilizer, biogas, cooking pallets, so (++) is the score. Agricultural waste: opportunity for multiple products; fertilizer, biogas, cooking pallets, so (++) is the score.	
	Job creation	If there is a high amount of jobs in both private and informal sector (+++) that can be created, this will positively affect the transition since people will want to get involved in the waste sector and want it to succeed/ a just transition that provides economic opportunities for workers. If the potential for job creation is low (---), people might feel more indifferent towards circularity transition.	3	(+++)	(-)	(++)	(-)	(++)	(++)	Plastic: high potential for job creation, there is already a big internal industry and potential for more, so (+++) is the score. Metal: mainly exported and difficult to handle, thus low opportunity for job creation, so (-) is the score. Paper: has potential since it is easy to handle and there is an internal industry, so (++) is the score. Glass: mainly exported and difficult to handle, thus low opportunity for job creation, so (-) is the score. Organic waste: because of the large volume many products can be created, giving potential for a variety of jobs, so (++) is the score. Agricultural waste: because of the large volume many products can be created, giving potential for a variety of jobs, so (++) is the score.	
	Availability of existing technological and innovative capacity within country	If the technological and innovative capacity necessary for a certain waste stream to move towards circularity is already available within the country (+++), then this can speed up implementation of such technologies and innovations and thus accelerate transition towards circularity. If this is not available yet (---), this might hinder the transition.	5	(++)	(-)	(-)	(-)	(+)	(+)	Plastic: most knowledge is available on plastic, so (++) is the score. Metal: almost no technological capacity within the country, so (-) is the score. Paper: there is some knowledge and technology, however it is not advanced, so (-) is the score. Glass: almost no technological capacity within the country, so (-) is the score. Organic waste: some activity and knowledge is available, however capacity should be increased, so (+) is the score. Agricultural waste: some activity and knowledge is available, however capacity should be increased, so (+) is the score.	
	Local market acceptance	If the market is already quite ready for a transition towards circularity and does not need to change too much (+++), then this will have a positive impact on the CE transition. However, if the amount of change that the market needs to do in order to transition towards circularity, is high (---) then this will negatively impact to speed of the transition.	4	(++)	(+)	(++)	(-)	(-)	(-)	Plastic: there is already a market, since recycling into new products is normalized, so (++) is the score. Metal: most is recycled, but mainly after being exported, but it is never just dumped, however volumes are low, so (+) is the score. Paper: there is already a market, since recycling into new products is normalized, so (++) is the score. Glass: market is not well developed, lack of capacity to process glass, which demands a lot of energy, investment in this waste stream is low. Additionally, glass is more expensive than for example plastics, so (-) is the score. Organic waste: there is not really a market yet for products made of organic waste, so (-) is the score. Agricultural waste: there is not really a market yet for products made out of agricultural waste, so (-) is the score.	
	Availability of investment capital	If the potential for capital investment in a certain waste stream is high (+++), then this will positively influence the transition. This might be the case in very large waste streams, or waste that still holds a lot of values, or streams where there already exists a big market. If there is not much capital available (---) in waste stream (small stream or low value), then this will negatively influence the transition.	5	(++)	(-)	(+)	(-)	(++)	(++)	Plastic: People are willing to invest, so (++) is the score. Metal: investment is low, since it requires a lot of energy while the volume is low. Paper: there are some opportunities for investment, so (+) is the score. Glass: investment is low, since it requires a lot of energy while the volume is low. Organic waste: potential for investments is present, because the volume is quite high and products can be exported as well, so (++) is the score. Agricultural waste: potential for investments is present, because the volume is quite high and products can be exported as well, so (++) is the score. ----- For plastic waste, people are willing to invest. Metal requires a lot of energy and offers low stream size, the same is true for glass, thus investment is low. Paper some opportunity so some capital. More willingness to invest in organic/agricultural since the products that can be made can also be sold internationally and these are quite big streams.	
	institutional	Embedding in policy and regulations	If no drastic policy and regulation changes are necessary (+++), then this will have a positive impact on the transition speed. However, when lots of policy and regulation changes are necessary (---), this will take a lot of time and hinder the speed and momentum of the transition towards circularity for a specific waste stream.	3	(++)	(+)	(+)	(+)	(-)	(-)	Plastic: Plastic ban laws has given more attention to plastic waste, so (++) is the score. Metal: policy and regulation is favourable towards this waste stream, so (+) is the score. Paper: policy and regulation is favourable towards this waste stream, so (+) is the score. Glass: policy and regulation is favourable towards this waste stream, so (+) is the score. Organic waste: policy has not yet been able to reduce organic waste, so more policy and regulation will be needed, so (-) is the score. Agricultural waste: policy has not yet been able to reduce organic waste, so more policy and regulation will be needed, so (-) is the score.
		Level of alignment of public and private agendas	If the public demands (hygiene, cleanliness, poverty etc.) can be aligned with private (economic opportunity) (+++), then this will have a positive impact on the speed of the transition because of synergies between the agendas, resulting available budget and attention. However if there is less alignment (---), then these benefits will not exist.	3	(+++)	(-)	(+)	(-)	(++)	(++)	Plastic: high potential for alignment, high value of the waste and proper handling this waste benefits health, creates jobs, and attracts investment and capital so (+++) is the score. Metal: low potential, because the volume is very low and already used internally, so (-) is the score. Paper: has potential for job creation, but low volume and low value at this moment, so (+) is the score. Glass: handling this waste is very energy intensive leading to less potential for alignment, so (-) is the score. Organic waste: potential for alignment for food security, improving health, creating jobs and investment of the private sector, so (++) is the score. Agricultural waste: potential for alignment for food security, improving health, creating jobs and investment of the private sector, so (++) is the score.
		Sufficiency of current separation system level	If the current separation level and system is sufficient (+++), then this can increase the speed of the circularity transition since waste is already separated (the second step, after collection). This might mean that there are incentives for households to separate, but it can also mean that there are separation mechanisms in place for when the waste arrives to dumpsites or landfills. If the separation level is still low (---), then there is a lot of systemic change needed in order to get volumes needed for circularity.	4	(-)	(+)	(-)	(-)	(-)	(-)	Plastic: currently there is no separation at household level, however the stream is easy to separate, so (-) is the score. Metal: easy to separate and households are willing to separate the stream, so (+) is the score. Paper: willingness to recycle at household level is low, however the stream is easy to separate, so (-) is the score. Glass: difficult to separate if not separated at households, since it is often broken, so (-) is the score. Organic waste: difficult to separate if not separated at households, since it is often contaminated, so (-) is the score. Agriculture waste: difficult to separate if not separated at households, since it is often contaminated, so (-) is the score.
Sufficiency of current collection level		If the current collection level and system is sufficient (+++), then this can increase the speed of the circularity transition since waste is already collected (the first step). If the collection level is still low (---), then there is a lot of systemic change needed in order to get volumes needed for circularity.	4	(-)	(+)	(-)	(-)	(-)	(-)	Plastic: separation of this stream is quite easy, which makes collection a lesser issue, so (-) is the score. Metal: easy to separate and thus to collect, so (+) is the score. Paper: separation of this stream is quite easy, which makes collection a less issue, so (-) is the score. Glass: difficult to separate when not at household level and often broken, so (-) is the score. Organic waste: often contaminated and difficult to separate if not separated at households, better collection is essential here, so (---) is the score. Agricultural waste: often contaminated and difficult to separate if not separated at households, better collection is essential here, so (---) is the score.	
Sum				112	68	83	57	93	99		

