

LIFE BIOBEST

GUIDING THE MAINSTREAMING OF BEST BIO-WASTE RECYCLING PRACTICES IN EUROPE

Executive Summary

D5.2: A policy brief including the regulatory barriers

WP5: Policy and Regulatory Recommendations for bio-waste

T5.1: Identifying and analysing policy and regulatory barriers for the production of high-quality compost and digestate from bio-waste

JANUARY 2024

Public Report



Co-funded by
the European Union

LIFE21-PRE-ES-LIFE BIOBEST – 101086420

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the CINEA – EC. Neither the European Union nor the granting authority can be held responsible for them.

Copyright © 2023 BIOBEST.

Copies of this publication – also of extracts thereof – may only be made with reference to the publisher.

Lead Authors	Mike Stinavage & Gemma Nohales (ENT)
Other Authors Involved	Riccardo Gambini (ECN)
Peer Reviewers	Riccardo Gambini (ECN) Michele Giavini & Marco Ricci (CIC) Ignasi Puig-Ventosa (ENT)
Additional Peer Reviewers	Lauriane Noirot (ACR+) Enzo Favoino (ZWE)
Research Period	March 2023 – November 2023
Publication Date	31 January 2024



1 LIFE BIOBEST Project Summary

EU obligations on the selective collection of bio-waste will come into force at the end of 2023, increasing the availability of source-separated bio-waste for composting and anaerobic digestion. To ensure the development of bio-waste management best practices and the production of quality compost and digestate for soil applications, while minimizing any negative effect and closing effectively the loop, a comprehensive analysis is required regarding bio-waste management strategies, instruments and management schemes and their results given that large disparities exist among experiences in the EU.

The LIFE BIOBEST project aims to identify and validate the current Best Practices (BP) and management instruments along the bio-waste management chain (from generation to treatment) that allow the production of quality compost and digestate and establish a series of reference Key Performance Indicators (KPI), based on the analysis of existing databases and experiences. Through interconnected co-creation meetings with relevant expert stakeholders of the sector, solutions will be provided to overcome the identified technical, regulatory, economic and environmental barriers to widely adopt the proposed BPs.

A comprehensive EU-wide guide will be created, together with two decision-support tree guides for local and regional authorities to adapt bio-waste management models to their specific context, offering feasible BP and management instruments to promote efficient collection and subsequent recycling of bio-waste into quality compost and digestate.

By means of an analysis of the input materials, treatment practices, resulting compost and digestate quality, a proposal for premium European standards for biological waste entering composting and anaerobic digestion will be developed with the ultimate goal of promoting the certification of these materials and treatments, guaranteeing optimal management processes and a safe return to the soil.

The outcomes of LIFE BIOBEST will promote a significant improvement of the collection and treatment systems, and consequently of the quantity and purity of the input material, reducing process losses and favouring the conversion of bio-waste into high-quality compost and digestate.

The LIFE BIOBEST consortium is led by [Fundació ENT](#) (ENT) in partnership with [Consorzio Italiano Compostatori](#) (CIC), [ACR+](#) (Association of Cities and Regions for Sustainable Resource Management), [European Compost Network](#) (ECN) and [Zero Waste Europe](#) (ZWE). It is a 2.5-years LIFE Preparatory Project funded by the European Commission.

Project Total Eligible Costs: €1,664,600.07, Funding Rate: 90%, Maximum Grant Amount: €1,498,140.05.



2 Acronyms

Acronym	Term
AD	Anaerobic digestion
ABPR	Animal By-product Regulation
BP	Best practice
CR	European Commission Country Report(s)
D	Deliverable
DtD	Door-to-door
EC	European Commission
EU	European Union
EWB	Early warning report(s)
FPR	Fertilising Product Regulation
LD	Landfill Directive
MBT	Mechanical biological treatment
MS	Member State(s)
WFD	Waste Framework Directive
WP	Work Package

3 Executive summary

While EU waste legislation is commendable in its scope and comprehension, measures related to bio-waste recycling are not uniformly implemented within and across all Member States (MS). In some areas, bio-waste management is nascent. The vast majority of EU MS, regrettably, do not fully comply with the 2024 obligation of separate collection across all its municipalities. While collection systems may exist, the capture and the quality of separately collected material must be improved, especially for food waste.

The Waste Framework Directive (WFD) and the Landfill Directive (LD) directly target bio-waste management and exist within a multitude of cross-cutting policy legislation, demonstrating that bio-waste management has wide reaching implications and can be a driver of many sectorial policies. Bio-waste is key to reaching recycling targets in the WFD and the landfill diversion targets in the LD.

Ahead of the EU bio-waste separate collection mandate in January 2024, LIFE BIOBEST identifies the gaps in the regulatory framework and systemic barriers obstructing efficient bio-waste management with high capture rates of high-quality material.

This report's findings suggest that a multitude of barriers plague the European institutions and stakeholders struggling to meet the EU mandate for separate collection of bio-waste and the landfill and recycling targets, thereby precluding the closure of the bio-waste cycle. Many barriers are interrelated and dispersed across EU MS, necessitating multiple transversal and vertical solutions to overcome them. Additionally, this study investigates the status of transposition and management results of the EU legal framework and proposes calls to action.

Using a multi-method approach, LIFE BIOBEST considers novel data on bio-waste regulatory and policy barriers from the following sources:

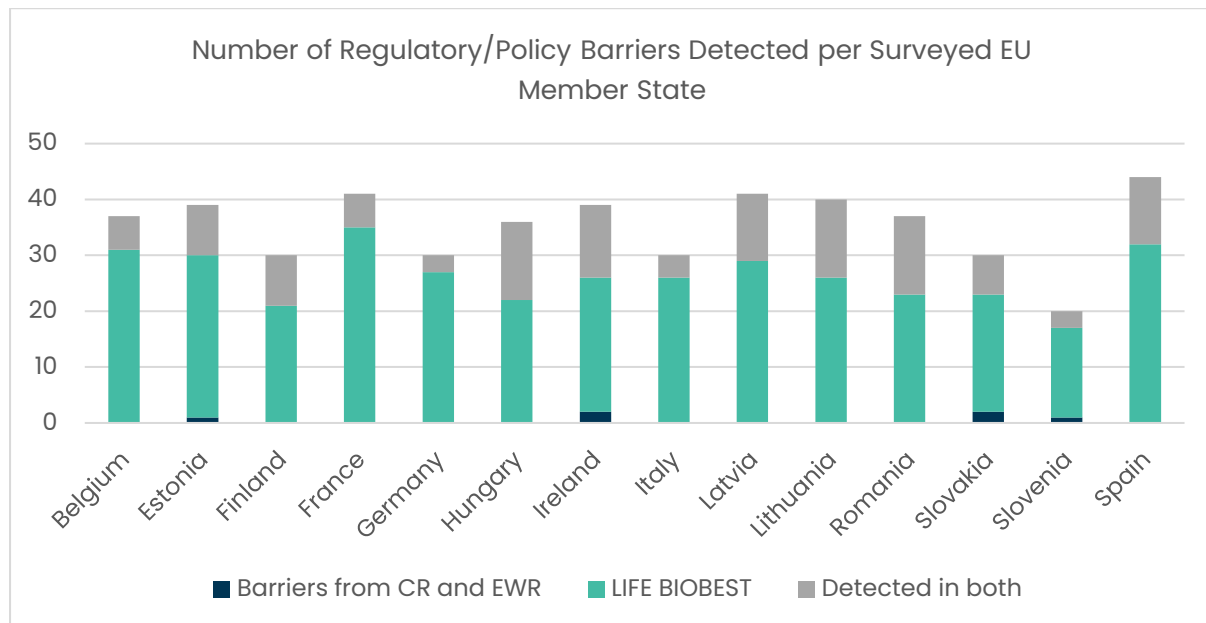
- Compilation of pre-existing data with particular focus on the Early Warning Reports and the European Commission Country Reports. This information was systematically leveraged.
- Open response barriers and incentives survey to ECN members,
- Co-creation events led by ACR+ in LIFE BIOBEST WP4,
- ENT pre-interview survey for ranking barriers sent to MS expert stakeholders,
- Personal interviews with MS expert stakeholders conducted by ENT.

LIFE BIOBEST interviewed experts from diverse geographic locations in the EU, reaching a total of 14 MS. The 14 MS represent all geographical regions of the EU, and many are those with the largest populations. By showing the frequency and distribution of barriers categorised by topic (Legal/Administrative, Economic, Organizational, Technical), level of

governance (EU, National, Regional, Municipal), and step in the bio-waste cycle (Collection (C), Treatment (T), Use of outputs (U) and Quality (Q)), the goal has been to disaggregate the barriers to provide a wide and comprehensive view of the constraints and bottlenecks – a necessary step towards the design of corrective measures.

LIFE BIOBEST validated over 95% of barriers detected in the EC Country Reports (CRs) and Early Warning Reports (EWRs) and increased barriers detection by almost threefold.

Figure 1. Total number of barriers detected per surveyed EU MS



3.1 Legal/Administrative Barriers

The legal framework of bio-waste policy is primarily centered on upper levels of policymaking since institutions on the EU and national levels provide laws and objectives that cascade down to institutional bodies on lower levels of the legal framework, guiding regional and local governments and organizations to adhere to the law and progress towards the identified goal.

The following table shows the four most common legal/administrative barriers with 85-100% detection in surveyed MS, alongside the End-of-Waste barrier.

Table 1. Analysis and categorisations of high frequency legal/administrative barriers

	Analysis
<p>Lack of effective binding policy or enforced legal obligations to reach minimum standards</p> <p>EU - C & T</p>	<p>Without binding policies and effective mechanisms for monitoring and enforcement of the bio-waste separate collection mandate scheduled for 2024, the EU runs the risk of setting a problematic legal precedent.</p> <p>Current binding policies that focus on recycling targets and landfill targets are not strong or effective enough to catalyze the intended change.</p>
<p>EU targets not cascaded to national/regional/municipal government</p> <p>National - C</p>	<p>To devolve power to the lower levels of government and promote locally appropriate solutions, legal/administrative policy measures should be based on objective mandates, benchmarks, and targets. The way to guarantee this is to use continuous and effective monitoring as well as appropriate and timely penalties.</p>
<p>Lack of local, regional, or national strategy for the separate collection of bio-waste</p> <p>National - C</p>	<p>Local governments implement bio-waste collection and treatment, and their willingness to do so may be less an isolated event than it is a response to policy measures (regional regulations and guidelines) on upper levels of government. Policy must be translated into strategic plans accompanied by sound financial strategies.</p>
<p>Inadequate appraisal of best practice options in policy design</p> <p>Regional - C & T</p>	<p>Existing best practices show the advantages and limitations of certain bio-waste collection and treatment schemes. This information is a tool for policy design, objectives, and recommendations as it provides practical insight in achieving efficiency. Currently there is a lack of technical recommendations and guidelines.</p>
<p>Absence of EoW criteria leads to lack of harmonization between MS</p> <p>EU - T</p>	<p>In the absence of EU-level End-of-Waste (EoW) criteria, national governments can define, if at all, their EoW criteria, leading to the persistence of fragmentation within the EU internal market and resulting in hampered market access for products originating from recycling and other recovery operations due to legal uncertainties. The latest version of the FPR introduced in its scope organic materials, previously left out. The revised regulation aims at creating a harmonised market and sets requirement for placing compost and digestate with the CE label into the market, which automatically grants the EoW status to these products that can then be freely traded intra-EU.</p> <p>In this regard, the FPR is a partial solution since it is optional. Operators must abide by obligations only if they want to introduce their fertilising product on the EU market. This could render the EoW criteria defined in the FPR ineffective since products that are usually traded locally or regionally are only obligated to comply with national rules.</p> <p>Furthermore, the FPR presents technical pitfalls when dealing with input material that includes animal by-products (e.g., kitchen waste from</p>

Analysis

households and canteens). For these input materials, the FPR refers to standard transformation parameters for composting and anaerobic digestion as laid down in the ABPR, which are difficult to be met by bio-waste recycling facilities. This results in compost and digestate from animal by-products do not meet the standards of the EU market, unless alternative parameters will be accepted and included in EU legislation.

Additional surveyed legal/administrative barriers detected in 50–85% of MS include:

- ✿ EU – Lack of quality standards for input materials (T)
- ✿ EU – Environmental and/or agricultural policies and management protocols lack synergies (T)
- ✿ National – Competition between recycling of and energy recovery from bio-waste (T)
- ✿ National – Regulatory uncertainty or modifications lead to highly variable systems (C & T)
- ✿ Regional – Administrative and bureaucratic barriers to implement / improve the treatment units (T)

3.2 Economic Barriers

Economic barriers are those that disrupt the conduits of capital and finances both between and within government levels, institutions, and non-governmental organizations. Considering the investments and operational costs needed to implement/update waste management procedures and make bio-waste management durable for municipalities, reducing the impact of economic barriers is crucial. Economic instruments must be aligned to motivate levels of governance and citizens.

Four economic barriers were detected in 85–100% of surveyed MS.

Table 2. Analysis and categorisations of high frequency economic barriers

	Analysis
Insufficient resources/finances National – C & T	Although EU funds (such as NextGeneration Funds) may be applied to bio-waste collection and treatment systems, low managerial capacity or other priorities may affect their application. These constraints can also be found on the regional and municipal levels, especially where EU funds are not utilized.

Analysis	
	<p>In the case of limited resources/finances, politicians and public administrators are not motivated to increase fees to institute updates or modifications to bio-waste management.</p> <p>Disposal taxes are another mechanism to balance costs in favor of bio-waste management. If the tax is earmarked (e.g. refund to municipalities according to their results), bio-waste management is more economically viable. Many countries have disposal taxes on incinerators and landfills, but often they are insufficient at motivating high performance bio-waste schemes.</p>
<p>No market or insufficient market incentive for compost, digestate, or biogas</p> <p>National - U</p>	<p>Proper incentives in the form of taxes for competitive products and subsidies should be implemented to support the use of the outputs of the bio-waste recycling process. A stable market for outputs would defray bio-waste operational costs and incentivise the outputs' quality improvements. Farmers and agricultural producers must be included in this strategy to synchronise fertiliser demand and supply. Regions with high-quality soils where there is no demand for fertilisers must devise alternative strategies for the uses of compost and digestate.</p> <p>Given the increasing cost of chemical fertilisers, the need for soil amelioration and for renewable energy production, it is likely that the output will increase in demand. Under these circumstances, so long as quality and quantity levels are achieved, a market for these commodities could rebalance the finances, thereby promoting effective management on all steps of the bio-waste cycle.</p>
<p>Lack of financial incentive for local authorities to separately collect bio-waste</p> <p>Regional - C</p>	<p>The overhead and operational costs deter local authorities from adopting measures needed to implement durable and high-performance bio-waste separate collection scheme, public outreach, and treatment. Without the elements discussed below in "Insufficient resources/finances", local governments are unlikely to prioritize bio-waste management.</p>
<p>Lack of financial incentives for the citizen (PAYT, discounts, etc.)</p> <p>Municipal - C</p>	<p>Since the separation of bio-waste is often perceived as a habit change in households, economic incentives or penalties are one instrument to onboard the public and ensure their ongoing participation.</p>

Additional surveyed economic barriers detected in 55-85% of MS include:

- ✿ National - Improper/lack of guidance on use of EU funds and taxonomy (C)
- ✿ National - Low costs of landfilling or low/lack of taxes (T)
- ✿ National - Low costs of incineration or low/lack of taxes (T)
- ✿ Regional - Lack or uncertainties regarding financing/subsidies for treatment (T)
- ✿ Municipal - Bio-waste collection is more expensive than residual waste (C)
- ✿ Municipal - Lack of resources to build or outfit waste treatment facilities for bio-waste (T)

3.3 Organizational Barriers

Organizational capacity speaks to the strength of institutions in carrying out policy and implementing effective solutions in bio-waste management. This requires collective activity to assemble fitting structures equipped with skilled personnel, politicians and public officials, processes, and practices that lead to well-functioning bio-waste systems. Central to these efforts are the institutions' capacities to interact transversally and onboard the public through communications and public education.

Five organizational barriers were detected in 85–100% of surveyed MS.

Table 3. Analysis and categorisations of high frequency organizational barriers

Analysis	
<p>Poor institutional organization and limited capacity to implement legislation</p> <p>National - C & T</p>	<p>To overcome this organizational barrier requires concerted interaction across institutions and stakeholders. The success of organizational strategies depends on the mobilization of waste policy into comprehensive operational processes, both durable and extensively applied. Efficient institutional structures, skilled human resources, and management oversight are necessary.</p> <p>A bottleneck present in the FPR is the conformity assessment procedure for waste-derived input materials such as compost and digestate, which requires the external control carried out by an accredited notified body of the quality assurance scheme set up by the producer. While a third-party assessment is in principle a correct requirement, at the moment no notified body is dealing with bio-waste derived fertilising products, and existing quality assurance organizations (QAOs) for compost and digestate are excluded from accreditation at EU level under the FPR, adding a further layer of administrative burden. Allowing these QAOs to assess the conformity of compost and digestate would bring many benefits.</p> <p>Well-established national and pan-European quality assurance schemes have proven to be effective and should be further considered in EU policy concerning bio-waste.</p>
<p>Lack of or inefficient penalties for non-compliance</p> <p>National - C</p>	<p>Enforcement is a key instrument to advance the quality and quantity of bio-waste collected and output produced. Penalties should be timely, appropriate, and effective. In order to homogenize performance and reach objectives, in the case of non-compliance, credible authorities must distribute penalties that stimulate progress on bio-waste management.</p>
<p>Lack of interest/support from decision-makers/elected representatives</p> <p>National - C & T</p>	<p>The role of politicians and elected officials has gone under recognized in pre-existing studies. When bio-waste management is subjected to the whims of politicians and election cycles, it will only progress if it is politically advantageous. Electoral cycles affect the implementation of or modifications to the bio-waste system. In general terms, bio-waste is not a popular issue for the public or politicians, though at times it is used as a political pawn.</p>



Analysis

Lack of economic scale efficiency schemes to develop cooperative management

Regional – C & T

For heightened efficiency, adjacent municipalities or regions may enter into agreements about shared bio-waste collection services or treatment facilities under economic scale efficiency models. However, this necessitates levels of inter-governmental and inter-organizational interaction that some surveyed MS have identified as scarce. These complex agreements between political parties and entities impact the willingness to enter or manage cooperative management schemes.

Lack of effective communication/educational campaigns

Municipal – C

Across all categorisations, as detected in all surveyed MS, one of the most crucial barriers is the lack of effective communication/educational campaigns since the public is a key actor in bio-waste management systems. For the development and economic solvency of bio-waste management, high levels of participation are a requisite. In general, initial campaigns are not sufficient. There is a lack continuous outreach services and a lack of financing for them. To maintain levels of participation requires advanced methodology to communicate and understand behavior.

Successful educational activities reach and convince the public are often bolstered by legal mandates and economic instruments to motivate and maintain participation. Public communications and social media have a crucial role in providing information and guiding public opinion. Under optimal circumstances, this reduces the societal stigmatisation of waste management.

Farmers, agricultural producers and landscapers are key stakeholders to close the cycle of bio-waste. Therefore, communication efforts should focus on their understanding of the positive benefits of compost/digestate and their willingness to buy or use them. To that end, awareness activities must nudge the public to participate and provide information about proper participation habits that lead to low impurity and contamination levels.

Additional surveyed organizational barriers detected in 50–85% of MS include:

- ✿ Regional – Institutions lack clarity regarding mandatory separate collection (C)
- ✿ Regional – Limited or lack of infrastructure for collection and treatment (C & T)
- ✿ Regional – Lack of synchronisation across public and private entities in charge (C & T)

3.4 Technical Barriers

Local authorities apply technical instruments to facilitate the system design, public participation, collection, monitoring, material transportation, transfer to treatment facilities, treatment, etc. Technical instruments and technological innovations depend on the municipality's financial capacity to utilize or update available infrastructure and equipment.

As a specific bottleneck both technical and organizational, the treatment capacity of many MS does not account for future increases in bio-waste flows. Without adequate treatment capacity, they are not ready to implement or increase bio-waste collection.

Table 4. Analysis and categorisations of high frequency technical barriers

Analysis	
<p>Insufficient data monitoring systems to track implementation, performance and evolution</p> <p>National - C & T</p>	<p>Data tracking mechanisms function as progress and performance reports. The lack of detailed and up-to-date information to monitor the objective achievements obstructs the planning or improvements of the system.</p> <p>On the local level, user participation indicators are necessary for authorities to evaluate and improve collection and enforcement. The information about the service and results, too, helps the public to evaluate the service provider.</p> <p>The storage, transmission, and homogenous management of data (especially municipal data) is linked to organizational barriers. Without integrated inter-institutional liaising on upper levels of management, the system's performance and evolution may not be properly controlled.</p>
<p>Inadequate appraisal of local circumstance in system set-up</p> <p>Municipal - C & T</p>	<p>Municipalities are diverse in topography, land use, population density, institutional capacity, economy, priorities, cultural disposition, bio-waste producers, etc. There is, therefore, no one-size-fits-all technical solution and accompanying instruments.</p>
<p>Inconveniently instituted separate collection system</p> <p>Municipal - C</p>	<p>Technical instruments and collection/treatment models must be tailored to the local necessities to maximize the quality and quantity of managed bio-waste. Authorities must exercise caution when copying and pasting models and should consider validated best practices.</p>
<p>Lack of materials provided for proper at-home separation</p> <p>Municipal - C</p>	<p>Given the domestic habit change necessary and the need for user-friendliness, systems set-up and implementation must include guidance and materials for at-home separation such as vented kitchen caddies, decals, compostable bags, or curbside collection bins. The distribution of these materials is a key outreach activity that should be aimed at increasing public participation to the extent possible. The best moment to do this is during the installation of the collection model, and at-home materials should be updated and redistributed as needed.</p>

Analysis

Lack of technical know-how

National - C & T

Lack of guidance or technical support for bio-waste management

National - C

These two interrelated barriers signify that, in some cases, technicians and the waste industry do not have a comprehensive and wide-reaching understanding of bio-waste management especially in territories in which zero waste practices are not widely implemented.

Technicians must have the skillset necessary to evaluate a service area's needs, recommend appropriate collection models and oversee their implementation, assess best treatment processes, assist in the coordination of outreach activities, track/monitor participation and progress towards objectives, etc. Guidelines from upper-level authorities such as the EU are important at disseminating know-how and ensure the installed systems are the most efficient possible.

Collection models don't account for contamination reduction/quality assurance

Municipal - C

Absence of monitoring of quality for collected bio-waste

Municipal - C

Technicians must ensure that collection systems are capable of handling maximum quantities in ways that do not forfeit quality. Moreover, collection models should be equipped with quality monitoring and assurance mechanisms that will lead to the reduction of contamination, such as the DtD collection model that includes the inspection of collected material. General communications and direct messaging to bio-waste producers are important strategies to reduce impurities.

In general, as seen in the interviews, there is a lack of detailed information about quality and its evolution. Periodic waste characterizations should be enacted to assess collected materials entering the recycling process. Other complementary mechanisms like economic incentives and penalisations can incentivise bio-waste managers to reduce impurities.

Additional surveyed technical barriers detected in 50–85% of MS include:

- ✿ National - Waste industry lacks required skills and competencies (C & T)
- ✿ Regional - Lack of or low geographical coverage of the separate collection system (C)
- ✿ Municipal - Limited collection monitoring information for application of corrective actions (C)
- ✿ Municipal - High population density challenges for collection systems (C)

3.5 Conclusion & Recommendations

Advancements in the sector must be led by the European Commission and will require cross-examining modalities and the inclusion of multi-disciplinary expertise. Waste management necessitates concerted coordination across MS in legal, environmental, political, fiscal, organizational, technical, and communication areas. This report's findings suggest that a multitude of barriers plague the European institutions and stakeholders struggling to meet the EU mandate for separate collection of bio-waste and the landfill and recycling targets, thereby precluding the closure of the bio-waste cycle.

The core lines of action to improve quantity and quality of bio-waste managed include:

- Close the gaps in and advance the regulatory framework,
- Promote and align economic incentives and funding,
- Extend the network of expert stakeholders across all levels of governance,
- Improve technical know-how and validation of BPs,
- Increase communications, public education and awareness,
- Implement efficient and individualised models (that identifies the user and allows controls of the collected material) and monitor performance.

LIFE BIOBEST proposes the following calls to action.¹ Signaled with orange are the priority actions considered as the first measures that must be taken.

¹ The full report includes bolded primary and complementary categorisations. Here, only primary categorisations have been included.

Table 5. Legal/Administrative Recommendations (L.1 – L.9)

L.1	Cascade national recycling targets down to the municipal level with responsibility for waste collection systems and ensure that there are consequences for municipalities that fail to meet targets. National laws state the transfer of the EU objective to regions, thereby giving the capacity to regions to decide how to transfer the objective to the local level.	C & T
L.2	Set binding mechanisms based in continuous and effective monitoring as well as appropriate and timely penalties for non-compliant institutions. Define sanctions for MS and regions that fail to mandate and monitor separate collection as well as for local entities that fail to achieve general recycling targets or bio-waste recycling target ² .	C & T
L.3	Policy measures must include bio-waste benchmarks and targets for separate collection, quality for bio-waste collected (impurities), and for quantity of bio-waste in residual waste (maximum amount per inhabitant) to control the quantity not diverted. Treat the new regulations on bio-waste as reglementary mandates that are directly adopted once the EU norm is approved. <i>For quality targets refer to the forthcoming quality standards information in LIFE BIOBEST Deliverable 5.4.</i>	C & Q
L.4	Create a follow up mechanism in line with Article 10 (6) of the WFD: "By 31 December 2021, Member States shall submit a report to the Commission on the implementation of this Article as regards bio-waste, including on the material and territorial coverage of separate collection and any derogations under paragraph 3." Set check points for monitoring and comprehensive indicators (<i>refer to ;Error! No se encuentra el origen de la referencia. and KPIs included in LIFE BIOBEST Deliverable 2.1 Improved and Homogenized Datasets</i>).	C & T
L.5	Define standards for bio-waste entering facilities mentioned in Article 22 of the WFD and cascade to municipal level. <i>Forthcoming quality standards information in LIFE BIOBEST Deliverable 5.4.</i>	C & Q
L.6	Resolve conflict at EU level between the FPR and ABPR on the end point in the manufacturing chain by allowing alternative transformation parameters for the composting and AD of bio-waste containing ABPR which better reflect current practices ³ . <i>Forthcoming related guidelines in Deliverable 3.3.</i>	C & T
L.7	Include the obligation in the national/regional waste laws to update local norms based on the national/regional laws.	C & T
L.8	Introduce obligation for producers to separate bio-waste in the national/regional waste laws and transpose it into local norms.	C
L.9	Include penalties that accompany inspections for non-compliant producers at local level.	C & Q

² When the collected flows enter central facilities, estimations of municipal recycling level should be calculated based on the individual input flows and the efficiency of the process.

³ This proposal references food-waste catering ABP (category 3) managed in the framework of municipal bio-waste.

Table 6. Organizational Recommendations (O.1 – O.14)

O.1	Create or improve strategic bio-waste implementation plans accompanied by sound financial strategies in order to streamline and homogenize performance. The plans must integrate BP and technical recommendations as well as include a subsection about facilities.	All
O.2	Ensure that planned or existing treatment infrastructure match generation and capture, guaranteeing the proximity principle . Evaluate and align the current capacity in both private and public facilities with long term planning to meet increasing capacity. Consider the adaptation of MBT facilities to treat separated bio-waste.	T
O.3	Promote shared bio-waste collection services or treatment facilities under economic scale efficiency models , especially among small municipalities.	All
O.4	Promote R&D for the introduction and improvement of quality control methods of bio-waste entering facilities or delivered to the collection services.	All
O.5	Promote studies on compost/digestate quality , application methods and benefits to soil, as to facilitate the use of these outputs.	Q & O
O.6	Provide validated guidelines and best practices endorsed by upper-level authorities such as the EU are important for disseminating know-how and ensuring the installed systems are the most efficient possible. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.1.</i>	All
O.7	Create inter-governmental bodies dedicated to the coordination of bio-waste management across MS regions. The bodies would serve as points of contact to transfer information and coordinate vertically and horizontally.	All
O.8	Creation of a stakeholders' working group on EU level that is focused on bio-waste or include a bio-waste working group in the Circular Economy Stakeholder Platform with activities including the organization of regular conferences on the topic.	All
O.9	Incorporate training and empowerment courses for politicians and other key stakeholders . Promote actions and awareness at local or regional level to avoid partisan interference in the legal application and compliance. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.2.</i>	All
O.10	Promote trainings to equip technicians with skillset necessary to evaluate a service area's needs, recommend appropriate collection models and oversee their implementation, assess best treatment processes, track/monitor participation and progress towards objectives, etc.	All
O.11	Promote awareness and training for agricultural producers to understand and apply compost and digestate on soil and farmland.	O
O.12	Clearly define roles, responsibilities and quantity/quality objectives in private waste sector contracts . The control and the monitoring should be developed by the public administration, and there must be mechanisms to update or modify contracts and apply penalties.	All
O.13	Promote accredited notified bodies of the quality assurance schemes dealing with bio-waste derived fertilising products and accredit at EU level under the FPR the existing quality assurance organization (QAO) for compost and digestate to assess the conformity.	T, O & Q
O.14	Increase financing for continuous outreach services , including effective initial outreach campaigns. Use advanced methodology to understand behavior and maintain levels of participation. Increase direct messaging to bio-waste producers to reduce impurities. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.4.</i>	C & Q

Table 7. Economic Recommendations (E.1 – E.11)

E.1	Re-evaluate the effectiveness of current MS disposal taxes on incinerators and landfills , increasing taxes to rebalance the economic viability of bio-waste management. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.2.</i>	C & T
E.2	Launch specific programme to promote private and public investment in new treatments facilities and to increase treatment capacity . This can be related to climate change mitigation actions.	T
E.3	Close the MS investment gap through the effective use of EU funds to develop waste infrastructure that supports improving bio-waste prevention and recycling performance.	C & T
E.4	Facilitate and standardize disbursement of EU funds for national, regional and municipal levels. The funds cover the human resources necessary for the distribution, implementation and justified usage of the funds.	All
E.5	Establish the specifications and destinations of the funds in terms of management model, eligible materials and accompanying activities. One of the main criteria should be the project's capacity to increase quality and quantity bio-waste recycling.	All
E.6	Improve EU taxonomy by removing unnecessary and burdensome technical criteria , which de-facto exclude bio-waste recovery through composting and AD from receiving support in the form of green investments.	T
E.7	Include measures or economic instruments in respective sectorial laws to enhance the marketability of biogas and compost/digestate , thereby bolstering the separate collection of bio-waste. Promote the final uses and the supply chain of the outputs.	O & Q
E.8	Align instruments related to energy and emissions (such as emissions trading permits, cap-and-trade models, and energy production taxes) with bio-waste management objectives.	T
E.9	Study the necessity and applicability of EPR for food products , and later the conditions and options for EPR schemes if utilized.	All
E.10	Include in national/regional waste laws the obligation for local authorities to apply waste charges that cover the total cost of waste management services including complementary activities such as communication and monitoring activities, landfill closure and monitoring, etc. The law could include a complementary obligation to institute PAYT or variable payment schemes based on participation. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.2.</i>	C & T
E.11	Promote the application of variable fees based on the input quality for biological treatment facilities. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.2.</i>	All

Table 8. Technical Recommendations (T.1 – T.11)

T.1	Promote effective and individualised collection models (mainly DtD collection schemes) in laws and implementation plans. <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.1.</i>	C
T.2	Promote commercial separate collection by applying individualised models with good quality and quantity results. Monitor the performance and destination of the activities using private bio-waste collection services to ensure good practices applications and law compliance.	C & Q
T.3	Investigate and validate best practices for multi-housing apartment buildings . <i>Forthcoming related guidelines in LIFE BIOBEST Deliverable 3.1.</i>	C
T.4	Provide guidance and materials for at-home separation such as vented kitchen caddies, decals, compostable bags, or curbside collection bins.	C & Q
T.5	Establish a monitoring system with set parameters (KPIs) and update frequencies . Obligate local entities and operators to monitor and report their data on separate collection and treatment including managed quantities and quality of the flows as well as destination of the outputs. Include the mandate to control the quality at the service delivery point as a strategy to minimize impurities at the source.	All
T.6	Consider home, community, and small-scale composting facilities as a low tech and low-cost solution, especially in low density areas and dispersed population areas, when the model is appropriate.	All
T.7	Standardize management protocols and data monitoring to ensure proper functioning and tracking of home composting ⁴ .	T
T.8	Develop periodic standardised characterisation for residual waste in order to monitor the flow of bio-waste not diverted and landfill directive compliance.	C & Q
T.9	Mandate and increase periodic bio-waste characterisation at entrance to bio-waste facilities . Composition studies should be applied to the different collection routes. <i>Forthcoming quality standards information in LIFE BIOBEST Deliverable 5.4 and guidelines in Deliverable 3.3.</i>	C & Q
T.10	Certify the quality of the input, recycling process and resulting compost/digestate . Develop mandatory, EU-level EoW criteria for waste categories falling under the FPR and revise existing transformation parameters to better reflect optimal bio-waste treatment conditions, thereby reducing intra-EU fragmentation. Create level playing field and increase cross-border market opportunities. <i>Forthcoming quality standards information in LIFE BIOBEST Deliverable 5.4 and guidelines in Deliverable 3.3.</i>	T, O & Q
T.11	Collaborate with private companies managing anaerobic digestion facilities to ensure the quality control of inputs and outputs to effectively return the organic matter to soil.	T & Q

⁴ This proposal should be applied to individual composting of households, HoReCa establishments with composting system and community composting points.

As a final note, the following LIFE BIOBEST outputs expected in 2024 will provide further insight on separate collection, governance and economic incentives, quality standards, and communication strategies:

- Guideline on separate collection (D3.1 led by CIC),
- Guideline on governance and economic incentives (D3.2 led by ENT),
- Guideline to promote quality compost and digestate (D3.3 led by ECN),
- Guideline on communication strategies (D3.4 led by ZWE) and
- Proposal for EU standards for bio-waste entering recycling processes for high-quality compost and digestate (D5.4 led by ECN).

4 References

References listed are those that appear in LIFE BIOBEST D5.2 Policy Brief:

Centemero, M., Bizzoni, F. and Ciotti, A. (2020) 'Webinar. Studio CIC-Corepla 2019-2020 - Plastiche e bioplastiche nella filiera del riciclo organico'. Consorzio Italiano Compostatori.

Commission of the European Communities (2005) *On the National Strategies for the Reduction of Biodegradable Waste Going to Landfills Pursuant to Article 5(1) of Directive 1999/31/EC on the Landfill of Waste.*

Directive (EU) 2018/850 (2018) *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., Official Journal of the European Union. Official Journal of the European Union. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018L0850> (accessed on 8 February 2020).*

Dubois, M. et al. (2020) *Guidance for separate collection of municipal waste.* Available at: <https://doi.org/10.2779/691513>.

European Commission (2018) *Report on the implementation of EU waste legislation, including the early warning report for Member States at risk of missing the 2020 preparation for re-use/recycling target on municipal waste.*

European Commission (2022) *Environmental Implementation Review 2022 Country Report - Estonia - Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.* Available at: <http://europa.eu>.

European Commission (2023) *Report from the Commission identifying Member States at risk of not meeting the 2025 preparing for re-use and recycling target for municipal waste, the 2025 recycling target for packaging waste and the 2035 municipal waste landfilling reduction target.* Available at: https://environment.ec.europa.eu/publications/waste-early-warning-report_en (Accessed: 15 June 2023).

European Compost Network (2018) *ECN Factsheet: State of Play of EU Waste Legislation Proposals.* Available at: https://www.compostnetwork.info/download/180306_ecn-factsheet-wfd/ (Accessed: 12 December 2023).

European Environment Agency (2022) *Diversion of waste from landfill in Europe, European Environmental Agency.* Available at: <https://www.eea.europa.eu/ims/diversion-of-waste-from-landfill> (Accessed: 22 May 2023).

European Environment Agency (2023) *Economic instruments and separate collection systems – key strategies to increase recycling, 2023.*

Eurostat (2023) *Guidance for the compilation and reporting of data on municipal waste according to Commission Implementing Decisions 2019/1004/EC and 2019/1885/EC, and the Joint Questionnaire of Eurostat and OECD.* Available at: <https://ec.europa.eu/eurostat/documents/342366/351811/Guidance+on+municipal+waste+data+collection/> (Accessed: 8 January 2024).

Favoino, E. and Giavini, M. (2022) *Unwrapping the biowaste potential: Operational, environmental and economic benefits of reducing plastic pollution in biowaste, compost and digestate in the EU.*

Favoino, R. and Giavini, M. (2020) *Bio-waste generation in the EU: Current capture levels and future potential.* Available at: https://zerowasteurope.eu/wp-content/uploads/2020/07/2020_07_06_bic_zwe_report_bio_waste.pdf (Accessed: 20 January 2022).

Gilbert, J. and Ricci-Jürgensen, M. (2023) *A Practitioner's Guide to Preventing and Managing Contaminants in Organic Waste Recycling*. Available at: https://www.iswa.org/wp-content/uploads/2023/11/14803_ISWA-Contaminants-Report-2023_60pp_v8-DIGITAL.pdf?v=04c19fale772 (Accessed: 8 January 2024).

Gilbert, J. and Siebert, S. (2022) *ECN DATA REPORT 2022 COMPOST AND DIGESTATE FOR A CIRCULAR BIOECONOMY*.

Hogg, D. et al. (2018) *Study to Identify Member States at Risk of Non-Compliance with the 2020 Target of the Waste Framework Directive and to Follow-up Phase 1 and 2 of the Compliance Promotion Exercise. Final Report*. Bristol: Eunomia for the European Commission. Available at: www.eunomia.co.uk.

Institute for Local Self-Reliance (2017) *'Food Waste Hierarchy'*.

Kardung, M. et al. (2021) *'Development of the circular bioeconomy: Drivers and indicators'*, *Sustainability (Switzerland)*, 13(1), pp. 1–24. Available at: <https://doi.org/10.3390/su13010413>.

van der Linden, A. and Reichel, A. (2020) *Bio-waste in Europe: Turning challenges into opportunities*. No 04/2020, EEA Report No 04/2020. No 04/2020. European Environment Agency. Available at: <https://www.eea.europa.eu/publications/bio-waste-in-europe>.

MAGRAMA (2013) *Gestión de biorresiduos de competencia municipal. Guía para la implementación de la recogida separada y tratamiento de la fracción orgánica*. Madrid. Available at: https://www.miteco.gob.es/es/calidad-y-evaluacion-ambiental/publicaciones/GUIA_MO_DEF_tcm30-185554.pdf.

Papineschi, J. et al. (2019) *Analysis of Nordic regulatory framework and its effect on waste prevention and recycling in the region*. Copenhagen: Nordic Council of Ministers (TemaNord). Available at: <https://doi.org/10.6027/TN2019-522>.

Puig-Ventosa, I. et al. (2013) *'Determining factors for the presence of impurities in selectively collected biowaste'*, *Waste Management & Research*, 31(5), pp. 510–517. Available at: <http://wmr.sagepub.com/content/early/2013/03/22/0734242X13482030.abstract> (Accessed: 6 January 2016).

Rodrigues, L.C. et al. (2020) *'The impact of improper materials in biowaste on the quality of compost'*, *Journal of Cleaner Production*, 251, p. 119601. Available at: <https://doi.org/10.1016/J.JCLEPRO.2019.119601>.

The European Parliament and the European Council and Directive 2008/98/EC (2008) *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain directives (Waste Framework Directive)*, *Official Journal of European Union*. Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:01:ES:HTML>.



Co-funded by
the European Union

LIFE BIOBEST is a project co-funded by the European Union

LIFE21-PRE-ES-LIFE BIOBEST – 101086420

www.lifebiobest.eu