Radarweg 60
1043 NT Amsterdam
The Netherlands

www.tno.nl

T +31 88 866 50 10

TNO 2022 P10972

Development of a waste stream-specific Roadmap for the circular economy of Zimbabwe

Sub report Output 5
National Roadmap for a circular economy in organic waste management

Date	28 April 2022
Author(s)	Naomi Montenegro Navarro Andrew Chinyepe Chandi Mutubuki Makuyana Jisca van Bommel Milou Derks Ebenezer Alenga Amadi Raymond Obare Ombega Dennis Kiplagat Paul van den Oosterkamp
Number of pages	24 (incl. appendices)
Sponsor	
Project name	
Project number	

Contents

1 List of abbreviations

CBO	=	Community Based Organizations
CBA	=	Cost Benefit Analysis
DIWS	=	Decentralized Integrated Waste-Transfer Station
EMA	=	Environmental Management Agency
EPR	=	Extended Producer Responsibility
IDBZ	=	Infrastructure Development Bank of Zimbabwe
KPI	=	Key Performance Indicators
NGO	=	Non-Governmental Organization
PET	=	Polyethylene
PPP	=	Public Private Partnership
PRO	=	Producer Responsibility Organisation
REA	=	Rural Electrification Agency
TA	=	Technical Assistance
R&D	=	Research and Development
WTS	=	Waste Transfer Stations

2 Executive summary

This Roadmap is the final output of the CTCN Technical Assistance study on circular economy in household waste management in Zimbabwe. During this study, a baseline assessment for the current waste system was conducted, looking at plastics, paper, metal, glass, household organic waste and (small scale) agricultural waste. This was followed by a comparative analysis per waste stream on the potential to move towards higher levels of circularity. After a physical stakeholder consultation in Harare, October 2021 the choice was made to focus on organic waste for the remainder of the project. Following this specification, a more detailed analysis was conducted on the current status of Zimbabwe's organic waste management system, looking at technology use, the policy and regulatory landscape and current markets and value chains on organic (waste) management. These three outputs combined (the baseline assessment, the comparative analysis and the organics deep dive) have made it possible to determine the most pressing challenges and gaps in Zimbabwe in relation to sustainable and circular organic (waste) management. Additional literature and other Roadmaps have been assessed complementarily. As a result, this document is designed to provide recommendations and suggestions for change.

The core objectives of the Roadmap are threefold:

1. Development and implementation of a sustainable waste management system for Zimbabwe
2. Increased valorisation of organic waste
3. Reduction of virgin material use and increased reuse of resources and products.

To achieve the objectives, it is important to foster change in four key underlying domains that influence each of the objectives. These are (1) Increasing knowledge development and awareness, (2) Enhancing the institutional environment, (3) Promoting constructive collaboration and (4) Improving the physical infrastructure. For each domain, a set of distinct interventions are concretized that show which areas of action to focus on. The interventions are prioritized into short, medium and long term actions. The interventions are summarized in Table 1.

Table 1. List of interventions per domain

	Domain			
Term (years)	Increasing knowledge development and awareness	Enhancing the institutional environment	Promoting constructive collaboration	Improving the physical infrastructure
Short term interventions (1-2)	1. Increase public awareness and information availability and sharing 2. Increase institutional awareness and information availability 3. Increase data availability	6. Improve policy and regulatory enforcement 7. Expand the policy and legal framework for Extended Producer Responsibility	11. Improve inter-institutional collaboration 12. Include the informal sector 13. Include women and young entrepreneurs	16. Enhance the valorisation of organic waste
Medium term interventions (3-5)	4. Prepare and foster human capacity building 5. Invest in Research and Development (R&D) and innovation	8. Provide incentives and disincentives for market development 9. (Re)design policies and regulations to support circularity and (organic) waste management	14. Improve public-private collaboration 15. Improve cross-sectoral collaboration	17. Increase collection levels 18. Increase dry-wet separation at source
Long term interventions (6-10)		10. Develop domestic funding instruments for the expansion of the waste infrastructure		19. Improve waste disposal options

3 Introduction

3.1 Objectives

The purpose of the Circular Economy Roadmap for Zimbabwe is to provide directions for the transition towards a circular economy in organic waste management in Zimbabwe. To achieve this, it is important to identify the underlying themes of influence to this purpose: (1) sustainable waste management, (2) increasing circularity in organic waste management, and (3) achieving a circular economy. The core objectives of the Roadmap are therefore threefold. To support the:

1. **Development and implementation of a sustainable waste management system** – in order to develop a well-developed organic waste management system, it is paramount that the underlying general waste management system improves as well.
2. **Increased valorisation of organic waste** – achieving more circularity in organic waste management means harvesting as much value as possible from the waste. This focuses on increased levels of organic waste recycling.
3. **Reduction of virgin material use and increased reuse of resources and products** – achieving a circular economy is broader than waste management alone. This also calls for strategies to reduce the total amount of organics in the waste system, particularly food waste. Beyond organics, circularity calls for strategies on reuse, expanding the lifespan of products and materials.

These objectives are interlinked to each other, as they all comprise a part of the same societal system of production, consumption and waste management. To achieve the objectives, it is important to foster change in four underlying and key subsystems that influence each of the objectives. These are (1) Increasing knowledge development and awareness, (2) Enhancing the institutional environment, (3) Promoting constructive collaboration and (4) Improving the physical infrastructure; as it is key to increase knowledge and awareness levels amongst citizens, companies as well as political and administrative actors; improvements in the institutional environment can accelerate change and pave the way for innovations to scale; improving the way parties collaborate ensures cross-learning and reduces resistance, while building capacity for change enables the deployment of necessary skills, both at decision-making as implementation levels. By achieving change in these three subsystems, implementation of improvements within physical infrastructure (the fourth subsystem) can come within reach.

Within each of the four subdomains, multiple interventions have been defined, which provide directions for the transition towards circular economy within the organic waste stream. It should be noted that the interventions are closely interlinked and influence each other. Moreover, although the four domains have an intentional order, this does not indicate that all short term actions are in the first domain and all long term in the last. Interventions will overlap and simultaneous action on multiple domains is needed. This can also imply that in some cases, interventions could belong to a different category too, yet the aim was to put them in the most relevant category. Additionally, some interventions, although presented separately, will strengthen each other.

3.2 Scope

The scope of the Roadmap is on household waste. Although this is part of a broader waste system in which industry and other commercial and institutional parties play a big role, this Roadmap is focussed on interventions within the household waste domain only.

Where possible, the interventions were made as concrete as possible by the definition of sub-actions specific to Zimbabwe. It is important to highlight that the Roadmap is a strategic document presenting directions for change and there is need for further development of a detailed implementation plan, providing insights at tactical and operational level – as often, this requires further study (e.g. quantification of specific targets) as well as decision-making on political levels. Further researching how to operationalize several of the interventions could well be a follow up to this Roadmap.

3.3 Time scale

The Roadmap spans a time period of ten years and is divided into three distinct phases – short, medium and long term. The following division is used, in accordance with central government timespans:

Short term: 1-2 years
Medium term: 3-5 years
Long term: 6-10 years

The interventions in the roadmap are presented in one of the three time frames. This prioritization has been developed and validated based on the input and feedback of local stakeholders.

The timeline of the Roadmap is from 2022-2032. The time frames for each intervention do not mean each activity is to be *finalized* within those years, but merely that the activity is to be *started* in those years. This allows for strategic prioritization and to take into account sequentially. Measures that are not deemed realistic to implement or do not start within this timeframe are excluded, even if they might be relevant for a transition to a circular economy. The prioritization and clustering of interventions presented in this Roadmap have been developed and validated based on the input and feedback of local stakeholder.

3.4 Summary of the key gaps defined

The purpose of this document is to suggest a way forward in optimizing the way Zimbabwe may deal with (organic) waste management. This is based on assessments done in previous studies, in which an overview of the current status of waste management in general and organic waste in particular was given. The conclusions and key gaps that were reported in these documents are shortly summarized below, as these gaps and observations form the basis under the roadmap.

- Zimbabwe generates about 2.5 million tonnes of waste annually with only 48% being properly collected. Collection percentages are even lower in high density areas.
- There is little to no separation at source and no separate collection by local authorities. A few private enterprises facilitate separate collection, but this is neglectable.
- There are currently only three engineered landfills in the country, the rest of the waste is brought to uncontrolled dumpsites, illegal dumpsites, littered or burnt.
- The markets for organic waste are least developed (compared to for example plastics or metal), while the volume is largest, comprising 56% of the total amount of household waste generated.
- In terms of implementation of valorisation pathways for organic waste, there is little activity:
    - There is currently no community level biogas production for solid organic waste;

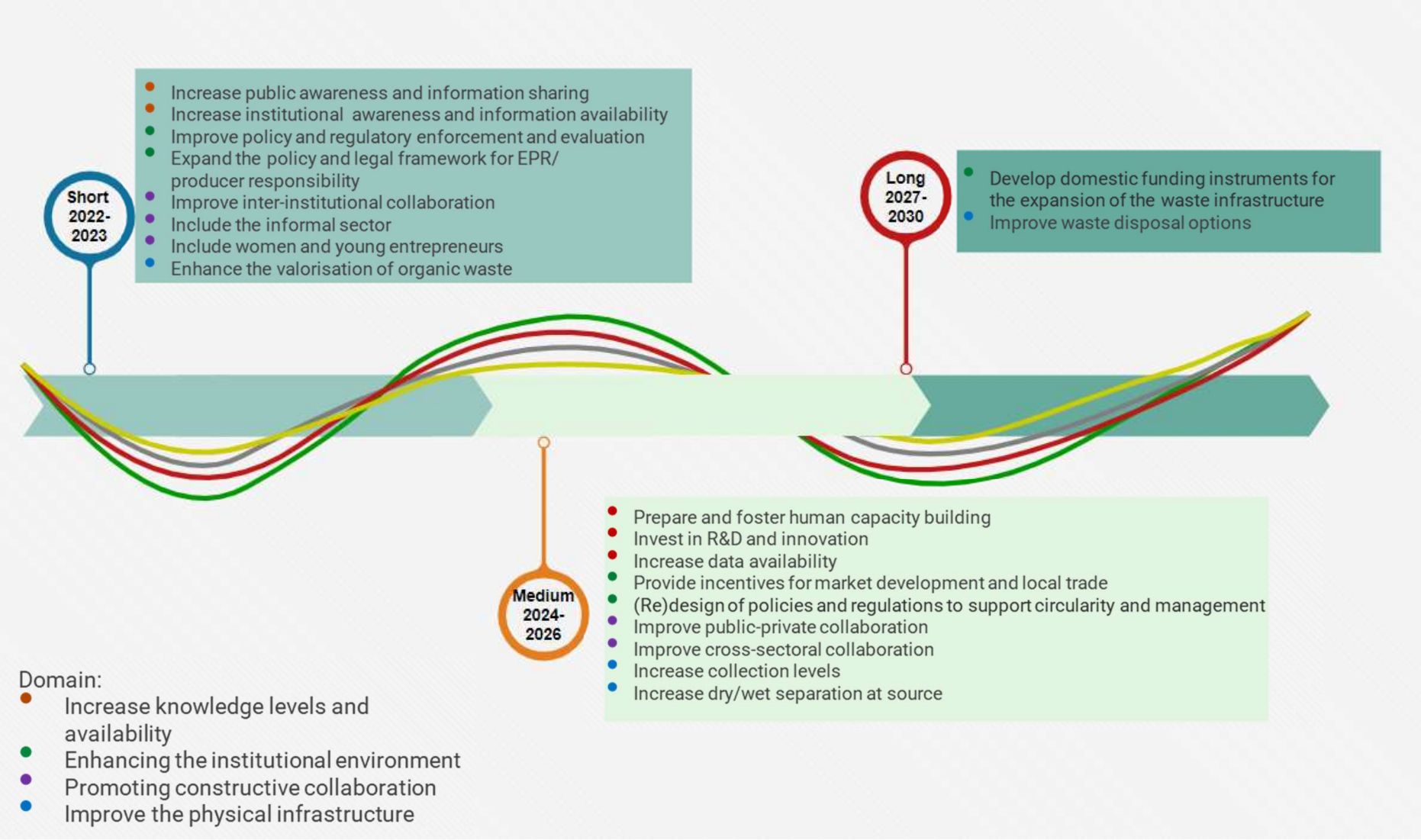
  - There is currently no commercial scale biogas production;
  - There is no conversion of biogas into electricity;
  - There are some entrepreneurs active in the provision of household biogas equipment;
  - There are currently only a few entrepreneurs working on household scale composting or vermicomposting initiatives in the country;
  - There is currently no commercial scale composting based on urban organic waste (there are a few on commercial agricultural waste);
  - There are only a few small scale entrepreneurs working with Black Soldier Flies for animal feed production.
- For entrepreneurs working with organic waste, one of the key gaps is obtaining sufficient volumes in an economic manner.
- There is little domestic technology development for larger scale composting or biogas production. This means everything has to be imported and challenges arise when equipment breaks down.
- Together with issues of quality and lack of regulations for fertilization, expensive upfront costs and issues with economy of scale for biogas and composting lead to low margins made from organic household waste products.
- Local authorities receive low (insufficient budget allocations) for waste management and struggle with proper collection of waste tariffs.
- There is a mismatch between what the policy envisions and allocation of resources to facilitate implementation (due to competing interests and limited budgets).
- In the current policy framework, there is a much stronger focus on punishment than incentivizing.
- There is limited data and data infrastructure available on the quantities, locations and sources of waste. This hinders decision-making.
- The current policy framework does not bank on opportunities for the creation of local demand. There is some attention made to the potential of biogas, but no attention for the creation of organic fertilizer or animal feed.
- There are low levels of coordination between Ministerial players on the alignment of policies to enhance adoption of technology to promote use of organic waste for fertilizer and energy.
- Low levels of implementation of existing regulations; for example, the EPR scheme that could be transitioned from the voluntary to the mandatory stage is developed further.

3.5 Reading guide

Chapter 5 presents the defined interventions per domain. Each intervention is concretized by one or more specific actions, detailing key steps to take or specifications to consider that would contribute to the achievement of that intervention. The results of the discussions on how to operationalize the current, strategic, Roadmap into an implementation plan are presented in Chapter 6.
It is important to note that some interventions are cross-cutting and continuous, while others require a single or temporary action, after which they are implemented. The type of intervention as well as its duration is visualized in the Gantt chart presented in chapter 7.

Before the interventions are detailed in the text, a visual overview of the roadmap is presented in Chapter 4, summarizing the interventions per time scale.

4 Visual overview of the Roadmap



5 Interventions towards a circular organic waste system in Zimbabwe

5.1 Increasing knowledge levels and awareness

To allow for effective scaling of sustainable waste management and the development of a circular economy, current knowledge and awareness levels as well as knowledge sharing between actor groups have to be increased.

Short term

5.1.1 Increase public awareness and information availability and sharing

Ministry of Local Government and Public Works, Ministry of Environment, Climate, Tourism and Hospitality Industry, Ministry of Information, Publicity and Broadcasting Services, Environmental Management Agency (EMA), Local authorities, Private Sector

Sustainable solid waste management is greatly influenced by the level of public participation, which asks for people to be well informed and knowledgeable. Therefore, it is important to increase public awareness and information availability and sharing.

1. Provide information via a one-stop-shop information points on waste. Tailor the medium to the audience intended (e.g. local radio for rural areas, applications for medium – high income urban residents). Provide information on:

a. Where people can bring their (organic) waste
b. What people can do to reduce the amount of waste they create
c. How people can process and separate their organic waste at home
d. How people can organize community composting initiatives
e. What type of business opportunities exist around (organic) waste valorisation.

2. Set up public awareness campaigns on the importance of waste management and waste workers, what people can do with their organic waste at home, as well as on dry/wet separation of waste.
3. Engage local NGO's and community organizations to create awareness on the health and environmental impact from littering.
4. Incorporate (organic) waste management into school programs, educating children and accelerating knowledge sharing to families as well.

5.1.2 Increase institutional awareness and information availability/sharing

Lead actor(s): Ministry of Local Government and Public Works, Ministry of Environment, Climate, Tourism and Hospitality Industry, Ministry of Information, Publicity and Broadcasting Services, EMA, Local authorities

Proper implementation of policies and incentives from government is greatly dependent on the level of knowledge and awareness amongst the relevant public officers, as well as the understanding of the public and private sector on policies and regulations. Therefore, the institutional awareness should be increased.

1. Carry out training programs for public officers dealing with policy making on organic waste management and circular economy.
2. Sensitization of the Cabinet Committee responsible for waste management on the importance of circularity and more specifically circulatory in the organic waste stream.
3. Sensitization of heads of ministries and permanent secretaries on circular economy

4. Communication and dissemination of waste and circular economy policies to the affected audiences: often citizens and/ or private sector. Share information on what this policy (change) means to them, how this affects their business or behaviour.
5. Increase communication on opportunities of PPPs to entrepreneurs. Currently, many entrepreneurs are not aware of the options that exist for collaboration with government bodies, nor are they aware of how to harvest on these opportunities.

Medium term

5.1.3 Prepare and foster capacity building

Lead actor(s): Ministry of Local Government and Public Works, Ministry of Higher and Tertiary Education, Science and Technology Development, Academia and Research Institutions, EMA

Substantial increase in capacity is needed in Zimbabwe to increase the sustainable waste management services. The transition to a circular economy cannot be achieved without sufficient trained people and skill development. Capacity building is thus important to ensure the circular economy does not stall on lack of skills and people.

1. Increase capacity in terms of equipment, staff and resources for (separate) waste collection, particularly in low and middle income areas in urban areas.
2. Assess the expected capacity needed on the different terms (short to long) for a sustainable (organic) waste management system and circular economy in terms of required skills and knowledge. What type of (technical) expertise is needed in the future? How many jobs are expected? What institutional needs exist that are not serviced yet?
3. Prepare educational and capacity building programs to timely train required staff.
4. Make working in the waste or valorisation sector attractive to both public servants and private enterprises through awards and incentive schemes. Incentives could for example be the provision of free airtime to waste sector employees, through a partnership with mobile network operators. Additionally, creating awareness on the importance of proper waste management lowers the negative attitude of people towards these jobs.
5. Develop curricula for vocations in a circular economy, in collaboration with private sector.

5.1.4 Invest in Research & Development and innovation

Lead actor(s): Ministry of Agriculture, Ministry of Higher and Tertiary Education, Science and Technology Development, Academia and Research Institutions

Investing in R&D is a key contributor to increase domestic knowledge domestic creative solutions for waste management, recycling and reuse beyond the status quo.

1. Set up a specific innovation budget for entrepreneurs interested in developing technologies for organic waste valorisation, to reduce the gap in domestically produced technologies.
2. Set a dedicated and annual funding budget for R&D and pilots on organic waste based composting, fertilizer production and biogas production at various scales. Develop clear application and eligibility criteria's for interested entrepreneurs and provide annual reports on budget expenditure.
2. Strengthen academic institutions with knowledge programs on sustainable solid waste management, organic waste treatment and circular economy.
3. Initiate peer-to-peer learning within African and international partners on circular economy innovations.

5.1.5 Increase data availability

Lead actor(s): Local authorities, Zimbabwe Statistical Agency, EMA

Increasing data availability is an important subset of the required infrastructure for sustainable (organic) waste management and a circular economy. Increased knowledge on and access to volumes, quality and locations of products and waste is key to develop a proper infrastructure and to facilitate scaling.

1. Compile a public access national information system based on IPCC standards and methodologies, which collects, analyses, harmonises and disseminates data on waste. Include information on:
    - Waste produced in the country, per region and per service zone;
    - Waste brought to dumpsites, landfills and received at Waste Transfer Stations and buy-back centres;
    - Waste composted/treated/recycled
    - Waste (products) exported
    - Cost database
2. Use an open access digital tool to map out the service areas in each city and to monitor the service provision, providing information on who is responsible for collection and when this is due. Allow for registration of inadequacies with collection by the public. Include information on the players active with waste or recycling in each area.
3. Invest in the development of digital technology such as applications and online platforms to connect people or institutions with collectors and Decentralized integrated Waste-Transfer Station (DIWS) to allow for private waste transfer as well. Existing tools could be expanded and promoted.

5.2 Enhancing the institutional environment

The role of local and particularly national government in the transition to sustainable solid waste management and a circular economy is pivotal. Effective deployment of institutional instruments can greatly accelerate change.

Short term

5.2.1 Improve policy and regulatory enforcement

Lead actor(s): Ministry of Environment, Climate, Tourism and Hospitality Industry, Ministry of Agriculture, EMA, Local authorities

One of the most important challenges with the current institutional framework is the lack of operationalisation and enforcement of policies, as well as monitoring and evaluation of activities on whether they are meeting the goal of the policies. Moreover, often budgets are not made available or not allocated correctly. For any transition to be successful, enforcement is to be improved.

1. With each newly enacted regulation or instrument on general waste management, set up Key Performance Indicator's (KPI) and control mechanisms to allow for operationalization of the policy.
2. Ensure that the environmental and social impacts are included in the KPI's as well to be able to steer beyond financial effectiveness only.
3. Policy implementation asks for assessment *and* organization of the budgetary requirements. Ensure policies are screened on these financial requirements and these ore arranged, before these are implemented.

4. Capacitate Local Authorities to structurally monitor and evaluate the enforcement of policies and regulations on waste management, as well as its effectiveness by assessing the pre-defined KPI's. This should be supported by EMA.
5. Set up a Monitoring and Evaluation system to track progress and effectiveness of circular economy activities in the country, how this is affected by the policy framework, and what adaptation is required.

5.2.2 Expand the policy and legal framework for Extended Producer Responsibility

Lead actor(s): EMA, Ministry of Industry and Commerce

Albeit less directly applicable to organic household waste, Extended Producer Responsibility (EPR) is a key instrument towards a circular economy worth mentioning in this Roadmap, as this activates the responsibility of producers and importers beyond the production phase to the end-of-life management of products. Functioning EPR schemes can provide incentives for better design aimed at recycling, can contribute to the financial resources needed for proper management of waste and materials and shifts end-of-life responsibility from the shoulders of government only to industry as well. Therefore, policy and legal framework for expanding EPR should be expanded.

1. Research the opportunities for an EPR or other producer responsibility scheme for organic waste. This would entail developing responsibility schemes for (large scale) commercial farmers and food importers, and making them (financially) partially responsible for end-of-life managements of organics.
2. Beyond organics, expand the current producer responsibility scheme for PET bottles to a plastic packaging EPR. In the more distant future, EPR could be expanded to diapers, beverage glass and e-waste as well. Key steps in setting up EPR are[1]:

a. Clearly define actors, roles & responsibilities within the organic value chains.
b. Calculate costs and fees for participating companies in the EPR system.
c. Establish a Producer Responsibility Organisation (PRO) for PET bottles and for organic packaging, to fulfil the EPR obligations on behalf of the members.
d. Clearly define ambitious EPR targets in a participative multi-stakeholder process.
e. Administrating and run EPR schemes through a dedicated monitoring body, including evaluation and compliance mechanisms such reviews and penalties.

Medium term

5.2.3 Provide incentives and disincentives for market development and local trade

Lead actor(s): Ministry of Agriculture, EMA, Ministry of Industry and Trade

For entrepreneurs in the waste sector and working with waste feedstock, acquiring sufficient market access is often difficult. To create a more level playing field for produce from organic waste it is important to support market development through public (financial) instruments.

1. Develop tax incentives in the following areas:
   - Develop lower tax tariffs for products made from waste. For organics, implement this for compost and organic fertilizer, animal feed, and biogas.

[1] For an extensive guiding document on how to implement EPR for plastic products and packaging it is advised to look into the 2021 WWF document on EPR for South Africa (Arp, R. (2021) Extended Producer Responsibility for plastic packaging in South Africa: A synthesis report on policy recommendations. WWF South Africa, Cape Town, South Africa.). Available online at www.wwf.org.za/reports/EPR_policy_for_plastic_packaging_synthesis_report

- Provide tax exemptions for import of sustainable waste processing, organic treatment and recycling technology, such as Windrow Turners for commercial composting.
- Progressively increase taxes on the import of chemical fertilizer and non-organic animal feed.

2. Adapt current policies to also include incentives for circular entrepreneurship. Particularly important is the Environmental Management Act [20:27], which has adopted a punishment approach to non-compliance but includes no mention of incentives; merely fees, fines, and imprisonment consequences for defaulters.
3. Provide easy access and long-term loans with low or zero percent interest rates for entrepreneurs and initiatives on compost, biogas and animal feed production.
4. Develop and accelerate the use of quality labels so customers are more inclined to trust the products put on the market. Start with quality labels on domestically produced compost, expand to fertilizer and animal feed.
5. Adopt regulations that enforce a minimum use (in percentage) of organic compost vs chemical fertilizer by commercial farms.
6. Conduct an Environmental Impact Assessment (EIA) and Cost Benefit Analysis (CBA) of two scenarios: proceeding with the use of chemical fertilizers versus transitioning to the use of organic fertilizers in terms of soil fertility and quality and crop potential. Such a study can assist in acquiring the necessary argumentation to push for increased use of organic fertilizer.

5.2.4 (Re)design policies and regulations to support circularity and (organic) waste management

Lead actor(s): Ministry of Environment, Climate, Tourism and Hospitality Industry, EMA, Ministry of Agriculture, Ministry of Industry and Commerce

Currently, there are several policies that are insufficiently developed or not develop at all that are important to consider to improve the management of (organic) waste:

1. Revise the EMA Act and Statutory Instrument 6 on solid waste management to promote circularity of organic waste (instead of an emphasis on waste disposal improvements only).
2. Assess the effectiveness and coherence of current by-laws.
3. Develop policies that promote the transition to the use of organic fertilizer. Currently, there is a focus on organic waste to Energy (e.g. in the National Climate Policy, the National Climate Change Response Strategy, and the Zimbabwe Long Term Low Greenhouse Gas Emission Development Strategy) while the potential for organic fertilizer is neglected.
4. Develop a Circular Economy Action Plan for Organic Produce and set ambitious but realistic targets on reduction strategies for organic waste. This can include (1) reduction targets for the amount of food waste produced in the country, mainly focussing on high income areas, since most food waste is generated in these areas; (2) decrease of product restrictions for fresh produce sold in supermarkets to avoid food spillage at farms (i.e. fruits and vegetables not complying to visual requirements); (3) investigation of policy opportunities to repurpose food (e.g. to food banks or to animal feed) that can no longer be sold in supermarkets.

Long term

5.2.5 Develop domestic funding instruments for the expansion of the waste infrastructure

Lead actor(s): Ministry of Local Government and Public Works, Ministry of Finance and Economic Development, Ministry of Environment, Climate, Tourism and Hospitality Industry, Infrastructure Development Bank of Zimbabwe (IDBZ), EMA, Zimbabwe Investment and Development Agency, Private sector

To scale any business in the (organic) waste recycling sector it is key that basic infrastructure for waste management exists and is functional. Now, this is hampered due to lack of investment power for key infrastructure (needed to scale collection and separation mainly). It is therefore important to develop domestic funding instruments for necessary infrastructure investments in time.

1. Develop a national Green or Waste Fund with dedicated budget for waste management infrastructure and annual plans for development. These funds can come from a Pay as you Buy principle, when a product is bought a percentage of the products price has to be paid for the purpose of Sustainable Waste Management. Another example could be the set-up of a climate fund which is based on contribution from the respective contributing sectors.
2. Determine necessary funding for basic infrastructure that cannot be covered by the Fund and develop acquisition strategies for donor funding and foreign investments to fill this gap.

5.3 Promoting constructive collaboration

A circular economy requires collaboration between various stakeholders. In order for this to take place, an enabling environment for collaboration must be created.

Short term

5.3.1 Improve inter-institutional collaboration

Lead actor(s): Local authorities, Ministry of Environment, Climate, Tourism and Hospitality, Ministry of Agriculture, Ministry of Local Government and Public Works, EMA, Private sector

Improving inter-institutional collaboration is required for effective steering towards circularity. Open and frequent dialogue among different institutions is needed to avoid working in silos, lack of clarity over roles and responsibilities, and the risk of developing similar initiatives in parallel.

1. Within government, set up inter-ministerial steering committees on Solid Waste Management and Infrastructure to harmonize and align efforts. These committees should have regular work sessions to ensure the momentum is maintained.
2. Set up a structural working group on organic (waste) management, including at least EMA, Ministry of Agriculture, Ministry of Environment, Climate, Tourism and Hospitality Industry. These committees should have regular work sessions to ensure the momentum is maintained. One of the key tasks of this Committee is to ensure the coordination and harmonization of current policies to enhance the adoption of technologies for organic waste valorisation.

5.3.2 Include the informal sector

Lead actor(s): Ministry of Local Government and Public Works, Ministry of Environment, Climate, Tourism and Hospitality Industry, EMA, Local authorities, Ministry of Women and Affairs and Small and Medium Enterprises Developments, Informal sector, Private sector, CSO's

The informal sector plays a crucial role in handling (organic) waste. It is important to consider their needs and invite them to the table when developing programs and policies on waste management.

1. Encourage Community Based Organizations (CBO)s and the informal sector to establish cooperatives and associations to represent their collective interests and improve information sharing.
2. Involve representatives of the informal sector in policy formation and dialogues on waste management.
3. Create social protection schemes for informal sector waste workers to improve their working conditions.

5.3.3 Include women and young entrepreneurs

Lead actor(s): Ministry of Agriculture, Ministry of Environment, Climate, Tourism and Hospitality Industry, Ministry of Women Affairs and Small and Medium Enterprises Developments, EMA, Local authorities, Private sector

A circular economy is inclusive. It is important to encourage the inclusion of youth and female entrepreneurs, enhancing creative solutions and ideas.

1. Set targets for the percentage of female entrepreneurs and workers active in the recycling business.
2. Foster training programs for female entrepreneurs in (organic) waste treatment or circularity businesses. Particularly focus on capacity building on relevant laws and bylaws.
3. Set up youth accelerator programs aimed at fostering young entrepreneurship in organic waste management and circular businesses.
4. Develop a loan fund with longer return on investment for young and female entrepreneurs in the waste management and plastic recycling business. This can be expanded to other areas such as glass or paper once the effectiveness is proven.

Medium term

5.3.4 Improve public-private collaboration

Lead actor(s): Ministries of Agriculture, Ministry of Industry and Commerce, EMA, Local authorities, Private sector

Inclusion of the private sector in the transition towards a circular economy is critical. This asks for open and frequent dialogue between public and private players and inclusion of the private sector into policy making processes on circularity. Improving the relationship between the public and private sectors in Zimbabwe, particularly on waste management, is thus important.

1. Develop a structural public-private sector dialogue platform for joint decision-making on sustainable organic waste management in Zimbabwe. Specifically aim to improve the collaboration between private players and local authorities for sustainable waste management issues.
2. Experiment with public-private sector collaboration schemes when piloting waste management projects, including joint investments. Start with a PPP format for a commercial composting facility. Construct a collaboration where each stakeholder has a clear responsibility for a determined aspect of the implementation of a composting facility. Make a steering committee of local, regional and national stakeholders responsible for the oversight of the project. Examples in other countries are the PPP for a composting plant in Ghana, which produces and supplies compost to local farmers[2].

[2] (Accra Compost Plant to become waste management hub – BusinessGhana)

3. Develop sectoral round tables when aiming to make decisions on the transition to the circular economy per sector. Include representatives of the public, private, and civil society. Allow for moderation and support for policy formation by neutral expert parties.

5.3.5 Improve cross-sectoral collaboration

Lead actor(s): Ministry of Agriculture, EMA, Private sector

Improving cross-sectoral collaboration is key to scale circular solutions, since circularity spans multiple sectors. Within organic waste management, this means encouraging multistakeholder partnerships and cross-sector dialogues between formerly ill or unconnected actors involved with (organic) waste and production value chains connecting:

1. Determine the sectors and actors needed to be included in an Organic Waste Taskforce (at least: Waste Management teams from the Local Authorities, Ministry of Agriculture, representatives of composters, biogas and animal feed producers, farmers) E.g. the Netherlands has the Taskforce Circular Economy in Food, consisting of companies, research institutes, civil societies and government bodies. A budget of USD$7 million is provided for a 4-year period by the Dutch Ministry of Agriculture and Food Quality to support innovation, research, monitoring and education[3].
    a. Determine and mainstream the activities on organic material per actor group to determine synergy, potential linkages and discrepancies.
    b. Set taskforce targets, linked to the National Development Strategy.
2. Monitor the number of circular businesses in the country and set up occasional cross-learning platforms for circular entrepreneurs.

5.4 Improving the physical infrastructure

A supportive physical infrastructure lies at the basis of a sustainable waste management system, and is an enabler for organic valorisation and a well-designed circular economy. The following interventions can be taken to improve the basic waste management infrastructure for Zimbabwe.

Short

5.4.1 Enhance the valorisation of organic waste

Lead actor(s): Ministry of Local Government and Public Works, Local authorities, Ministry of Agriculture, Private sector, Rural Electrification Agency (REA)

To achieve circularity within waste management it is essential that higher percentages of the waste generated are valorised. To achieve circularity in general, it is also key that products are reused or refurbished more to avoid the creation of waste in the first place. Enhancing the valorisation of waste is therefore key.

1. For Local Authorities, engage with the department of Physical Planning to determine which areas are most suitable for scaling of (organic) waste recycling initiatives.
2. Support animal feed production, e.g. through black soldier flies, by local government for easy dedication of land is needed.
3. Select one area in Harare or Bulawayo to pilot with community or commercial scale composting. Both cities would allow for sufficient volumes. Selection criteria for a

[3] Dutch agenda against food waste aims to cut food waste by half - WUR

suitable location are: medium or high density area (high volume, low transport distances); close to a market (50% of the input), ability to expand after success of the pilot and desire to scale; access to electricity, water, and road network.[4]

4. Expand initiatives on household, at source composting for low income areas. Effective initiatives already exist that provide opportunities for low income households to fully reuse their own organic waste as fertilizer to grow their own crops, which is very common practice. These could be used to build on.
5. After compost piloting, experiment with biogas production with solid household waste at community and commercial scale, preferably in Harare or Bulawayo to allow for sufficient volumes. See selection criteria above. Household biogas production is already taken up by the market.

Medium

5.4.2 Increase collection levels

Lead actor(s): Ministry of Local Government and Public Works, Local authorities, Ministry of Agriculture, Private sector

Working towards maximum coverage of waste collection from households is a basic requirement for developing any sustainable (organic) waste management system. Current collection levels thus have to be increased.

1. Monitor whether in each service area collection is organized by a public or private collector that collects waste at least once a week, particularly in high density areas (currently in many high density zones there is no collection at all, or very infrequent). Investigate for different areas the preference of households and collectors of waste collection, the frequency, whether it has to be brought to a collective point or whether it is collected at every individual household. Together, find a compromised way to organize collection and communicate this to all households and collectors[5].
2. Streamline public and private sector operations to avoid double charging of residents. Digital mapping of service areas allows for an overview of who is responsible for what and in which area, this helps to streamline public and private sector operations (See intervention 5.1.5).
3. Invest in a minimum amount of waste trucks per service zone in each city. This should be based on the expected waste generation per zone divided by the capacity for a fully operational truck. Use funds from e.g. the EPR or producer responsibility schemes (see intervention 5.2.2).
4. Mandate and ensure maintenance of waste trucks. A fixed percentage of the Solid Waste Management (SWM) fees could be directed to equipment maintenance. In addition, give maintenance workshops for repairing waste trucks and acquire waste trucks for which spare parts are relatively easily available[6].

5.4.3 Increase dry/wet separation at source

Lead actor(s): Local authorities, Ministry of Local Government and Public Works, Ministry of Environment, Climate Tourism and Hospitality, Department of Physical Planning, Private collectors

[4] See Output 5.2 on the Pilot concept for a more detailed overview of the pilot description
[5] Collection.of.MSW.v38.book.indd (unhabitat.org)
[6] Collection.of.MSW.v38.book.indd (unhabitat.org)

Dry/wet separation should be increased at source and full separation should be aimed for post-collection. Separating dry fractions from organic (wet) waste at source increases the potential for treatment or organics substantially by decreasing cross-contamination. Full separation into distinct fractions allowing for recycling of other materials, could also be done at dedicated waste stations, as this requires lower transport costs. This also requires less behaviour change by households.

1. Provide licences for companies specializing in separate collection. Currently, most companies often mix waste at collection even if it is separated, leading for every separation at source effort to be undone at collection, decreasing trust and participation of citizens.
2. Dedicate land for composting at community levels as well as commercial levels, to ensure sufficient outlets for collected organic waste. E.g. in Ghana there is a PPP formed to set up a commercial composting plant that produce safe organic fertilizer of high quality, which is sold to local farmers.[7] This reduces the amount of land needed for landfills, since composting reduces the amount of organic waste by half. However, exact decision frameworks on where to dedicate land are based on the insights of Local Authorities Waste Teams as well as the Department of Physical Planning.
3. Increase the number of material buy back centres and Waste Transfer Stations (WTS) by developing these as local authorities and/ or providing easy access to land and permits for entrepreneurs. Eventually, targeting a WTS in each service zone.

Long term

5.4.4 Improve waste disposal options

Lead actor(s): Local authorities, EMA, Ministry of Local Government

Although the aim is to reuse and recycle as much as possible, there will always be materials or products that have to be disposed of. Proper waste disposal solutions that do not harm human health and the environment are to be developed and expanded. There are several initiatives being developed (or already in advanced planning stages) in the country (e.g. in Bulawayo, Kwekwe or Harare). As these efforts are already taking place in the short term, further improvement of waste disposal options refers to additional actions to be taken later on, building on what is already underway.

1. Develop properly designed and maintained engineered landfills for each city, beyond Bulawayo, Kadoma and Norton (in place) and Harare (to be developed).
2. Pilot with or develop a first waste-to-energy installation for the non-recyclable waste streams such as diapers. This could be linked to the upcoming initiatives such as in Bulawayo, Kwekwe or Harare.

[7] Can you imagine a world of waste-wise cities? Accra leads the way | Water, Land and Ecosystems (cgiar.org)

6 Operationalizing the Roadmap

6.1 From strategic to operational

Prior studies of the CTCN TA on circularity in organic waste management, on which this roadmap is based, have allowed for a thorough understanding of the current system. By identifying current hindrances and obstacles in the (organic) waste management and circularity landscape in Zimbabwe, it was possible to draft interventions on how to improve this situation, as presented in the roadmap. However, this roadmap is a strategic document which will require a detailed implementation plan. During the stakeholder meeting in April 2022 in Harare it was discussed how to operationalize and use the roadmap. The results of this discussion are presented below.

Direct application of the roadmap
In the short term, the roadmap and underlying studies can directly be used for dissemination of the outcomes and sensitisation of waste sector stakeholders such as local authorities, NGO's and private sector players. Distributing the roadmap among the stakeholders allows them to use the roadmap for inspiration and activation and as a lobbying tool.

Translation of the roadmap into an implementation plan
In terms of operationalizing the roadmap, it was decided that the Ministry of Environment, Climate, Tourism and Hospitality Industry will be in the lead. The Ministry will set up a small working group, with whom the following activities will be conducted:

1. Translation of the roadmap into an implementation plan by defining measures for each intervention, starting with the short term interventions.
2. Definition of projects and targets to achieve the determined measures.
3. Definition and engagement of key actors to be included per intervention.
4. Definition of KPI's and mapping out of the expected deliverables per project.

The working group together with the lead actors for each intervention or project will be part of the Steering Committee. It is expected that within this Steering Committee, the Ministry of Environment, Climate, Tourism and Hospitality Industry will play a key role, with EMA and Ministry of Lands, Agriculture, Fisheries, Water and Rural Resettlement supporting for operationalization, supplemented by representation of key actors to the roadmap (including private sector, civil society, informal sector, young entrepreneurs.

During the session it was proposed that the Steering Committee Chair should be a neutral and knowledgeable player, that can act as a connecting actor between the stakeholders involved and can bring in relevant expertise.

6.2 Greenhouse gas reduction potential

Although this roadmap is strategic and it is thus not yet possible to fully determine which activities will be implemented and what their effect will be, it is possible to do a rough estimate on the potential impact of implementing the roadmap on total Greenhouse Gas emissions. This is done by an estimation of the reduction of organic waste to dump or landfill, as we assume that due to implementation of the interventions in the roadmap, the pilot will be able to be achieved over a

5-year period. The reduction of GHG emissions coming from the pilot is 41 kg CO2/ton of waste[8], for a pilot of 3,500 ton/yr. Total emission reduction 3,500*41 kk= 143.500 kgCO2e /yr = 143,5 tCO2/yr. For the roadmap, this results in 5*143,5= 717.5 $tCO2_{eq}$.

6.3 Assessment of existing initiatives

With the implementation of innovations and technologies for the recycling or disposal of organic waste, it is important to value and build on those initiatives that already exist within the country. Therefore, it is advised for the start of each intervention to conduct an assessment of existing initiatives, harvesting the efforts from private and civil society actors, potentially accelerating their work and building on it, instead of reinventing the wheel. This is integrated in the Gantt chart presented in the next chapter.

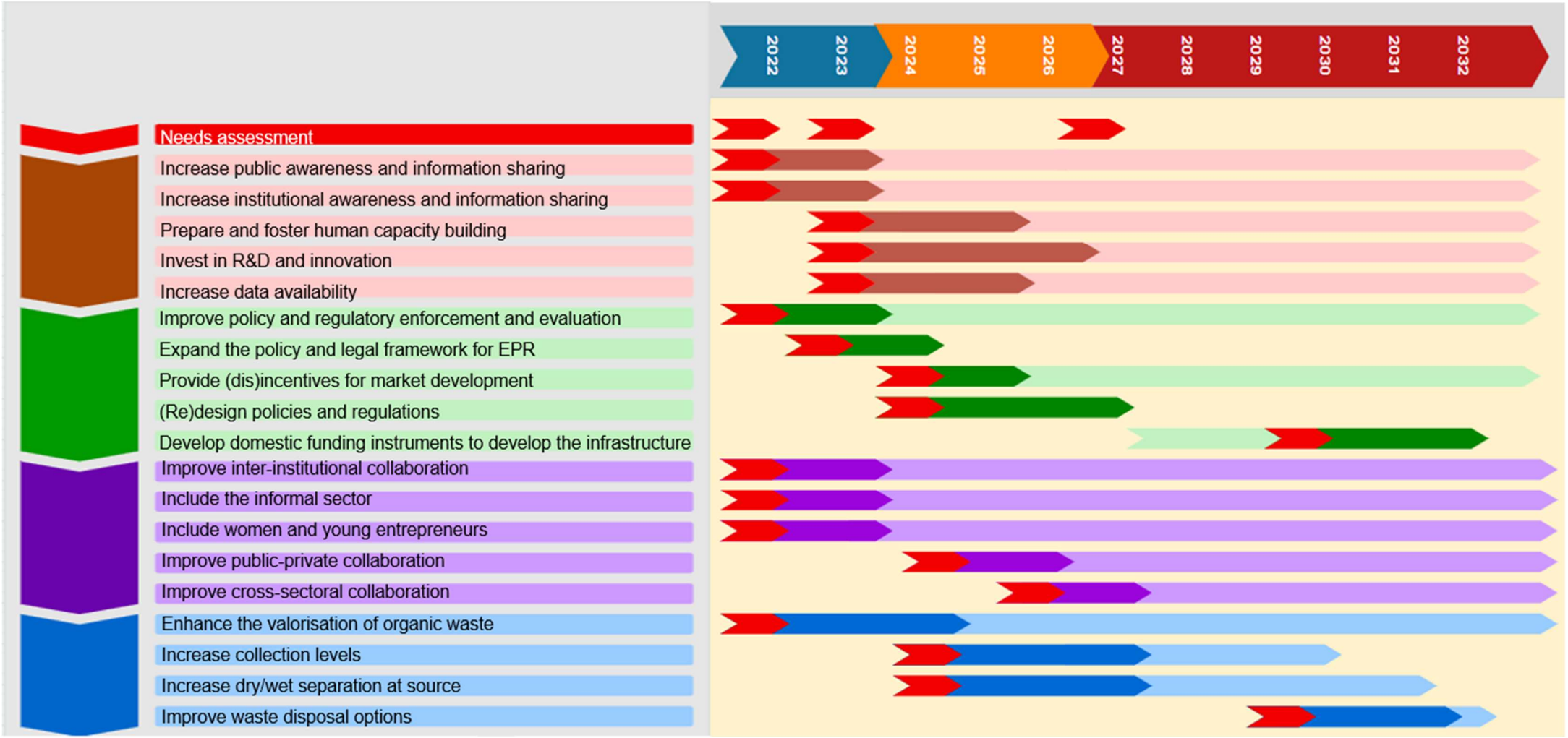
6.4 Needs assessment

Many of the interventions presented in the roadmap are continuous, meaning they will not be 'finished' after the key actions suggested are taken. For example, the necessary levels of awareness, capacity building, and collaboration depend on the level of development achieved and will adapt and grow accordingly. Therefore, it is critical to carry out a needs assessment for all four intervention domains at the start of each new phase, to identify what actions are needed and to be implemented. This is integrated in the Gantt chart presented in the next chapter.

[8] Nordahl, S. L., Devkota, J. P., Amirebrahimi, J., Smith, S. J., Breunig, H. M., Preble, C. V., ... & Scown, C. D. (2020). Life-cycle greenhouse gas emissions and human health trade-offs of organic waste management strategies. *Environmental science & technology*, *54*(15), 9200-9209.

7 Gantt chart of the Roadmap

As stated in the introduction, the interventions will overlap and implementing the roadmap will require simultaneous action. To allow for a better understanding and overview of the interventions in a system over time, the Gantt chart on the page below is presented. This gives a quick indication of which intervention starts at which moment and which domain the intervention strengthens. The light shading has been distinguished from the darker shading with the dark shading indicating that within that respective time frame, the intervention requires most effort. Moreover, the continuation of the shading indicates that the intervention is not a once-off activity, but one that is ongoing and requires continuous effort (e.g. awareness creation and sensitization should be kick-started on the short term, but will require additional and continuous efforts over time according to changing needs in knowledge creation). The prioritization is established based on multiple discussions and validation sessions with local stakeholders.


2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
Needs assessment
Increase public awareness and information sharing
Increase institutional awareness and information sharing
Prepare and foster human capacity building
Invest in R&D and innovation
Increase data availability
Improve policy and regulatory enforcement and evaluation
Expand the policy and legal framework for EPR
Provide (dis)incentives for market development
(Re)design policies and regulations
Develop domestic funding instruments to develop the infrastructure
Improve inter-institutional collaboration
Include the informal sector
Include women and young entrepreneurs
Improve public-private collaboration
Improve cross-sectoral collaboration
Enhance the valorisation of organic waste
Increase collection levels
Increase dry/wet separation at source
Improve waste disposal options

8 Consulted sources

This Roadmap is primarily based on the results of the three prior studies to the CTCN Technical Assistance on Circularity in Waste Management:

TNO (2021) CTCN Technical Assistance Output 2 Baseline Assessment of the Current Waste Management System in Zimbabwe

TNO (2021) CTCN Technical Assistance Output 3 Comparative Analysis Circularity Potential for Six Household Waste Streams

TNO (2022) CTCN Technical Assistance Output 4 Technology, Policy and Market Analysis of the Current Organic Waste Management System in Zimbabwe

In addition to these studies, the following complementary sources have been consulted:

Bonnaire, S. M., Jagot, J., Spinazzé, Potgieter, J. E., Rajput, J., Spinazze, C., Hemkaus, M., Ahlers, J., Koehler, J., van Hummelen, S., & McGovern, M. (2010). European Commission Directorate-General for Environment Directorate F-Global Sustainable Development Unit F2-Bilateral & Regional Environmental Cooperation Circular Economy in Africa-EU Cooperation Country Report Senegal. https://doi.org/10.2779/042060

CCAC. (2016). Strategy for Organic Waste Diversion - Collection, Treatment, Recycling and Their Challenges and Opportunities for the City of Sao Paulo, Brazil | Climate & Clean Air Coalition. https://www.ccacoalition.org/en/resources/strategy-organic-waste-diversion-collection-treatment-recycling-and-their-challenges-and

Ddiba, D., Andersson, K., Koop, S. H. A., Ekener, E., Finnveden, G., & Dickin, S. (2020). Governing the circular economy: Assessing the capacity to implement resource-oriented sanitation and waste management systems in low- and middle-income countries. Earth System Governance, 4, 100063. https://doi.org/10.1016/J.ESG.2020.100063

DSGC. (n.d.). Transition Time! A Circular Economy for Plastics Summary.

INSWMSP. (2014). National Strategic Roadmap on Integrated Waste Management Keep Sierra Leone Clean, Play your Role for Change.

NPAP. (2021). A Roadmap for Radical Reduction of Plastic Pollution in Ghana.

OECD. (2019). Waste Management and the Circular Economy in Selected OECD Countries. https://doi.org/10.1787/9789264309395-en

WIEGO. (n.d.) Waste Pickers. Waste Pickers | WIEGO

WWF. (2021). South Africa Extended Producer Responsibility for plastic packaging in South Africa a synthesis report on policy recommendations. www.wwf.org.za/reports/EPR_policy_for_plastic_