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Guidelines for the Municipal Management of Biowaste in the Baltic States

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Table of Contents

1. Executive Summary

These guidelines represent the final outcome of the project “Development of Guidelines for the Municipal Management of Biowaste in the Baltic States.” The project was funded by the German Federal Ministry for the Environment, Climate Action, Nature Conservation and Nuclear Safety (BMUKN) as part of the Export Initiative Environmental Protection (Exportinitiative Umweltschutz).

The project activities generated consolidated insights through extensive exchanges among stakeholders involved in municipal biowaste management in Germany and the Baltic States. The process began with a situation analysis (see next chapter) and a field visit that brought together stakeholders from all three Baltic States at Latvia’s main waste management centre, followed by an online webinar involving participants from Estonia, Latvia, and Lithuania as well as German experts. Subsequently, stakeholders from the Baltic States deepened their understanding of biowaste management during a study tour in Germany. The information gathered throughout these activities was further structured during an in-person workshop in Latvia, attended by Baltic and German stakeholders as well as the project’s consulting team. The knowledge collected to support improvements in the Baltic States has now been consolidated into the guidelines presented here.

They provide a comprehensive framework to assist municipalities in the Baltic States in developing and enhancing sustainable biowaste management systems. They outline the purpose and scope of coherent biowaste policies, take into account the current situation and challenges in the Baltic States, and establish common definitions to ensure consistency in planning and implementation.

Key policy principles are defined for the prevention, separate collection, and environmentally sound treatment of biowaste, clearly outlining the responsibilities of national authorities, municipalities, waste operators, and citizens. Strong emphasis is placed on preventing and reducing biowaste at the source, followed by effective source separation and collection systems tailored to local conditions.

Various treatment options are examined, including composting, anaerobic digestion, home composting, and community composting, along with criteria for selecting suitable technologies. Technical design standards are provided for collection infrastructure, transfer and storage facilities, and treatment plants to ensure operational efficiency, environmental protection, and public health. In addition, the document addresses quality assurance for compost and digestate, promoting their safe and beneficial use.

Furthermore, legal and regulatory frameworks, financing mechanisms, and cost-recovery models required for long-term system viability are discussed. Communication, capacity building, social inclusion, and equity are highlighted as essential elements for fostering public participation and acceptance. Finally, the guidelines integrate climate change mitigation and adaptation considerations, define monitoring and reporting mechanisms, and present an example implementation roadmap. Practical annexes offer templates, tools, and checklists to support municipalities throughout the planning and implementation process.

It should also be noted that waste management is a continually evolving field. Therefore, these guidelines should be reviewed every 3–5 years, or as needed, to reflect new regulations, technologies, and emerging best practices.

2. Current situation

Bio-waste (food and garden waste) is a key waste stream in the transition to a circular economy. Representing at least 40 % of municipal waste in the EU, it contains valuable nutrients and organic matter that can be recycled or used for energy recovery, while improper disposal leads to greenhouse gas emissions.

In the EU, bio-waste is currently composted at home, treated in composting plants, or converted into biogas. However, much of its potential remains unused, as large quantities are still not collected separately and end up in landfills or incinerators.

From 1 January 2024, separate collection or recycling at source of bio-waste became mandatory across the EU, significantly boosting its recovery. Additional targets under the Waste Framework Directive[1] include reducing landfilling and achieving a 65% recycling rate of municipal waste by 2035, which depends heavily on effective bio-waste management[2]. Binding food waste reduction targets for 2030 further support this goal.

As mentioned before, a situation analysis of municipal waste management in the Baltic States was carried out at the start of the project. The analysis can be found on the homepage of the German-Baltic Chamber of Commerce (www.ahk-balt.org). The main learning was that the management of bio-waste in the Baltic states does not reach a level required by EU targets. As Germany has progressed further in developing its approaches in this field, the following guidelines provide theoretical knowledge aligned with the results of the situation analysis and complemented by best practices from Germany to support municipalities in Estonia, Latvia and Lithuania.

3. Definitions

Bio-waste is defined by the Waste Framework Directive as biodegradable garden and park waste, food and kitchen waste from households, restaurants, catering and retail, and similar waste from food processing. It excludes forestry and agricultural residues, manure, sewage sludge, natural textiles, paper, processed wood, and food production by-products that never become waste.

The Landfill Directive[3] defines biodegradable waste more broadly as any waste capable of aerobic or anaerobic decomposition, such as food, garden waste, paper, and paperboard.

Bio-waste is sometimes used to mean kitchen waste only, excluding green waste. Kitchen waste consists mainly of food waste. On average, kitchen and green waste quantities are similar, but significant differences exist between urban and rural areas.

[1] Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste; https://eur-lex.europa.eu/eli/dir/2018/851/oj/eng

[2] Zero Waste Europe - LIFE BIOBEST: Comprehensive Guidance for effective bio-waste management in the EU - Policy and regulatory recommendations for bio-waste; 2023; https://circulareconomy.europa.eu/platform/sites/default/files/2025-07/250213_BIOBEST_WP5_D5.4_ComprehensiveGuidance_webpublication_v2.pdf

[3] Directive (EU) 2018/850 of the European Parliament and of the Council of 30 May 2018 amending Directive 1999/31/EC on the landfill of waste; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018L0850

Key terms used in this chapter:

- **Bio-waste**: Biodegradable waste such as food, kitchen scraps, and garden and park waste.
- **Source separation**: Sorting waste at the point of generation into dedicated streams.
- **Composting**: Aerobic biological treatment producing compost.
- **Anaerobic digestion** (AD): Oxygen-free biological treatment producing biogas and digestate.
- **Contamination**: Substances that reduce the biological, chemical, or hygienic quality of bio-waste and its end-products (e.g. heavy metals, pesticides, pathogens).
- **Impurities** (foreign materials): Non-biodegradable materials in bio-waste that reduce treatment efficiency and contaminate outputs. Typical impurities include plastics (including biodegradable plastics), metals, glass, stones, treated wood, textiles, rubber, hazardous substances, and non-organic packaging.

Bio-waste management covers collection, treatment, and recovery processes that determine material quality and final uses. There is no uniform bio-waste management model across Europe, and systems vary significantly between Member States.

4. Policy Principles for the Separate Collection and Treatment of Bio-waste

Policies for bio-waste recycling follow the same principles as for other recyclable waste and should respect the waste hierarchy. Prevention, reduction, reuse, and recycling take priority over disposal. Mandatory separate collection allows the recovery of nutrients and organic matter, enabling the production of compost or digestate that can be safely returned to soil.

Bio-waste shall be collected separately at source to avoid contamination and ensure suitable input for biological treatment, in line with EU waste legislation. Separate collection systems should cover households, businesses, and public institutions.

High-quality compost and digestate require clean bio-waste. Clear sorting rules, public guidance, and monitoring are essential to minimise contamination by plastics, metals, and hazardous substances. Separately collected bio-waste shall be treated through environmentally sound composting or anaerobic digestion processes that meet health and environmental standards, minimise emissions, and protect soil and water resources.

Compost and digestate must meet defined quality standards to ensure safe use in agriculture, horticulture, and landscaping. Quality assurance and certification systems help build confidence in these products.

Anaerobic digestion contributes to climate and energy goals by reducing landfill methane emissions and producing renewable biogas. Recycling digestate supports nutrient recovery and reduces reliance on mineral fertilisers. Returning compost and digestate to soils supports the circular economy by closing nutrient cycles, improving soil health, and enhancing biodiversity.

Bio-waste collection and treatment systems should be cost-effective and promote local value creation, including local jobs and regional treatment facilities to reduce transport impacts.

Effective systems rely on public participation. Education, awareness campaigns, and user-friendly collection schemes are essential to ensure correct sorting.

Authorities should monitor collection performance, contamination levels, and treatment outcomes to support continuous improvement and policy evaluation.

Under the Polluter Pays Principle, waste generators bear the costs of bio-waste collection and treatment. Fee systems linked to waste quantities encourage prevention and proper separation.

5. Roles and Responsibilities

Effective bio-waste reduction and separate collection require cooperation among all stakeholders, including waste generators, municipal authorities, operators, regulators, NGOs, and the scientific community[4]. Shared resources and expertise support efficient, high-quality systems.

Effective bio-waste reduction and separate collection rely on close cooperation among all stakeholders, including waste generators, municipal authorities, operators, regulators, NGOs, and the scientific community. Shared resources and expertise help build efficient, high-quality systems. Successful bio-waste systems, tailored to local conditions, also require several common elements: strong and continuous public awareness campaigns, door-to-door collection, and incentive schemes such as pay-as-you-throw. Where communal containers are used instead, controlled access and monitoring systems help ensure proper separation and traceability. [5].

5.1 Municipal Authority

Municipalities lead in planning, implementing, and monitoring separate organic waste collection. Responsibilities include:

- **Policy and Regulation:** Define organic waste, set collection standards, and enforce compliance.
- **Infrastructure:** Provide bins, design collection routes, and ensure access to treatment facilities.
- **Public Awareness:** Run education campaigns and provide guidance to maintain high participation and low contamination.
- **Oversight and Quality Control:** Monitor collection performance, contamination, and treatment outcomes.
- **Financial Management:** Budget for services, set fees, secure funding, and drive continuous improvement.

[4] Otero, M.; Gresset, S.: 2023; The circular bio-waste management handbook for local authorities; https://cityloops.eu/bio-waste

[5] Ling, J. (2024). Collection and valorisation of urban bio-waste: Tools and resources for cities and regions. https://zenodo.org/records/11146150

5.2 Waste Collection and Treatment Operators

Clear roles and coordination between collection and treatment operators are essential for compliance, efficiency, quality, and environmental performance.

Collection Operators

- Design and operate separate collection schemes with suitable bins and vehicles.
- Implement quality control, inspect for contamination, train staff, and report data.
- Coordinate with treatment operators to align service with processing capacity.

Treatment Operators

- Accept and process bio-waste via composting or anaerobic digestion.
- Ensure process stability, hygienisation, emission control, and output quality.
- Monitor operations, manage residues, and report to authorities.

Shared Responsibilities

- Align collection and treatment systems, exchange data, optimise performance, and support public awareness initiatives.

5.3 Waste Generators (Households, Businesses, Institutions)

Active participation by waste generators is essential for effective organic waste separation, higher-quality compost, and reduced environmental impact:

- **Source Separation**: Separate bio-waste from other streams.
- **Use of Bins**: Follow guidelines for proper containers and accepted materials.
- **Collection Compliance**: Follow schedules and ensure bin accessibility.
- **Waste Reduction**: Minimise food waste through responsible purchasing and consumption.
- **Participation and Hygiene**: Engage in awareness campaigns, maintain clean bins, and follow hygiene practices.
- **Legal Compliance**: Adhere to local regulations and inspections.

5.4 Regulatory and Supervisory Authorities

Regulatory authorities ensure compliance, environmental protection, and effective long-term organic waste management:

- **Policy and Standards**: Develop laws, regulations, and quality standards for organic waste.
- **Permitting and Licensing**: Approve operators and treatment facilities to meet technical, environmental, and safety requirements.

- **Monitoring and Enforcement**: Inspect compliance, apply corrective measures, and track performance.
- **Data and Guidance**: Collect, verify, and analyse waste data; provide technical support and training.
- **Public Awareness and Coordination**: Support campaigns and stakeholder engagement.
- **Continuous Improvement**: Review system performance and update regulations to align with best practices and environmental goals.

6. Bio-waste Prevention and Reduction

Waste prevention is at the top of the waste hierarchy and should always be prioritised. Unlike other measures, it targets the source, aiming to avoid waste generation, with food waste being a particularly urgent concern.

Roles of Local Authorities:

- Reduce food waste in municipal operations such as schools and canteens.
- Influence other actors at home and in the catering sector.
- Promote demand forecasting, stock optimisation, and portion control to prevent spoilage.
- Raise public awareness and encourage waste reduction practices.

Food Redistribution and Recovery:

- **Donations:** Pass surplus food to food banks, shelters, or community programs.
- **Recovery:** Collect food not meeting market standards but safe for consumption.
- **Exchange Platforms:** Facilitate sharing of surplus food within communities.

Decentralised Bio-waste Treatment:

- **Home composting** is a real measure for waste prevention.
- Organic kitchen and garden waste is avoided directly at source, as it does not need to be collected, transported and treated. The promotion of home composting, especially in rural areas, should definitely be encouraged.

Pay-As-You-Throw (PAYT) Systems:

- **Waste fees** vary depending on the amount of residual waste, while separately collected bio-waste is exempt from the fee or receives a reduction. This can reduce the amount of residual waste (**waste prevention**) and increase the amount of recyclable waste.
- Implementation requires reliable measurements (e.g. RFID, weighing), clear tariffs, data management, user instructions and monitoring.
- Social exemptions or allowances help to mitigate distributional effects.

When combined with separate bio-waste collection, PAYT systems improve compliance with the waste hierarchy, reduce landfilling and incineration, and enhance environmental and economic performance.

7. Source Separation and Collection

Source separation of bio-waste - food scraps, fruit and vegetable peels, garden waste, and other biodegradable materials - is essential for effective waste management. Waste should be separated from the point of generation into designated Bio Bins to prevent contamination and ensure suitability for composting or biogas production.

Collection Approaches:

- **Curbside collection:** Door-to-door service with special containers, often without household plastic bags. Weekly in summer, biweekly in winter.
- **Community/bring points:** Large local containers, sometimes with electronic lockers, for areas where curbside collection is impractical.
- **Bulk generators:** Special arrangements for markets, restaurants, and institutions.
- **Green waste:** Homes with gardens may include green waste, which aids compost structure but may affect anaerobic digestion.
- **Container standards:** Tightly sealed 60 - 240 L bins, preferably brown/green, with filter lids or liners to reduce odour and improve hygiene.

Collection Frequency and Hygiene:

- Frequency depends on climate, season, and waste type; higher temperatures require more frequent emptying.
- Regular cleaning of bins, at least annually, is important for hygiene and user acceptance.
- Vehicles may be equipped for water release to maintain cleanliness.

Note that the Baltic winter in particular makes bio-waste collection difficult. Certain measures can increase the success of collection.

- The use of paper bags for collection in households to reduce moisture; possibly adjusted collection frequencies to prevent waste from freezing to the container walls.
- Measures to ensure the accessibility of collection containers even in ice and snow.
- Waste collection vehicles can be adapted to winter conditions.
- Draining of kitchen waste before collection and insulated containers, possibly also in frost-free rooms, are more feasible in the commercial sector.

Contamination Control:

- Clear bin labelling and standardised colours.
- Public education campaigns and feedback systems.
- Visual inspection of bins by collectors; contaminated bins may be rejected with guidance or fines.
- Automatic detection systems can help identify foreign matters.

Key Principles:

- Mandate separate collection for households and relevant non-residential generators.
- Clearly define accepted materials and update guidance periodically.
- Adapt collection systems (door-to-door, communal, or bring points) to urban density.
- Ensure appropriate bin size, ventilation, and certified liners where possible.

- Adjust collection frequency to prevent odours, pests, and Not-In-My-Backyard (NIMBY) issues.
- Combine education, spot checks, and enforcement to minimise contamination.

8. Treatment Options

The selection of an appropriate bio-waste treatment technology must be based on local conditions, including settlement structure, bio-waste potential, waste composition, collection system, financing, available staff, and energy framework conditions. The decision between pure material recovery (composting) and cascade use with prior energy recovery (anaerobic digestion) must always be made on a case-by-case basis.

A wide range of technical processes exists, but a detailed description is beyond the scope of this handbook. Exchange of practical experience is strongly recommended. The market for treatment technologies is limited, and highly automated, enclosed systems require a minimum annual throughput to be economically viable.

8.1 Composting

Aerobic treatment (composting) produces high-quality compost at relatively low cost. Green waste, especially woody material, is an essential input, providing structure and supporting process stability. It is also required for post-composting of digestate. Kitchen waste is rich in nutrients and energy but requires carbon-rich structural material to ensure proper aerobic decomposition.

Composting is a humification process that results in stabilised organic matter, contributing to soil health. It is suitable for garden waste and low-contamination mixed bio-waste. Controlled process conditions (temperature, aeration, moisture) are necessary to ensure hygienisation and compliance with national quality standards.

8.2 Anaerobic Digestion

Anaerobic digestion (AD) is a biological process in which organic materials are broken down without oxygen. Typical feedstocks include food waste, manure, sewage sludge, and agricultural residues. The process produces biogas, which can be used for electricity, heat, or fuel, and digestate, a nutrient-rich material suitable for use as fertiliser or soil conditioner. AD is a well-established technology, with hygienisation and regulatory requirements similar to those for composting.

8.3 Home Composting and Community Composting

Home and community composting are decentralised treatment options[6], particularly suitable for rural areas and small settlements. Community composting requires trained personnel ("compost masters") to ensure proper operation and quality control; participation rates rarely exceed 50 %. Home composting is widespread and considered a form of waste prevention, as organic waste is treated at the point of generation. Hygienic operation is essential, and meat-containing food waste should generally be excluded.

Decentralised systems offer several advantages, including low investment and operating costs, reduced transport-related emissions and costs, and strong community involvement.

8.4 Technology Selection Criteria

Composting and anaerobic digestion - each have their pros and cons. In principle, the following factors must be taken into account:

- Waste composition and quantity
- Available land and infrastructure
- Environmental impacts and permitting requirements
- Financial viability and market outlets.

Based on over 30 years of experience in Germany, the following can be summarised.[7]

Advantages of composting technologies:

- Low technical complexity
- Comparatively low investment costs
- Compost as a product for fertilisation
- Low staffing requirements
- Flexible plant operation
- Proven system
- Safe hygienisation
- Low ecological footprint
- Low energy requirements for operation
- Fluctuations in volume can be easily managed (with sufficient space)
- Input material rich in lignin can also be utilised
- Sanitisation is guaranteed
- Short retention time and low space requirements when using the intensive rotting system (+/- 11 days)

[6] Marcon, A.; Recupero, R.: Community Composting: A Practical Guide for Local Management of Bio-waste; Association Fertile Auro, Zero Waste Europe, 2019; https://zerowasteeurope.eu/wp-content/uploads/2019/04/zero_waste_europe_fertile_auro_guide_community-composting_en.pdf

[7] Umweltbundesamt TEXTE 40/2018: Best Practice Municipal Waste Management - Information pool on approaches towards a sustainable design of municipal waste management and supporting technologies and equipment; https://www.umweltbundesamt.de/system/files/medien/1410/publikationen/2018-05-30_texte_40-2018-municipal-waste-management_en.pdf

- CO_2 retention through the introduction of organic material into the soil

Disadvantages of composting methods:

- The thermal energy generated during the rotting process usually cannot be utilised.
- Emissions from post-rotting or, in the case of open composting, from gas emissions from the compost heap

Anaerobic digestion is another established technology that is used in many different ways for the treatment of bio-waste, agricultural residues and organic components in residual waste.

Advantages of anaerobic digestion technologies:

- Energy and material utilisation of the input material
- Low space requirements
- Technically established
- Safe hygienisation
- Production of biomethane as a biofuel possible (but only to a very limited extent in this case)
- Reduction in greenhouse gas emissions

Disadvantages of anaerobic digestion technologies:

- Higher investment costs (compared to composting)
- Low flexibility in operation and in the event of fluctuations in volume and substrate composition
- Higher maintenance costs for technology and plant
- Higher personnel requirements
- Personnel must be trained
- Higher requirements for occupational and plant safety (explosion protection, gas leakage, etc.)
- Odor formation possible
- No lignin degradation
- Local or district heating networks must be available in order to utilise thermal energy

Taking into account the current state of the art and experiences in Germany, it appears that smaller material streams tend to preferably be composted in plants (< 20,000 t/a).

Whereas larger material streams are more frequently used in larger plants (> 20,000 t/a) using combination processes, in which the substrate is recycled in addition to the energy recovery of biogas or biomethane - under the right conditions.

Smaller plants in particular, which process green waste in addition to bio-waste, are well suited for composting using intensive rotting. A combination of fermentation and composting technologies requires increased investment combined with training of employees in occupational safety, process technology and plant control. The use of biogas for energy can be a source of income. Energy self-sufficiency today has more than just a financial aspect.

However, in addition to the use of electrical energy, it must also be possible to use heat at the site. The alternative of biomethane production incurs additional costs.

It is not possible to make a general assessment about costs and cost structure. Local conditions must be taken into account. All conditions at every site must be checked and evaluated individually. Specific bids from technology providers help in the decision-making process.

9. Technical Design Standards

There are many technical design standards in the European Union in the area of separate collection and recovery.

9.1 Collection Infrastructure

In the European Union, the separate collection of bio-waste is governed primarily by a **regulatory framework rather than binding, bio-waste-specific technical design standards.** The central legal basis is the **Waste Framework Directive (Directive 2008/98/EC, as amended by Directive (EU) 2018/851)**, which establishes the obligation for separate collection and sets functional objectives such as contamination prevention, protection of human health, and environmentally sound waste management.

The directive deliberately **avoids prescribing detailed technical specifications for the collection infrastructure** (e.g. containers, vehicles, layouts of collection points). The responsibility for technical system design is therefore delegated to Member States, regions, and municipalities, allowing adaptation to local conditions.

At EU level, technical standardisation relevant to bio-waste collection mainly takes the form of horizontal equipment standards developed by CEN (European Committee for Standardization). In practice, bio-waste containers are covered by general standards such as **EN 840** (mobile containers) and **EN 12574** (stationary containers). These standards define dimensions, mechanical strength, compatibility with lifting systems, safety, durability, and marking requirements. Although not bio-waste-specific, they provide a harmonised technical basis for collection infrastructure across Europe.

Bio-waste-specific guidance is primarily provided through **non-binding technical documents and best practice manuals**. EU-funded initiatives such as **LIFE BIOBEST**[8,9], offer practical recommendations on system design, including the choice between door-to-door and bring systems, container sizes for different housing types, collection frequencies, and integration with treatment facilities. While not legally binding, such guidance is widely used by public authorities and operators as a technical reference.

In addition, CEN Workshop Agreements (CWAs) address selective bio-waste collection[10]. Although CWAs do not have the legal status of European Standards, they provide structured operational

[8] https://zerowasteeurope.eu/project/life-biobest/
[9] Zero Waste Europe - LIFE BIOBEST: Guideline on the separate collection of bio-waste; 2024; https://zerowasteeurope.eu/library/guideline-on-the-separate-collection-of-bio-waste/
[10] https://valuewaste.eu/the-cen-cenelec-workshop-key-bio-waste-kicks-off/

guidance based on stakeholder consensus, covering contamination prevention, user convenience, logistics efficiency, and performance monitoring.

In practice, EU-aligned bio-waste collection systems follow common design principles:

- **Source separation** at household or commercial level, supported by small kitchen caddies and dedicated outdoor containers
- **Robust, animal-proof (rat-proof) containers** with lids
- **Standardised colour coding** (typically brown or green) and clear labelling
- **Barrier-free usability** for older people and people with disabilities

Materials used for containers and liners must be compatible with biological treatment processes. In some Member States, certified compostable bags compliant with EN 13432[11] are permitted, subject to acceptance by local treatment plants. By contrast, **the acceptance of biodegradable plastic bags is very limited, as many treatment processes cannot fully degrade bioplastics.**

System design reflects settlement structure. Door-to-door collection with individual or shared bins is common in urban areas, while storage conditions must ensure hygiene and odour control, including shaded placement, regular cleaning, and, where relevant, separate handling of food and garden waste.

Overall, the EU approach combines legal obligations, harmonised equipment standards, and extensive technical guidance rather than rigid design prescriptions, enabling local optimisation while ensuring EU-wide environmental objectives.

9.2 Transfer and Storage

Collection frequency is a key design parameter, particularly in warmer climates, and is closely linked to container size, storage duration, hygiene, and odour control.

Bio-waste is typically transferred using standard waste collection vehicles. Rotary drum vehicles offer advantages for handling moist organic waste. Cooling options may be applied in specific cases, such as the transport of animal by-products.

Collected bio-waste must be transported to composting or anaerobic digestion facilities without cross-contamination. Direct delivery to treatment plants is common; otherwise, general hygiene, odour control, and waste transport regulations apply.

Maintaining bio-waste quality is essential for successful treatment. Many Member States define maximum contamination thresholds for plastics, metals, or glass. Sampling and analysis, guided by standards such as EN 14899[12], are used to assess quality. Highly contaminated loads may be rejected by treatment facilities, as impurities can prevent compliance with compost or digestate quality standards and significantly increase operational costs.

Efficient logistics and route planning are critical due to the high moisture content, rapid decomposition, and odour potential of bio-waste. The main objective is to minimise transport time

[11] https://docs.european-bioplastics.org/publications/bp/EUBP_BP_En_13432.pdf

[12] EN 14899:2005; Characterization of waste - Sampling of waste materials - Framework for the preparation and application of a Sampling Plan; https://sampling-manual-customs-taxation.ec.europa.eu/sampling-procedures-cards/retail-packages-waste/sampling-waste_en

and costs while ensuring reliable service and regulatory compliance. Well-planned routes reduce fuel consumption, emissions, and vehicle wear, while preventing overflow and nuisance.

Collection systems must be adapted to settlement patterns:

- **Urban areas:** door-to-door or communal containers
- **Commercial generators:** dedicated, high-frequency collection
- **Rural areas:** bring systems or less frequent collection

Vehicles must be leak-proof, have sufficient payload capacity, and limit compaction to avoid leachate release. Increasingly, municipalities use biogas-powered vehicles to support circular economy objectives.

Route optimisation may rely on fixed schedules or, in complex environments, dynamic systems using GPS, traffic data, and fill-level sensors. Mathematical optimisation models and GIS-based software support efficient planning and monitoring.

9.3 Treatment Facilities

The technical design of bio-waste treatment facilities in the EU is driven by environmental protection, public health, and resource efficiency objectives set out in EU legislation. Facilities must prevent risks to air, water, soil, and human health, and minimise nuisances such as odour and noise.

Composting and anaerobic digestion plants falling under the Industrial Emissions Directive[13] must comply with the BAT Reference Document (BREF) for Waste Treatment[14]. BAT requirements influence plant layout, enclosure of operations, process control, emission abatement, and monitoring systems.

Biological treatment processes must be designed to ensure controlled stabilisation and hygienisation. This includes appropriate temperature, moisture, oxygen availability (aerobic processes), or anaerobic conditions, as well as sufficient retention times. Where animal by-products are treated, the Animal By-Products Regulation[15] imposes additional requirements, such as validated sanitisation steps and separation of clean and unclean zones.

Odor and emission control are a central design aspect. Facilities are typically designed with enclosed reception and processing areas, controlled ventilation, and exhaust air treatment (e.g. biofilters or scrubbers). Measures must also limit the release of bioaerosols and ammonia.

[13] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control); https://eur-lex.europa.eu/eli/dir/2010/75/oj/eng

[14] Best Available Techniques (BAT) Reference Document for Waste Treatment; https://bureau-industrial-transformation.jrc.ec.europa.eu/sites/default/files/2019-11/JRC113018_WT_Bref.pdf

[15] Commission Regulation (EU) No 142/2011 of 25 February 2011 implementing Regulation (EC) No 1069/2009 of the European Parliament and of the Council laying down health rules as regards animal by-products and derived products not intended for human consumption and implementing Council Directive 97/78/EC as regards certain samples and items exempt from veterinary checks at the border under that Directive Text with EEA relevance; https://eur-lex.europa.eu/eli/reg/2011/142/oj/eng

Water and leachate management requires impermeable surfaces, sealed drainage systems, and controlled collection and treatment of process water and stormwater, in line with water protection legislation.

Plant layout must clearly separate reception, processing, storage, and dispatch areas and include weighbridges, sampling points, and sufficient storage capacity. Safe traffic flow, fire prevention, and emergency response must be integrated into design.

Monitoring and documentation are essential. Facilities must be equipped for process and emission monitoring and operated under an environmental management system aligned with permit requirements.

Specific Design Aspects

Composting Facilities:
Composting plants must ensure controlled aerobic degradation with sufficient oxygen supply, moisture control, and temperature monitoring. Enclosed or semi-enclosed systems are increasingly preferred to reduce emissions. Impermeable surfaces, leachate collection, aeration systems, and treated process air (commonly via biofilters) are standard design elements. Compost maturation and refining areas must prevent recontamination and ensure compliance with quality standards.

Anaerobic Digestion Facilities:
Anaerobic digestion plants are designed as closed systems with controlled anaerobic conditions. Pre-treatment systems protect downstream equipment, and hygienisation steps are required where animal by-products are processed. Digesters must be designed for appropriate temperature regimes, retention times, and loading rates, with effective mixing. Biogas systems require gas-tight design, safety equipment, and compliant utilisation systems. Digestate storage and post-treatment must control emissions and ensure suitability for further recovery or agricultural use.

10. Quality Assurance for Compost and Digestate - Use of Outputs

The quality of compost and digestate significantly influences facility design. Plants must be able to produce materials that meet end-of-waste or product standards, requiring controlled input streams, contaminant removal (e.g. sieves, magnets, density separators), and continuous process monitoring. This supports EU circular economy objectives for safe nutrient recycling to soils.

Compost and digestate provide agronomic benefits, including improved soil structure, water infiltration and retention, enhanced soil biology, and nutrient supply. To enable their use in agriculture and horticulture, product quality must be clearly defined and assured.

Bio-waste must be treated to eliminate sanitary and phytosanitary risks before land application. Operators are required to verify process efficiency, treatment temperatures, hygienic safety, and the absence of harmful substances. Indirect process control requires documentation of temperature profiles, composting residence times, and feeding intervals in anaerobic digestion. The extent of testing depends on the plant’s annual throughput.

The agricultural use of compost and digestate is regulated to protect the environment, human and animal health, and product quality, while enabling nutrient recycling. Relevant EU legislation includes the Fertilising Products Regulation (EU) 2019/1009[16], the Waste Framework Directive and End-of-Waste criteria[17], the Nitrates Directive[18], and the Organic Farming Regulation[19].

National regulations should at least cover input material control and traceability, regular laboratory testing (pathogens, pollutants, impurities, stability), hygienisation requirements, certification or quality labels, and clear user guidance on application rates and safety[20]. Bio-waste treatment processes must also be continuously monitored[21].

Finally, market development through public procurement and cooperation with farmers and landscapers is essential. Agricultural regulations should be adapted to facilitate the use of treated organic waste products.

11. Practical Implementation and Usage of Collection Systems

In order to introduce and increase the collection and recycling of bio-waste, statutory regulations on household waste bins are necessary, e.g.: '**It is not permitted to place compostable waste in residual waste bins.**' This is the only way to provide a legal basis for controls and sanctions.

Furthermore, it must be clearly communicated what should be collected in the Bio Bin. A note should be posted indicating that plastic bags used to collect organic or kitchen waste in households must not be disposed of in the Bio Bin. Plastic bags can be a significant contaminant that severely limits composting.

Bio Bins (also called organic waste bins, bio-waste bins, food waste bins, brown bins or compost bins) are meant for biodegradable, food-based and plant-based materials. Exact rules vary by municipality, but the following guidelines are widely accepted.

What can go into the Bio Bin:

Food waste and kitchen waste

- Fruit and vegetable scraps (peels, cores, skins)
- Leftover food (cooked or raw)
- Bread, rice, pasta, cereals
- Meat, fish, bones, and seafood
- Dairy products (cheese, yogurt, small amounts of milk)
- Eggs and eggshells

[16] Regulation (EU) 2019/1009 Rules on the making available on the market of EU fertilising products and amending Regulations (EC) No 1069/2009 and (EC) No 1107/2009 and repealing Regulation (EC) No 2003/2003; https://eur-lex.europa.eu/eli/reg/2019/1009/oj/eng
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[20] Zero Waste Europe - LIFE BIOBEST: Proposal for quality standards for bio-waste entering biological recycling facilities; 2024; https://zerowasteeurope.eu/wp-content/uploads/2024/12/241129_LIFEBIOBEST_WP5_D5.3_QualityProposal_webpublication.pdf
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- Nuts, shells, and seeds
- Coffee grounds and paper coffee filters
- Tea leaves and paper tea bags (remove staples if possible)
- Hair, feathers, compostable small animal litter, soiled paper (fruit and bread bags), paper kitchen towels, paper napkins, paper tissues, cut flowers, potted plants (without pots), spoiled food, sausage scraps, small amounts of newspaper (e.g. for wrapping) ...
- Paper plates or cardboard contaminated with food (if not plastic-coated)

Garden and plant waste (if allowed locally)

- Tree cuttings, flowers, potting soil, vegetables, hedge trimmings, windfall fruit, leaves, plant debris, grass clippings, shrub cuttings, wild herbs
- Wood wool, wood chips and sawdust from untreated wood, wood ash and charcoal

Compostable materials (only if certified) - These materials may only be mentioned if their degradability has been proven in the respective bio-waste treatment plant. Otherwise, they are to be considered contaminants and excluded from collection.

- Certified compostable bags (often marked “EN 13432” or similar)
- Certified compostable packaging or tableware

What should NOT go into the Bio Bin

- Plastic bags or packaging (even “biodegradable” unless certified; or excluded by the waste disposal company because they are not degradable in the connected waste treatment plant)
- Metal, glass, or aluminium
- Liquids (soups, oils, sauces)
- Diapers, sanitary products
- Animal waste or cat litter (unless explicitly allowed)
- Cigarette butts
- Wood treated with paint or chemicals
- Vacuum dust or ashes
- All waste that may contain harmful substances and is not biodegradable.

Figure 1: Waste that belongs – and does not belong into the Bio Bin[22]

12. Financing and Cost Recovery

The design of the fee system strongly influences participation and collection performance. Whether and how Bio Bins are charged must be decided locally, based on economic and operational conditions.

Financing separate bio-waste collection covers all costs for organisation, operation, and maintenance, including bins, vehicles, labour, transport, treatment (composting or digestion), monitoring, data reporting, public awareness, and administration. Funding typically combines waste fees, municipal budgets, environmental charges, and national or EU support. The objective is a cost-effective, sustainable, and legally compliant system, in line with the polluter pays principle.

12.1 Main Financing Mechanisms for the Separate Collection of Bio-Waste

1. **Fee-based systems**: Flat-rate or variable fees to recover investment and operating costs
2. **Pay-As-You-Throw** (PAYT): Charges based on quantity or frequency, incentivising waste prevention and correct separation.
3. **Municipal budget financing**: Often used during start-up phases to ensure high participation
4. **Environmental charges**: Use of landfill or incineration taxes to support bio-waste systems
5. **Public–private partnerships** (PPP): Private financing and operation under performance-based contracts
6. **Grants and subsidies**: National, regional, or EU funding for infrastructure, upgrades, and innovation
7. **Cross-subsidisation**: Revenues from other waste streams offset bio-waste costs

8. Financing bio-waste collection and treatment through **Extended Producer Responsibility** (EPR) schemes is usually not feasible.

Lower fees for Bio Bins compared to residual waste bins can encourage separation, but excessive incentives may cause misuse or littering. Variable fees, different bin sizes, or charges for collection bags can provide additional flexibility.

Bio-waste treatment is generally cheaper than residual waste treatment, often offsetting higher collection costs and increased volumes. However, higher overall costs may occur in specific cases, such as outdated residual waste facilities or when waste previously managed outside the public system is newly collected.

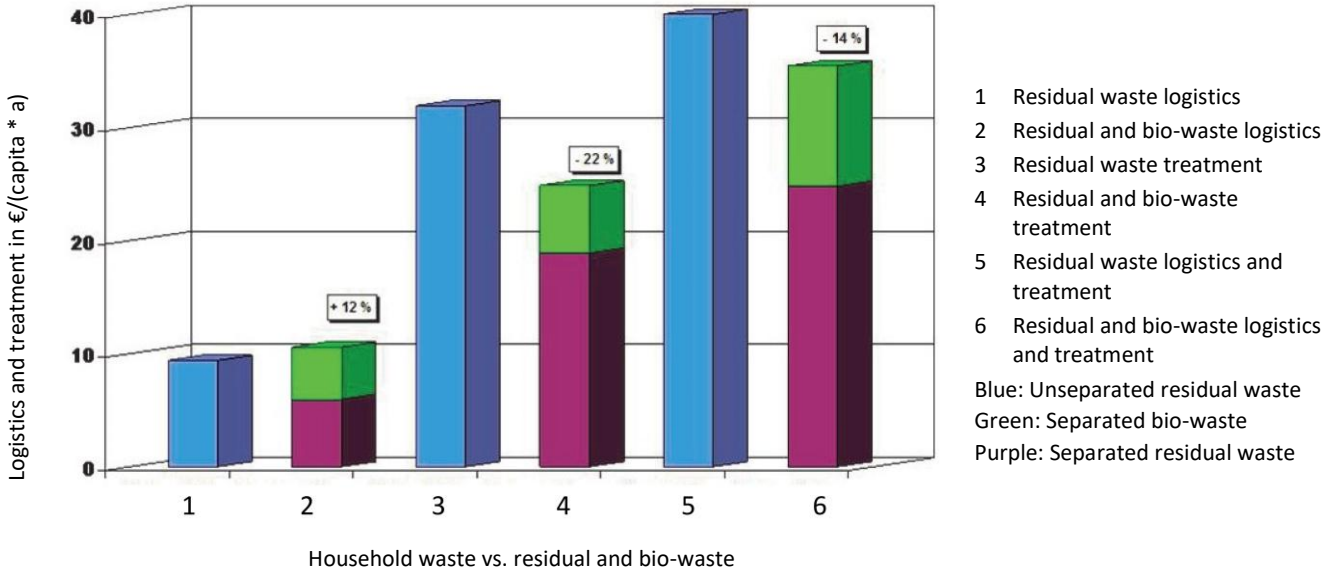

*Figure 2: Comparison of costs for logistics (1-2),treatment (3-4), logistics and treatment (5-6) for household waste compared to separate collection of residual and organic waste per capita and year in €/(capita * a) for a rural collection area*[23]

12.2 Risk Management and Contingency Planning

Separate bio-waste systems involve operational, environmental, financial, and regulatory risks. These are managed through phased implementation, route optimisation, preventive maintenance, staff training, and reserve capacity.

Low participation and contamination risks are addressed through clear separation rules, appropriate container design, monitoring, user feedback, and targeted communication. Environmental and health risks (odour, pests, leachate) are mitigated by adequate collection frequency, sealed containers, vehicle hygiene, and personal protective equipment.

Financial and treatment risks are reduced through conservative cost planning, long-term contracts, and access to alternative licensed treatment facilities. Continuous monitoring of key indicators (capture rates, contamination, service reliability, complaints) supports timely corrective action and system optimisation.

13. Communication and Capacity Building

Public relations and awareness campaigns are essential when introducing Bio Bins, as their success depends on correct citizen behaviour. The main objectives are:

1. Information and understanding
Many people are unfamiliar with what belongs into the Bio Bin, why bio-waste is collected separately, and how it is treated. Adequate communication measures help to explain these aspects clearly and accessibly.

2. Prevent incorrect disposal
Wrong materials such as plastic or metal reduce waste quality and can make compost unusable. Campaigns show what is allowed and why even small mistakes cause major problems and higher costs.

3. Increase acceptance and participation
New systems are accepted only if they are seen as practical. Good communication reduces concerns (odour, pests, extra effort) and encourages regular use.

4. Emphasise environmental benefits and climate protection
Bio-waste is converted into compost or biogas, conserves resources, improves soil quality and reduces greenhouse gas emissions. Highlighting these benefits increases motivation for correct separation.

5. Support legal compliance
Separate collection of organic waste is mandatory in the EU. Communication helps citizens understand and comply with these requirements.

6. Encourage long-term behaviour change
Repeated awareness campaigns help make waste separation a routine habit.

7. Address potential fee increases transparently
Possible increases in waste fees should be mentioned early and objectively, without alarmism. Communication should explain reasons (logistics, investments, higher initial costs) without citing uncertain figures, and always link costs to benefits such as environmental protection, reduced residual waste and long-term cost stabilisation.

In summary:
Targeted communication is a key success factor for effective bio-waste collection. Without it, Bio Bins are more likely to be misused and poorly accepted. Practical experience shows that intensive public relations, regular bin cleaning and supportive fee systems significantly improve participation and waste quality.

14. Social Inclusion and Equity in Separate Bio-waste Collection

Separate bio-waste collection provides environmental benefits, but its success depends on social inclusion and fairness. Systems that ignore vulnerable groups risk low participation and public resistance.

Key considerations include:

1. Universal access
Services must reach all residents, including low-income areas, apartment buildings, rural communities, older people and persons with disabilities. Infrastructure should be safe and easy to use.

2. Affordability
Costs for bins, bags or fees should not burden low-income households. Fair fee systems, subsidies or free starter kits support equal participation.

3. Inclusive communication
Information should be clear and accessible, using multiple languages, visuals and community-based outreach to reflect different literacy levels and cultural practices.

4. Community participation
Early involvement of residents, local leaders and community groups builds trust, improves acceptance and helps adapt services to real needs.

5. Equity in implementation
Informal waste workers should be recognised and protected, gender equality promoted, and unpaid household labour not increased. Participation and service coverage should be monitored to identify gaps and improve equity over time.

In summary:
Socially inclusive and equitable bio-waste systems ensure higher participation, better performance and fair distribution of benefits and responsibilities.

15. Climate Change Mitigation and Adaptation

Separate bio-waste collection supports both climate change mitigation and adaptation by improving the management of organic materials. Optimised collection routes and low-emission vehicles further reduce climate impacts.

Climate change mitigation
When bio-waste is landfilled with mixed waste, it generates methane, a highly potent greenhouse gas. Separate collection and treatment through composting or anaerobic digestion significantly reduce these emissions. Anaerobic digestion produces biogas that replaces fossil fuels, while compost and digestate return organic carbon to soils, supporting carbon sequestration. In addition,

using compost reduces the need for energy-intensive synthetic fertilisers, lowering overall emissions and supporting a circular economy.

Climate change adaptation
Compost and digestate improve soil structure, water retention and nutrient availability, making soils more resilient to drought, heavy rainfall and erosion.

16. Monitoring, Reporting, and Improvement

Effective bio-waste collection requires systematic monitoring based on reliable data on waste composition and collection performance.

Key indicators include the **connection rate**, which shows the percentage of eligible households served by a Bio Bin system, and the **collection rate**, which compares the amount of bio-waste collected separately (= organic waste) with the total amount of organic waste generated.

$$\textbf{Connection Rate (\%)} = \left(\frac{\text{Number of households (or units) with an organic waste bin}}{\text{Total eligible households (or units)}}\right) \times 100$$

Variable Definitions

- *Households with Bio Bins = Properties that have been provided with a bin and are included in the collection service.*
- *Total eligible households = All households that could reasonably participate (often excluding remote, commercial-only, or exempt properties).*

The exact **collection rate** formula depends on how your system defines “potential” organic waste, but the most widely used definition is below.

$$\textbf{Organic Waste Collection Rate (\%)} = \left(\frac{\text{Amount of organic waste collected separately}}{\text{Total organic waste generated}}\right) \times 100$$

Variable Definitions

- *Organic waste collected separately = Weight (or volume) of bio-waste collected through dedicated organic/food/garden waste bins (e.g. tons/year).*
- *Total organic waste generated = Estimated or measured total organic fraction of municipal solid waste (food waste + green waste), whether collected separately or not.*

Data on organic waste potential usually comes from waste composition analyses and should also consider home composting, which is recycled but not recorded.

Additional guidance and benchmarks are available from organisations such as the European Compost Network (ECN) [22].

For a meaningful assessment, authorities and waste operators should use combined indicators, including:

- Analysis of organic waste composition to quantify food and green waste, applicable to different collection systems.
- Measurement of organic waste remaining in residual waste (kg per capita per year), which should be minimised to avoid losing valuable resources.

High-quality separate collection depends on cooperation between authorities, waste companies, businesses and citizens. Contamination increases costs and environmental impacts and must be reduced through awareness campaigns, control measures and technical innovations. In line with the waste hierarchy, preventing contamination and improving sorting behaviour at source is the most sustainable and efficient approach.

17. Implementation Roadmap for Separate Organic Waste Collection

Once separate organic waste collection is established in law, it can be introduced step by step. Pilot projects in limited areas with simple treatment processes are a suitable starting point and can be supported by targeted funding. An overall concept is required, covering waste analyses, regulatory changes and comprehensive public awareness campaigns.

Residual waste analyses help identify the share of bio-waste and the recycling potential. Based on this, appropriate treatment methods, logistics, costs and financing models must be defined. Waste regulations need to be amended to include mandatory use of the Bio Bin and a revised fee system. A flat fee based on residual waste bin size, including the Bio Bin, can be beneficial.

The goal is to introduce Bio Bins without increasing fees, for example by extending residual waste emptying cycles and alternating collection with Bio Bins. This can keep staff and vehicle costs stable. As residual waste disposal is more expensive than organic waste treatment, savings increase with higher organic waste capture. These benefits should be clearly communicated to the public, as the new bin often meets initial resistance.

Implementation Roadmap

(Bullet Points - in more detail in Annex A)

Policy and Regulation

- Define legal requirements and targets for bio-waste separation.
- Establish responsibilities of municipalities and waste operators.

Planning and Preparation

- Analyse current waste streams and quantities of bio-waste.

[22] ECN Guidance on Separate Collection, 2022, https://www.compostnetwork.info/download/ecn-guidance-on-separate-collection/

- Identify suitable collection systems (bins, bags, curbside collection).

Infrastructure and Equipment
- Procure and distribute bio-waste bins/containers.
- Adapt or build treatment facilities (composting, anaerobic digestion).

Waste Fees and Financing
- Adjust waste fee structures to reflect separate bio-waste collection.
- Introduce financial incentives for proper waste separation.
- Ensure transparent cost allocation and long-term financial sustainability.

Pilot Phase
- Launch pilot projects in selected areas.
- Monitor participation rates and contamination levels.

Public Awareness and Communication
- Inform households and businesses about correct organic waste separation.
- Provide clear guidelines and educational material.

Training and Capacity Building
- Train collection staff and municipal employees.
- Establish procedures for quality control.

Full-Scale Rollout
- Expand separate collection to all target areas.
- Integrate organic waste collection into regular waste management services.

Monitoring and Improvement
- Track key performance indicators (collection rates, quality, costs).
- Continuously optimise the system based on data and feedback.

Simple bio-waste treatment processes like small scale composting which is already in place can be expanded while incoming material streams are growing. Existing facilities can also be adapted for other purposes. For example, the biological residual waste treatment plant in Riga could begin treating separately collected bio-waste as well.

It is important to start making use of bio-waste – for example by composting garden and park waste that is already collected separately. Experience can be built up step by step. Expansion to kitchen waste, e.g. from restaurants and supermarkets can then follow. Small, manageable service areas can be chosen for initial practice.

Start small and gradually expand to more types of waste and more waste producers.

18. Closing Remarks

These guidelines provide a practical and forward-looking framework to support municipalities across the Baltic States in transitioning towards more sustainable, circular, and climate-resilient

waste management systems, - especially for bio-waste. By emphasizing prevention, separate collection, high-quality treatment, and the beneficial use of biowaste, the guidelines align municipal practices with broader environmental, public health, and resource-efficiency objectives.

Effective bio-waste management is not solely a technical challenge, but a governance and community endeavour. Its success depends on strong local leadership, clear regulatory frameworks, adequate financing, and sustained cooperation among municipalities, waste operators, businesses, and residents. Public engagement is equally important: informed and motivated citizens are key actors in ensuring proper source separation and reducing food waste at household and commercial levels.

Further, this document recognises the diversity of local conditions across municipalities and encourages flexible, stepwise implementation tailored to local capacities, geographic contexts, and demographic realities. Continuous monitoring, data collection, and knowledge sharing—both within and between countries—are essential to improve performance over time and to scale up successful practices.

Looking ahead, municipal bio-waste management will play an increasingly important role in achieving climate mitigation targets, enhancing soil health, and strengthening local bio-economies. By applying the principles and recommendations set out in these guidelines, municipalities can turn biowaste from an environmental burden into a valuable resource, contributing to cleaner cities, healthier ecosystems, and a more sustainable future for present and coming generations.

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Annex A: Guideline for Planning and Implementation Separation Collection of Bio-Waste[23]

1. Definition of Goals and Development of a Short and Long-Term Phase Concept

Goal setting involves comprehensive planning and implementation of separate collection of bio-waste. When done correctly, goal setting is effective and often critical to success. Goals are giving direction by focusing attention on goal-relevant behaviour and away from irrelevant tasks.

- Analyse the composition of waste in your municipality (sorting analysis of household waste; volume flows of organic waste from the industry; green waste)
- Adapt your waste management concept and the waste fee system to the current and future situation
- All measures must be backed up by decisions of the local government
- Ensure the financial support for the pilot projects and accompanying measures (public relations, etc.)

2. Planning and Implementation of Appropriate Pilot Project

In a pilot project, local authorities and its inhabitants are to gain initial experience with the separate collection of bio-waste. The way to achieve this is via the following steps:

- Define a part of the municipality as the first separate collection area. The area should already be able to offer many possible types of waste (bio-waste from households, canteen waste, green waste, and commercial bio-waste)
- Prepare a technical and economic study for this pilot area (locations for collection bins, type and number of collection bins, collection vehicles and staff; operating costs, public relations).
- Discuss the results of the study in the local council and with the residents and consider meaningful ideas
- Publicise the adapted study and start public relations work to implement the study (introduction of separate bio-waste collection)
- Purchase of collection bins and vehicles; staff training
- Implementation of the pilot project in the selected collection area
- Regular control of the collection quantity and quality

3. Evaluation of the Pilot Project and Identification of Weak Points, Optimisation and Expansion

Check the success of the separate collection regularly:

- Bin usage and capacity utilisation
- Quality of the collected bio-waste by sorting analyses at the treatment plant
- Collection frequency synchronisation to the amount of waste generated and the climate

[23] Guide for Greek municipalities with steps to be taken to introduce separate collection of bio-waste: 2020; https://www.giz.de/de/downloads/Bio-waste%20Guide%20for%20municipalities%20EN.pdf; in collaboration with envero GmbH

- Document and check the costs of the pilot project and ensure financing
- As part of the public relations work, check the acceptance of separate collection by the residents
- Publication of the results of the pilot project with strengths and weaknesses (in news media and as information leaflets)
- Constant error correction and adaptation of the procedure and use of the experience gained
- Extension of the "separate collection" project to other parts of the municipality

4. Development of the Legal and Organisational Municipal Framework Related to the Experiences and Local Conditions

The local authorities should continuously customise their legal and organisational framework based on the gained experience and local conditions of the pilot project

- Adaptation of the bio-waste management concept (on-site handling, storage and processing; bio-waste collection; transfer and transport of bio-waste; and bio-waste treatment and final disposal)
- Adjustment of waste charges based on the experience of the pilot project (both for residents and for business)
- Adaptation of municipal planning to legislation requirements (expansion of the collection area)
- Adapting the structure and organisation to separate collection (persons responsible for separate collection and treatment)
- Documentation of waste quantities, material flows and monetary flows
- Information and update of the public on the status of the introduction of separate collection scheme

5. Planning and Implementation of the Concept for Optimising and Increasing the Added Value

Continuous data collection and monitoring during pilot implementation is a key tool to evaluate the progress of the program, assess its effectiveness and above all optimise it to the local conditions. More specifically:

- Regular monitoring of the system (quantity and quality of the separately collected bio-waste, costs, public relations)
- Need for adaptation and optimisation to increase the collected bio-waste quantity and quality (reduction of the impurities)
- Assessment of the environmental impact of separate collection (reduction of CO_2 emissions)
- Cost optimisation via optimisation of procurement practices, adaption of technology, supplier competition, adaption of negotiation strategies, bundling of services, etc. - – there are available tools that can be used i.e. the full cost accounting tool (YPEN, 2020)
- Added value in the local community through the recycling of organic waste (composting of green waste and/or of kitchen waste)
- Possibilities of composting the green waste directly on site in the municipality

Annex B: Example of public relations work

Below is a **clear, practical guide** to designing **communication and awareness-raising campaigns for Bio Bins and separate collection**, based on widely used **waste-management and behaviour-change principles**.

1. Objectives of the Campaign

A good campaign starts with **clear, measurable goals**:

- Increase **correct use** of Bio Bins
- Reduce **contamination** (plastics, metals, glass in bio-waste)
- Improve **participation rates** in separate collection
- Build long-term **habit change**, not just awareness

Example objectives:

- "Reduce contamination in Bio Bins by 30 % in 6 months"
- "Reach 90 % household awareness in targeted areas"

2. Key Principles for Effective Bio-Waste Campaigns

Simplicity

- Messages must be short, visual, and easy to remember
- Focus on what goes in/ what stays out
- Avoid technical language

✔ Good: *"Food scraps only – no plastic"*
✘ Bad: *"Biodegradable organic fractions suitable for composting"*

Clarity and Consistency

- Use the same colors, symbols, and wording everywhere:
  - Bins
  - Flyers
  - Social media
  - Collection trucks
- Align with national or municipal color codes (e.g. brown = bio-waste)

3. Targeted Communication

Different groups need different approaches:

Target Group	Approach
Households	Simple guides, fridge magnets, door-to-door info
Apartments	Posters in common areas, caretaker training
Schools	Games, workshops, competitions
Restaurants	Practical training, inspections + guidance
Markets	On-site signage and staff engagement

Target Group **Approach**

- Positive Messaging
- Focus on benefits, not punishment:
  - Cleaner cities
  - Compost for agriculture
  - Reduced landfill costs
  - Climate benefits
- Use social norms:
  - "Most households in your area already separate bio-waste"
- Visual Communication

Images work better than text:

- Clear **icons** for food waste
- Photos of **acceptable vs non-acceptable waste**
- Avoid cluttered posters
- **Core Messages to Communicate**

What to Put into the Bio Bin	**What NOT to Put into the Bio Bin**
Food scraps	Plastic bags
Fruit and vegetable peels	Packaging
Coffee grounds, tea bags	Glass
Bread, leftovers	Metals
Garden waste (if applicable)	Liquids
Food scraps	Diapers
	Plastic bags

⚠️ If compostable bags are allowed, explain **clearly which ones**.

4. Communication Tools and Channels

A. On-Bin Communication (Most Important) ▪ Stickers directly on the bin lid ▪ Simple "YES / NO" visuals ▪ Large, weather-resistant labels	**D. Digital and Media** ▪ Short videos on social media ▪ Municipal website FAQ ▪ SMS or app reminders on collection days ▪ Local radio and newspapers
B. Printed Materials ▪ Flyers delivered with bins ▪ Fridge magnets with sorting rules ▪ Simple brochures (one page only)	**E. Schools and Youth Programs** ▪ Composting demonstrations ▪ School competitions ▪ Children as "waste ambassadors" at home

C. Face-to-Face Engagement ▪ Door-to-door campaigns ▪ Community meetings ▪ Market-day info stands ▪ Training for building managers and waste collectors	

Annex C: Campaign Phases (How to Do It Step-by-Step)

Phase 1: Preparation

- Analyse current waste composition
- Identify main contamination problems
- Define target groups and key messages
- Design simple, unified visuals

Phase 2: Launch

- Announce the bio-waste collection clearly:
  - When it starts
  - Why it matters
  - How to do it
- Combine **media + local presence**
- Distribute bins and materials together

Phase 3: Reinforcement

- Repeat messages regularly
- Share success stories
- Show results ("X tons of compost produced")
- Provide feedback stickers ("Thank you for sorting correctly")

Phase 4: Monitoring and Feedback

- Inspect bin quality
- Measure contamination levels
- Adjust messages based on mistakes observed
- Provide corrective communication, not blame

Common Mistakes to Avoid	Key Success Factors
❌ Too much text	✓ Simple rules
❌ One-time campaign only	✓ Repetition
❌ No feedback to users	✓ Visual clarity

❌ Ignoring multi-language needs	✓ Local engagement
❌ Inconsistent symbols or colors	✓ Continuous education

Below are ready-to-use sample campaign messages for bio-waste bin use and separate collection, written in simple, clear language. They are grouped by audience and channel, so you can directly copy, adapt, or translate them.

Please be sure to adapt to the local situation and your own needs!

1. Core Campaign Slogan Options

Use one main slogan consistently across all materials.

- "Food waste belongs in the Bio Bin."
- "Sort food waste today. Compost tomorrow."
- "No plastic. Just food."
- "Separate bio-waste. It makes a difference."
- "From kitchen to compost."

2. On-Bin Sticker Messages (Very Short)

Front of Bin

- "BIO-WASTE ONLY"
- "FOOD SCRAPS ONLY"
- "NO PLASTIC, NO PACKAGING"

Lid (Inside or Outside)

- YES ✅
  Food scraps • Peels • Leftovers • Coffee grounds
- NO ❌
  Plastic • Glass • Metal • Diapers

3. Household Flyer / Leaflet Messages

Headline
"How to use the Bio Bin correctly"

Main Message

Put only food waste into the Bio Bin.
Do not use plastic bags or throw in packaging.
Clean bio-waste helps produce quality compost.

Call to Action
"Sort your food waste every day – it's easy and important."

4. Positive Motivation Messages

- "Your food waste becomes compost for our land."

- “Thanks for sorting – you’re helping keep waste out of landfills.”
- “Clean bio-waste = better compost = cleaner environment.”
- “Most households in your neighborhood already sort bio-waste.”

5. Apartment Buildings / Shared Spaces

Poster Text

“Please use the Bio Bin correctly”

Only food waste is allowed.
Plastic bags and packaging cause problems.
Let’s keep the bin clean for everyone.

Thank you for your cooperation.

6. Restaurants and Food Businesses
   - “Separate food waste – it’s part of your responsibility.”
   - “Clean food waste improves recycling and reduces costs.”
   - “No plastic, gloves, or packaging in Bio Bins.”

Short reminder sign:

Food waste only
No plastic bags
Keep the bin clean

7. Social Media and Digital Messages

Short Posts

- “Did you know? Food waste can become compost if sorted correctly.”
- “Plastic in bio-waste ruins compost. Keep it clean!”
- “Sorting food waste takes seconds – the benefits last years.”

Reminder Message

- “Collection day tomorrow! Remember: food waste only in the Bio Bin.”

8. School and Youth Messages
   - “Food scraps are not garbage – they’re a resource!”
   - “Be a compost hero: use the Bio Bin correctly.”
   - “Teach your family how to sort bio-waste.”

9. Feedback and Reinforcement Messages

Positive Feedback Stickers

- “Great sorting – thank you!”
- “This bin is clean. Keep it up!”

Corrective (Non-Punitive)

- “Too much plastic found. Please use food waste only.”
- “Let’s keep bio-waste clean for composting.”

10. Emergency / Problem Messages (If Contamination Is High)
    - “Plastic found in this bin – collection may be refused.”

- "Incorrect sorting damages compost quality."
- "Please follow the bio-waste rules."

(Use sparingly and always alongside positive messages.)

Annex D: Technical Design Standards for Treatment Facilities – "Checklist"

Always adapt to the situation in the bio-waste collection area!

1. Pre-Design and Feasibility

A. Regulatory and Permitting

- Determine applicable EU directives and national regulations
- Identify statutory thresholds for operator permits / IED permits
- Confirm applicable emission limit values and receptor distance requirements
- Identify feedstock acceptance rules and categorisation (source-segregated bio-waste, co-feedstocks)
- Assess whether animal by-product rules apply

B. Site Selection and Planning

- Land-use designation (industrial, agricultural, greenfield/ brownfield)
- Geotechnical survey (soil type, bearing capacity, groundwater depth)
- Hydrology and flood risk assessment
- Access for feedstock delivery and digestate/compost removal
- Utilities availability (electricity, water, sewer/ Incorporate pre-treatment)

C. Environmental Assessment

- Baseline air quality and odor sensitivity study
- Noise impact assessment
- Surface water and groundwater protection requirements
- Waste acceptance and storage safety studies
- Traffic and transport impact assessment

2. Process Design and Equipment

A. Feedstock Handling and Pre-Processing

- Reception hall / drop-off areas (covered, paved)
- Weighbridge with recording system (required for bio-waste segregation evidence and **cost and fee allocation**!)
- Sorting and screening area (manual) + mechanical)
- Shredders and grinders sized for typical feedstock
- Magnetic and density separators to remove contaminants
- Pre-storage bays with containment

B. Biological Treatment System For Composting

- Covered composting zones (windrows, tunnels, in-vessel)
- Forced aeration system with blower(s) and aeration plenum
- Temperature, oxygen, (moisture) sensors
- Moisture control and leachate drainage and storage system

C. Biological Treatment System For Anaerobic Digestion

- Feedstock homogenisation tank or area
- Sealed digesters with agitation/ mixing (dep. on technology)
- Temperature control (mesophilic/thermophilic capability)
- Gas collection and storage system with pressure relief
- Biogas utilisation and/or upgrading (CHP, grid injection option)

3. Instrumentation and Control

- Temperature sensors (multiple zones)
- Operating parameter recording (digesters and compost reactors)
- Biogas composition analysers (CH_4, CO_2, H_2S)
- SCADA (Supervisory Control and Data Acquisition) and PLC (Programmable Logic Controller) systems with logging and alarm capability
- Redundant power supply for critical monitoring
- Data retention system for compliance records (*Obligations to demonstrate compliance to the authorities; e.g. sanitation results*)

4. Air Emissions and Odor Control

- Enclosure of processing areas (where required)
- Air ventilation system
- Biofilters (or activated carbon) units for odour reduction
- Ammonia (NH_3) abatement system (scrubbers/ biofiltration)
- Fume hoods or gas capture at odour hotspots
- Dust suppression systems (water sprays, covers)
- Stack design with sampling ports
- Continuous/periodic emissions monitoring plan

5. Water and Wastewater Management

- Floor drains routed to collection pit / sump
- Leachate collection and storage tank
- Reuse/recirculation systems for process water (where feasible)
- Wastewater pretreatment (if discharging to sewer)
- Oil/grease separators (where heavy equipment washing occurs)
- Stormwater controls (vegetated swales/ detention basins)
- Fire water supply

- Spill containment berms around tanks

6. Hygiene and Sanitation

- Separate clean and dirty areas with protocols
- Hand-wash and boot-wash stations for staff
- Controlled access (limited to authorised personnel)
- Disinfection points for machinery and vehicles
- Dedicated area for animal by-product processing (if applicable)
- Pest control plan (bait stations, sealed doors)
- Preventing recontamination of products (compost, digestate)

7. Product Quality and End-of-Waste

Compost / Digestate Quality

- Stability / maturity testing routine (e.g., respiration rate)
- Pathogen reduction verification (temperature profile proof/indicator organisms)
- Metal contamination testing (heavy metals)
- Physical contamination limits (plastics > specified mm size)
- Nutrient analysis (NPK levels)
- Record retention for product certification

Standards and Criteria

- Feedstock documentation (source segregation evidence; costs; fees)
- Compliance with any national quality schemes (e.g., quality assurance systems)
- Trackability from input to output (digital records)
- Packaging and labelling compliant with end-use destination (soil improver vs fertiliser)

8. Health, Safety and Fire Protection

- ATEX (ATmospheres EXplosibles; 2014/34/EU and 1999/92/EC)) assessment if biogas present (possibly also in a composting plant)
- Explosion prevention and mitigation devices
- Gas leak detectors in relevant enclosures
- Emergency shut-off systems for gas and electrical
- Safety signage and Personal Protective Equipment availability
- Fire suppression systems (hydrants/ extinguishers)
- Lockout-Tagout (LOTO) procedures for maintenance

9. Operation and Maintenance

- Standard Operating Procedures for every major task
- Preventive maintenance schedule (fans, screens, conveyors, pumps)
- Calibration schedule for all sensors
- Operator training program (safety + process control)

- Incident reporting and corrective action log
- Document management system (permits, logs, Standard Operating Procedures)

10. Compliance Monitoring and Reporting

Environmental Monitoring

- Air emission sampling (frequency per permit)
- Odor impact assessments (community surveys/ downwind checks)
- Noise monitoring (if required by permit)
- Groundwater sampling (if required)
- Wastewater / leachate quality monitoring

Regulatory Reporting

- IED (Industrial Emissions Directive) and BAT (Best Available Techniques) reporting (annual environmental performance)
- Emission Inventory reporting (where required)
- Hazardous incident reporting procedures
- Safety Data Sheets (SDS) for all chemicals used
- Record submission deadlines calendar

11. Record-Keeping and Documentation

- Feedstock intake logs (origin, weight, quality)
- Product quantities and users; disposal certificates
- Process parameter logs (Temp., pH, gas readings)
- Maintenance logs and calibration records
- Environmental monitoring results
- Complaints/incident register
- Permits and compliance correspondence

12. Optional: EU Taxonomy / Sustainability Verification Checklist

- Source-segregated feedstock percentage documented
- Evidence of EN 13432 compliance for biodegradable packaging inputs
- Demonstrated avoidance of contamination thresholds
- Evidence of efficient biogas use (CHP, grid injection etc.)
- Circularity evidence (nutrient recycling outcome documented)