ADMINISTRATION AGREEMENT BETWEEN THE EUROPEAN COMMISSION ON BEHALF OF THE EUROPEAN UNION AND THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT CONCERNING ESTONIA

Trust Fund No. TF073493

EC Contract No. REFORM/GA2020/007

OUTPUT 2

Policy Recommendations and Action Plan for Estonian Solid Waste Management System

October 2021

The project was funded by the European Union via the Structural Reform Support Programme (SRSP) and implemented by The World Bank in cooperation with the European Commission's Directorate General for Reform Support (DG REFORM)

European Commission

REPUBLIC OF ESTONIA
MINISTRY OF THE ENVIRONMENT

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP

DISCLAIMER

This document was produced with the financial assistance of the European Union. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

This report is a product of the International Bank for Reconstruction and Development / The World Bank. The findings, interpretation and conclusions expressed in this paper do not necessarily reflect the views of the Executive Directors of the World Bank, the European Commission or the Government. The World Bank does not guarantee the accuracy of the data included in this work.

COPYRIGHT STATEMENT

This report has been delivered in October 2021, under the EC Contract No. REFORM/GA2020/007 (under TF073493), signed between the European Commission and the International Bank for Reconstruction and Development. It corresponds to Output 2 for the Technical Assistance on municipal waste management for Estonia under the above-mentioned agreement.

Abbreviations and Acronyms

AD	Anaerobic Digestion
CDW	Construction and demolition waste
C&D	Construction and demolition
DG REFORM	Directorate-General for Structural Reform Support
EC	European Commission
EEA	European Environment Agency
EU	European Union
EoW	End of Waste
EPR	Extended producer responsibility
GPS	Global positioning system
IT	Information technology
KOTKAS	Environmental Decision Information System
KPI	Key performance indicator
MoE	Ministry of Environment
MRF	Materials recovery facility
MSW	Municipal solid waste
NACE	Statistical classification of economic activities in the European Community
PAYT	Pay as you throw
PRO	Producer responsibility organisations
RVM	Reverse vending machines
R&D	Research and development
R-D	Recovery-disposal
UK	United Kingdom
UN	United Nations
WB	World Bank
WEEE	Waste, electrical and electronic equipment
WRAP	Waste and Resources Action Programme

Contents

List of Tables

List of Figures

1 Introduction

The World Bank was engaged by the European Commission on behalf of the Government of Estonia to undertake a review of its waste management system, in light of current projections that Estonia may fall short of European Union recycling targets. The World Bank is assessing the current municipal solid waste management system, analysing the potential options, proposing policy recommendations, and developing an action plan to improve the effectiveness and circularity of the solid waste management system in Estonia. This includes a review of the system in an integrated and holistic manner, considering waste management operations, the legal framework, institutional arrangements, technical solutions, communications, data management and reporting, and financing. This report is Output 2, providing policy recommendations and a corresponding action plan, for consideration by the Ministry of Environment (MoE).

This report presents:

- A summary of key policy recommendations
- An action plan for implementing these recommendations

The policy recommendations and action plan are based on the Options Analysis study prepared by the World Bank team in July – August 2021.

2 Summary of policy recommendations

Key recommendations from this study are summarised below.

Data

1. **Waste reporting.** There is a variety of waste tonnage data collected from various sources. Different sources of data indicate different tonnages. It is recommended that a thorough review and update of waste data reporting systems is conducted to identify and clarify relevant sources of data, and establish effective systems for collecting and communicating accurate and transparent data on waste flows in Estonia.

2. **Data collection protocols.** Packaging data values vary significantly between different information sources. This is thought to be related to the definition of municipal waste and separately collected packaging, some of which is not considered to be municipal and, as such, cannot be counted towards recycling performance. It is recommended that the definitions of data are clarified and incorporated in data collection and processing protocols.

3. **Waste composition analysis programme.** Implement a regular programme of waste composition analysis that provides data on composition at national and intermunicipal level, and for different waste streams (e.g. door-to-door collection and civic amenity sites).

Biowaste

1. **End of waste compliance.** Analysis of data on quantities of biowaste collected and treated indicates that only a small fraction of treated biowaste is counted as 'recycled' due the small number of facilities which are operated in accordance with End of Waste Ordinances. If more facilities were to meet End of Waste requirements, then Estonia's biowaste recycling rate would be higher. It is recommended that a programme to transition existing and future biowaste treatment sites to 'End of waste' compliance is implemented.

2. **Improve biowaste capture.** Analysis indicates that increasing capture of this material in municipal biowaste collections could increase recycling performance by a further 8%. It is recommended that a programme is implemented to increase biowaste capture to a level that is comparable with the best performing systems in Europe, a capture rate of 65%. This will require investment in collection systems and infrastructure, and also communications and behaviour change, to maximise the capture rates achieve for this material.

3. **Increase garden waste capture.** Garden waste forms a key component of municipal biowaste. Levels of recovery of this material could be increased. It is recommended that a scheme is implemented to encourage householders to deliver their separated garden waste to civic amenity sites.

4. **Biowaste treatment supporter programme.** Whilst there is adequate capacity to treat collected biowaste in Estonia, this largely comprises in-vessel and open windrow composting facilities. There is an opportunity to increase treatment of biowaste via anaerobic digestion,

generating renewable energy. It is recommended that a biowaste treatment supporter programme is implemented to provide appropriate biowaste treatment capacity across Estonia and incentivise operators to accept and treat kitchen waste (including investing in appropriate pre-treatment equipment). This programme will need to include both financial and technical support and proactive engagement with operators.

Packaging

1. **Minimum technical requirements.** Set up minimum technical requirements and KPIs for separate waste collection and sorting system and establishment of unified collection model through the country.

2. **Combine paper and card collection systems.** Unite the systems for separate collection of paper and cardboard organized by municipalities with systems for separate collection of paper and cardboard packaging organized by PROs.

3. **Extend door-to-door packaging collection.** Improve household packaging waste collection systems and provide conditions for the achievement of higher recycling rates through extended door-to-door collection.

4. **Define responsibilities.** Define clear requirements for division of responsibility between several PROs operating on market. The following options should be considered in declining order:
    a. Enforce requirements for national coverage of separate collection system and compliance with the minimum technical requirements by each PRO – the enforcement is likely to result in merging of activities and concentration of single PRO
    b. Geographical division of national territory between several PROs based on market share and number of residents served
    c. Establishment of clearing house or equivalent structure
    d. Establishment of shared responsibility model where municipalities become responsible for organizing separate collection (depending on institutional arrangements for municipal waste)

5. **Review the documentation and reporting requirements with focus to:**
    a. Establish clear documentary evidences based on primary accounting documents for each single operation with waste (collection, sorting, recycling/recovery). Introduce obligatory requirements for PROs to own collected and sorted material (except in case of shared responsibility model with municipalities)
    b. Review and extend the scope of annual reporting requirements for the PROs allowing traceability of physical implementation of separate collection system and quantities of packaging waste collected, separated and recycled/recovered by municipality, source (household and similar), material type and collection channel
    c. Establish requirement for auditing annual reports of PRO and clear definition of audited information

6. **Divide cost structures.** Divide the cost structures for household packaging and group/transport packaging for individual packaging materials in order to improve transparency of the EPR system and reduce cross-subsidies between different collection channels and materials. The different cost structures shall be taken into account in the financial and operational planning documents submitted by PRO for obtaining license and used for the justification of proposed service tariffs (licensing fees of PROs) and in the annual reports submitted by the PROs.

7. **Licensing requirements.** Review the requirements for the licensing and operation of PROs. The revisions shall establish precise requirements on the scope and content of application for a license, including submission of detailed operating programme and financial projections, communication and public awareness programme. The PRO license duration shall be limited by time and period of 5 years which is considered appropriate for this purpose. Longer period of the license increases uncertainties in the submitted programme for operations and financial projections. The change in the legal requirement, ownership of the PRO and licensing fees shall be considered as conditions requiring permit amendment. The competent authorities should have the right to initiate procedure for permit amendment or withdraw the permit in case that submitted operating programme is not implemented. Equal treatment of clients should be guaranteed and enforced during the entire operation of PRO.

8. **Public awareness.** Increase significantly the public awareness costs to support participation of households in the waste separate collection systems and achievement of higher recycling rates for household packaging waste. The proposed indicative value of minimum public awareness costs to be financed by PROs altogether is 1 EUR per capita per year. The threshold value for minimum public awareness costs could be formulated as percentage of annual revenue of PROs assuming that the cumulative effect will exceed 1.3 million EUR per year. The PROs must be obliged to submit a detailed communication and public awareness programmes as part of application for obtaining license.

9. **Modulated fees.** Introduce modulated fees for obliged companies taking into account the recyclability, the achieved recycled rates of individual packaging types and recycled material content. The modulated fees should be considered as source of revenue for the payment of Estonia's contribution to EU budget for non-recycled plastic packaging.

10. **Establish stakeholder consultation platform.** The proposed changes in the way how EPR system if established and implemented will require extensive and regular consultations between various stakeholders. Involvement of Associations of Estonian cities and municipalities and PROs in consultation process is of particular importance. The Packaging Commission envisaged in the Packaging Act could serve as such a consultation platform.

Other wastes

1. **Waste prevention.** Waste prevention should form a key element of any national waste or circular economy strategy. It sits above recycling and recovery in the waste hierarchy. It is recommended that a national waste prevention plan is developed and implemented.

2. **Plastics.** Enhance the collection and recycling of plastic waste.
    a. Assess the feasibility of developing regional plastics sorting infrastructure (e.g. as part of regional MRFs) to add value to plastic wastes whilst at the same time making the most of economies of scale offered by intermunicipal cooperation.
    b. Make plastics form a key focus of nationally coordinated communication activities on waste reduction and recycling, and that this effort is managed in close coordination with the PROs (who have responsibility for delivering communication activities for packaging materials).
    c. Establish a working group, or other forum, with the private sector and PROs to provide a platform for identifying and implementing long term solutions to managing difficult to recycle plastics.
    d. Consider the use of eco-modulation as part of any EPR reform (see above). This will need to be done in close discussion with key stakeholders, including producers, PROs, waste management companies and municipalities.
    e. Adopt clear standards on bio-based plastics and biodegradable plastics to ensure that these materials are managed effectively.

3. **Construction and demolition wastes.** C&D wastes, in the form of soils and rubble, form a significant element of municipal waste and, in particular of CA site waste (approximately 10% of total quantity received). However, there is limited information on the nature, quantities and management routes used for this material. Analysis of available data indicates that approximately 3 million tonnes of construction and demolition waste is generated overall[1]. It is recommended that a detailed assessment of household C&D waste issues (e.g. quantities, nature, etc) is conducted and that a programme is developed to address this unique municipal waste stream is developed, if appropriate. Also, consider setting of the reuse and recycling targets for C&D waste.

4. **Textiles.** Capture and recycling rates for textiles in municipal waste appear to be relatively low. Whilst there is an established textiles collection and recycling system in Estonia there is an opportunity to further increase recovery of these materials, In addition, there is likely to be scope to focus on recovery of non-clothing textile materials and items such as mattresses and carpets. It is recommended that an action plan for increasing the diversion of textiles waste from mixed municipal waste stream is developed, including:
    a. Ensuring that textiles is a key focus of any national communication and behaviour change campaign.

[1] Source: https://jats.keskkonnainfo.ee/failid/2019_1_ewc.pdf

b. Assess the management of non-clothing textiles in greater detail and consideration is given to implementing measures to encourage their recovery (e.g. an innovation fund to support development of systems and technologies for recovering value from these items).

5. **Waste electrical and electronic equipment (WEEE).** Analysis of available data indicates that there is scope to increase WEEE recycling. This would not have significant effect on overall recycling performance compared to other waste streams considered as part of the analysis, so it has not been assessed in detail. However, consideration should be given to the following recommendations:
    a. **Establishing minimum technical requirements for the collection of WEEE from households.** Such requirements shall include an agreement of optimal number of public civic amenity sites and their geographical distribution, requirements for collection points established at the premises of large retail shops and the implementation of one-to-one take back obligation by the retailers to take back a used product upon purchase of a new product of the same type. In addition, collection upon request of large household appliances (in combination with bulky waste collection) or periodic door-to-door collection campaigns could improve the collection rates achieved, especially in rural areas. The collection of some WEEE small appliances could also be combined with the separate collection of household hazardous waste. Such WEEE collection from households can be organized by municipalities or directly by the PROs. Similar to the packaging waste, minimum collection requirements should be agreed between PROs and local authorities.
    b. **Reviewing arrangements for division of responsibilities between PROs for WEEE collections**. Such division can be based on setting up a "clearing house" or an equivalent structure for cost sharing between PROs proportional to their market share for the respective WEEE category.
    c. **Reviewing reporting requirements for PROs on WEEE collection**.

The dialog between all stakeholders including industry, state authorities, municipalities and waste management companies will be crucial for the successful implementation of legal requirements. Progress will only be possible if all stakeholders work together for the achievement of common objectives.

<u>Institutional and organisational arrangements</u>

1. **Municipal targets.** Place responsibility for meeting preparing for reuse and recycling targets for household and similar waste on municipalities levies**.** Allow municipalities to levy fees from waste generators.
2. **Municipal levies.** Allow municipalities to levy fees or taxes from waste generators. The municipalities will have the right whether to keep the present model where waste management fees are charged directly by service provider to household and legal entities, or to establish municipal waste fee/tax and channel all payments to service providers through municipal budget. A combination of fixed municipal charge covering services organized by

local authorities and service fee charged by the operators is also possible alternative. Such provision was existing in Estonian legislation till 2015 and is supposed to provide greater flexibility of municipalities how to organize waste management services in their territories, will increase the opportunities for inter-municipal cooperation and not at the last place will provide conditions for more fair allocation of costs between different waste streams and activities.

3. **Intermunicipal cooperation.** Establish requirements and mechanisms to support intermunicipal cooperation that allow several municipalities to organize common waste management services and/or facilities.
4. **Project finance.** Align project financing requirements to support inter-municipal cooperation.
5. **Limitations.** Remove limitation of maximum number of residents when contracting waste management services.

Financial arrangements

1. **Pay as you throw tariffs.** Allow and support municipalities to establish PAYT weight-based tariffs (in mid-term).

3 Data

3.1 Recommendations

Waste reporting. There is a variety of waste tonnage data collected from various sources. Different sources of data indicate different tonnages. It is recommended that a thorough review and up-date of waste data reporting systems is conducted to identify and clarify relevant sources of data, and establish effective systems for collecting and communicating accurate and transparent data on waste flows in Estonia.

Data collection protocols. Packaging data values vary significantly between different information sources. This is thought to be related to the definition of municipal waste and separately collected packaging, some of which is not considered to be municipal and, as such, cannot be counted towards recycling performance. It is recommended that the definitions of data are clarified and incorporated in data collection and processing protocols.

Waste composition analysis programme. Implement a regular programme of waste composition analysis that provides data on composition at national and intermunicipal level, and for different waste streams (e.g. door-to-door collection and civic amenity sites).

3.2 Key considerations

In recent years, innovation has brought an array of new technologies to market that can improve waste data collection, management and reporting. Some key developments include vehicle technology of on-board weighing and GPS tracking, smart e-bin, smart waste tracking, MRF scanning, data dashboards and real-time monitoring, and innovations around deposit return scheme technology. Alongside these, technology can support the management and reporting of waste data to serve more audiences and provide bespoke insight to any user. Introducing such technology should be carefully planned so that it adds value and does not create an unmanageable and overwhelming source of data.

A more detailed discussion of these key considerations and potential technology innovations can be found in a separate report on Data and Information Management.

3.3 Actions

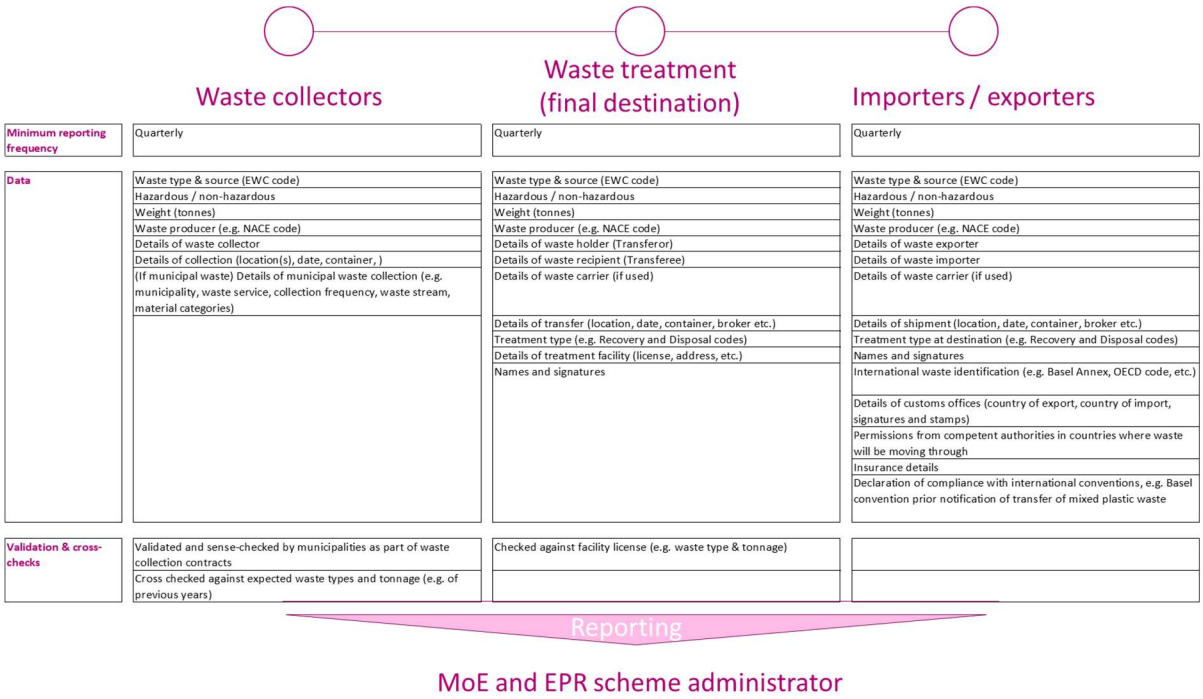
The system of waste data collection can be improved in terms of its coverage, detail, and quality, and there is a lack of monitoring, enforcement and follow-up. Important gaps persist, possibly due to legislative gaps and a lack of human resources. An incremental action plan to improve waste data collection and management is presented in three stages: short, medium, and long-term. The timescales of delivering these changes depends on the ambition and resources available. Indeed, the long-term plan could be achieved within 5-10 years given the right support.

3.3.1 Short-term

The fundamentals of national waste data relate to waste collection, the final destination of waste, and the import and export of waste materials. If comprehensive, detailed and high quality data is reported at these three points in the value chain then a robust understanding of waste arising, treatment and

recycling rates can be gained. Suggested waste data, reporting frequency and validation steps are illustrated in **Tõrge! Ei leia viiteallikat.** based on international best practice. Additional data may be required, as relates to environmental regulations in Estonia.

Figure 1: Basic data reporting from key stakeholders



This level of data reporting provides an overview of waste management but masks the intermediary steps of waste passing between different operators and going through intermediary treatment processes. As recycling rates increase, the waste value chain typically becomes more complicated as more materials are separated and treated at different facilities specialising in specific materials and processes.

An illustration of a waste value chain is shown in

Figure 2, taken from the smart waste tracking project Vastum that is currently being developed by environmental consultancy Anthesis. The figure shows multiple stages in the value chain, with waste collected from the waste producer by a waste carrier and transported to the receiving site. The receiving site might be a waste bulking and transfer station or, in some cases, it might be direct-delivered to a waste recovery of disposal facility. The waste may be transferred between waste operators at this point, with a corresponding financial transaction, or the waste collector may own the receiving site and/or further steps in the value chain. The figure shows the value chain branching as a result of the sorting of waste into different materials and the subsequent onward journey of separated wastes. Import and export of waste is not represented in the figure.

Figure 2: Waste value chain

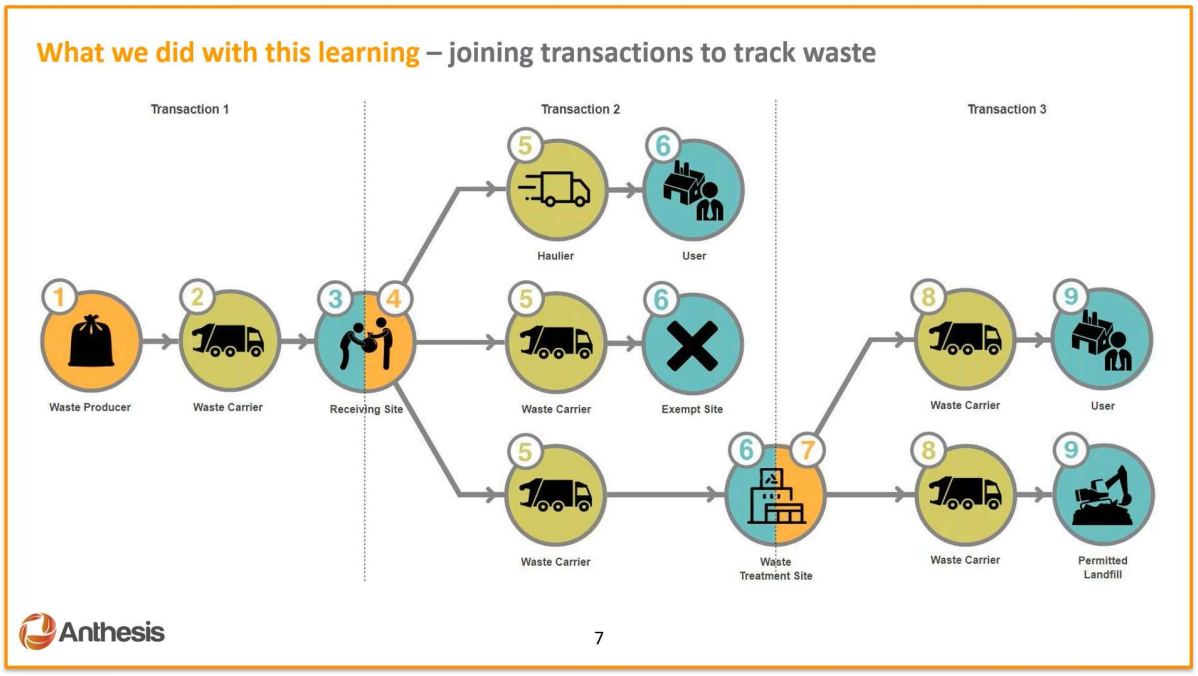
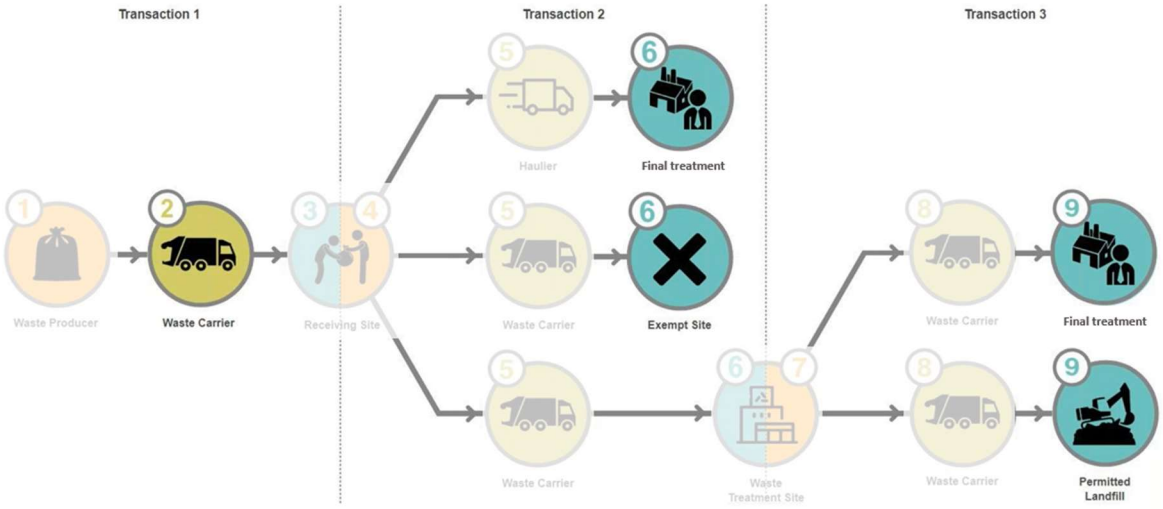


Figure 3 illustrates the points in the value chain that would be represented in the short-term action plan, with waste collectors and waste treatment facilities at the final destination of waste reporting data. As the figure shows, this captures data from the economic operators at the start and the end of the waste value chain, but the intermediary steps remain opaque due to the lack of data collected at those points.

Figure 3: Data captured in the by waste collectors and final destination waste treatment facilities



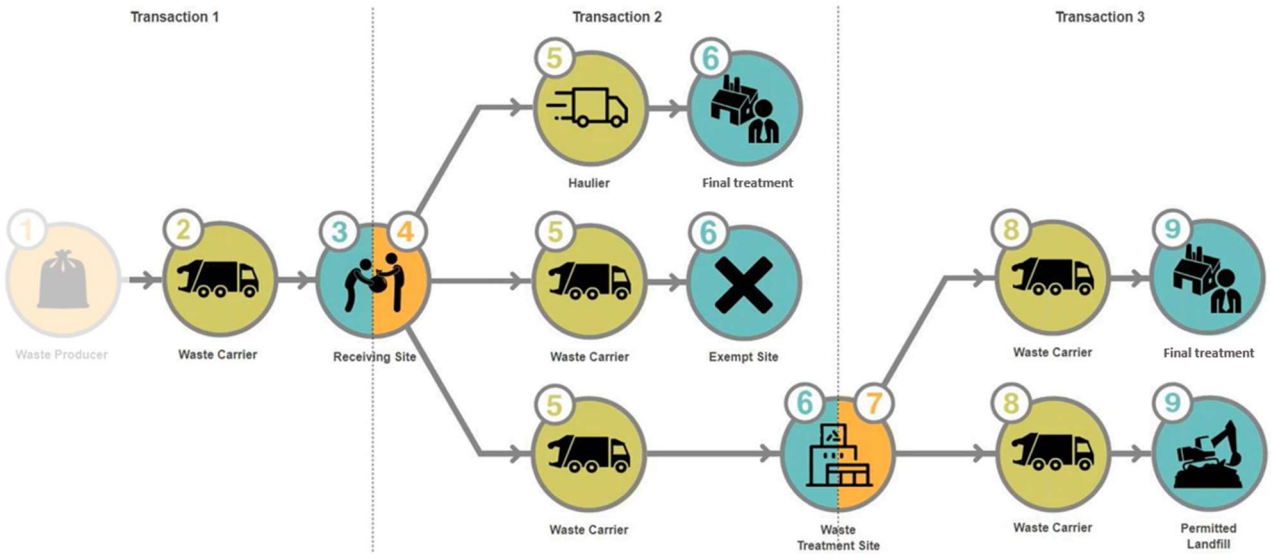
The following recommendations are given to support waste data collection and reporting in the short-term:

- **Address local waste data collection issues.** Create a single standardised data management system for waste handlers to collect data for KOTKAS. Develop features for waste tracking, data traceability and verification, and automated validation checks with non-compliance notices for the data manager (i.e. the MoE).
- **Continue to develop KOTKAS as a single central location of waste data**, and make data accessible to relevant parties in granular or aggregated form. Avoid introducing separate systems and duplicating data. If there are gaps or deficiencies in granular data that affect regional or national summaries, address these gaps as a priority so that data is complete and can be aggregated to different level without the need for additional estimates.
- **Address issues of scope and granularity in packaging waste data.** Review requirements under national packaging EPR legislation and EU Directives, e.g. breakdown of packaging waste by source and collection type. Engage PROs on mandating new reporting requirements. Update data submission templates and reporting for MoE annual activity reports.
- **Ensure a functioning chain of responsibility for high quality and timely waste data reporting**, from the lowest level of granular waste data collection up to municipal and national government. Two key parts of the chain to address are:
    - *Data collection:* typically waste contractors and treatment facility operators. Review/update legislation on data reporting requirements, in particular data submission, validation and correction requirements and response timescales. In particular, address issues around response time for verifying and updating erroneous data. Provide online portals with KPIs to monitor how individual operators perform against these requirements and require/encourage municipalities to build the KPIs into waste contracts, with minimum performance requirements and penalties for non-compliance, e.g. part of contract fees being linked to KPI performance ideally with a sliding scale to incentivise high performance. Provide functionality within the KOTKAS system which requires data verification of reports by municipality before sign-off.
    - *Municipalities.* Create similar data reporting requirements and incentives for municipalities. Provide municipalities with tools and support to validate data they collate from third parties, and link their performance requirements to submitting timely and validated data. Ensure there are consequences for poor data handling performance, which in turn will motivate municipalities to better manage their contractors (using the means outlined above).
- **Create functionality for the Environment Agency to correct data as a last resort** if the data submission party fails to do so.
- **Minimise poorly categorised data and other forms of low-quality data.** Reduce quantity of waste categorised as ‘unspecified treatment’ or ‘unknown origin/municipality of the collection’ in national reports by ensuring better traceability at local level. Utilise municipalities in verification of data at submission to provide greater understanding of movement of waste, from collection to treatment, by waste contractors.

3.3.2 Medium-term

In the medium-term, it is recommended that waste data collection and reporting move to a transactional model wherein each movement of waste is reported in standard format so that the full value chain becomes clear as waste passes between different operators, is separated into different materials, and undergoes one or more treatment processes before its final destination in recovery or disposal. Ideally, this would extend beyond the point of export and follow the waste to its final destination in foreign counties. This would ensure waste is treated responsibly, reducing the risk around illegal landfills and burning of waste, but it is recognised that this is currently difficult to monitor and enforce.

Figure 4: Transactional data reporting in the waste value chain



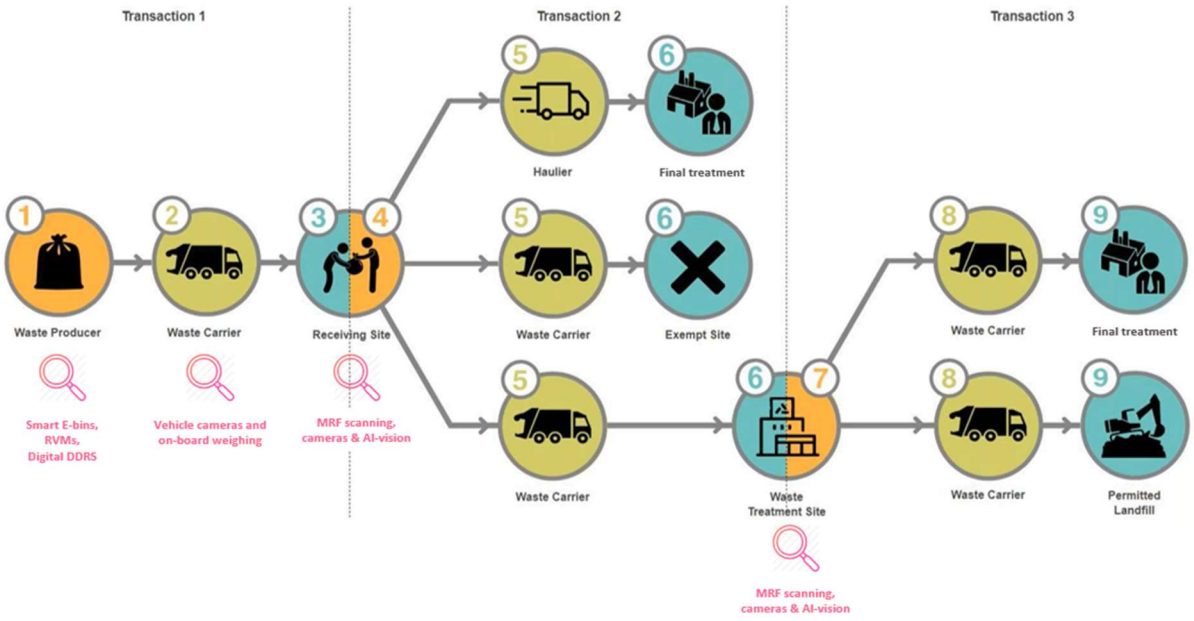
The following recommendations are provided to support waste data collection and reporting in the medium-term:

- **Introduce electronic waste transfer notes** to collect transactional data on the full waste value chain, as described above.
- **Increase and automate granular waste data collection and submission to KOTKAS.** Review EU Directives and National strategy to foresee future data needs, e.g. introduction of EPR for new waste streams such as fishing gear, textiles, certain C&D wastes, etc. or eco-modulation of producer fees under EPR reform, which may be based on 'recyclability' of packaging and other factors. When new legislation is drafted, start to adapt KOTKAS to incorporate new datasets and fields so as to maintain a single dataset for waste legislation compliance and reporting needs.
- **Benchmark municipalities for performance**, identify outliers, and investigate reasons for high and low performance. Address issues identified and share best practice.

3.3.3 Long-term

In the long-term, new technology can be introduced to gather data on the waste producer and to provide greater granularity, frequency and automation of data collection at other points in the value chain. Figure 5 illustrates how some of the data collection technologies that can be integrated into the data collection action plan to supplement transactional data outlined above.

Figure 5: Full waste value chain transparency with additional granularity denoted in pink



The following recommendations are provided to support waste data collection and reporting in the long-term:

- **Take advantage of new technologies available** for waste data collection, waste monitoring, tracking, and reporting. Carefully design roll-out of such technologies to avoid duplication of data (and potential disparities) and ensure successful integration with national systems. Focus on key areas of data gaps or data quality issues, such as greater granularity on source of data (waste generator type and location, aligning with EU and national waste categorisation schemes such as Waste Framework Directive methods for categorising MSW).
- **Use near real-time data feeds from new technologies to create dashboards and monitoring systems** that can remotely identify and respond to waste crime. For example, compare waste permits to live operations and notify operators if they are reporting waste types they are not licensed for, or are approaching their permit limits on quantities of waste. Automate mass-balance checks on individual operators to identify potential criminal activity, such as fly-tipping or illegal waste treatment.
- **Create a centralised data centre for national material flows** – raw materials, finished and semi-finished products and waste, taking account of import, exports and national production, as well as consumables and process losses (such as evaporation of wet waste, and incineration of waste). Aim to produce a comprehensive view of material flows through the economy and

through the geography, from which national circular economy strategies can be targeted and performance measured.

- **Aim to align data categories** where possible, e.g. align EWC codes with industrial categories (such as NACE codes) used to record non-waste material flows, to allow a direct comparison and unification of data. This may require additional data requirements at waste data collection, e.g. NACE code of waste generator, but this would not be onerous if new waste technology were utilised – as described elsewhere in this report.

4 Biowaste

4.1 Recommendations

1. **End of waste compliance.** Implement a programme to transition existing and future biowaste treatment sites to 'End of waste' compliance.
2. **Improve biowaste capture.** Implement a biowaste collection system that performs at a level that is comparable with the best performing systems in Europe, achieving a capture rate of 65%. This will require investment in collection systems and infrastructure, and also communications and behaviour change, to maximise the capture rates achieve for this material.
3. **Increase garden waste capture.** Implement a scheme to encourage householders to deliver their separated garden waste to civic amenity sites.
4. **Biowaste treatment supporter programme.** Implement a biowaste treatment supporter programme to provide appropriate biowaste treatment capacity across Estonia and incentivise operators to accept and treat kitchen waste (including investing in appropriate pre-treatment equipment). This programme will need to include both financial and technical support and proactive engagement with operators.

4.2 Key considerations

4.2.1 Key considerations for an enhanced kitchen waste collection scheme

Kitchen waste can constitute around 30% of the municipal residual waste stream. The collection and disposal of this waste via landfill can have considerable financial and environmental costs. As a major part of the mixed municipal waste is incinerated, so is the bio-waste contained within it. Yet this fraction is wet, lowering therefore average calorific value of the waste (although energy generated from the biogenic fraction is calculated as renewable energy). Note however, that part of the mixed municipal waste is landfilled because the amount of waste exceeds energy recovery capacities. As such, better source separation and treatment of the bio-waste would improve application of the waste hierarchy principle.

The advantages of collecting kitchen waste separately are significant, both through reducing both the collection and disposal element of the costs and through achieving the added benefits of carbon reduction and energy production. However, kitchen waste collection systems vary widely in their effectiveness, with a large range in participation levels and capture of material by the individual household. The following paragraphs describe the key issues to consider, key approaches to take and provide some examples of services where the service design has helped to maximise capture and participation.

How will the food waste be processed?

When designing the collection service, it will be necessary to discuss with the processing plant operators how and when they would like to receive the material. This will include such issues as liner and sack use and its impact on the process - such as front-end debagging or the initial mixing process – the maximum and minimum throughputs of the plant and guaranteed tonnage delivery; how the material is received on site – which vehicles are suitable for delivery and whether adaptations to the receiving area are required.

Compostable liners are generally recommended for use by households, as they help with increasing and maintaining kitchen waste capture, which ensures that the collection service is cost-effective. If the processing plant, particularly Anaerobic Digestion (AD), is not currently set up for receiving food waste in liners, due to the initial process, it would be worth investing in changing this initial debagging or mixing/shredding mechanism. For instance, in Italy kitchen waste is removed from compostable liners using presses which squeeze out the material. The "cake" of liners is then composted separately.

In the UK, for example, it is increasing likely that compostable liners will be made mandatory, with polyethylene (PE) liners, once popular due to lower costs, being phased out. This is due to the issues of contamination with small fragments of PE within the AD plant digestate outputs.

The location of the kitchen waste processing plant

The destination of the kitchen waste has an impact on the collection services due to the time spent delivering collected waste. It may be efficient for the kerbside collection vehicles to deliver directly to the processing plant, however, if this is at some considerable distance, the collected material may need to be bulked-up at a waste transfer station so that the kerbside collection vehicles are more effectively deployed on the collection rounds.

As highlighted above, suitable treatment capacity for kitchen waste is currently centred around Tallinn and the north of the country. Consideration should be given to whether treatment facilities are needed on other regional centres, but that requires also more clear distinction of the responsibilities between municipalities and private companies.

Predicting the quantity of material

It is important to conduct residual waste composition analysis prior to implementing a kitchen waste collection service, so that it can be gauged how much material they may have to collect and resource accordingly. Quantities are affected by demography, with more deprived areas and areas of greater housing density, achieving typically both a lower yield per property and lower percentage participation. All those issues should be analysed in the local waste management plan, required by Waste Act. A high performing scheme in the UK achieves up to 55% participation and around 1 – 1.5 kgs per household on each collection. Therefore, even at high levels, the total available kitchen waste will not be the amount collected or requiring treatment. Making a range of sensible estimates of total kitchen waste is key to understanding the collection and treatment resources and costs required.

4.2.2 Key approaches for developing a successful kitchen waste collection system

It is important that householders are provided with a system that is easy to use and are given clear instructions. Many householders perceive a variety of barriers to participation in kitchen waste collections; many of which can easily be overcome, with those that do participate finding that the barriers don't materialise. Ensuring that you have a collection system and accompanying communications to clearly explain the service and deal with any perceived barriers is essential and early preparation is required.

Barriers

Perceived barriers cited by householders include:

- they don't produce enough food waste or deal with it in other ways sufficiently well;

- there will be issues with smells, flies and slop;
- they don't want to pay for caddy liners;
- they don't have the kit; and
- they don't have the information required to take part.

Considering each of these in turn:

- insufficient kitchen waste - residents typically produce more food waste than they expect. Yields of food waste tend to be good once the schemes are running;
- Flies are not a problem if the residents use the system correctly, using caddy liners, kitchen caddies and external containers correctly. Also note that when bio-waste is disposed of in the mixed waste container, the same problems exist. Source-separation does not create them.
- The free supply of liners on a regular basis, so that there is no break in supply, can ensure good participation and capture;
- Providing the correct equipment (containers, etc) is essential – more details regarding the equipment are provided below;
- High quality information is essential for residents to understand how to use the service, and this should accompany the kit at the start of the scheme. Information regarding the reasons for introducing the service can be provided as part of an overall campaign prior to its introduction to ensure buy-in from the communities involved.

Containers

For all kerbside properties good practice is to provide a set of kit, including a kitchen caddy, usually around 7 litres in size, and accompanying compostable liners, that correctly fit the kitchen caddy and an external caddy/ bin usually 23 litres in size; into which multiple full, tied kitchen liners are deposited.

Providing a steady supply of liners might be viewed as expensive, but, as they ensure good participation and yields then they are a cost-effective element to the service. If vehicles are deployed but not used to their full capacity then that is definitely not cost-effective. Following the issuing of a roll of liners to all households covered by the scheme further distribution of liners needs only to be to those households that are actually participating in the service, which is likely to reduce the initial cost by over 45%, albeit they will need to be supplied regularly. On average households in the UK, for example, use around 2.5 liners per week for kitchen waste.

Research suggests that the following is important:

For kitchen caddies:

- the size, colour, type of lid, type of handle, whether they allow air to circulate or are more "sealed", whether they can have an absorbent pad in the lid etc. all need to be considered:
- the size needs to be big enough to easily allow food waste from plates to be scraped into the caddy;
- a handle can help with ease of tipping the caddy contents into the larger external caddy;

- air vents help to prevent smells by wicking moisture away when using corn-starch liners, however they seem to be less popular with the public who may like to keep the food waste sealed away; and
- the colour is important – dark brown is not popular, green seem to be more favoured but the most popular is likely to be silvery grey to match chrome/ lighter kitchens; and
- some caddies have a lid that can be "locked" which can prevent animals or small children from getting at the contents – this is important where space is limited and caddies might be stored less securely.

For external caddies:

Information such as stickers on the caddy or embossed printing can be important as can having a small square where a household might write their house number;

- can they be "locked"? Often the carrying handle can be pulled over the top of the caddy to stop the lid either blowing open or coming open if the caddy is tipped up – this helps prevent animals getting at the food waste and a mess being caused; and
- colour, size and ease of carrying are also important as the appearance, both within a property and on the street, should be considered.

For flats, small "bring site" systems can be used for kitchen waste. The residents can still use the internal kitchen caddies and lines and carry the waste, using the caddies to the external bin into which they tip the contents. If plastic bins are used care should be taken with weight limits, as food waste has a high bulk-density and the bin could fail. Metal bins may be better for kitchen waste. These bins will need to be labelled carefully and contamination monitored. Putting food waste bins adjacent to residual waste bins could encourage contamination if the residual bins are full. A kitchen caddy sized aperture on the bin could, however, reduce contamination from other materials.

Examples of communications regarding the use of the kitchen and external caddies are provided in a separate section below.

Vehicles

Consideration will need to be given as to whether a separate collection vehicle is used or whether co-collection with other materials is the best option for a municipality. This will depend upon the methodology of the other collections, the rurality level of the authority (sparsity) and the delivery points for food waste and other materials.

Dedicated food waste collection vehicles are invariably optimised efficiently, as they continue collecting until they are full, whereas vehicles that collect other materials need to travel to tip off as soon as the first material fills its allotted section. 7.5 tonne vehicles are often used as the capacity is sufficient for the number of properties that can be collected from in one day. These vehicles usually have standard bin lifting equipment on the back and "slave" bins can be used. External caddy contents can be tipped into these bins and then emptied into the back of the vehicle.

Large standard refuse collection vehicles are generally not efficient for food waste as their capacities are too high, they are expensive to run and require license heavy goods vehicle (HGV) drivers.

Co-collecting with other materials is a feature of many UK collection systems. Often this is via a weekly collection with dry recyclables, such as plastics, cans, paper and card. A common vehicle used is the Romaquip vehicle or the Terberg equivalent.

Alternatively, some standard refuse collection vehicles have pods behind the cabs into which food waste is deposited, with the rest of the vehicle used for residual or garden waste, such as this example below. However, as stated earlier, this is less likely to be fully efficient and may only be useful for more rural collections where a single pass may not be considered efficient.

Frequency of collections

As kitchen waste is putrescible the recommended frequency for its collection is weekly in northern Europe. This frequency also ensures that participation is maintained after the initial scheme implementation. In the past UK authorities have attempted fortnightly collections of food waste, or have attempted to collect one week in a separate vehicle and the other with other recyclables, to fit will their other services, however, this has proved confusing for residents and has not helped to maintain overall kitchen waste quantities.

It has been found that the accompanying restrictions to residual waste collections drives up food waste yields. Some municipalities restrict residual waste through reducing the size of the weekly collected residual bin and some through reducing frequency but keeping the same size of residual bin. It has been found that frequency is the most likely to improve food waste capture. Kitchen waste is not bulky and can fit into gaps in the smaller residual bin, whereas the drive to have the putrescible element of waste removed frequently helps to ensure participation and capture of kitchen waste. It has been found through the Waste and Resources Action Programme's (WRAP) research in the UK that if kitchen waste is accompanied by weekly residual rates of participation drop after the first few months, whereas a frequency of fortnightly of less maintains higher levels of participation.

Enforcement

Some municipalities have clear enforcement procedures for misuse of collection services, others rely on good communications including clear instructions. Some municipalities use a residual bin sticker, such as the example below, which encourages residents to use their food waste collections.

Communications

Communications is key, both prior to the introduction of food waste collections and to maintain participation and capture. This section shows examples of sample communications material.

For example, rolls of caddy liners can be encased in wrapping that communicates key message to residents. The wrapping was designed as a constant reminder of the reasons for separate food waste collections:

The liners themselves were printed with the following:

Food recycling

Yes please

- ✔ All uneaten food and plate scrapings
- ✔ Mouldy and out of date food (including ready meals)
- ✔ Raw and cooked meat and fish, including bones
- ✔ Tea bags and coffee grounds
- ✔ Dairy products, cheese, egg, egg shells and yoghurt
- ✔ Rice, pasta and beans
- ✔ Bread, cakes and pastries
- ✔ Raw and cooked vegetables and fruit, whole and peelings

No thanks

- ✖ Packaging of any kind
- ✖ Liquids such as milk
- ✖ Oil or liquid fat
- ✖ Any material that is not food waste

Please allow hot food to cool before you put it in!

Only use liners supplied by the Council. The last few liners have red lines on them, this will alert the collection crew to leave you another roll.

To avoid danger of suffocation keep this bag away from babies and small children

Calderdale Council

An example of a kitchen waste information leaflet, that was supplied to all households, is shown below:

Frequently asked questions

Q. Why recycle food waste?

A. Recycling your food waste really does make a difference! It's better for the environment and helps the Council to save money to spend on other services.

Q. How is my food waste recycled?

A. Your food waste is turned into something useful when you recycle it. We take your food waste to a local treatment facility where it is turned into fertilisers for agriculture.

Q. How can I waste less food?

A. For tips and recipes to help you waste less food and save money, visit **www.lovefoodhatewaste.com**

LOVE FOOD hate waste

Thank you for recycling. Last year Calderdale households recycled over 5,000 tonnes of their food waste. Let's work together to recycle even more!

For more information contact us
Visit www.recycleforcalderdale.org
Call 0845 245 7000

BioBag

Food recycling

It really does make a difference!

recycle for Calderdale

SUEZ SITA

Calderdale Council

It's easy to recycle your food waste

- We collect your food recycling **every week** with your other recycling.
- We give you free liners to help keep your food recycling caddies clean.
- The last few liners on the roll are printed with a red stripe. This is to let the recycling crew know when you need a new roll.

What food can I recycle in my caddy?

Remember, you can include all food waste: cooked and uncooked, peelings, bones and leftovers.

- ✔ All uneaten food and plate scrapings

- ✔ Cheese
- ✔ Egg & shells
- ✔ Yoghurt

- ✔ Bread
- ✔ Cakes
- ✔ Pastries

- ✔ Raw meat
- ✔ Cooked meat
- ✔ Bones

- ✔ Tea bags
- ✔ Coffee grounds

- ✔ Raw vegetables
- ✔ Cooked vegetables
- ✔ Whole fruit
- ✔ Peelings

- ✔ Fish
- ✔ Cooked fish
- ✔ Bones

- ✔ Rice
- ✔ Pasta
- ✔ Beans

Please allow hot food to cool down

Remember to recycle your mouldy and out of date food, including ready meals removed from their packaging.

Please do not put any of these materials in your caddy

✖ Packaging of any kind ✖ Liquids such as milk ✖ Oil or liquid fat
✖ Any material that is not food waste

Printed on recycled paper

Using your food recycling collection

1. Line your kitchen caddy with one of the **free liners** supplied and put your food waste in it.

2. When the liner is almost full, tie the top and put it in your outdoor food recycling caddy.

3. Your outdoor food recycling caddy can be locked by putting the handle down fully. Please put your food recycling caddy out at the edge of your property, with the rest of your recycling, **by 7.00am on your usual collection day**.

If you don't have a kitchen or outdoor caddy please visit **www.recycleforcalderdale.org** or call **0845 245 7000**

4.3 Actions

Each of the suggested key actions is discussed in the sections below.

1. **End of waste compliance.** It is recommended that a programme to transition existing and future biowaste treatment sites to 'End of waste' compliance is implemented.
2. **Improve biowaste and garden waste capture.** It is recommended that a programme is implemented to increase biowaste capture to a level that is comparable with the best performing systems in Europe, a capture rate of 65%. This will require investment in collection systems and infrastructure, and also communications and behaviour change, to maximise the capture rates achieve for this material. The programme should also seek to increase garden waste capture and encourage householders to deliver their separated garden waste to civic amenity sites.
3. **Biowaste treatment supporter programme.** Whilst there is adequate capacity to treat collected biowaste in Estonia, this largely comprises in-vessel and open windrow composting facilities. There is an opportunity to increase treatment of biowaste via anaerobic digestion, generating renewable energy. It is recommended that a biowaste treatment supporter programme is implemented to provide appropriate biowaste treatment capacity across Estonia and incentivise operators to accept and treat kitchen waste (including investing in appropriate pre-treatment equipment). This programme will need to include both financial and technical support and proactive engagement with operators.

4.3.1 End of waste compliance

The key action here is to develop an accelerator programme to encourage biowaste treatment site operators to achieve End of Waste compliance. The following steps are proposed:

1. Identify compliant and non-compliant biowaste treatment sites and test the assumption that recycling performance could be increased by creating more compliant sites

2. Review the environmental permitting process for biowaste treatment sites to assess whether there are any inherent barriers to achieving End of Waste compliance and address these. Generally, the waste hierarchy principle should be applied as part of the permitting process – giving preference to the facilities, which have recycling capabilities (i.e. EoW requirements are met), also for the municipalities there must be added obligation to maximise recycling through the terms of tenders they organise.

3. Assess the need and potential for incentives to encourage greater End of Waste compliance at biowaste treatment sites. For example, introducing a levy on non-compliant sites or subsiding markets for outputs produced by compliant sites, such as compost.

4. Establish a technical supporter programme for site operators to assist them in developing and implementing appropriate procedures for achieving End of Waste compliance. The Environmental Board could provide this support, perhaps as part of the environmental permitting process, or it could be delivered by a separate, specialist provider.

The table below summarises the key actions, the suggested lead stakeholder and the timeline (short term (less than 6 months), medium term (6 months – 1 year) or long term (1 year plus)).

Table 1: Summary of proposed actions – End of waste compliance

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	**Identify compliant and non-compliant biowaste treatment sites**	Environmental Board	• Service providers	Short term	50	Assumes that a consultancy or research organisation is contracted to prepare a registry of sites and evaluate compliance.
2	**Review the environmental permitting process for biowaste treatment sites**	MoE	• Environmental Board • Service providers	Short term	-	An internal project for MoE and the Environment Agency to undertake. It is recommended that MOE forms a task force to review the process and make specific recommendations for adjusting the permitting process.
3	**Assess the need and potential for incentives to encourage greater End of Waste compliance**	MoE	• Environmental Board • Service providers	Short term	100	See above. This issue should be led by the task force described under action 2 above. However, it would be appropriate to commission a specialist research or consultancy organisation to conduct an independent review of these issues.

4	**Establish a technical supporter programme for site operators**	MoE	• Environmental Board • Service providers	Medium term	200	For a supporter programme to be successful it will need to be appropriate resourced so that extra capacity can be built. One approach is to establish an internal team at the Environment Agency to manage this process and also create a framework contract of specialist contractors who can be called upon to provide technical support to site operators as needed. This approach should ensure that appropriate expertise is available and, through the use of competitive tendering for these services, achieve value for money for the services.

4.3.2 Improve biowaste and garden waste capture

Proposed actions are as follows:

1. Form a 'food waste action forum' with key stakeholders, municipalities, waste service providers, retailers, food supply chain and commercial brands to raise awareness across the value chain and develop a collaborative approach to tackling food waste.

2. Develop and implement an engagement programme to encourage behaviour change amongst householders. This should include: a) a national, high profile behaviour change multi-media campaign; b) standardised, national communication materials that can be tailored locally for use by municipalities and service providers; c) a monitoring and evaluation framework that serves to track progress in terms of capturing greater levels of biowaste. This last component should include a detailed waste composition analysis at the start of the programme to provide baseline information and insight on the nature of food waste (e.g. collect data on edible/non-edible fractions, and combined with consumer behaviour survey to identify key drivers for food waste practices).

3. Develop and implement a technical supporter programme to work with municipalities and their service providers to a) provide biowaste services in areas where there are not currently any services; and b) enhance capture rates.

4. Provide financial support to help municipalities and their service providers purchase the necessary vehicles and containers to increase biowaste collection service provision.

The table below summarises the key actions and describes key stakeholders and likely timescales.

Table 2: Summary of proposed actions – improve biowaste and garden waste capture

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	**Form a 'food waste action forum'**	MoE	• Municipalities • Service providers • Environment Agency • Environmental Board • Retailers • Food producers • Commercial brands • Community groups and citizen representatives	Short term	10	The forum should comprise representatives from all key parts of the food value chain, including food producers, retailers, consumer groups and the waste sector. It is assumed that participants will be self-funding but a small budget will be needed to provide the secretariat function for the forum (e.g. to engage stakeholders, arrange meetings, record and publicise outcomes, etc). The secretariat could be hosted by the Environment Agency or an NGO or research organisation.
2	**Implement a food waste behaviour change programme**	MoE	• Environment Agency • Service providers • Municipalities	Medium term	500	A major food waste prevention and recycling campaign incorporating multi-media communications activities and appropriate monitoring and evaluation requires significant resources. The indicative value provided here indicates the order of magnitude needed to fund a campaign of this scale. It is

						recommended that the action commence with the development of a detailed plan and budget for this element. It will also be important this this campaign is integrated with any wider behaviour change campaign.
3	**Develop technical supporter programme supporter**	Contracted technical specialist commissioned by Environment Agency or MoE	• Municipalities • Service providers	Medium term	500	Significantly ramping up food waste collections will require significant additional technical capacity. A technical supporter programme providing free or subsidised support to municipalities and service providers will serve to accelerate this roll out of services. Such a programme will require careful management by MoE or the Environment Agency with the technical support itself provided by contractors.
4	**Financial support programme**	MoE	• Environment Agency • Service providers	Long term	4,000	The capital investment needed to expand food waste collection has been estimated as part of the Options Analysis study. The indicative value provided here assumes that all of this investment will need to be provided through some form of financial support program. However, the specific mechanisms used to provide this support will require detailed design and could be based on a loan financing scheme whereby the financial investment needed is paid back through waste fees over time.

4.3.3 Biowaste treatment supporter programme

Key suggested actions are:

1. Form a biowaste treatment infrastructure steering group to help design and oversee the programme. This forum will help guide the development of the programme, ensuring that it takes account of views from across the wide range of interested stakeholders affected, and serving to raise awareness and encourage buy-in and participation. In particular, it will be important that, as well as treatment facility operators, the agricultural sector and food supply chain are engaged. The agricultural sector will be a key outlet for outputs from anaerobic digestion of biowaste so it will be important that this sector drives demand for these outputs. It is also a key stakeholder in the anaerobic digestion facilities that currently treatment agriculture slurry, but which could be adapted to treatment biowaste from municipal sources.
2. Develop and implement technical supporter programme for biowaste treatment infrastructure development. Investment alone (see below) is not sufficient. Technical barriers are also a key constraint to developing new infrastructure, particularly for new technologies and new, more variable feedstocks. The provision of free or subsidised technical support for treatment infrastructure operators will be important to aid uptake of technologies. Many operators will not be familiar with the technologies needed to treat municipal sourced biowaste (e.g. equipment needed to remove contaminants).
3. Create and roll out a biowaste treatment investment fund. Finance will be essential to support investment in new treatment infrastructure and, in particular, equipment needed to pre-treat municipal waste to remove contaminants and make it suitable for treatment by anaerobic digestion. The financial support programme should build upon similar programmes that have been applied previously. It will be important that the programme includes proactive outreach to raise awareness and encourage treatment facility operators, particularly those in the agricultural and wastewater treatment sectors, to engage and access the fund.

Table 3: Summary of proposed actions – Biowaste treatment supporter programme

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	**Form a biowaste treatment infrastructure steering group**	MoE	• Municipalities • Service providers • Environment Agency • Environmental Board • Food supply chain representatives • Agriculture sector representatives	Short term	10	Developing new infrastructure for biowaste treatment will require close engagement and partnership with waste services provides and site operators. A formal infrastructure steering group, chaired by the MoE, could provide the basis for this proactive and positive stakeholder engagement. The cost indicated here is to provide for a secretariate (e.g. engaging with stakeholders, organising meetings, communication outcomes, etc).
2	**Develop and implement a technical supporter programme supporter**	Contracted technical specialist commissioned by Environment Agency or MoE	• Municipalities • Service providers	Long term	500	As for collections, significantly increasing biowaste treatment capacity will require significant additional technical capacity.

3	**Financial support programme**	MoE	• Environment Agency • Service providers • Environmental Investment Centre	Long term	10,000	The capital investment needed to biowaste treatment was estimated as part of the Options Analysis study. As with the cost estimate for expanding food waste collections, this cost could be borne directly by central government or provided in the form of a loan scheme whereby the investment is repaid through user fees over time. Some initial grant funding may help demonstrate the feasibility of specific treatment technologies that are likely to be needed (e.g. pre-treatment of municipal biowaste to make it suitable for anaerobic digestion).

5 Packaging

5.1 Recommendations

1. **Minimum technical requirements.** Set up minimum technical requirements and KPIs for separate waste collection and sorting system and establishment of unified collection model through the country.

2. **Combine paper and card collection systems.** Unite the systems for separate collection of paper and cardboard organized by municipalities with systems for separate collection of paper and cardboard packaging organized by PROs.

3. **Extend door-to-door packaging collection.** Improve household packaging waste collection systems and provide conditions for the achievement of higher recycling rates through extended door-to-door collection.

4. **Define responsibilities.** Define clear requirements for division of responsibility between several PROs operating on market. The following options should be considered in declining order:
    a. Enforce requirements for national coverage of separate collection system and compliance with the minimum technical requirements by each PRO – the enforcement is likely to result in merging of activities and concentration of single PRO
    b. Geographical division of national territory between several PROs based on market share and number of residents served
    c. Establishment of clearing house or equivalent structure
    d. Establishment of shared responsibility model where municipalities become responsible for organizing separate collection (depending on institutional arrangements for municipal waste)

5. **Review the documentation and reporting requirements focused on:**
    e. Establish clear documentary evidences based on primary accounting documents for each single operation with waste (collection, sorting, recycling/recovery). Introduce obligatory requirements for PROs to own collected and sorted material (except in case of shared responsibility model with municipalities).
    f. Review and extend the scope of annual reporting requirements for the PROs allowing traceability of physical implementation of separate collection system and quantities of packaging waste collected, separated and recycled/recovered by municipality, source (household and similar), material type and collection channel
    g. Establish requirement for auditing annual reports of PRO and clear definition of audited information

6. **Divide cost structures.** Divide the cost structures for household packaging and group/transport packaging for individual packaging materials in order to improve transparency of the EPR system and reduce cross-subsidies between different collection channels and materials. The different cost structures shall be taken into account in the financial and operational planning documents submitted by PRO for obtaining license and

used for the justification of proposed service tariffs (licensing fees of PROs) and in the annual reports submitted by the PROs.

7. **Licensing requirements.** Review the requirements for the licensing and operation of PROs. The revisions shall establish precise requirements on the scope and content of application for a license, including submission of detailed operating programme and financial projections, communication and public awareness programme. The PRO license duration shall be limited by time and a period of 5 years is considered appropriate for this purpose. Longer period of the license increases uncertainties in the submitted programme for operations and financial projections. The change in the legal requirement, ownership of the PRO and licensing fees shall be considered as conditions requiring permit amendment. The competent authorities should have the right to initiate procedure for permit amendment or withdraw the permit in case that submitted operating programme is not implemented. Equal treatment of clients should be guaranteed and enforced during the entire operation of PRO.

8. **Public awareness.** Increase significantly the public awareness costs to support participation of households in the waste separate collection systems and achievement of higher recycling rates for household packaging waste. The proposed indicative value of minimum public awareness costs to be financed by PROs altogether is 1 EUR per capita per year. The threshold value for minimum public awareness costs could be formulated as percentage of annual revenue of PROs assuming that the cumulative effect will exceed 1.3 million EUR per year. The PROs must be obliged to submit a detailed communication and public awareness programmes as part of application for obtaining license.

9. **Modulated fees.** Introduce modulated fees for obliged companies taking into account the recyclability, the achieved recycled rates of individual packaging types and recycled material content. The modulated fees should be considered as source of revenue for the payment of Estonia's contribution to EU budget for non-recycled plastic packaging.

10. **Establish stakeholder consultation platform.** The proposed changes in the way how EPR system if established and implemented will require extensive and regular consultations between various stakeholders. Involvement of Associations of Estonian cities and municipalities and PROs in consultation process is of particular importance. A structure similar to the Packaging Commission that was previously envisaged in the Packaging Act could serve as such consultation platform.

5.2 Key considerations

The EPR system for packaging waste requires a comprehensive review and some adjustments to ensure optimal functioning. There is a disconnect between the current bring system for separate collection of paper and cardboard, plastic, glass and metal packaging and the door-to-door collection of residual waste and other separately collected fractions organized by municipalities. The number of installed bring sites for separate collection is insufficient or not serviced frequently enough, resulting in illegal dumping at times. The materials are often not separated properly, and in some municipalities the number of sites is below the minimum requirements defined in the legislation. There are

increasingly small-scale efforts for localized containers at multi-story buildings and use of bags which have been effective and indicate that the system seems to be moving closer to households.

Considering that the present separate collection system for household packaging waste based on public container bring sites do not guarantee the achievement of long-term recycling targets, the extending of door-to-door waste separate collection system must be considered.

The present revenues of PROs licensed to operate on the market are considerably below the projected revenues based on national data about packaging placed on market and same unit tariffs. The present material structure of packaging placed on the market reported by PRO differ considerably from Environmental Agency data. Additionally, the review of the annual financial statements of PROs shows total annual revenues below potential revenue estimates if officially declared tariffs are applied for the same quantities of contracted materials. Such finding opens questions whether discounts from the present tariffs are provided by the PROs to obliged companies and whether equal treatment of all clients as required by law is guaranteed.

The conducted option analysis shows that present tariffs of PROs are sufficient to implement more advanced separate collection and sorting system. The estimated revenues from licensing fees are supposed to exceed 25 million EUR and expected to grow with the increase of licensed packaging amounts of PRO. The optimization of separate collection and sorting costs supposes grouping of municipalities from several counties into common service zone. The preliminary assessment is that five service zones will be appropriate: Tallin, Tartu, Jõhvi, Paide and Pärnu.

The present tariffs of the PROs allow them to generate significantly higher revenues that significantly exceed the estimated costs of presently implemented separate collection and sorting system. In addition to the lower revenues of the PROs, the possible reasons could be that either operations are not organized efficiently, and considerably higher costs occur for the system or PROs' operations are profit oriented and such profit is distributed through payments to service providers.

To optimize the EPR system, operational arrangements are critical to detail further including: (i) the responsibility of municipalities to organize the waste management services in their territories, including separate collection, (ii) the responsibility of PROs to cover the full implementation costs for separate collection and sorting of packaging waste, the costs for public awareness and if necessary the administrative cost, (iii) the contracts between PROs and local authorities, and (iv) the ownership of PROs and independence from waste management companies. Some concrete recommendations to consider include:

- **A review of minimum technical requirements towards separate collection and sorting** should be reconsidered, based on the variability of housing, geography, containerization, and existing residual waste collection systems in localities (this aligns with a previous recommendation around right-sizing operations for municipal waste collection in general).
- **Further clarify and standardize responsibilities of PROs and local authorities and between PROs** in order to support a more efficient system. Currently agreements and performance standards vary and are between PROs and individual municipalities. Some standardization could improve collection of all types of waste as well as securing financing for both capital and

operational expenditures. More clear requirements for distribution of responsibilities between PROs operating on the market could also support an efficient system.

- **Improve transparency and standardization in data reporting and verification.** Evidence should be documented at all stages, including collection and sorting, rather than being limited to evidence for export and recycling of packaging waste. While quantitative information is provided, there is limited information on organization of separate collection and sorting, implementation, and how targets were achieved. Quantities of separately collected waste from different collection channels should be reported separately to help with clarity in material flow and calculating targets. Some packaging waste is counted under recycling but is actually sent to landfills or incinerators. Also, the scale of free riding by PROs is unclear and could be resulting from multiple sources including underreporting by large companies, lack of declaration by small companies, or reporting challenges for packaging and electronic due to e-commerce and cross-boundary purchase.
- **Improve existing requirements for the licensing and operations of PROs, their independence from waste companies, and their ownership to ensure transparency, effective monitoring, and competition.** The role of PROs is crucial for the establishment of an efficient system for packaging waste management and for a separate collection and recycling system for household waste. An optimal balance between competition and economies of scale should be analysed, and their licensing and operations should consider timebound, performance-based conditions.
- **The calculations of collection costs is appropriate to be performed and reported separately for the different collection alternatives and collection channels**. Such an approach will improve considerably the transparency of the system and will support to reduce the recent cross-material subsidies.

Information management systems for waste related data should be aligned, transparent and offer reliable verified information at a more granular geographic and administrative level. Both municipal level and national level data about household and similar/other waste generated contain significant inconsistencies that result significant overestimate of recyclable waste fraction and packaging waste in particular. The current system for documentation, data reporting, and data processing provides aggregated data at the national level and meets the EU reporting requirements. However, there is no unified data management system at the local level and little information is available at the local level that could support improved planning. There should be standard performance indicators for stakeholders at all levels to allow for improved benchmarking, planning, and reporting. The information management system should be aligned with new legal requirements adopted at the EU level and with roles and responsibilities of stakeholders, especially municipalities, PROs, and service providers. The documentation and reporting requirements and the related procedures for verification of data need to be reviewed and amended accordingly.

A significant improvement in expenditure and coordination of public awareness campaigns is crucial to improving recycling rates. The support and active involvement of citizens is necessary to achieve higher recycling rates for both improved source separation of materials and also to support any new production and consumption models. Communication measures have to be carefully planned, financially secured and well-coordinated. The requirement for allocation of 1% of PROs' annual

revenue has not resulted in increased separation rates over recent years and the resources needed for public awareness need to be increased considerably.

Coordination structures, such as the Packaging Commission, should be activated and capacitated to play the envisioned role of improved coordination and consultation in the recyclable waste chain. Coordination between local government, between local and national government, between local governments and PRO's and between different PRO's need to improve in general. Greater clarity on responsibility for targets (as recommended above), supported by greater transparency and coordination in reporting are foundational steps towards a better functioning recycling system.

5.3 Actions

The proposed actions to implement above recommendations are presented in the following table.

Table 4: Summary of proposed actions – Extended producer responsibility system for packaging waste

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)[2]	Comments
1	**Establish stakeholder consultation platform based on Packaging Commission**	MoE	• Associations of Estonian cities and municipalities • PROs • Environmental Agency • Environmental Board	2021	20 (annually)	The Packaging Commission will be established through administrative order of the Minister of MoE. Rules for operation of Packaging Council shall be developed in addition defining how the meetings will be scheduled, what subjects will be considered in the Packaging Commission, how the meetings will be organized and held and the procedures for decision making
2	**Develop and agree minimum technical requirements towards separate waste collection and sorting systems**	MoE	• Associations of Estonian cities and municipalities • PROs	First half 2022		The minimum technical requirements will be first developed and agreed with stakeholders, prior initiating the necessary legal changes to formally establish the requirements.

[2] If no costs are indicated for the respective measure, it is assumed that implementation will be organized within the administrative budget of the responsible institutions/organizations

3	**Define the EPR implementation modalities for the intermediate period until new legal requirements enter in force**	MoE	• Associations of Estonian cities and municipalities • PROs	First half 2022		Considering that the required amendments to implement the recommendations will take time and will not enter in force before first half of 2023, achieving agreement on improved operation of EPR system in this transitional period is necessary. The implementation of such measures can be based on enforcing present legal requirements, decision of the Packaging Commission and/or signing of memorandum/voluntary agreement between the MoE, PROs and associations of Estonian cities and municipalities. The measures shall focus on extending door-to-door separate waste collection, improving separate waste collection through public bring sites, extending communication and public awareness activities, extending and improving quality of annual reports submitted by PROs
4	**Amend the requirements for sorting municipal waste and bases for classification of sorted waste**	MoE	• Associations of Estonian cities and municipalities • PROs	Second half 2022		The amendment will be focused on formalizing the new minimum technical requirements for separate waste collection and sorting

5	**Adopt measures to improve compliance with EPR requirements of goods sold via internet-based platforms**	MoE	• PROs • MF • Environmental Board	2022		Improve control over internet sales, and courier services to ensure that all packaging placed on the market in Estonia is properly declared
6	**Decide on the optimal model for division of responsibility between several PROs operating on market**	MoE	• Associations of Estonian cities and municipalities • PROs	First half 2022		The decision shall be taken following consultations with local authorities and considering the opinion of PROs. The decisions will serve as a basis for preparing the necessary legal amendments
7	**Amend of Packaging Act**	MoE	• MoE • Environmental Board	Second half 2022	30 (if external consultant advise is required)	The amendments of the Packaging Act shall include (i) new requirements and procedures for issuing, amendment and withdrawal of PRO licence; (ii) new documentation and reporting requirements for the PROs, obliged companies, service providers and local authorities, (iii) auditing of annual reports of PROs (iv) requirements for division of responsibilities between several PROs and the related administrative procedures, (v) revised responsibilities of local authorities, (vi) new technical requirements towards separate collection and sorting systems, and (vii) other revisions necessary to ensure proper functioning of the EPR system

8	**Amendment of Packaging Excise Duty Act**	MoE	• MF	Second half 2022		The amendments in the structure and size of the excise of the different packaging materials focused to support implementation of modulated fees and generating revenues required for Estonia's contribution to EU budget for non-recycled plastic packaging
9	**Establish the necessary administrative procedures for auditing, review and verification of annual reports of PROs**	Environmental Agency	• MoE • Environmental Board	2022	100 (additional costs for auditing and data processing)	
10	**Issuing new licenses for the operation of PROs**	MoE	• Environmental Agency • Environmental Board	2023		Following the legal amendments all existing PROs will be obliged to submit new applications for licensing. The new applications for licensing are supposed to include detailed operating plan, cost estimates and financial projections. Detailed communication and public awareness programmes will also be included in the application requirements
11	**Develop standard contract templates**	MoE	• Associations of Estonian cities and municipalities		15	The standard contract template shall define the responsibilities of municipalities and PROs in establishing separate collection and sorting system

	and guidance to local authorities		• PROs		(external consultant support)	
12	**Implement household waste separate collection system that guarantees long-term achievement of preparing for reuse and recycling targets**	PROs	• Municipalities • Service providers • MoE • Environmental Board	2022 - 2025	15,000 - 30,000	Estimated investment costs for establishment of new separate waste collection and sorting infrastructure. The exact amount of investment will depend on the established minimum technical requirements
13	**Analysis of required additional treatment and recycling capacities**	PROs	• MoE • Recycling companies	2023-2025	100 (for preparing the analysis)	Establishment of additional treatment and recycling capacities will improve self-sufficiency of Estonia to achieve recycling and recovery targets. Such capacities could be justified for recycling of plastics and for treatment of glass packaging. The value of required investments in additional recycling capacities is expected to exceed 50 million EUR. The feasibility of such investment will depend on the market conditions in Baltic region

6 Other wastes

6.1 Recommendations

1. **Waste prevention.** Waste prevention should form a key element of any national strategy. It sits above recycling and recovery in the waste hierarchy. It is recommended that a national waste prevention plan is developed and implemented.

2. **Plastics.** Enhance the collection and recycling of plastic waste
    a. Assess the feasibility of developing regional plastics sorting infrastructure (e.g. as part of regional MRFs) to add value to plastic wastes whilst at the same time making the most of economies of scale offered by intermunicipal cooperation.
    b. Make plastics form a key focus of nationally coordinated communication activities on waste reduction and recycling, and that this effort is managed in close coordination with the PROs (who have responsibility for delivering communication activities for packaging materials).
    c. Establish a working group, or other forum, with the private sector and PROs to provide a platform for identifying and implementing long term solutions to managing difficult to recycle plastics.
    d. Consider the use of eco-modulation as part of any EPR reform (see above). This will need to be done in close discussion with key stakeholders, including producers, PROs, waste management companies and municipalities.
    e. Adopt clear standards on bio-based plastics and biodegradable plastics to ensure that these materials are managed effectively.

3. **Construction and demolition wastes.** C&D wastes, in the form of soils and rubble, form a significant element of municipal waste and, in particular of CA site waste (approximately 10% of total quantity received). However, there is limited information on the nature, quantities and management routes used for this material. It is recommended that a detailed assessment of household C&D waste issues (e.g. quantities, nature, etc) is conducted and that a programme is developed to address this unique municipal waste stream is developed, if appropriate. Also, consider setting of the reuse and recycling targets for C&D waste.

4. **Textiles.** Capture and recycling rates for textiles in municipal waste appear to be relatively low. Whilst there is an established textiles collection and recycling system in Estonia there is an opportunity to further increase recovery of these materials. In addition, there is likely to be scope to focus on recovery of non-clothing textile materials and items such as mattresses and carpets. It is recommended that an action plan for increasing the diversion of textiles waste from mixed municipal waste stream is developed, including:
    a. Ensuring that textiles is a key focus of any national communication and behaviour change campaign.
    b. Assess the management of non-clothing textiles in greater detail and consideration is given to implementing measures to encourage their recovery (e.g. an innovation fund to support development of systems and technologies for recovering value from these items).

6.2 Key considerations

6.2.1 Waste prevention

Experience suggests that there is a number of key fractions of the waste stream that can be targeted as a priority for prevention activities. Key examples include:

- Single use items and packaging materials such as disposable coffee cups, disposable crockery and cutlery, and disposable food containers
- Disposable nappies/diapers.
- Food waste.
- Construction and demolition waste

There are also a number of other single use items that are receiving increased attention in the context of waste prevention, such as disposal sanitary items, with an increase in the up-take of reusable menstrual products for example.

All of these different fractions require different types of action to drive their reduction, either through changing behaviours aimed at reducing overall consumption or encouraging the use of alternatives (e.g. replacing disposable plastic bags with reusable bags).

6.2.2 Plastics

Overall, it is possible to consider approaches to tackle waste plastics as of the following three actions:

1. Eliminate the plastics that are not needed (e.g. banning single use items)
2. Apply reuse models to reduce the need for single use plastic packaging and other single use plastic products
3. Maximise the recovery of plastics by ensuring that all plastics are 100% recyclable, including compostable, and implementing solutions that ensure that these materials are collected via the municipal waste management system.

Eliminating plastics is a key focus of the EU Single Use Plastics Directive, which is being implemented in Estonia. Efforts are also underway in a range of countries to avoid other single use plastic items and packaging. Changing the way that products are delivered is one key approach for tackling other plastics items. For example, selling cosmetics and hygiene products, such as shampoo, in solid form thus removing the need for packaging (e.g. Lush handmade cosmetics[3]).

Reuse models are becoming increasingly prevalent, particular for food service materials and items. Reusable coffee cups are commonplace across Europe. Other food services are also exploring the potential to implement reusable containers (for example, the use of returnable takeaway containers). Reuse models can be considered in terms of four main modes[4]:

[3] www.Lush.com

[4] Ellen MacArthur Foundation, New Plastics Economy.

1. Refill at home – consumers refill their container at home (e.g. Sodastream provides gas refill bottle services).
2. Refill on the go – consumers visit a store to refill their container (e.g. The Milk Station provides refill stations in the UK for consumers to refill their own containers with milk)
3. Return from home – empty packaging is picked up from home and replaced with a full item (e.g. Danone water jugs deliver full water dispensers and collect empty ones).
4. Return on the go – consumer returns empty packaging at a drop off point (e.g. the Freiberg Cup coffee cup refill scheme in Freiberg, Germany).

A holistic approach needs to be taken in terms of developing alternatives to plastic materials. This is to ensure that other, perhaps greater, impacts are not created by changing the way that plastics are managed or substituting plastics with other materials. For example, replacing plastics with heavier packaging materials may reduce some impacts but also has the potential to increase other impacts in the product lifecycle (e.g. carbon emissions resulting from transporting heavier packaging materials such as glass). It is important to take a lifecycle thinking approach to alternatives so as to ensure that unintended consequences are avoided.

The use of compostable plastics also needs to be considered carefully. Compostable plastics typically require very specific conditions to be degraded into benign products. If treatment facilities that provide these conditions, such as industrial composting facilities, are not available then compostable plastic materials are likely to either become part of the mixed residual waste stream or to contaminate conventional plastics recycling streams.

6.2.3 Textiles

While the collection and reuse and recovery of textiles materials is well-established in Estonia, analysis suggests that there are still significant quantities of these materials in the municipal waste stream that can be diverted from disposal.

Changing consumer behaviours and encouraging those who currently dispose of textile items in the mixed residual waste stream is a central element of any effort to increase textiles recycling. Identifying these groups will be essential to developing targeted behaviour change activities as a key part of wider communications and behaviour change action.

Wider engagement with the supply chain will also be important to encourage more circular management of clothing textiles. Clothing brands, retailers, reuse organisations and recyclers all have a role to play in encouraging greater reuse and recovery of clothing textiles. Establishing a textiles-specific forum in Estonia may well be the best way to explore and address issues specific to Estonia (e.g. the need to increase domestic textiles recycling capacity) but there may also be an opportunity to engage with the recently established Europe-wide European Clothing Action Plan[5].

Secondly, increasing the diversion of non-clothing textiles represents a significant opportunity for tackling difficult wastes. This would reduce the prevalence of items such as mattress in the mixed

[5] https://ec.europa.eu/environment/europeangreencapital/clothing-waste-initiative/

waste stream, which are very difficult for energy from waste and landfill disposal to handle, and will also increase textiles recycling levels. A number of organisations have demonstrated that these materials can be collected and recycled (e.g. Matt UK[6]).

6.3 Action plan

6.3.1 Waste prevention

As the key action at the top of the waste hierarchy, waste prevention should form a fundamental pillar of any national waste strategy. Developing a waste prevention strategy requires an evidence-based assessment of the potential for prevention and an understanding of the potential ways to encourage it.

Development of a waste prevention strategy will require the following key steps:

1. Collation of relevant evidence to understand the scope for prevention activities. This will require analysis of waste quantities and composition data to identify key waste fractions that have greatest potential to be prevented.

2. Options analysis to identify key policy options and other actions for promoting behaviour change (e.g. banning specific single use items (beyond those identified by EU legislation) or supporting reuse models, etc).

3. Developing and consulting on a waste prevention plan.

It is recommended that MoE commission the components above from a research or consultancy organisation.

Engaging key stakeholders throughout the process will also be important. Key stakeholders include consumer groups, business, research bodies, waste management service provider and municipalities.

[6] http://www.matt-uk.co.uk/

Table 5: Summary of proposed actions – waste prevention

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	**Collation of relevant evidence**	MoE	• Research organisations • Municipalities • Waste service providers	Short	250	Waste prevention is arguably the most important component of a waste management strategy. A programme to collate the evidence, assess options, develop a plan in partnership with stakeholders requires appropriate support and resources. This indicative estimate allows for a focused study be developed on this issue.
2	**Options analysis**	MoE	• Research organisations	Medium	Included as part of action 1	Included above
3	**Developing and consulting on a waste prevention plan**	MoE	• Municipalities • Service providers • Environment Agency • Environmental Board	Medium	Included as part of action 1	Included above

			• Community representatives			
4	**Stakeholder engagement**	MoE	• Recyclers • Municipalities • Environment Agency • Waste management service providers • NGOs	On-going	Included as part of action 1	Included above

6.3.2 Plastics

The following key actions are recommended:

1. Assess the feasibility of developing regional plastics sorting infrastructure (e.g. as part of regional MRFs) to add value to plastic wastes whilst at the same time making the most of economies of scale offered by intermunicipal cooperation.

2. Make plastics a key focus of nationally coordinated communication activities on waste reduction and recycling, and that this effort is managed in close coordination with the PROs (who have responsibility for delivering communication activities for packaging materials).

3. Establish a working group, or other forum, with the private sector and PROs to provide a platform for identifying and implementing long term solutions to managing difficult to recycle plastics.

4. Consider the use of eco-modulation as part of any EPR reform. This will need to be done in close discussion with key stakeholders, including producers, PROs, waste management companies and municipalities.

5. Engage with EU activities seeking to clarify standards for bio-based plastics and biodegradable plastics and adopt these once agreed at EU level. In the short-term, raise awareness of the issues associated with bio-based and biodegradable plastics so that appropriate infrastructure can be developed.

Table 6: Summary of proposed actions - plastics

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1.	Assess the feasibility of developing regional plastics sorting infrastructure	MoE	• Research organisations • Waste management service providers • Recyclers • Environment Agency	Medium	50	This allows for a specialist study to assess this issue in detail.
2	Make plastics a key focus of nationally coordinated communication activities	MoE	• Environment Agency	Short	100	A national communications campaign on this issue will require substantial resources. Clearly, it will be important that this is integrated into any general national campaign (including food waste). See **Tõrge! Ei leia viiteallikat.** below for examples.
3	Establish a working group on plastics	MoE	• Plastics supply chain • PROs • Waste service providers • Recyclers • Retailers	Medium	10	Proactive engagement with key stakeholders on plastics issues will require the support and coordination of a secretariat body.

4	Consider the feasibility of eco-modulation	MoE	• Researchers • PROs	Medium	Included under packaging-related actions (see section 5).	Included under packaging-related actions (see section 5).

Figure 6: Examples of communications campaigns targeting food contamination of plastic items

Source: www.norfolkrecycles.com

Source: WRAP, UK

Source: https://www.rte.ie/create/2018/0504/960284-irelands-household-recycling-list/

6.3.3 Construction and demolition wastes

A much better understanding of the nature and scale of municipal construction and demolition waste is required in order to develop a detailed implementation plan on this issue. There is currently little information on the nature of these materials and their current management route (e.g. via the municipal mixed waste collection system or illegal dumping). Analysis of available data indicates that approximately 3 million tonnes of construction and demolition waste is generated overall[7]. The first step therefore is to undertake or commission a study that collects this baseline information.

The study should include collection of waste composition data to provide information on the nature of municipal C&D waste and also behavioural survey data to understand the way in which generators of C&D currently manage this material. An assessment of current capacities for handling different

[7] Source: https://jats.keskkonnainfo.ee/failid/2019_1_ewc.pdf

types of C&D waste will also be needed (e.g. inert materials/rubble, wood and hazardous materials such as paint).

Table 7: Summary of proposed actions – construction and demolition waste

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	Detailed assessment of household C&D waste issues	MoE	Research organisations	Short	50	An allowance for commissioning a detailed assessment of municipal C&D waste.

6.3.4 Textiles

Several areas of action are likely to be needed to increase the diversion of textiles materials from energy from waste and landfill disposal:

1. Engagement with stakeholders across the textile value chain to explore and identified Estonia-specific solutions. The formation of a textiles action group for discussing these issues is one option for providing a forum for these discussions. The potential to engage with the recently established European Clothing Action Plan should also be considered.

2. Collection of baseline information to provide more granular information on the nature of textiles waste and current behaviours of waste generators. This will provide an understanding of current practices and the scale and nature of textiles materials that currently form a key component of mixed residual municipal waste. This data collection step should include consideration of non-clothing textiles such as mattress and carpets.

3. Assessment of existing reuse and recycling capacity and exploration of options for increasing domestic capacity. Estonia currently has relatively limited domestic recycling capacity for textiles waste. This baseline understanding of capacity can then be used as a basis for exploring options for increasing domestic capacity (e.g. by incentivising textiles recyclers to invest in creating capacity in Estonia).

4. Assessment and piloting of collection and treatment systems for recovering non-clothing textiles waste such as carpets and mattresses. There are examples of collection and treatment systems for managing these wastes in other parts of Europe. These approaches could be piloted in Estonia to test and demonstrate the feasibility.

Table 8: Summary of proposed actions - textiles

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	Engagement with stakeholders across the textile value chain	MoE	• Clothing brands • Retailers • Waste service providers • Recyclers • Municipalities • Environment Agency • Consumer groups	Short	10	Proactive engagement with stakeholders in the textiles sector will require support and coordination from a secretariat or similar body hosted at the MoE or Environment Agency.
2	Collection of baseline information	MoE	• Research and consultancy organisations	Medium	50	A detailed baseline study and assessment of options.
3	Assessment of existing reuse and recycling capacity	Environment Agency	• Research and consultancy organisations • Waste service providers • Recyclers	Medium	Included under action 2.	Comparison of existing textiles capacity with treatment potential.

4	Assessment and piloting of collection and treatment systems for recovering non-clothing textiles	MoE	• Research and consultancy organisations • Waste service providers • Recyclers • Municipalities	Long	100	An allowance for some form of grant-funded demonstrator programme to assess and test the feasibility of new technologies and approaches for collecting and recovering municipal non-clothing textile wastes.

6.3.5 Waste electrical and electronic equipment

Analysis of available data indicates that there is scope to increase WEEE recycling. This would not have a significant effect on overall recycling performance compared to other waste streams considered as part of the analysis, so has not been assessed in detail. However, consideration should be given to establishing minimum technical requirements for the collection of WEEE from households. There may also be scope for reviewing existing arrangements for division of responsibilities between PROs for WEEE collections.

Table 9: Summary of proposed actions – WEEE

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost (thousands EUR)	Comments
1	Review and up-date technical standards and consider supporting measures and institutional arrangements.	MoE	PROs, municipalities	Short	50	An allowance for commissioning a review of technical standards and development of up-dated standards and supporting measures.
2	Agreement on division of responsibilities between PROs	MoE	PROs	Short	-	Such division can be based on setting up "clearing house" or cost sharing between PROs proportional to their market share.
3	Review and amend reporting requirements for PROs	MoE	PROs	Short	-	The new requirements about scope and content of annual reports

						submitted by PROs

7 Institutional, organisational and financing arrangements

7.1 Recommendations

1. **Municipal targets.** Place responsibility for meeting preparing for reuse and recycling targets for household and similar waste on municipalities.

2. **Municipal levies.** Allow municipalities to levy fees or taxes from waste generators. The municipalities will have the right whether to keep the present model where waste management fees are charged directly by service provider to household and legal entities, or to establish municipal waste fee/tax and channel all payments to service providers through municipal budget. A combination of fixed municipal charge covering services organized by local authorities and service fee charged by the operators is also possible alternative. Such provision was existing in Estonian legislation till 2015 and is supposed to provide greater flexibility of municipalities how to organize waste management services in their territories, will increase the opportunities for inter-municipal cooperation and not at the last place will provide conditions for more fair allocation of costs between different waste streams and activities.

3. **Intermunicipal cooperation.** Establish requirements and mechanisms to support intermunicipal cooperation that allow several municipalities to organize common waste management services and/or facilities.

4. **Project finance.** Align project financing requirements to support inter-municipal cooperation.

5. **Limitations.** Remove limitation of maximum number of residents when contracting waste management services.

6. **Pay as you throw tariffs.** Allow and support municipalities to establish PAYT weight-based tariffs (in mid-term).

7.2 Key considerations

Assigning the responsibility for achieving re-use and recycling targets of household and similar waste to a specific addressee at the national level could improve accountability. Having targets defined only at the national level, while waste operations are assigned as an explicit local government function poses a risk for the achievement of long-term targets. While local governments sometimes include recycling targets in local waste management plans, they lack control over the achievement with current operational arrangements, and their role regarding the achievement of targets needs to be clarified. The designation of responsibility should be aligned with the authority to implement, the ability to report data and financial incentives to achieve higher recycling rates.

Municipalities responsibilities should be aligned with their implementation authority and rights. Performance and financial incentives could be better aligned so incentivize municipalities to implement according to their rights. The Amendments in the Waste Act have prohibited collection of municipal fees and taxes which limits flexibility of local authorities to implement the waste

management system. Additionally, municipalities are required to tender out waste management services and do not have the option for in-house service provision. However, municipalities still have waste management costs related to the establishment of public amenity sites, collection of street waste, and organizing collection of specific waste streams. Municipalities have the right to determine the treatment facility for waste management companies to deliver the collected waste to but often this is not carried out in practice or monitored.

Contracting constraints and lack of incentives prevent cooperation for greater efficiency in municipal waste management. While intermunicipal cooperation is allowed and is being practice in some cases, the contracting restrictions are compounded by a lack of incentives and guidance to pursue this approach. Removing present barriers for contracting across municipalities without population restrictions and incentivizing development of public waste treatment infrastructure could support economies of scale.

Revising the maximum number of residents (30,000) per waste collection area as well as the minimum collection frequencies could improve efficiency and convenience of the service to citizens. While this could support a competitive market and provide access to small and medium sized companies, right sizing operations based on local conditions could also unlock the potential to take advantage of economies of scales when services are organized for larger areas and stimulate intermunicipal cooperation. The required minimum collection frequencies for residual waste of once per four weeks in urban areas and once per twelve weeks in rural areas, settlements, are considered below norms from a hygienic and sanitary perspective.

The waste fee structure (from household fees to gate and landfill fees) needs to support recycling ambitions. While it would be expected that there would be increased separation of waste as final disposal costs increase, the recycling rate has been relatively unchanged over recent years. Increased gate fees for landfills and incineration over recent years do not seem to be positively affecting recycling and source separation. Issues around free-riding households seem to manifest in observed actions such as illegal dumping, burning, and depositing of residual waste in PRO containers. Whether this relates to households purchasing incorrectly sized containers, fee avoidance or inadequate collection frequencies has to be investigated.

There is a need to understand the actual cost as well as the flow of fees and revenues across the waste management system as a whole and per locality. There does not seem to currently be a holistic understanding of the full cost to operate the waste management system, and it is not clear that full cost recovery is taking place, as is prescribed in law. A holistic view could support financial and evidence-based planning and benchmarking for local authorities, PROs, and service providers. It could result in reconsidering how financing and cost recovery should occur with any updated institutional arrangements or responsibilities and the expanded system. For example, prohibiting municipalities from directly collecting fees limits flexibility on how the system is organized broadly, and on how they fund recurring costs. It also impacts potential intermunicipal cooperation, and interest in developing additional waste treatment and disposal capacity. The current approach limits the interest of both the public and private sectors to apply for the available financing through the EU funding 2014 – 2020. However, **costs for the overall system will increase with the expansion of biowaste management and recycling to achieve the EU targets and will require increased operational financing.**

Priority areas for coordinated and sequenced investment to stimulate recycling should be identified and agreed for implementation within the financing envelopes of the Environmental Investment Centre. Future EU funding (2021 – 2027) in the sector is expected to be allocated to activities and equipment likely to deliver the results that are urgently needed such as, more dry recyclables captured through collection systems and lower subsequent loss rates, as well as better management of biowaste. An alignment of priority investment areas between the new NWMP and these funding options are likely to yield significant efficiencies and accelerate investment. This effort needs to go beyond a laundry list of projects and might require a consideration and analysis of the sector's experience from the previous EU funded projects.

In the longer term there many be some scope to introduce some form of incineration tax to promote the diversion of waste from incineration. However, at this stage we would suggest that other priorities exist and that, if a disincentive is required, an adjustment can be to the renewable energy rebate offer for energy from waste. This is an issue that needs to be considered carefully in the context of wider energy policy.

7.3 Action plan

The key actions related to above institutional, organizational and financial arrangements are presented in the following table.

Table 10: Summary of proposed actions – Institutional, Organizational and Financial Arrangements

No.	Action	Lead stakeholder	Other key stakeholders	Timeline	Indicative cost ('000 EUR)	Comments
1	**Initiate consultations with local authorities on selection of optimal model for the financing and contracting of waste management services**	MoE	• Associations of Estonian cities and municipalities • Service providers	First half 2023	75	Providing municipalities with possibility for establishment of local tax or fee for waste management services or applying combined charging system with fixed municipal charge covering services organized by local authorities and service fee charged by the operators. PAYT charging models shall be considered
2	**Amend Local Taxes Act to provide municipalities with legal power to set up local waste management fees and taxes**	MoE	• Associations of Estonian cities and municipalities	2023	25 (for external expert support, if required)	Depending on the selected model for financing waste management services
3	**Analysis and agreement of optimal intermunicipal cooperation models.**	MoE	• Associations of Estonian cities and municipalities	2022	100	The analysis shall consider possible organizational forms of intermunicipal cooperation. Particular attention shall be given on common procurement of services, establishment and operation of common/regional recovery and disposal

						facilities; establishment of common service tariffs at regional level
4	**Adopt new National Waste Management Plan**	MoE	• Associations of Estonian cities and municipalities • Waste management service providers • Industrial associations • NGOs	2022-2023	100	The new NWMP is expected to provide the view for the future organizational models for the management of municipal waste and the role of intermunicipal cooperation. The plan is also supposed to define the need for additional recovery and disposal capacities
5	**Amend Waste Act and introduce preparing for re-use and recycling targets at municipal level and the related responsibilities and implementation requirements; intermunicipal cooperation models; new arrangements for the financing and contracting of waste management services;**	MoE	• Associations of Estonian cities and municipalities • Waste Management Service Providers • NGOs	2023	25 (for external expert support, if required)	More than one amendment to WA is possible

	documentation and reporting requirements					
6	**Develop guidelines on inter-municipal cooperation in waste management sector**	MoE	• Associations of Estonian cities and municipalities	2023	100	The guidelines are expected to identify appropriate legal forms to implement inter-municipal cooperation models and to provide the necessary procedures for decision making, organizational requirements and implementation procedures
7	**Develop guidelines and templates for contracting waste management services by local authorities**	MoE	• Associations of Estonian cities and municipalities	2022	100	The guidelines shall cover all waste management services within the responsibility of local authorities. Particular attention will be given to separation of waste collection from waste treatment and disposal operations and establishing performance measurement criteria
8	**Develop local and regional waste management plans**	Municipalities		2023 - 2024	1,500	Following the adoption of new NWMP Several municipalities will be allowed to establish common waste management plan. WM planning at county level could be also considered

9	**Establish appropriate financial provisions for the financing of regional waste recovery and disposal capacities**	MoE	• Environmental Investment Centre		The amount of project financing to be defined in NWMP	The measure shall consider how the financing of required treatment and disposal capacities identified in NWMP will be provided. Priority shall be given to facilities operating at regional level
10	**Prepare and implement capacity development and training programme for local authorities**	MoE	• Associations of Estonian cities and municipalities • Municipalities	2023 - 2025	3,000 (including 30 for developing the programme)	The programme will be developed following need assessment and cover the main aspects related to planning and budgeting waste management services; procurement, contracting and contract management; etc.