

LIFE BIOBEST

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

D2.3: Assessment Matrix of Best Practices

WP2: Definition of bio-waste indicators and data analysis

T2.3: Statistical analysis of existing databases

NOVEMBER 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.

Document citation: Nohales, G. & Stinavage, M. (2024a). *LIFE BIOBEST D2.3 – Assessment Matrix of Best Practices*.

In-text citation: (Nohales & Stinavage, 2024a)





Table of Contents

1	Document attributes.....	3
1.1	Document Management Control Sheet.....	3
1.2	Document Revision History.....	4
1.3	Document Overview	5
1.4	Table of Acronyms.....	6
1.5	LIFE BIOBEST Project Summary.....	7
2	Introduction.....	8
3	Contextual factors	10
4	Linking barriers and recommendations	18
5	Theoretical cases	31
5.1	Visualising the scenarios	35
6	Assessment matrix.....	37
7	Conclusions	44
8	Annex 1: Assessment matrices for each scenario	46
8.1	Scenario 1 – Major city, tourism hub.....	46
8.2	Scenario 2 – Mid-size regional city	51
8.3	Scenario 3 – Small commuter city with outlying high-density areas.....	55
8.4	Scenario 4 – Touristic coastal town	59
8.5	Scenario 5 – Small urban conurbation with disperse households	63
8.6	Scenario 6 – Village with low density surroundings and dispersed housing.....	67
9	Index of tables.....	71

1 Document attributes

This report has been carried out under a contract awarded by the European Commission, contract number: LIFE21-PRE-ES-LIFE BIOBEST – 101086420. The content of this publication is the sole responsibility of the LIFE BIOBEST project.

1.1 Document Management Control Sheet

Table 1. Document Management Control Sheet

PROJECT NAME:	LIFE BIOBEST
Full Project Title:	Guiding the mainstreaming of best bio-waste recycling practices in Europe
Start Date of Project:	1 st January 2023
Duration:	30 months
Type of Document:	Report
Title:	D2.3 Assessment Matrix of Best Practices
Dissemination Level:	Deliverable – Public
Work Package & WP Leader:	WP2 Definition of bio-waste indicators and data analysis (CIC)
Task & Task Leader:	T.2.3 Statistical analysis of existing databases (ENT)
Related Deliverables:	D2.1 & D2.2
Related Milestones:	MS4 & MS5
Lead Authors:	ENT – Gemma Nohales and Mike Stinavage
Other Authors Involved:	--
Peer Reviewers:	ECN – Steffen Walk, Stefanie Siebert ACR+ – Jean-Benoit Bel
Due Submission Date:	M20
File Version Date:	22 November 2024
Approval Date:	15 November 2024

Participant Portal Upload Date:	22 November 2024
Status:	Submitted
File Name:	241122_WP2_D2.3_AssessmentMatrix_Submitted
File Location:	P-22-04 PLP BIOBEST > BIOBEST Shared documents > WP2>T2.3>D2.3 (internal copy) Participant Portal (submitted copy)

1.2 Document Revision History

Table 2. Document Revision History

Version Number	Date	Version	Short Description of the Changes	Editor
0.1	06/06/24	1 st Draft	Document created as 1 st version	ENT – Mike Stinavage
0.2	21/06/24	2 nd Draft	Document created as 2 nd version	ENT – Mike Stinavage, Gemma Nohales
0.3	16/10/24	3 rd Draft	Document created as 3 rd version to be distributed	ENT – Mike Stinavage, Gemma Nohales
0.4	31/10/24	4 th Draft	Peer reviewers' contributions in track changes	ACR+ and ECN
0.5	12/11/24	5 th Draft	Revision to include peer reviewers' contributions and Linguistic and format revision	ENT – Mike Stinavage, Gemma Nohales
0.6	15/11/24	Definitive/ Approved	Definitive and approved version to be submitted	ENT – Mike Stinavage, Gemma Nohales
0.7	22/11/24	Submitted	Submitted to Participant Portal in PDF	ENT – Gemma Nohales

1.3 Document Overview

The **LIFE BIOBEST D2.3 Assessment Matrix of Best Practices** evaluates contextual factors that affect bio-waste management. The schematisation of technical and contextual constraints is a necessary step towards adaptation or mitigation measures that increase the efficiency of bio-waste collection and treatment systems.

Six diverse yet frequently occurring municipal scenarios are provided as a starting point for standardised comparison. Stakeholders can compare their contexts to the scenarios provided. The real-life circumstances and conditions of each jurisdiction may differ. The final chapters of this report link frequently detected barriers to recommendations and priority actions. Lastly, the assessment matrix consolidates the contextual factors alongside the recommendations and scenarios, which is further detailed based on theoretical scenario in **Annex 1: Assessment matrices for each scenario** (section [8](#)).

The goal is to provide local, regional and national authorities a roadmap for understanding the needs and adaptations related to these contexts and factors so that the final management design can be more applicable and efficient.

1.4 Table of Acronyms

Table 3. Table of Acronyms

Acronym	Term
AD	Anaerobic digestion
BP	Best practice
com.	Commercial
D	Deliverable
DtD	Door-to-door
EC	European Commission
EoW	End of Waste
EU	European Union
EWR	Early warning report(s)
GW	Garden waste
Ho.Re.Ca.	Hotels, restaurants and cafeterias
Inhab.	inhabitant
KPI	Key performance Indicator
km	kilometre
KW	Kitchen waste
LD	Landfill Directive
MS	Member State(s)
n.d.	No data
res.	Residential
RW	Residual waste
yr	year

1.5 LIFE BIOBEST Project Summary

EU obligations on the selective collection of bio-waste came 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. In a policy brief about barriers and 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.

Four guidelines and 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, beneficial 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 rejects 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 Introduction

Unique municipal and regional contexts shape bio-waste management solutions since the design of the collection and treatment systems must be adapted to or aligned with contextual factors such as geography, topography, urbanism, and socio-economic conditions.

The **LIFE BIOBEST D2.3 Assessment Matrix of Best Practices** evaluates these factors in order to provide local, regional and national authorities a roadmap for understanding the needs and adaptations related to these contextual factors. The design of the final management system may then be more applicable and efficient.

The goal is to provide a foundational checklist that authorities can use when designing or improving their bio-waste management scheme for their own specific context. To this end, this report schematises contextual constraints as a means to apply adaptation or mitigation measures that increase the efficiency of bio-waste collection and treatment schemes and the users' participation. Six diverse yet frequently occurring municipal scenarios are provided as a starting point to assess the contextual factors. Stakeholders can compare their contexts to the scenarios provided to choose the most appropriate recommendations.

In **LIFE BIOBEST D2.3 Assessment Matrix of Best Practices**, stakeholders and authorities can find:

- Contextual factors affecting bio-waste management (section [3](#)),
- Barriers frequently affecting the bio-waste management and possible scenarios alongside recommendations (section [4](#)),
- Six theoretical municipal scenarios that serve as a basis of cross-comparison with one's own case. The related contextual factors linked to each scenario are ranked from low to very high impact (section [5](#)),
- An assessment matrix that consolidates the recommendations for each contextual factors, linking them to the theoretical scenarios (section [6](#)) and
- Detailed scenario-by-scenario matrices in **Annex 1: Assessment matrices for each scenario** (section [8](#)).

This report is connected to the LIFE BIOBEST events where the scenarios were generated in the framework of working groups. In October 2023 and March 2024, the diverse municipal contexts were discussed by European frontrunners and event participants in [Barcelona, Spain](#) and [Lyon, France](#).



The documents listed below serve as launching points for this report and references for more information.

- [**LIFE BIOBEST D2.2**](#) **Statistical analysis regarding bio-waste collection data in relation to socio-economic parameters,**
- [**LIFE BIOBEST D3.1**](#) **Guideline on separate collection,**
- [**LIFE BIOBEST D3.2**](#) **Guideline on governance and economic incentives,**
- [**LIFE BIOBEST D3.3**](#) **Guideline on quality compost and digestate,**
- [**LIFE BIOBEST D3.4**](#) **Factsheets on the analysis of best practices in communication and engagement from various countries and**
- [**LIFE BIOBEST D5.2**](#) **Policy brief.**

3 Contextual factors

A jurisdiction's bio-waste management system depends on a variety of contextual factors. Due to the uniqueness of each municipality or local entity, bio-waste systems must be comprehensively designed and implemented based on the real puzzle of the contextual factors.

Table 4 categorizes common contextual factors (based on geographic, demographic, economic, zoologic, technical, organizational), provides detailed explanation of each and includes the intersection with other factors. The final columns contain the summary of the Catalonian and Italian panel data analysis results from [LIFE BIOBEST D2.2 Statistical analysis regarding bio-waste collection data in relation to socio-economic parameters](#) regarding kitchen waste collection results. For information about the interpretation of the results, please see the key below the table.

Table 4. Contextual factors categorized and explained

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
Terrain, road conditions & public space	Geographic	<p>Terrain and topography impact bio-waste collection service and routes configuration. The presence of mountains and hills requires carefully planned routes as well as adequate equipment to navigate steep uphill, downhill, unpaved, narrow or one-way roads.</p> <p>Topographic elements such as mountains, islands, forests, dunes, and rivers may elongate waste collection routes and complicated traffic circulation, especially in the case of large waste collection vehicles, and require adapted vehicles. In the case of waste management on islands, maritime transport may be necessary.</p> <p>Cold, snowy or icy winter conditions impact roads and traffic circulation, especially in mountainous areas. Proper measures must be taken to ensures safety and timely service provision.</p>	Climate, Population density, Urban dispersion	n.d.	n.d.

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
		<p>Mountainous and hilly localities may also have difficulty securing flat and conveniently located parcels of land for waste transfer stations and bio-waste treatment facilities. These areas may have difficulty transporting feedstock and centralising waste treatment, especially large facilities.</p> <p>To avoid traffic congestion typical of daytime and rush hours, nighttime collection in urban areas may be faster and more efficient, though should consider possible noise pollution. In sprawling urban areas, collection routes must be designed in conjunction with traffic circulation limitations and ever-changing commercial activities.</p> <p>In urban and densely populated areas, generally there is limited public space on streets or sidewalks to house waste containers. The condition and widths of sidewalks also impact the service of DtD caddies, bins or bags, and waste collection services. Scheme must prioritise collection points where trucks can collect without dangerous manoeuvres that jeopardize vulnerable users like pedestrians or cyclists.</p> <p>Cultural heritage centres with narrow, one-way and dead-end streets make access more challenging, with the added factor of very concentrated bio-waste production with lots of commercial activities and tourism.</p>			
Climate	Geographic	<p>Extreme climates (both hot and cold) impact the collection scheme, collection frequencies and treatment processes.</p> <p>Heat, especially over long periods, speeds up the decomposition of bio-waste and leads to bothersome odours and leachates. This</p>	Terrain, road conditions & public space,	n.d.	n.d.

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
		<p>necessitates increased collection frequencies and the use of proper at-source separate collection materials. Odours are liable to attract wildlife, especially insects and scavengers.</p> <p>Colder conditions may lead to the bio-waste material freezing to the collection containers and bins, which presents difficulties at the time of collection and subsequent treatment processes. Lower temperatures slow the micro and macrobiotic process of bio-waste decomposition via home composting. In the case of biogas production, more external heat is required to keep the reactors at temperature, which reduces the energetic benefits.</p> <p>The selection and design of the treatment facilities should be adapted based on the climate conditions, prioritising indoor composting processes or anaerobic digestion schemes.</p>	Wildlife & pests		
Population density	Demographic	<p>Population density impacts collection capacity and frequency, equipment, and routes since increases in population lead to more waste to manage. Dense cities necessitate advanced solutions to involve waste generators. In population dense areas, more kitchen waste is generated (especially if the commercial and tourism level are included) and the service must be designed to capture the total delivered amounts.</p> <p>High-rise apartment buildings present a unique difficulty, especially if they are not designed with specific spaces like rooms, shoots, or closets to deliver and store waste within DtD collection schemes. It is generally more challenging to track individual contributions (especially when collection equipment is shared by the different apartments). Additional instruments (see LIFE BIOBEST D3.1 & D3.4</p>	Urban dispersion, Type of producer	(-) Negative relationship with low impact D2.2 Variable name: Population density	n.d.

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
		<p>Guidelines) and continuous outreach campaigns must be implemented due to the complexity triggered by a robust population.</p> <p>Within bring collection schemes, the type, capacity of containers, and walking distance to the delivery points should adapted to the production of the fraction, considering large capacity receptacles and mechanised collection vehicles.</p>			
Urban dispersion	Demographic	<p>Collection routes that service isolated or disperse housing or commercial activities (rural hotels, restaurants, ski resorts, etc.) must be strategically designed to be time and resource efficient, which may be accomplished by using bi-compartmented vehicles, reducing the collection frequency or locating containers at centralised delivery points, etc.</p> <p>In areas with high levels of population dispersion (this typically coincides with very low population density and isolated producers), alternative bio-waste solutions such as home composting are the most efficient option (see LIFE BIOBEST D3.1 Guideline).</p>	Terrain, road conditions & public space, Type of producer	n.d.	(-) Negative relationship with low impact D2.2 Variable name: Population (municipalities w/ ≤5,000 inhab.)*
Income inequality	Economic & demographic	<p>The income inequality of an area and its residents may influence the economic and other resources available that can be devoted to bio-waste management services.</p> <p>Populations experiencing economic hardship may require additional instruments and accompanying tools to promote their proper participation in the source separation.</p>	Type of producer	(++) Positive relationship with medium impact D2.2 Variable name: Average net income per person	n.d.
Tourism level	Demographic	Year-round or seasonal influxes of tourism lead to increased bio-waste feedstock, in some cases, for specific months/seasons. Collection and treatment schemes must be designed to handle the	Climate	(---)	(++)

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
		<p>complexities associated with visitors' participation, fluctuations and the maximum and minimum quantities of bio-waste. In the case of collection, additional services should be provided in the peak periods.</p> <p>Tourists and temporary residents are likely to be unaware of local separation at source and collection protocols and services. Targeted awareness campaigns in key languages based on tourism trends are necessary to avoid contamination of the bio-waste stream with other waste materials and to increase capture levels.</p> <p>Commercial activities related to tourism also must be provided with the materials and services to increase separate collection.</p>		Negative relationship with high impact D2.2 Variable name: Total accommodation establishments per 1,000 inhab.***	Positive relationship with medium impact D2.2 Variable name: Total accommodation establishments per 1,000 inhab.***
Wildlife & pests	Zoologic & technical	<p>The presence of wildlife can condition the type or dynamics of the waste set outs and the collection system. It can also thwart participation. In extreme cases, wildlife presents public health concerns or a potential danger to the public.</p> <p>While small animals (such as insects, birds, mice and rats) may present minimal difficulties to collection and treatment systems, measures must be taken to prevent their proliferation.</p> <p>When animals such as raccoons, bears and other large scavengers are present, collection bins and treatment facilities must be designed accordingly. Properly located, sealed or locked bins reduce animals' ability to disturb the bins or disrupt the service. Community composting areas or large treatment facilities should be sufficiently fenced (in order to deter land animals) and covered (to deter birds).</p>	Climate	n.d.	n.d.
Resident foreign nationals	Demographic	In places with non-native residents, outreach campaigns must account for cultural and linguistic differences. Monitoring of the	Population density	n.d.	(-) Negative relationship with low impact

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
and non-resident populations		<p>collected bio-waste material must be paired with outreach and education to increase quality bio-waste at high quantities.</p> <p>Municipalities and neighbourhoods with university students are also a key target. It is not only a matter of the number of students, but also how frequently new ones arrive.</p>			D2.2 Variable name: Foreign population
Population with reduced mobility & diverse abilities	Demographic & technical	<p>Bio-waste management schemes must keep accessibility in mind. For neighbourhoods with high proportions of individuals with reduced mobility, adequate consideration must be paid to ensure accessibility.</p> <p>In areas with DtD collection schemes, sidewalks must be accessible by wheelchair, individuals with reduced mobility and those with reduced visibility. Containers must be accessible for blind, visually impaired individuals and elderly people.</p>	Population density	(++) Positive relationship with medium impact D2.2 Variable name: Average age of the population	(+) Positive relationship with low impact D2.2 Variable name: Average age
Type of producers	Organizational & technical	<p>Types of waste producers can be broadly grouped into residential/households, commercial producers (such as restaurants, canteens, hotels, schools and others) or urban areas themselves (i.e. green waste from public parks).</p> <p>Regarding the expected results in diversion and recycling of MSW, it is of utmost importance that collection schemes are addressed to households, which generally represent the largest group of kitchen waste producers in a municipality.</p> <p>To improve general performance, collection service for commercial producers should be considered within the municipal services, prioritising DtD, especially for large producers.</p>	Population density, Urban dispersion, Availability & proximity of waste facilities	n.d.	n.d.

Contextual factor	Categorisation	Explanation	Related to other factors	Catalonian results from D2.2 Statistical analysis**	Italian results from D2.2 Statistical analysis**
		In localities with high levels of green waste production from, for example, parks or detached houses, collection schemes must consider the seasonal influxes and bulkiness of the flow.			
Availability & proximity of waste facilities for bio-waste	Organizational	<p>The location of waste transfer stations as well as treatment facilities (compost, anaerobic digestion, or combination processes) depend on land use and permitting, and impact the cost effectiveness of the bio-waste management scheme.</p> <p>The type, size and location of the bio-waste recycling plants that are already available or planned to be built must correspond to the needs of the locality or region. Some types of facilities will have a limited acceptance of specific bio-waste categories such as garden waste (especially woody and bulky) or liquid food waste (as explained in LIFE BIOBEST D3.1 Guideline).</p> <p>Norms established in the Animal By-products Regulation should be considered since they condition the flows treated together and facilities.</p> <p>Additionally, the distance between the areas of collection and the location of the recycling plants should also be considered when designing a specific collection scheme for bio-waste. Transfers should also be included in the bio-waste scheme as a way to consolidate collected material and reduce traffic circulation from collection to treatment facilities.</p> <p>The sprawl and size of the urban area necessitate more extensive collection management. Given the development of the land, collected waste may need to be transported larger distances to reach the treatment facilities.</p>	Population density, Type of producer	n.d.	n.d.

**Key: "+" or "-"; "++" or "--" and "+++" or "---" indicate, respectively, a low, medium and high impact of the demographic and socio-economic independent variable on kitchen waste per capita collection. The positive sign, represented in different shades of green according to its intensity, indicates that the effect is produced in the same direction; that is, an increase in the independent variable implies an increase in per capita collection. The negative sign, representing shades of yellow-orange, indicates that an increase in the independent variable implies a decrease in per capita collection. Data panel analysis for 2010-2021.

***The opposing impacts in Catalonia and Italy may be explained by the more common bio-waste collection scheme applied: open containers (Catalonia) and DtD (Italy).

4 Linking barriers and recommendations

Bio-waste management can be affected by barriers and constraints with varying levels of impact. Barriers can be classified as primarily legal/administrative (L), economic (E), organizational (O) and technical (T), unequally affecting certain stages of the bio-waste cycle such as collection (C), treatment (T) and use of outputs (U).

To reach the optimal management scenarios, the local (L), regional (R), national (MS) or European Union (EU) level must apply certain measures or strategies based on their circumstance and future projections. Recommendations and priority actions can be generally classified by their connectedness to particular levels of government.

The following tables provide barriers alongside the key actions required to minimise or overcome them. The objective is to facilitate strategic decision-making when selecting instruments and designing, implementing and operating bio-waste management schemes. The following barriers and recommendations are taken from [LIFE BIOBEST D5.2 Policy brief](#) (included are primary barriers based on the results of the policy brief analysis. Refer to the full report for additional barriers).

Barriers and corresponding recommendations are placed side by side for readability and to demonstrate the linkages and interrelation between them. Some barriers pertain to more than one recommendation, as shown in the grey boxes with multiple barriers. Likewise, some recommendations can be assigned to more than one barrier.

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

Barriers	N° Recommendations
Key: (gov't level, step in bio-waste cycle)	Key: priority actions in yellow
EU targets not cascaded to national/regional/municipal government (MS, C & T)	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.
Lack of effective binding policy or enforced legal obligations to reach minimum standards (EU, 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 ¹ .
Lack of local, regional, or national strategy for the separate collection of bio-waste (MS, C)	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>See LIFE BIOBEST Deliverables 3.3 & 5.3.</i>
Regulatory uncertainty and modifications lead to highly variable systems (MS, C & T)	
Lack of guidance or technical support for bio-waste management (MS, C)	
Lack of effective binding policy or enforced legal obligations to reach minimum standards (EU, C & T)	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>See KPIs in LIFE BIOBEST Deliverable 2.1.</i>

¹ 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.

Barriers	N° Recommendations
Key: (gov't level, step in bio-waste cycle)	Key: priority actions in yellow
Insufficient data monitoring systems to track implementation, performance and evolution (MS, C & T)	
Lack of quality and service standards for input (EU, T)	L.5 - Define standards for bio-waste entering facilities mentioned in Article 22 of the WFD and cascade to municipal level. <i>See LIFE BIOBEST Deliverable 5.3.²</i>
Environmental and/or agricultural policies and management protocols lack synergies (EU, T)	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>See LIFE BIOBEST Deliverables 3.3 & 5.2.</i>
EU targets not cascaded to national/regional/municipal government (MS, C & T)	L.7 - Include the obligation in the national/regional waste laws to update corresponding local ordinances based on the national/regional laws.
EU targets not cascaded to national/regional/municipal government (MS, C & T)	L.8 - Introduce obligation for producers to separate bio-waste in the national/regional waste laws and transpose it into local norms. ⁴
Lack of effective binding policy or enforced legal obligations to reach minimum standards (EU, C & T)	L.9 - Include penalties that accompany inspections for non-compliant waste producers at local level according to local ordinances.

² Responsibility must be shifted from plant operator to municipality or private waste producer. This mechanism allows a penalty/rejection scheme.

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

⁴ As further detailed in [LIFE BIOBEST D5.2 Policy brief](#), instruments needed to implement the collection obligation include the local entity's supervision of private collection for commercial bio-waste and the modification of local ordinances.



Barriers Key: (gov't level, step in bio-waste cycle)	N° Recommendations Key: priority actions in yellow
Absence of monitoring of quality for collected bio-waste (L, C)	
Administrative and bureaucratic barriers to implement / improve the treatment units (R, T)	L10 - Streamline and standardize permissions and financing process for the improvement and implementation of treatment units with facility specifications based on long term capacity projections and efficiency.

Table 6. Linking Organizational Barriers and Recommendations (O.1 – O.14)

Barriers	N° Recommendations
Key: (gov't level, step in bio-waste cycle)	Key: priority actions in yellow
<p>Poor institutional organization and limited capacity to implement legislation (MS, C & T)</p> <p>Inadequate appraisal of local circumstances in system set-up (L, C & T)</p>	<p>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.</p>
<p>Limited or lack of infrastructure for collection and treatment (R, C & T)</p>	<p>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.⁵</p>
<p>Lack of economic scale efficiency schemes to develop cooperative management (R, C & T)</p> <p>Inadequate appraisal of local circumstances in system set-up (L, C & T)</p> <p>Bio-waste collection is more expensive than residual waste collection (L, C)</p>	<p>O.3 - Promote shared bio-waste collection services or treatment facilities under economic scale efficiency models, especially among small municipalities.⁶</p>

⁵ MBT for residual waste can be repurposed to treat bio-waste in specific treatment lines or spaces (separated from residual waste) to take advantage of these existing facilities in case that the residual waste flows are reduced, and the available capacity and redesign of the facility make it feasible.

⁶ The core of this recommendation advocates for two clauses: collaboration of municipalities (1) to share CAPEX & OPEX (2).

Barriers Key: (gov't level, step in bio-waste cycle)	N° Recommendations Key: priority actions in yellow
Lack of guidance or technical support for bio-waste management (MS, C)	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.
No market or insufficient market incentives for compost, digestate, or biogas (MS, U)	O.5 - Promote studies on compost/digestate quality , application methods and benefits to soil, as to facilitate the use of these outputs. <i>See LIFE BIOBEST Deliverable 3.3.</i>
Insufficient data monitoring systems to track implementation, performance and evolution (MS, C & T) Lack of guidance or technical support for bio-waste management (MS, C) Inadequate appraisal of best practice options in policy design (R, C & T)	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>See LIFE BIOBEST Deliverables 3.1 & 3.3.</i>
Lack of synchronisation across public and private entities in charge (R, C & T) Lack of interest/support from decision-makers/elected representatives (MS, C & T)	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. 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 (circular bioeconomy leadership group) with activities including the organization of regular conferences on the topic.

Barriers	N° Recommendations
<p>Key: (gov't level, step in bio-waste cycle)</p> <p>Poor institutional organization and limited capacity to implement legislation (MS, C & T)</p> <p>Inadequate appraisal of local circumstances in system set-up (L, C & T)</p> <p>Lack of technical know-how (MS, C & T)</p> <p>Waste industry lacks required skills and competencies (MS, C & T)</p> <p>Lack of guidance or technical support for bio-waste management (MS, C)</p>	<p>Key: priority actions in yellow</p> <p>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>See LIFE BIOBEST Deliverable 3.2.</i></p> <p>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.</p>
<p>Lack of effective communication/educational campaigns (L, C)</p>	<p>O.11 - Promote awareness and training for agricultural producers to understand and apply compost and digestate on soil and farmland.</p>
<p>Insufficient data monitoring systems to track implementation, performance and evolution</p>	<p>O.12 - Clearly define roles, responsibilities and quantity/quality objectives in private waste sector contracts. The control and monitoring should be developed by the public administration, and there must be mechanisms to update or modify contracts and apply penalties.</p>



Barriers	N° Recommendations
<p>Key: (gov't level, step in bio-waste cycle)</p> <p>(MS, C & T)</p> <p>Lack of synchronisation across public and private entities in charge</p> <p>(R, C & T)</p> <p>Collection models don't account for contamination reduction/quality assurance</p> <p>(L, C)</p> <p>Absence of monitoring of quality for collected bio-waste</p> <p>(L, C)</p>	<p>Key: priority actions in yellow</p> <p>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 QAO for compost and digestate to assess the conformity.</p>
<p>Lack of effective communication/educational campaigns</p> <p>(L, C)</p> <p>Absence of monitoring of quality for collected bio-waste</p> <p>(L, C)</p>	<p>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>See LIFE BIOBEST Deliverable 3.4.</i></p>

Table 7. Linking Economic Barriers and Recommendations (E.1 – E.11)

Barriers	N° Recommendations
<p>Key: (gov't level, step in bio-waste cycle)</p> <p>Low costs of landfilling or low/lack of taxes (MS, T)</p> <p>Bio-waste collection is more expensive than residual waste collection (L, C)</p> <p>Lack of financial incentive for local authorities to separately collect bio-waste (R, C)</p>	<p>Key: priority actions in yellow</p> <p>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. The addition of refund schemes may increase the effectiveness of the incentive, returning money from the tax to local entities based on performance. <i>See LIFE BIOBEST Deliverable 3.2.</i></p>
<p>Limited or lack of infrastructure for collection and treatment (R, C & T)</p> <p>Lack of resources to build or outfit waste treatment facilities for bio-waste (R, T)</p>	<p>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.</p>
<p>Insufficient resources/finances (MS, C & T)</p> <p>Lack of financial incentive for local authorities to separately collect bio-waste (R, C)</p>	<p>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.</p> <p>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.</p> <p>E.5 - Establish the specifications and destinations of the funds in terms of management model, eligible materials and accompanying activities based on existing BPs and benchmarks. One of the main criteria should be the project's capacity to increase the quality and quantity of bio-waste recycling.</p>

Barriers Key: (gov't level, step in bio-waste cycle)	N° Recommendations Key: priority actions in yellow
Improper/lack of guidance on use of EU funds and taxonomy (MS, C)	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.
No market or insufficient market incentives for compost, digestate, or biogas (MS, U)	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.
Bio-waste collection is more expensive than residual waste collection (L, C)	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.
Lack of resources to conduct waste analysis and monitor bio-waste quality and quantity (L, U) Insufficient resources/finances (MS, C & T)	E.9 - Study the necessity and applicability of EPR for food products , and later the conditions and options for EPR schemes if utilized. <i>See LIFE BIOBEST Deliverable 3.2.</i>
Lack of financial incentives for the citizen (PAYT, discounts, etc.) (L, C)	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>See LIFE BIOBEST Deliverable 3.2.</i>
Bio-waste collection is more expensive than residual waste collection (L, C) Collection models don't account for contamination reduction/quality assurance (L, C)	E.11 - Promote the application of variable fees based on the input quality (such as visual inspections or characterizations) for biological treatment facilities. <i>See LIFE BIOBEST Deliverables 3.2 & 5.3.</i>

Table 8. Linking Technical Barriers and Recommendations (T.1 – T.11)

Barriers	N° Recommendations
Key: (gov't level, step in bio-waste cycle)	Key: priority actions in yellow
Lack of guidance or technical support for bio-waste management (MS, C)	T.1 – Promote effective and individualised collection models (mainly DtD collection schemes) in laws and implementation plans. ⁷ <i>See LIFE BIOBEST Deliverable 3.1.</i>
Lack of or low geographical coverage of the separate collection system (R, C)	T.2 – Promote commercial separate collection by applying individualised models with good quality and quantity results. In case commercial generators are using private collection services, they should monitor the performance and destination of the activities to ensure good practices applications and law compliance by local authorities according to the applicable local ordinances.
Inadequate appraisal of local circumstances in system set-up (L, C & T)	T.3 – Investigate and validate best practices for multi-housing apartment buildings and minimize anonymity. <i>See LIFE BIOBEST Deliverable 3.1.</i>
Lack of quality and service standards for input (EU, T)	
High population density challenges for collection systems (L, C)	

⁷ In case the mandate is not enough to influence the expansion of the service coverage, economic instruments such as grants or tax refund should be used.

Barriers	N° Recommendations
Key: (gov't level, step in bio-waste cycle)	Key: priority actions in yellow
<p>Lack of effective communication/educational campaigns</p> <p>(L, C)</p> <p>Lack of materials provided for proper at-home separation</p> <p>(L, C)</p>	<p>T.4 - Provide guidance and materials for at-home separation such as (vented) kitchen caddies, decals, compostable bags, or curbside collection bins.</p>
<p>Insufficient data monitoring systems to track implementation, performance and evolution</p> <p>(MS, C & T)</p> <p>Lack of guidance or technical support for bio-waste management</p> <p>(MS, C)</p>	<p>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 via a consolidated and homogenized system coordinated by the national government. Include the mandate to control the quality at the service delivery point as a strategy to minimize impurities at the source.</p>
<p>Lack of or low geographical coverage of the separate collection system</p> <p>(R, C)</p> <p>Inadequate appraisal of local circumstances in system set-up</p> <p>(L, C & T)</p>	<p>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.⁸ <i>See LIFE BIOBEST Deliverable 3.1.</i></p>

⁸ This may include appointing composting experts to train and monitor the home practices and collect data (e.g. through sampling or composition analysis) to monitor the effectiveness.

Barriers	N° Recommendations
Key: (gov't level, step in bio-waste cycle)	Key: priority actions in yellow
<p>Insufficient data monitoring systems to track implementation, performance and evolution (MS, C & T)</p>	<p>T.7 - Standardize management and revision protocols and data monitoring to ensure proper functioning and tracking of home composting.⁹</p>
<p>Insufficient data monitoring systems to track implementation, performance and evolution (MS, C & T)</p>	<p>T.8 - Develop periodic standardised characterisation for residual waste in order to monitor the flow of bio-waste not diverted and landfill directive compliance.</p>
<p>Limited collection monitoring information for application of corrective actions (L, C)</p> <p>Collection models don't account for contamination reduction/quality assurance (L, C)</p>	<p>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>See LIFE BIOBEST Deliverables 3.3 & 5.3.</i></p>
<p>Absence of monitoring of quality for collected bio-waste (L, C)</p>	<p>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>See LIFE BIOBEST Deliverables 3.3 & 5.3.</i></p>
<p>Lack of guidance or technical support for bio-waste management (MS, C)</p>	<p>T.11 - Collaborate with private bio-waste treatment facilities, especially companies managing anaerobic digestion facilities, to ensure the quality control of inputs and outputs to effectively return the organic matter to soil. <i>See LIFE BIOBEST Deliverable 3.3.</i></p>

⁹ This proposal should be applied to individual composting of households, Ho.Re.Ca. establishments with composting system and community composting points.

5 Theoretical cases

The theoretical cases described below are generalized to capture common types of contexts and living environments. This should be considered as a standardization since it is known that within real life cases, there can be immense variability in the contextual factors themselves and combination of them. Entities and municipalities seeking a first input for the improvement of their local bio-waste management concept should consider the theoretical case that most fits to their local circumstances.

Table 9 details the contextual factors within the theoretical scenarios. **Bolded** information signals the high impact factors, and each colour corresponds to an impact level (see key below). The recommendations and solutions to ameliorate the impact of these factors are provided in section [6](#) and **Annex 1: Assessment matrices for each scenario** (section [8](#)).





Impact	Color
Low	
Medium	
High	
Very high	

Table 9. Evaluation of the impact of contextual factors in six scenarios

Scenario / factor	Terrain, road conditions & public space	Climate	Population & Population density	Urban dispersion	Income inequality	Resident foreign nationals and non-resident population	Population with reduced mobility & diverse abilities	Tourism level	Wildlife & pests	Type of producer	Availability & proximity of waste facilities	Ex. cities
Scenario 1: Major city, tourism hub	Roads and public spaces maintained	Mild winters, hot summers ¹⁰	1.5 million & 7,000 inhab/km²	Population concentrated in urban area	Diverse income area	30% foreign born, 300 languages spoken	Diverse	6+ million visitors /yr	Mice, rats, seagulls and boars	Diverse mix of res. & com. sub-flows	Within 20-40 km of city centre	Barcelona, Milan, Bucharest
Scenario 2: Mid-size regional city	Roads and public spaces regularly maintained	Mild winters, hot summers	400,000 & 8,000 inhab/km²	Population concentrated in urban area	Diverse income area	20% foreign born	Diverse with a larger proportion of elderly	2+ million visitors /yr	Mice and birds	Diverse mixture of res. & com. sub-flows	Within 10-30 km of city centre	Toulouse, Tallinn, Bologna

¹⁰ Intensity of summers and winters may vary greatly based on the geographic location.



Scenario / factor	Terrain, road conditions & public space	Climate	Population & Population density	Urban dispersion	Income inequality	Resident foreign nationals and non-resident population	Population with reduced mobility & diverse abilities	Tourism level	Wildlife & pests	Type of producer	Availability & proximity of waste facilities	Ex. cities
Scenario 3: Small commuter city with outlying high-density areas	Relatively flat terrain, roads maintained	Moderate seasons	170,000 & 500 inhab/km ²	Mixture of high-density areas and low-rise subdivisions	Low-income area	Around 15%	High percentage of population with diverse abilities	Low tourism levels	Mice, rats, and small birds	Mostly res. sub-flows, also com.	Facilities are 30-40 km away	Guadalajara, Spandau and Glyfada
Scenario 4: Touristic coastal town	Hilly area with many narrow streets	Wet winters, humid and hot summers	20,000 & 1,500 inhab/km ²	80% of population lives in concentrated urban area	High income area	Around 15%	Low proportion reduced mobility	1 million visitors during peak months	Rats and seagulls	Res. and high proportion of Ho.Re.Ca	Waste facilities are 40-50 km	Krk Island, Biarritz and Olbia



Scenario / factor	Terrain, road conditions & public space	Climate	Population & Population density	Urban dispersion	Income inequality	Resident foreign nationals and non-resident population	Population with reduced mobility & diverse abilities	Tourism level	Wildlife & pests	Type of producer	Availability & proximity of waste facilities	Ex. cities
Scenario 5: Small urban conurbation with disperse households	Town is in a valley with nearby mountains and hills	Moderate seasons	7,000 & 300 inhab/km ²	80% of population lives in sprawling peripheral area	Medium income level	Below 10%	High proportion of population over 60 yrs	Low tourism levels	Foxes, boars and magpies	Res. and Ho.Re.Ca, high proportion of green waste	Green waste locally treated but treatment facilities are 50-70km	Chambery, Elizondo and Borken
Scenario 6: Village with low density and dispersed housing	Mountainous, steep and sometimes unpaved roads. Snow and ice removal necessary	Cold and snowy winters, mild summers	2,000 & below 100 inhab/km ²	35% of residents reside in the town centre and 65% in dispersed houses	Low-income area	Around 15%	Diverse	Around 50,000 visitors, year-round nature tourism	Large animals such as foxes and bears	Mostly res. and Ho.Re.Ca	Community and home composting with small scale facilities	Lienz, Jaca and Bormio

5.1 Visualising the scenarios¹¹

Scenario 1: Major city



Scenario 2: Regional city



Scenario 3: Small commuter city



¹¹ All photographs have been retrieved from the public domain and creative commons.

Scenario 4: Coastal town



Scenario 5: Small urban conurbation



Scenario 6: Rural village



6 Assessment matrix

A comprehensive approach is necessary to ameliorate the impact of contextual factors. In Table 10, each contextual factor is provided alongside recommendations to improve bio-waste management. The last column marks the scenarios where the contextual factor produces a high or very high impact.

Overall, the recommendations should be considered as a checklist to compare to one's own context. Due to the unique qualities of each municipality, the recommendations are neither exhaustive nor applicable to all real cases. For specific scenario-by-scenario recommendations, please see **Annex 1: Assessment matrices for each scenario**.

In the second column, recommended priority actions, as listed in section 4, are named based on classification as primarily legal/administrative (L), economic (E), organizational (O) and technical (T).

Table 10. Assessment matrix linking contextual factors to priority actions and recommendations

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5.2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
Terrain, road conditions & public space	<ul style="list-style-type: none"> • O.10 - Promote trainings to equip technicians with necessary skillset • O.3 - Shared bio-waste collection services or treatment facilities under economic scale efficiency models • T.6 - Consider home, community, and small-scale composting facilities 	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections. • Adapt trucks and street cleaning/clearing services on the collection route to ameliorate issues due to winter snow, ice, etc. • Reassess collection points to maximise their efficiency in disperse areas. When possible, consolidate collection points to reduce road circulation. In very disperse or mountainous areas, centralized collection points should be in accessible locations for trucks and citizens. 	<ul style="list-style-type: none"> • Scenario 5: Small urban conurbation • Scenario 6: Rural village

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5.2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
Climate	<ul style="list-style-type: none"> • O.1 - Strategic bio-waste implementation plans accompanied by sound financial strategies • T.4 - Provide guidance and materials for at-home separation 	<ul style="list-style-type: none"> • Create a specific collection model for the old city centre, such as DtD or mobile bring points with containers. • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency in peak summer months. • Increase collection bin cleanings in summer months, if needed. • Provide appropriate equipment/tools to residents to prevent the waste from freezing to the bin. • Provide educational material to households for reducing pests. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste). 	<ul style="list-style-type: none"> • Scenario 6: Rural village
Population density	<ul style="list-style-type: none"> • O.1 - Strategic bio-waste implementation plans accompanied by sound financial strategies • O.6 - Guidelines and best practices endorsed by upper-level authorities • O.10 - Promote trainings to equip technicians with necessary skillset • T.2 - Promote commercial separate collection • O.14 - Increase financing for continuous outreach services 	<ul style="list-style-type: none"> • Using traffic patterns and monitoring information, design collection routes that minimise distances driven especially during peak traffic hours. • Prioritise collection during low traffic periods to take advantage of reduced traffic and pedestrians. • Strategically plan bio-waste transfer stations or transfers between trucks to reduce the kilometres driven per tonne of bio-waste collected. • Include in strategic waste plans the trajectory of neighbourhoods and the necessary measures to reach objectives. • Ensure that private and communal spaces in new buildings are designed for effective waste management, including waste storage spaces. 	<ul style="list-style-type: none"> • Scenario 1: Major city • Scenario 2: Regional city • Scenario 3: Small commuter city • Scenario 4: Coastal town

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5.2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
	<ul style="list-style-type: none"> • T.3 – Best practices for multi-housing apartment buildings • T.5 – Establish a monitoring system with set parameters 	<ul style="list-style-type: none"> • Equip spaces in buildings and on the streets with necessary bio-waste collection scheme elements such as hangers, poles, closets, etc. that are accessible by the service providers. • Implement collection schemes specific to the building and housing type. • In neighbourhoods and blocks with varying levels of population density and housing types, various collection schemes may be implemented in a single area considering the optimization of the scheme and collection routes. • Evaluate the limitations of high-rise buildings and tailor bio-waste collection scheme accordingly. • Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management. 	
Urban dispersion	<ul style="list-style-type: none"> • O.3 – Shared bio-waste collection services or treatment facilities under economic scale efficiency models • O.1 – Strategic bio-waste implementation plans accompanied by sound financial strategies • O.6 – Guidelines and best practices endorsed by upper-level authorities • O.10 – Promote trainings to equip technicians with necessary skillset • T.6 – Consider home, community, and small-scale composting facilities 	<ul style="list-style-type: none"> • Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when necessary. • Ensure that all areas, including those that are outlying, have the proper collection service, or, if more efficient, home composting. • Implement community or individual composting for isolated Ho.Re.Ca. activities and households and small villages and combine efficient bio-waste collection services with adapted frequencies for more populated centres. • For rural houses with animals, use the food-waste for animal feeding if permitted. 	<ul style="list-style-type: none"> • Scenario 3: Small commuter city • Scenario 5: Small urban conurbation

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5,2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
Income inequality	<ul style="list-style-type: none"> • O.14 - Increase financing for continuous outreach services • T.4 - Provide guidance and materials for at-home separation • T.5 - Establish a monitoring system with set parameters 	<ul style="list-style-type: none"> • Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. • Follow up with users to ensure their continued participation. • Involve social programs and ongoing educational resources in low-income areas. • Consider tax bonuses for taxpayers with a vulnerable economic situation. 	<ul style="list-style-type: none"> • Scenario 1: Major city • Scenario 3: Small commuter city
Resident foreign nationals and non-resident populations	<ul style="list-style-type: none"> • O.14 - Increase financing for continuous outreach services • T.4 - Provide guidance and materials for at-home separation • T.5 - Establish a monitoring system with set parameters 	<ul style="list-style-type: none"> • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Provide locally appropriate and adapted outreach to neighbourhoods and schools with high populations of resident foreign nationals. • Involve community representatives and members in campaigns and as educators. • Contact newcomers (for instance when they register in the municipality) to deliver the sorting instructions or at home sorting materials. 	<ul style="list-style-type: none"> • Scenario 1: Major city • Scenario 2: Regional city
Population with reduced mobility	<ul style="list-style-type: none"> • O.10 - Promote trainings to equip technicians with necessary skillset 	<ul style="list-style-type: none"> • Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people. • Adapt type and identification of bins and bin location to the population's needs (ex. foot pedal, height of the aperture, proximity to the sidewalk). • Ensure sufficient free space on the sidewalks for the passage of wheelchairs and the visually impaired once the delivery materials and caddies bins are set out. • Set clear rules on how and when to put bags/bins for collection and limit the time the bins are on the street. 	<ul style="list-style-type: none"> • Scenario 2: Regional city • Scenario 3: Small commuter city • Scenario 5: Small urban conurbation

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5.2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
Tourism level	<ul style="list-style-type: none"> • O.1 – Strategic bio-waste implementation plans accompanied by sound financial strategies • O.6 – Guidelines and best practices endorsed by upper-level authorities • O.10 – Promote trainings to equip technicians with necessary skillset • T.2 – Promote commercial separate collection • T.5 – Establish a monitoring system with set parameters 	<ul style="list-style-type: none"> • Waste authorities must collaborate with tourism agencies, hotels, etc. to clearly mark separation at source and delivery norms in establishments. • Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas. • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Pilot creative solutions to reach tourists such as informational videos shown at airports and bus and train stations. • Ensure managers of touristic private flats debrief cleaning staff and guests on separate collection protocols. • Specific collection solution for short stay tourists (daily visits) at picnic areas, roadside attractions, natural parks, etc. • Specific collection solutions for camping and roadside/free camping sites and caravan parking. • Follow up with touristic activities and sites to monitor participation. • Track and monitor tourism trends, coordinate waste collection routes and frequency according to results and seasonal variation. • Design an effective municipal waste tax that applies to touristic activities covered by public collection service. • Use funds related to the touristic tax to cover the management activities and costs derived from the additional waste production from touristic sector. 	<ul style="list-style-type: none"> • Scenario 1: Major city • Scenario 2: Regional city • Scenario 4: Coastal town • Scenario 6: Rural village
Wildlife & pests	<ul style="list-style-type: none"> • O.10 – Promote trainings to equip technicians with necessary skillset 	<ul style="list-style-type: none"> • Implement collection schemes that prevent disturbances by insects, rats, birds and boars. • Collection bins should be chew-proof and have latching lids. 	<ul style="list-style-type: none"> • Scenario 5: Small urban conurbation

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5.2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
		<ul style="list-style-type: none"> Establish a call centre or platform where residents can report wildlife sightings in waste areas and a task force to resolve reported issues. When community composting is present, ensure it is managed by professionals and the process is optimised to reduce pests. 	<ul style="list-style-type: none"> Scenario 6: Rural village
Type of producer	<ul style="list-style-type: none"> O.1 - Strategic bio-waste implementation plans accompanied by sound financial strategies O.6 - Guidelines and best practices endorsed by upper-level authorities O.10 - Promote trainings to equip technicians with necessary skillset T.2 - Promote commercial separate collection O.14 - Increase financing for continuous outreach services T.1 - Promote effective and individualised collection models T.4 - Provide guidance and materials for at-home separation T.5 - Establish a monitoring system with set parameters 	<ul style="list-style-type: none"> Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. Outfit collection trucks and stations with data tracking systems. During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. Coordinate green waste collection (centralized bring points) and home composting in rural areas. Provide option to owners of (large) gardens for the collection of increased amounts of garden waste during high vegetation period (e.g. May - October). Producers in disperse areas like rural restaurants or rural accommodation should have specific solutions such as their own container collected in domestic routes or home composting. When individual or community composting is present, ensure it is monitored and/or managed by professionals and the process is optimised. Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. 	<ul style="list-style-type: none"> Scenario 1: Major city Scenario 2: Regional city Scenario 4: Coastal town Scenario 6: Rural village
Availability and proximity of	<ul style="list-style-type: none"> O.1 - Strategic bio-waste implementation plans 	<ul style="list-style-type: none"> Include in strategic waste plans a comprehensive present and future outlook on waste facilities, considering projected population and tourism changes. A 	<ul style="list-style-type: none"> Scenario 4: Coastal town

Contextual factors	Recommended priority actions <i>From LIFE BIOBEST D5.2 Policy brief</i>	Specific recommendations	Scenarios with high and very high impact of the contextual factor
waste facilities	<p>accompanied by sound financial strategies</p> <ul style="list-style-type: none"> • E.2 – Promote private and public investment in new treatments facilities • O.2 – Treatment infrastructure match generation and capture • O.3 – Shared bio-waste collection services or treatment facilities under economic scale efficiency models • L.5 – Define standards for bio-waste entering facilities 	<p>large urban environment necessitates waste facilities at strategic points around the perimeter of the city.</p> <ul style="list-style-type: none"> • Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks. • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. • Adapt treatment options in relation to the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste. • Take advantage of composting facilities at farms and agricultural activities to co-manage kitchen waste and garden waste. • In decentralised areas, promote efficiency of small-scale facilities with simpler or no pre-treatment. 	<ul style="list-style-type: none"> • Scenario 5: Small urban conurbation

7 Conclusions

LIFE BIOBEST D2.3 Assessment Matrix of Best Practices evaluates contextual factors in order to provide recommendations. While the true impacts of these variables may change based on jurisdiction, the impact assessment is meant to provide local, regional and national authorities a starting point to analyse their own case and propose improvements. The goal has been to schematise contextual difficulties in a checklist format as a means to increase the efficiency of bio-waste collection and treatment schemes. Six general scenarios are used as a mode of comparing living environments, and **Annex 1: Assessment matrices for each scenario** provides specific assessment matrices for each.

The conclusion of this report is the assessment matrix (section 6) as it consolidates the all the recommendations. For more details, please see the **LIFE BIOBEST WP3 Guidelines**.

Synthesized conclusions that complement the assessment matrices and recommendations include:

- Each municipality is a unique organism. The impacts of the contextual factors assessed will vary depending on the municipality. Within a municipality, the factors are liable to change over time. Each municipality encompasses different contexts within its territory, so the variables can also change within the municipality (different types of neighbourhoods, or even different typologies within each area), and that requires differentiated approaches.
- Contextual factors such as terrain & road conditions, climate, income inequality, population density, urban dispersion, resident foreign nationals, population with reduced mobility, tourism level, wildlife & pests, type of producers, and proximity and type to waste facilities must be considered.
- The contextual factors listed in the scenarios with **high** and **very high** impact warrant prioritised consideration. Depending on the case, other factors with lower impacts should be evaluated and properly managed.
- The core element to incentivise proper separate collection is the type of collection scheme, namely individualised collections such as DtD, which are able to identify the user, limit the number of set-outs of residual fraction and control the quality of the delivered materials (monitoring scheme). For more information, see **LIFE BIOBEST D3.1 Guideline on separate collection**.
- Many constraints and barriers are related to governance and economic contextual factors or the lack of these type of instruments. Main recommendations from **LIFE BIOBEST D3.2 Guideline on governance and economic incentives** include:
 - The extension, efficacy, longevity and scalability of technical instruments and economic incentives for bio-waste management rely on governing bodies to set objectives and direct capital, skilled human resources, infrastructure, communication, monitoring and technical know-how.



- Economic incentives are key instruments to apply the polluter pays principal and contribute to the consolidation of separate collection participation. Promote disposal taxes (linked to tax refund schemes), PAYT and variable charges (based on participation in the separate collection and number of set-outs for residual waste) are decisive tools to mobilise authorities and producers to improve bio-waste management and make it more cost competitive.
- The contextual factor “Availability and proximity of waste facilities” is connected to [LIFE BIOBEST D3.3 Guideline on quality compost and digestate](#). Main key takeaways from that document include:
 - High-quality feedstock material eases the production of high-quality products.
 - Pre- and post-treatment is important for improving the quality of and refining the final product.
 - Know benefits of anaerobic digestion and composting as well as their combination. Be aware of local circumstances and technical potentials for treatment in order to select a preferred treatment pathway as well as the required capacity. Consider the principle of proximity when planning the location of the treatment plant.
 - Know about the different market sectors that may require different specifications for compost and digestate.
- Many contextual factors are connected to public participation, outreach and engagement. Main recommendations from [LIFE BIOBEST D3.4 Factsheets on the analysis of best practices in communication and engagement from various countries](#) include:
 - Design communication and engagement interventions to truly foster citizen participation. The “hardware” components (such as the design of the scheme and its user-friendliness) and the “software” components (such as communication and education) are crucial.
 - Draw insight from behavioural science studies to improve the persuasiveness of the communication tools designed to positively influence users’ behaviours.
 - Prioritise communication interventions that are adaptive, versatile and inclusive to reach all population segments.
 - Provide transparent results to increase users’ confidence in the system and their willingness to sort their waste.
 - Combine one-time communications (e.g. a campaign) with regular or continuous interventions to maintain system performance over time, focus and engagement from the community after the initial implementation.

8 Annex 1: Assessment matrices for each scenario

To complement the consolidated assessment matrix in section 6, the tables below provide a scenario-by-scenario outlook. Each table presents a theoretical scenario (as established in section 5) followed by the assessment of the contextual factors, impact level, impact explanation and specific recommendations based on impact level.

8.1 Scenario 1 – Major city, tourism hub

Scenario 1: Major city, tourism hub	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Terrain, road conditions & public space	Medium	Relatively flat terrain and regularly maintained roads. Nighttime collection service provided to reduce the impact of traffic congestion	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design collection model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections. • Create a specific collection model for the old city centre, such as DtD or mobile bring points with containers.
Climate	Medium	Especially during summer months, hot weather exacerbates bothersome odours. Winters are mild, with infrequent freezing temperatures	<ul style="list-style-type: none"> • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency in peak summer months. • Increase collection bin cleanings in summer months. • Provide educational material to households for reducing pests. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste).
Population density	Very high	With 1.5 million inhabitants and a population density of 7,000 inhab./km ² , this factor has a strong	<ul style="list-style-type: none"> • Using traffic patterns and monitoring information, design collection routes that minimise distances driven especially during peak traffic hours. • Prioritise collection during low traffic periods to take advantage of reduced traffic and pedestrians.

Scenario 1: Major city, tourism hub	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
		impact on bio-waste management	<ul style="list-style-type: none"> • Strategically plan bio-waste transfer stations or transfers between trucks to reduce the kilometres driven per tonne of bio-waste collected. • Include in strategic waste plans the trajectory of neighbourhoods and the necessary measures to reach objectives. • Implement collection schemes specific to the building and housing type. • Ensure that private and communal spaces in new buildings are designed for effective waste management, including waste storage spaces. • In neighbourhoods and blocks with varying levels of population density and housing types, various collection schemes may be implemented in a single area to optimize the scheme and collection routes. • Evaluate the limitations of high-rise buildings and tailor bio-waste collection scheme accordingly. • Equip common spaces in buildings and on the streets with necessary bio-waste collection scheme elements such as hangers, poles, closets, etc. that are accessible by the service providers. • Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management.
Urban dispersion	Medium	The majority of the population is concentrated in urban areas	<ul style="list-style-type: none"> • Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when necessary. • Implement community or individual composting for isolated Ho.Re.Ca. activities and households and combine efficient bio-waste collection services with adapted frequencies.
Income inequality	High	Diverse incomes per neighbourhood. Some are near the poverty line, therefore requiring additional resources	<ul style="list-style-type: none"> • Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. • Follow up with users to ensure their continued participation. • Involve social programs and ongoing educational resources in low-income areas. • Consider tax bonuses for taxpayers with a vulnerable economic situation.

Scenario 1: Major city, tourism hub	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
Resident foreign nationals and non-resident populations	Very high	Culturally diverse city with over 200 languages spoken. 30%+ of residents are foreign nationals	<ul style="list-style-type: none"> • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Provide locally appropriate and adapted outreach to neighbourhoods and schools with high populations of resident foreign nationals. • Involve community representatives and members in campaigns and as educators. • Contact newcomers (for instance when they register in the municipality) to deliver the sorting instructions or at home sorting materials.
Population with reduced mobility	Medium	Population is generationally diverse with a range of mobility levels	<ul style="list-style-type: none"> • Ensure sufficient free space on the sidewalks for the passage of wheelchairs and the visually impaired once the delivery materials and caddies bins are set out. • Set clear rules on how and when to put bags/bins for collection and limit the time the bins are on the street. • Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people.
Tourism level	Very high	Over 6 million tourists per year. Though there is consistent tourism year-round, high levels tourism are in the summer	<ul style="list-style-type: none"> • Waste authorities must collaborate with tourism agencies, hotels, etc. to clearly mark separation at source and delivery norms in establishments. • Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas. • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Pilot creative solutions to reach tourists such as informational videos shown at airports and bus and train stations. • Ensure managers of touristic private flats debrief cleaning staff and guests on separate collection protocols. • Follow up with touristic activities and sites to monitor participation. • Track and monitor tourism trends, coordinate waste collection routes and frequency according to results and seasonal variation.

Scenario 1: Major city, tourism hub	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
			<ul style="list-style-type: none"> Design an effective municipal waste tax that applies to touristic activities covered by public collection service. Use funds related to the touristic tax to cover the management activities and costs derived from the additional waste production from touristic sector.
Wildlife & pests	Medium	The city is home to rats, birds and boars	<ul style="list-style-type: none"> Implement collection schemes that prevent disturbances by insects, rats, birds and boars. Collection bins should be chew-proof and have latching lids. Establish a call centre or platform where residents can report wildlife sightings in waste areas and a task force to resolve reported issues.
Type of producer	Very high	Diverse mixture of residential and commercial bio-waste sub-flows from restaurants, markets, hotels, concert halls, stadiums, and universities	<ul style="list-style-type: none"> Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. Outfit collection trucks and stations with data tracking systems. During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary.
Availability & proximity of waste facilities	Low	Waste facilities are 20-40km from the city centre	<ul style="list-style-type: none"> Include in strategic waste plans a comprehensive present and future outlook on waste facilities, considering projected population and tourism changes. A large urban environment necessitates waste facilities at strategic points around the perimeter of the city. Adapt treatment options in relation the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste. Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary.



Scenario 1: Major city, tourism hub	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
			<ul style="list-style-type: none">• Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks.

8.2 Scenario 2 – Mid-size regional city

Scenario 2: Mid-size regional city	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
Terrain, road conditions & public space	Low	Early morning collection service provided to reduce the impact of traffic congestion. Cultural heritage centre combines challenging access and a very concentrated bio-waste production with lots of commercial activities and tourism	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design collection model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections. • Create a specific collection model for the old city centre, such as DtD or mobile bring points with containers.
Climate	Medium	Especially during summer months, hot weather exacerbates bothersome odours. Winters are milder, though temperatures regularly drop below freezing	<ul style="list-style-type: none"> • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency in peak summer months. • Increase collection bin cleanings in summer months. • Provide educational material to households for reducing pests. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste).
Population density	Very high	With 400,000 inhabitants and a population density of 8,000 inhab./km ² , this factor has a strong impact on bio-waste collection services	<ul style="list-style-type: none"> • Using traffic patterns and monitoring information, design collection routes that minimise distances driven especially during peak traffic hours. • Prioritise collection during low traffic periods to take advantage of reduced traffic and pedestrians. • Strategically plan bio-waste transfer stations or transfers between trucks to reduce the kilometres driven per tonne of bio-waste collected. • Include in strategic waste plans the trajectory of neighbourhoods and the necessary measures to reach objectives.

Scenario 2: Mid-size regional city	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
			<ul style="list-style-type: none"> • Implement collection schemes specific to the building and housing type. • Ensure that private and communal spaces in new buildings are designed for effective waste management, including waste storage spaces. • In neighbourhoods and blocks with varying levels of population density and housing types, various collection schemes may be implemented in a single area to optimize the scheme and collection routes. • Evaluate the limitations of high-rise buildings and tailor bio-waste collection scheme accordingly. • Equip common spaces in buildings and on the streets with necessary bio-waste collection scheme elements such as hangers, poles, closets, etc. that are accessible by the service providers. • Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management.
Urban dispersion	Medium	Majority of inhabitants reside in urban areas. Outside of the urban centre, there are a small number of more decentralised areas, which produce high quantities of garden waste	<ul style="list-style-type: none"> • Ensure that all areas, including those that are outlying, have the proper collection service, or, if more efficient, home composting. • Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when necessary. • Implement community or individual composting in decentralised households, neighbourhoods and isolated Ho.Re.Ca. activities, if needed.
Income inequality	Medium	Economic and income levels are relatively stable with the vast majority of the population above poverty levels	<ul style="list-style-type: none"> • Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. • Follow up with users to ensure their continued participation.
Resident foreign nationals and non-resident populations	High	Approximately 20% of residents are foreign nationals	<ul style="list-style-type: none"> • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Provide locally appropriate and adapted outreach to neighbourhoods and schools with high populations of resident foreign nationals.

Scenario 2: Mid-size regional city	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
			<ul style="list-style-type: none"> • Involve community representatives and members in campaigns and as educators. • Contact newcomers (for instance when they register in the municipality) to deliver the sorting instructions or at home sorting materials.
Population with reduced mobility	High	High levels of generational and physical ability diversity. Significant proportion of the population is over 60 years old	<ul style="list-style-type: none"> • Adapt type of bins and bin location to the population's needs (ex. Foot pedal, height of the aperture, proximity to the sidewalk). • Ensure sufficient free space on the sidewalks for the passage of wheelchairs and the visually impaired once the delivery materials and caddies bins are set out. • Set clear rules on how and when to put bags/bins for collection and limit the time the bins are on the street. • Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people.
Tourism level	Very high	Yearly, there are over 2 million visitors. During summer months, the level of overnight stays increases	<ul style="list-style-type: none"> • Waste authorities must collaborate with tourism agencies, hotels, etc. to clearly mark separation at source and delivery norms in establishments. • Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas. • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Pilot creative solutions to reach tourists such as informational videos shown at airports and bus and train stations. • Ensure managers of touristic private flats debrief cleaning staff and guests on separate collection protocols. • Follow up with touristic activities and sites to monitor participation. • Track and monitor tourism trends, coordinate waste collection routes and frequency according to results and seasonal variation. • Design an effective municipal waste tax that applies to touristic activities covered by public collection service.

Scenario 2: Mid-size regional city	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
			<ul style="list-style-type: none"> Use funds related to the touristic tax to cover the management activities and costs derived from the additional waste production from touristic sector.
Wildlife & pests	Low	Although mice and birds are present, they do not often disrupt waste services	<ul style="list-style-type: none"> Implement collection schemes that prevent disturbances by insects, rats, birds and boars. Collection bins should be chew-proof and have latching lids. Establish a call centre or platform where residents can report wildlife sightings in waste areas and a task force to resolve reported issues.
Type of producer	High	Diverse mixture of residential and commercial bio-waste sub flows from hotels, restaurants, and street fairs	<ul style="list-style-type: none"> Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. Outfit collection trucks and stations with data tracking systems. During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary.
Availability and proximity of waste facilities	Low	Waste facilities are 10-30km from the city centre	<ul style="list-style-type: none"> Include in strategic waste plans a comprehensive present and future outlook on waste facilities, considering projected population and tourism changes. A large urban environment necessitates waste facilities at strategic points around the perimeter of the city. Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. Adapt treatment options in relation the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste. Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks.

8.3 Scenario 3 – Small commuter city with outlying high-density areas

Scenario 3: Small commuter city with outlying areas	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Terrain, road conditions & public space	Low	Relatively flat terrain and regularly maintained roads	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design collection model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections.
Climate	Low	Moderate climate year-round	<ul style="list-style-type: none"> • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency and bin cleanings in summer months. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste).
Population density	High	With 170,000 residents (65,000 in the centre and 105,000 in outer areas) and a population density of 500 inhab./km ² , collection schemes must be tailored to neighbourhoods based on the differences in population density.	<ul style="list-style-type: none"> • Using traffic patterns and monitoring information, design collection routes that minimise distances driven especially during peak traffic hours. • Prioritise collection during low traffic periods to take advantage of reduced traffic and pedestrians. • Strategically plan bio-waste transfer stations or transfers between trucks to reduce the kilometres driven per tonne of bio-waste collected. • Include in strategic waste plans the trajectory of neighbourhoods and the necessary measures to reach objectives. • Implement collection schemes specific to the building and housing type. • Ensure that private and communal spaces in new buildings are designed for effective waste management, including waste storage spaces. • In neighbourhoods and blocks with varying levels of population density and housing types, various collection schemes may be implemented in a single area to optimize the scheme and collection routes. • Evaluate the limitations of high-rise buildings and tailor bio-waste collection scheme accordingly.

Scenario 3: Small commuter city with outlying areas	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
			<ul style="list-style-type: none"> Equip common spaces in buildings and on the streets with necessary bio-waste collection scheme elements such as hangers, poles, closets, etc. that are accessible by the service providers. Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management.
Urban dispersion	High	There are many adjacent, surrounding high-density neighbourhoods and new developments, some of which are low-rise subdivisions	<ul style="list-style-type: none"> Ensure that all areas, including those that are outlying, have the proper collection service, or, if more efficient, home composting. Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when necessary. Implement community or individual composting for isolated Ho.Re.Ca. activities and households and small villages and combine efficient bio-waste collection services with adapted frequencies for more populated centres.
Income inequality	Very high	Economic and income levels are relatively low. A substantial proportion of the population lives at the poverty level	<ul style="list-style-type: none"> Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. Follow up with users to ensure their continued participation. Involve social programs and ongoing educational resources in low-income areas. Consider tax bonuses for taxpayers with a vulnerable economic situation.
Resident foreign nationals and non-resident populations	Medium	Approximately 15% of residents are foreign nationals	<ul style="list-style-type: none"> Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). Provide locally appropriate and adapted outreach to neighbourhoods and schools with high populations of resident foreign nationals. Involve community representatives and members in campaigns and as educators.

Scenario 3: Small commuter city with outlying areas	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Population with reduced mobility	High	High levels of generational and physical ability diversity. Significant proportion of the population is over 60 years old	<ul style="list-style-type: none"> Adapt type of bins and bin location to the population's needs (ex. Foot pedal, height of the aperture, proximity to the sidewalk). Ensure sufficient free space on the sidewalks for the passage of wheelchairs and the visually impaired once the delivery materials and caddies bins are set out. Set clear rules on how and when to put bags/bins for collection and limit the time the bins are on the street. Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people.
Tourism level	Low	The area is infrequently visited by tourists	<ul style="list-style-type: none"> Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas.
Wildlife & pests	Low	At times, mice and rats disrupt waste services	<ul style="list-style-type: none"> Implement collection schemes that prevent disturbances by insects, rats, birds and boars. Collection bins should be chew-proof and have latching lids.
Type of producer	Medium	Primarily residential bio-waste sub-flows, also commercial and Ho.Re.Ca.	<ul style="list-style-type: none"> Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. Outfit collection trucks and stations with data tracking systems. During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary.
Availability and proximity of waste facilities	Medium	Bio-waste facilities are 30-40 km from the city centre	<ul style="list-style-type: none"> Include in strategic waste plans a comprehensive present and future outlook on waste facilities, considering projected population and tourism changes. A large urban environment necessitates waste facilities at strategic points around the perimeter of the city. Adapt treatment options in relation the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste.



Scenario 3: Small commuter city with outlying areas	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
			<ul style="list-style-type: none"> • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. • Take advantage of composting facilities at farms and agricultural activities to co-manage kitchen waste and garden waste. • Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks.

8.4 Scenario 4 – Touristic coastal town

Scenario 4: Touristic coastal town	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Terrain, road conditions & public space	Medium	Hilly area with many narrow and one-way streets and dead ends	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design collection model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections.
Climate	Medium	Wet winters, humid and hot summers	<ul style="list-style-type: none"> • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency and bin cleanings in peak summer months. • Provide educational material to households for reducing pests. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste).
Population density	High	There are 20,000 permanent residents and a population density of 1,500 inhab./km ²	<ul style="list-style-type: none"> • Using traffic patterns and monitoring information, design collection routes that minimise distances driven especially during peak traffic hours. • Prioritise collection during low traffic periods to take advantage of reduced traffic and pedestrians. • Strategically plan bio-waste transfer stations or transfers between trucks to reduce the kilometres driven per tonne of bio-waste collected. • Include in strategic waste plans the trajectory of neighbourhoods and the necessary measures to reach objectives. • Implement collection schemes specific to the building and housing type. • Ensure that private and communal spaces in new buildings are designed for effective waste management, including waste storage spaces. • In neighbourhoods and blocks with varying levels of population density and housing types, various collection schemes may be implemented in a single area to optimize the scheme and collection routes.

Scenario 4: Touristic coastal town	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
			<ul style="list-style-type: none"> Evaluate the limitations of high-rise buildings and tailor bio-waste collection scheme accordingly. Equip common spaces in buildings and on the streets with necessary bio-waste collection scheme elements such as hangers, poles, closets, etc. that are accessible by the service providers. Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management.
Urban dispersion	Medium	80% of population live in the concentrated urban area	<ul style="list-style-type: none"> Ensure that all areas, including those that are outlying, have the proper collection service, or, if more efficient, home composting. Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when necessary. Implement community or individual composting in decentralised households, neighbourhoods and isolated Ho.Re.Ca. activities, if needed.
Income inequality	Low	Economic and income levels are clustered in the medium/high income range	<ul style="list-style-type: none"> Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. Follow up with users to ensure their continued participation.
Resident foreign nationals and non-resident populations	Medium	Around 15% of residents are foreign nationals	<ul style="list-style-type: none"> Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). Provide locally appropriate and adapted outreach to neighbourhoods and schools with high populations of resident foreign nationals. Involve community representatives and members in campaigns and as educators.
Population with reduced mobility	Low	Low levels of generational and physical ability diversity. Majority of the population is below the age of 60	<ul style="list-style-type: none"> Ensure sufficient free space on the sidewalks for the passage of wheelchairs and the visually impaired once the delivery materials and caddies bins are set out. Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people.

Scenario 4: Touristic coastal town	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
Tourism level	Very high	1 million visitors during the peak summer months. Tourists primarily come from five non-adjacent countries with different languages and do not speak the local language	<ul style="list-style-type: none"> • Waste authorities must collaborate with tourism agencies, hotels, etc. to clearly mark separation at source and delivery norms in establishments. • Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas. • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Pilot creative solutions to reach tourists such as informational videos shown at airports and bus and train stations. • Ensure managers of touristic private flats debrief cleaning staff and guests on separate collection protocols. • Follow up with touristic activities and sites to monitor participation. • Track and monitor tourism trends, coordinate waste collection routes and frequency according to results and seasonal variation. • Specific collection solution for short stay tourists (daily visits) at picnic areas, roadside attractions, natural parks, etc. • Specific collection solutions for camping, roadside/free camping sites and caravan parking. • Design an effective municipal waste tax that applies to touristic activities covered by public collection service. • Use funds related to the touristic tax to cover the management activities and costs derived from the additional waste production from touristic sector.
Wildlife & pests	Medium	At times, seagulls and rats disrupt waste services	<ul style="list-style-type: none"> • Implement collection schemes that prevent disturbances by insects, rats, birds and boars. • Collection bins should be chew-proof and have latching lids. • Establish a call centre or platform where residents can report wildlife sightings in waste areas and a task force to resolve reported issues.

Scenario 4: Touristic coastal town	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4.</i>
Type of producer	High	Residential and high proportion of commercial waste generated in hotels, campgrounds, and restaurants	<ul style="list-style-type: none"> • Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. • Outfit collection trucks and stations with data tracking systems. • During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. • Producers in disperse areas like rural restaurants or rural accommodation should have specific solutions such as their own container collected in domestic routes or home composting. • When individual or community composting is present, ensure it is monitored and/or managed by professionals and the process is optimised.
Availability and proximity of waste facilities	High	Bio-waste facilities are 40–50km from city centre	<ul style="list-style-type: none"> • Include in strategic waste plans a comprehensive present and future outlook on waste facilities, considering projected population and tourism changes. A large urban environment necessitates waste facilities at strategic points around the perimeter of the city. • Adapt treatment options in relation the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste. • Take advantage of composting facilities at farms and agricultural activities to co-manage kitchen waste and garden waste. • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. • Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks. • In decentralised areas, promote efficiency of small-scale facilities with simpler or no pre-treatment.

8.5 Scenario 5 – Small urban conurbation with disperse households

Scenario 5: Small urban conurbation with disperse households	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Terrain, road conditions & public space	Very high	Town is in a valley with nearby mountains and hills	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections. • Adapt trucks and street cleaning/clearing services on the collection route to ameliorate issues due to winter snow, ice, etc. • Reassess collection points to maximise their efficiency. When possible, consolidate collection points to reduce road circulation. In very disperse or mountainous areas, centralized collection points should be in accessible locations for trucks and citizens.
Climate	Medium	Moderate climate	<ul style="list-style-type: none"> • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency and street bin cleanings in peak summer months, if needed. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste).
Population density	Medium	7,000 permanent residents and a population density is below 300 inhab./km ²	<ul style="list-style-type: none"> • Implement collection schemes specific to the building and housing type. • Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management.

Scenario 5: Small urban conurbation with disperse households	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Urban dispersion	Very high	80% of population lives in peripheral area. Outside of the small centre are many isolated stand-alone homes and decentralised areas	<ul style="list-style-type: none"> • Ensure that all areas, including those that are outlying, have the proper collection service or, if more efficient, home composting. • Implement community or individual composting for isolated Ho.Re.Ca. activities and households and small villages and combine efficient bio-waste collection services with adapted frequencies for more populated centres. • For rural houses with animals, use the food-waste for animal feeding if permitted. • Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when possible.
Income inequality	Medium	Economic and income levels are relatively stable	<ul style="list-style-type: none"> • Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. • Follow up with users to ensure their continued participation.
Resident foreign nationals and non-resident populations	Low	Below 10% of residents are foreign nationals	<ul style="list-style-type: none"> • Translate educational materials to most commonly spoken languages, if needed.
Population with reduced mobility	High	High proportion of the population is over 60 years old	<ul style="list-style-type: none"> • Adapt type of bins and bin location to the population's needs (ex. foot pedal, height of the aperture, proximity to the sidewalk). • Ensure sufficient free space on the sidewalks for the passage of wheelchairs and the visually impaired once the delivery materials and caddies bins are set out. • Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people. • Set clear rules on how and when to put bags/bins for collection and limit the time the bins are on the street.

Scenario 5: Small urban conurbation with disperse households	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Tourism level	Low	During summer months, the level of overnight stays and camper vans increases slightly	<ul style="list-style-type: none"> • Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas. • Ensure managers of touristic private flats and houses debrief cleaning staff and guests on separate collection protocols. • Follow up with touristic activities and sites to monitor participation. • Specific collection solution for short stay tourists (daily visits) at picnic areas, roadside attractions, natural parks, etc.
Wildlife & pests	High	Foxes, magpies, boars and raccoons disrupt waste services	<ul style="list-style-type: none"> • Implement collection schemes that prevent disturbances by insects, foxes, birds and raccoons. • Collection bins should be chew-proof and have latching lids. • Establish a call centre or platform where residents can report wildlife sightings in waste areas and a task force to resolve reported issues. • When community composting is present, ensure it is managed by professionals and the process is optimised to reduce pests.
Type of producer	Medium	Primarily residential waste, though some commercial waste generated in hotels, campgrounds, and restaurants. High proportion of green waste	<ul style="list-style-type: none"> • Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. • Outfit collection systems with data tracking capabilities. • Coordinate green waste collection (centralized bring points) and home composting in rural areas. • Producers in disperse areas like rural restaurants or rural accommodation should have specific solutions such as their own container collected in domestic routes or home composting. • During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. • When individual or community composting is present, ensure it is monitored and/or managed by professionals and the process is optimised.

Scenario 5: Small urban conurbation with disperse households	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
			<ul style="list-style-type: none"> • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary.
Availability and proximity of waste facilities	High	Green waste locally treated but bio-waste treatment facilities are 50-70km	<ul style="list-style-type: none"> • Include in strategic waste plans a comprehensive present and future outlook on waste facilities, taking into account projected population and tourism changes. • Adapt treatment options in relation the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste. • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. • Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks. • In decentralised areas, promote efficiency of small-scale facilities with simpler or no pre-treatment. • Take advantage of composting facilities at farms and agricultural activities to co-manage kitchen waste and garden waste.

8.6 Scenario 6 – Village with low density surroundings and dispersed housing

Scenario 6: Village with low density surroundings	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Terrain, road conditions & public space	Very high	Mountainous and steep country roads, some of them unpaved. During the winter months, regular snowfall affects road conditions and require ice and snow removal	<ul style="list-style-type: none"> • Maintain road quality and optimised traffic circulation. • Design model (collection weekly calendar, installed equipment, vehicle type and capacity, transfer stations) to optimise routes and number of collections. • Adapt trucks and street cleaning/clearing services on the collection route to ameliorate issues due to winter snow, ice, etc. • Reassess collection points to maximise their efficiency. When possible, consolidate collection points to reduce road circulation. In very disperse or mountainous areas, centralized collection points should be in accessible locations for trucks and citizens.
Climate	High	Extreme cold in the winter and frequent snowstorms. Summers are mild	<ul style="list-style-type: none"> • Promote use of vented kitchen caddy and compostable bags. • Distribute collection bins that do not absorb odours. • Increase collection frequency and street bin cleanings in peak summer months. • Optimise collection schedule according to bio-waste production and delivery needs (bio-waste should be collected at a higher frequency than residual waste). • Provide appropriate equipment/tools to residents to prevent the waste from freezing to the bin.
Population density	Medium	2,000 permanent residents and a population density below 300 inhab./km ²	<ul style="list-style-type: none"> • Implement collection schemes specific to the building and housing type. • Monitor and track participation and quality. Direct outreach to underperforming areas, specific users and property management.

Scenario 6: Village with low density surroundings	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Urban dispersion	Very high	35% of residents reside in the town centre and 65% in dispersed houses along the mountainsides	<ul style="list-style-type: none"> • Ensure that all areas, including those that are outlying, have the proper collection service or, if more efficient, home composting. • Implement community or individual composting for isolated Ho.Re.Ca. activities and households and small villages and combine efficient bio-waste collection services with adapted frequencies for more populated centres. • For rural houses with animals, use the food-waste for animal feeding if permitted. • Use optimised routes, volume sensors for containers, bi-compartment trucks, etc. to reduce distances travelled for collection when necessary.
Income inequality	Low	Economic and income levels are relatively stable	<ul style="list-style-type: none"> • Direct additional outreach and resources to areas with lower income levels to facilitate their bio-waste separation and participation. • Follow up with users to ensure their continued participation.
Resident foreign nationals and non-resident populations	Medium	Around 15% of residents are foreign nationals	<ul style="list-style-type: none"> • Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). • Provide locally appropriate and adapted outreach to neighbourhoods and schools with high populations of resident foreign nationals. • Involve community representatives and members in campaigns and as educators.
Population with reduced mobility	Medium	Fairly even distribution of generational and physical ability diversity, though there is a slightly higher proportion of +60 years old	<ul style="list-style-type: none"> • Adapt type of bins, location and bin identification to the population's needs (ex. foot pedal, height of the aperture, proximity to the sidewalk). • Ensure that bio-waste collection schemes are physically and technologically accessible to those with reduced mobility and elderly people.

Scenario 6: Village with low density surroundings	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
Tourism level	High	Around 50,000 tourists come to ski in the winter and hike in the summer; consistent levels of year-round tourism	<ul style="list-style-type: none"> Waste authorities must collaborate with tourism agencies, hotels, etc. to clearly mark separation at source and delivery norms in establishments. Provide outreach to tourists and local tourism establishments and ensure proper signage at bring areas. Translate educational materials to most commonly spoken languages. Prioritise language-free communication, especially regarding sorting instructions (use of pictograms). Ensure managers of touristic private flats debrief cleaning staff and guests on separate collection protocols. Follow up with touristic activities and sites to monitor participation. Track and monitor tourism trends, coordinate waste collection routes and frequency according to results and seasonal variation. Specific collection solution for short stay tourists (daily visits) at picnic areas, roadside attractions, natural parks, etc. Specific collection solutions for camping, roadside/free camping sites and caravan parking.
Wildlife & pests	Very high	Bears and raccoons frequently disrupt waste services	<ul style="list-style-type: none"> Implement collection schemes that prevent disturbances by insects, foxes, birds, bears and raccoons. Collection bins should be chew-proof and have latching lids. Establish a call centre or platform where residents can report wildlife sightings in waste areas and a task force to resolve reported issues. When community composting is present, ensure it is managed by professionals and the process is optimised to reduce pests.
Type of producer	High	Residential and high proportion of commercial waste generated in hotels, campgrounds, ski resort and restaurants	<ul style="list-style-type: none"> Implement locally appropriate and highly efficient collection scheme, keeping in mind the effectiveness of individualised collection schemes such as DtD. Outfit collection systems with data tracking capabilities. Coordinate green waste collection (centralized bring points) and home composting in rural areas.

Scenario 6: Village with low density surroundings	Impact level	Impact explanation	Specific recommendations <i>Complementary information in the four guidelines: LIFE BIOBEST D3.1, LIFE BIOBEST D3.2, LIFE BIOBEST D3.3 and LIFE BIOBEST D3.4</i>
			<ul style="list-style-type: none"> • During seasonal influxes of garden waste and at large garden waste producers, design specific strategy to optimise collection and treatment. • Producers in disperse areas like rural restaurants or rural accommodation should have specific solutions such as their own container collected in domestic routes or home composting. • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary.
Availability and proximity of waste facilities	Low	Community and home composting with small scale facilities	<ul style="list-style-type: none"> • Include in strategic waste plans a comprehensive present and future outlook on waste facilities, taking into account projected population and tourism changes. • Adapt treatment options in relation the type and amount of input materials. Consider the limitations and needs to efficiently manage and treat green waste. • Implement quality assurance schemes on operation plants including requirements for input materials, process requirements and product quality and their environmentally safe use. Also refer to the Animal By-Product Regulation as necessary. • Leverage waste transfer stations to aggregate feedstock and transfer to larger vehicles, reducing the circulation of waste trucks. • In decentralised areas, promote efficiency of small-scale facilities with simpler or no pre-treatment. • Take advantage of composting facilities at farms and agricultural activities to co-manage kitchen waste and garden waste.

9 Index of tables

Table 1.	Document Management Control Sheet	3
Table 2.	Document Revision History	4
Table 3.	Table of Acronyms	6
Table 4.	Contextual factors categorized and explained	10
Table 5.	Linking Legal/Administrative Barriers and Recommendations (L.1 – L.9)	19
Table 6.	Linking Organizational Barriers and Recommendations (O.1 – O.14)	22
Table 7.	Linking Economic Barriers and Recommendations (E.1 – E.11)	26
Table 8.	Linking Technical Barriers and Recommendations (T.1 – T.11)	28
Table 9.	Evaluation of the impact of contextual factors in six scenarios	32
Table 10.	Assessment matrix linking contextual factors to priority actions and recommendations	37



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