



D8.5

**HOOP guidelines for local
and regional authorities**

Author(s): ACR+



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Author(s)	Serena Lisai, Jean-Benoit Bel (ACR+)
Reviewer(s)	Miguel Ángel Suárez, Elisa Gambuzzi (CETENMA), David Silva (RdA)
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Table of contents

1. EXECUTIVE SUMMARY	10
2. INTRODUCTION	12
2.1. What are the HOOP Guidelines?	12
2.1.1. THE SCOPE OF THE HOOP GUIDELINES	12
2.1.2. HOW TO USE THE HOOP GUIDELINES	12
2.1.3. WHERE TO FIND WHAT?	13
2.2. A short introduction to the HOOP project	14
2.2.1. HOOP: CITIES AS CIRCULAR BIOECONOMY HUBS	14
2.2.2. THE HOOP LIGHTHOUSE CITIES	14
2.2.3. THE HOOP NETWORK	15
2.2.4. KEY RESOURCES	15
2.3. Circular bioeconomy	16
2.3.1. WHAT IS CIRCULAR BIOECONOMY?	16
2.3.2. THE ROLES OF CITIES AND REGIONS	17
2.3.3. KEY REGULATIONS	17
3. ASSESS YOUR BASELINE SITUATION	18
3.1. Key recommendations	19
3.1.1. HOW TO ASSESS ITS INITIAL SITUATION?	19
3.1.2. WHAT INDICATORS TO USE?	20
3.1.3. HOW TO BENCHMARK WITH OTHER TERRITORIES?	23
3.2. Interesting resources	25

4. ENGAGE YOUR STAKEHOLDERS	26
4.1. Key recommendations	26
4.1.1. HOW TO IDENTIFY KEY STAKEHOLDERS.....	26
4.1.2. LIST OF KEY STAKEHOLDERS	27
4.1.3. HOW TO APPROACH AND ENGAGE THEM.....	29
4.1.4. DRIVERS AND BARRIERS	30
4.2. Interesting resources	31
5. BOOSTING BIOWASTE PREVENTION AND COLLECTION, THROUGH CITIZEN ENGAGEMENT	32
5.1. Key recommendations	33
5.1.1. BIOWASTE PREVENTION	33
5.1.2. BIOWASTE COLLECTION	35
5.1.3. CITIZENS ENGAGEMENT	37
5.2. Interesting resources	39
6. IDENTIFY AND DESIGN WAYS TO VALORISE YOUR BIOWASTE	42
6.1. Key recommendations	43
6.1.1. EXISTING TECHNOLOGIES	43
6.1.2. HOW TO IDENTIFY RELEVANT TECHNOLOGIES?	48
6.1.3. HOW TO PREPARE THE IMPLEMENTATION OF A NEW VALORISATION ROUTE?.....	49
6.2. Interesting resources	50
7. FIND CAPITAL FOR YOUR BIOWASTE PROJECTS	52
7.1. Key recommendations	53

7.1.1. BUSINESS MODELS FOR CIRCULAR BIOECONOMY	53
7.1.2. INVESTING IN NEW PROJECTS.....	53
7.1.3. INNOVATION PUBLIC PROCUREMENT	59
7.2. Interesting resources	60
8. REFERENCES	63
8.1. HOOP References.....	64
9. ANNEX	65
Annex 1. Feedback from the HOOP Members.....	65
FEEDBACK ON THE GENERAL SECTIONS.....	65
FEEDBACK ON THE CONTENT	66
FORMAT OF THE GUIDELINES	68
CONCLUSION OF THE SURVEY	70

List of Tables

Table 1: List of the HOOP Bio-Circularity Label indicators for the baseline assessment	21
Table 2: List of high-TRL technologies to process urban biowaste and wastewater sludge identified by the HOOP project (CETENMA, 2023)	44
Table 3: Main funding and financing categories	54
Table 4: Risk assessment and funding categories for several types of circular bioeconomy projects (RdA, 2022)	55
Table 5: Examples of funding schemes for biocircular projects (RdA, 2022)	55

List of Figures

Figure 1: The HOOP Lighthouses	14
Figure 2: The HOOP Lighthouses and their own specific expertise on circular bioeconomy	15
Figure 3. Example of visualisation of urban metabolism of urban biowaste and wastewater	20
Figure 4: The HOOP Circularity Labels	25
Figure 5: The quadruple helix.....	28
Figure 6: HOOP technologies for material valorisation of biowaste and urban wastewater sludge (CETENMA, 2023).....	43
Figure 7: Key steps to identify and implement a new valorisation route	49

List of acronyms

Acronym	Description
AD	Anaerobic Digestion
BC	Bacterial Cellulose
CBM	Circular Business Model
CE	Conformité Européenne
CL	Circularity Level
CPP	Circular Public Procurement
DNSH	Do No Significant Harm
ERDF	European Regional Development Fund
EU	European Union
HE	Horizon Europe
HoReCa	Hotel/Restaurant/Catering
inh/km ²	Inhabitants per square kilometre
kg/cap	kilograms per capita
kg/cap y	kilograms per capita per year
KPI	Key Project Indicator
kWh	Kilowatt-hour
L/y	Litres per year
m ³	Cubic metre
M€	Millions of Euros
NET	Negative Emissions Technology

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

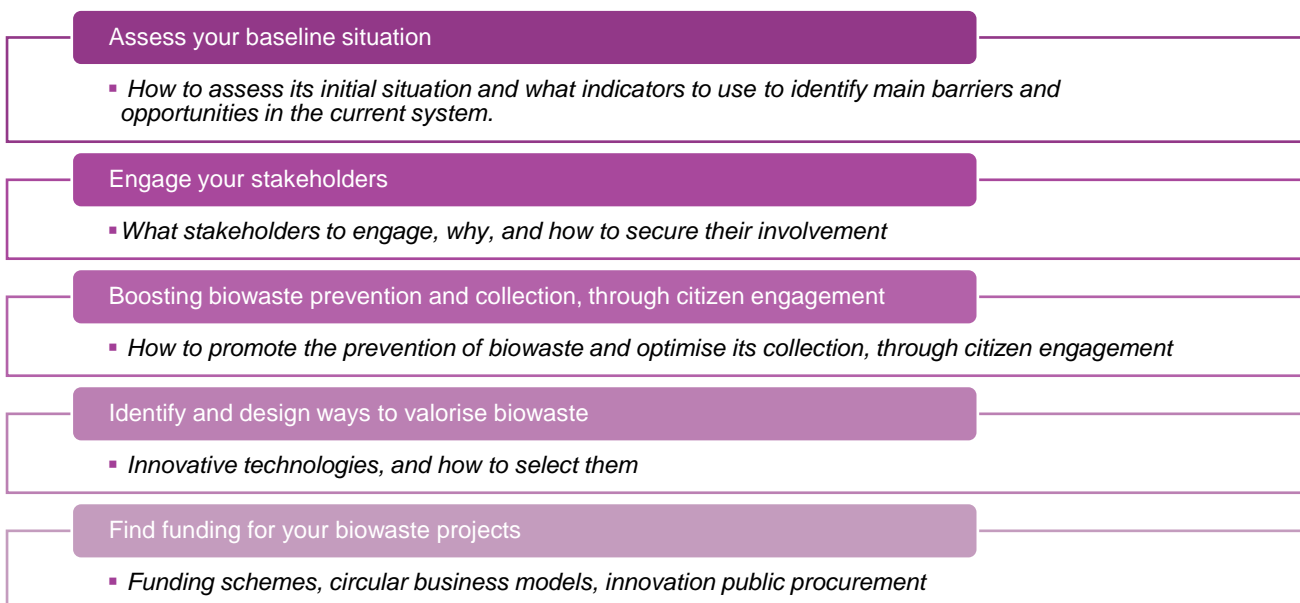
Acronym	Description
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Cooperation and Development
OFMSW	Organic Fraction Municipal Solid Waste
PAYT	Pay As You Throw
PCP	Pre-Commercial Procurement
PDA	Project Development Assistance
PHA	Polyhydroxyalkanoates
PIN	Prior Information Notice
PML	Project Maturity Level
PPI	Public Procurement of Innovative solutions
P3HB	Poly-3-HydroxyButyrate
R&I	Research and Innovation
SME	Small and Medium-sized Enterprise
TED	Tenders Electronic Daily
TRL	Technology Readiness Level
t/d	Tonnes per day
t/y	Tonnes per year
UN	United Nations
UWWS	Urban WasteWater Sludge
VFA	Volatile Fatty Acid
WFD	Waste Framework Directive

1. Executive summary

The HOOP Project helps to unlock bio-based investments and adopt local bio economies in Europe through a systemic and cross-cutting approach. It offers Project Development Assistance (PDA) at the 8 Lighthouse Cities and Regions - to shape the technical, economic, financial, and legal expertise needed to develop concrete investments for the valorisation of the OFMSW (Organic Fraction of Municipal Solid Waste) or UWWS (Urban Wastewater Sludge) with the aim of obtaining safe and sustainable bio-based products.

The HOOP Guidelines will guide you through the key steps to identify, design, and implement innovative valorisation routes for urban biowaste and wastewater sludge. It summarises key recommendations, as well as relevant resources and tools that can be used to produce high-quality biowaste-based products and materials. The HOOP Guidelines also aims to guide the readers through the different HOOP resources and tools available in the [HOOP Urban Circular Bioeconomy Hub](#).

The **key sections** are presented below:



Overall, the HOOP project formulates several key recommendations for the transition toward a more circular bioeconomy for urban biowaste and wastewater treatment:

- **Get a good knowledge of your own territory:** it is essential to base the whole biocircular approach on a solid baseline assessment that covers the mapping of potential feedstock, the market and local end-users for the potential outputs, the needs and challenges of the current system, and any contextual

parameter that can hinder or facilitate the transition. There is no “one size fits all” solution, therefore it is important to have a proper knowledge of the local context, based on solid data.

- **Identify and engage key stakeholders:** the success of biocircular systems heavily relies on the involvement of key stakeholders such as feedstock producers, researchers, solution providers, end-users, etc. Connecting with them, understanding their perspectives, and securing their involvement are essential for the sustainability of the projects.
- **Prevention first:** even if upcycling generally yields significant environmental benefits by generating materials and products substituting to e.g. fossil-based ones, it is unlikely that they can offset the environmental impact linked with the production of products whose waste is used as feedstock. Preventing avoidable waste must be the priority.
- **Finding the “right” technologies:** consider the available feedstock, in terms of nature, quantities, and quality, the potential markets for end-products, and any possible legal barriers to select the relevant technologies. How its environmental benefits match with the local environmental strategies and objectives, and its economic implications (including required capital, potential risk, existing business models) are also key elements to consider.
- **Get inspired by others:** transitioning toward circular bioeconomy is a challenging journey, but you are not alone! There are many good practices to get inspiration from and to capitalise on. Make sure to also understand their key factors of success, especially favourable contextual parameters or any enabling legal and economic framework before considering a transfer of good practice.

2. Introduction

2.1. What are the HOOP Guidelines?

The HOOP Guidelines compile the main outcomes and findings of the HOOP project to support cities and regions in their transition toward an urban circular bioeconomy, focusing on biowaste recycling and upcycling. It summarises key recommendations, as well as relevant resources and tools that can be used to implement innovative recycling routes and the production of high-quality biowaste-based products and materials.

The HOOP Guidelines aims to deliver these key findings in a concise and user-friendly manner. To access more detailed information, the users are invited to consult the different documents linked in this report, or to consult the [HOOP Urban Circular Bioeconomy Hub](#) that includes essential resources and tools from the HOOP projects as well as other initiatives.

2.1.1. THE SCOPE OF THE HOOP GUIDELINES

The HOOP Guidelines only address few aspects of the circular bioeconomy: innovative valorisation routes for municipal biowaste, which includes the separate collection of high quality biowaste, its conversion into high value products, and its uptake by end-users. It is important to consider these elements in a larger perspective; the Bioeconomy Strategy (2018) and the updated Circular Economy Action Plan (2020) provide a more general view on the overall concept of circular bioeconomy. It is also important to remind that biowaste prevention should be the absolute priority, and that biowaste recycling yields considerably lower environmental and economic benefits than the strict avoidance of food waste and losses.

2.1.2. HOW TO USE THE HOOP GUIDELINES

The HOOP Guidelines for local and regional authorities aim to provide guidance to organisations planning or operating biowaste management and/or wastewater treatment at the level of a city or a region, for them to transition to circular bioeconomy approach, by shifting from linear models to circular ones converting biowaste into high value products.

These guidelines provide key recommendations for the main steps to develop a circular bioeconomy approach, meaning the increase of the biowaste capture rate and its conversion into high value products. It includes the following sections:

- Assess your baseline situation
- Engage your stakeholders
- Boosting biowaste prevention and collection, through citizen engagement
- Identify and design ways to valorise biowaste
- Find funding for your biowaste projects

The HOOP guidelines should be considered as a toolkit for transitioning toward more circular biowaste management systems. It is built upon different knowledge blocks that were developed by the HOOP partners, and the insights of the eight HOOP Lighthouses, cities and regions that made a journey toward biocircularity.

For each of the steps mentioned above, the HOOP Guidelines provide key recommendations, but also links toward useful resources, tools, or concrete practices, that lead readers to more specific information. They must be regarded as a toolkit that will guide you to useful resources for you to apply to your own situation.

The HOOP Guidelines were designed via the consultation of the HOOP Network Members, bringing together more than 100 cities, regions, waste companies, and local organizations managing biowaste and wastewater treatment. The HOOP Network Members validated the outlines of the Guidelines and specified their key needs and priorities, which are addressed in this document.

Last but not least, you may want to consider reading this manual back-to-back with the “National action manuals for local uptake and replicability”, which follow a similar structure and provide more in-depth information on how the HOOP Lighthouses underwent these different steps.

2.1.3. WHERE TO FIND WHAT?

Assess your baseline situation

- *How to assess its initial situation and what indicators to use to identify main barriers and opportunities in the current system.*

Engage your stakeholders

- *What stakeholders to engage, why, and how to secure their involvement*

Boosting biowaste prevention and collection, through citizen engagement

- *How to promote the prevention of biowaste and optimise its collection, through citizen engagement*

Identify and design ways to valorise biowaste

- *Innovative technologies, and how to select them*

Find funding for your biowaste projects

- *Funding schemes, circular business models, innovation public procurement*

2.2. A short introduction to the HOOP project

2.2.1. HOOP: CITIES AS CIRCULAR BIOECONOMY HUBS

The HOOP project has supported 8 Lighthouse cities and regions in developing large-scale urban circular bioeconomy projects aiming to create bio-based products out of urban biowaste and wastewater, between 2020 and 2024. To do so, the experts of the consortium provided Project Development Assistance to the 8 Lighthouses, covering different aspects ranging from the assessment of their current situation, the involvement of local stakeholders, the identification of promising, innovative valorisation routes, and the search for investors. It also addressed the practical aspects of biowaste collection and the engagement of inhabitants to reduce and sort waste, and to raise their awareness on the benefits of bio-based products.

2.2.2. THE HOOP LIGHTHOUSE CITIES

The [HOOP Lighthouses](#) are 8 European Cities and Regions representing a diverse panel of territories in terms of geographical location, context, and circular bioeconomy strategies.

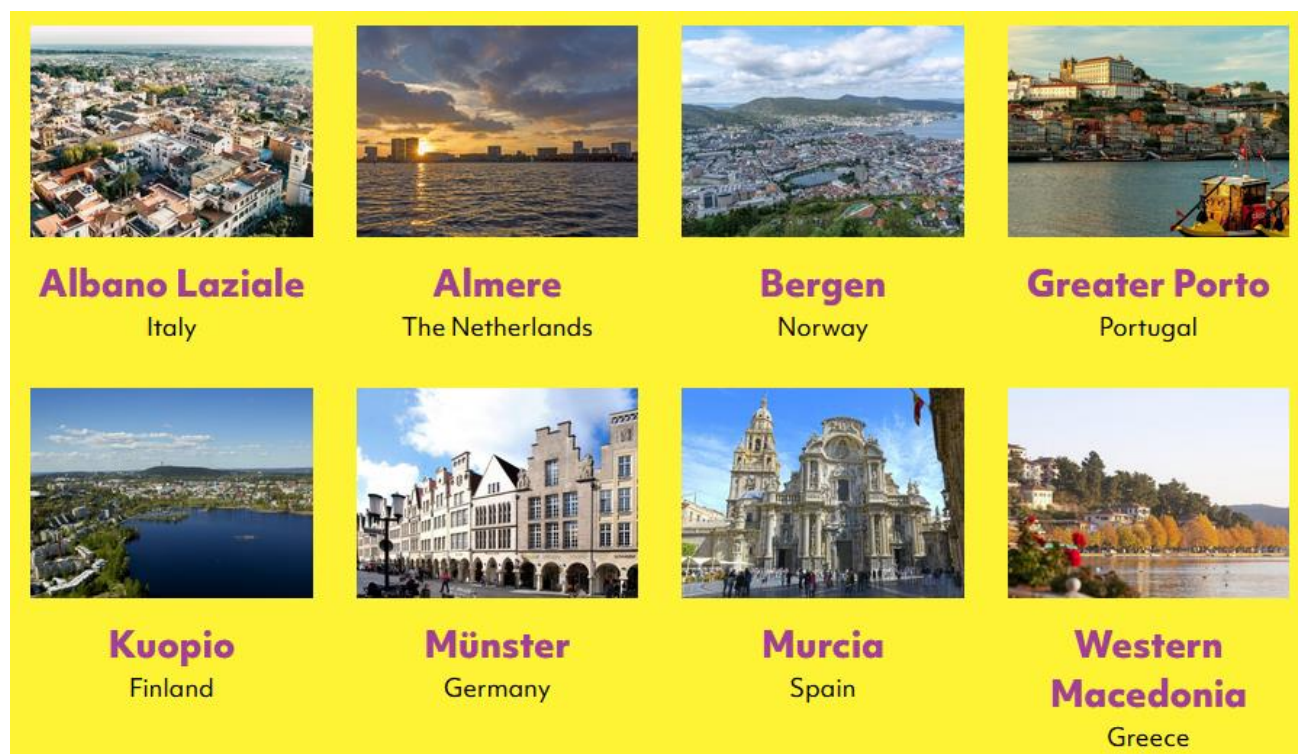


Figure 1: The HOOP Lighthouses

The HOOP Lighthouses underwent a journey toward circular bioeconomy and each of them investigated different valorisation routes addressing specific challenges and opportunities linked with their context, and through the active collaboration of local stakeholders via [Biowaste Clubs](#). The journey of the HOOP Lighthouses can be accessed in the HOOP National Action Manuals that details their key steps and findings.



Figure 2: The HOOP Lighthouses and their own specific expertise on circular bioeconomy

2.2.3. THE HOOP NETWORK

The HOOP project aimed to share its findings and expertise beyond its consortium, and to create a community of cities and regions around the topic of circular bioeconomy. This community was brought together in the [HOOP Network of Cities and Regions](#), that gathered local and regional authorities and companies managing, operating, and planning biowaste management and wastewater treatment. Over the course of the project, more than 100 organisations joined the HOOP Network and could be invited to study visits and workshops, attend monthly webinars, and connect with each other to share their challenges and solutions.

2.2.4. KEY RESOURCES

The HOOP project developed different tools and platform to provide support to the members of the HOOP Network. These different tools are centralised on the HOOP [Urban Circular Bioeconomy Hub](#). The HOOP Hub includes the following resources:

- **NETWORK:** HOOP Members can connect with other cities, share data, and highlight their topics of interest to filter the information provided by the Hub by logging in the [HOOP Virtual Network](#). Registering to the HOOP Hub also allows users to select their key topic interests and get a more direct access to the right resources.
- **LEARN:** [A virtual academy](#) which is a virtual library focusing on urban circular bioeconomy solution.
- **TOOLS:** [Different tools for self-assessment](#), including:
 - [The Bio-Circularity Label](#) is an instrument to understand the current performance of a city/region regarding the implementation of biocircular measures.
 - [A circular valuation method](#) helping public body to assess the circularity and financial attractiveness of their projects.
 - [The Project Maturity Level](#) that evaluates the level of maturity of a circular project and suggest improvement for its bankability
- **GET SUPPORT:** Possibilities to ask for [technical or financial support](#) from the HOOP partners (only available to the HOOP Network members)

2.3. Circular bioeconomy

2.3.1. WHAT IS CIRCULAR BIOECONOMY?

Bioeconomy includes the part of the economy that uses renewable biological materials from land and sea (crops, forests, animals, micro-organisms) as well as the losses and residues, to produce food, materials, and energy¹. Circular economy is an economic system in which the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste is minimised². Circular bioeconomy is the application of circularity principles to the bioeconomy. According to the European Commission, circular bioeconomy has the potential to contribute to all dimensions of the Green Deal by producing fossil-free materials, enhancing the protection of the environment and ecosystems, while also delivering on Europe's economic prosperity and ensuring a Fair and Just transition³.

The valorisation of biowaste is an important part of circular bioeconomy, considering that it composes about 50% of municipal waste, while only one third of it is currently recovered.

¹ European Commission (2018), A sustainable bioeconomy for Europe

² European Commission (2015), Closing the loop - An EU action plan for the Circular Economy

³ European Commission (2020), How the bioeconomy contributes to the European Green Deal,

2.3.2. THE ROLES OF CITIES AND REGIONS

Cities and regions play a fundamental role in the transition toward a circular bioeconomy, both on an operational level by organising the collection and recovery of municipal biowaste, and on the strategic level by planning and setting priorities, mobilising key stakeholders, and stimulating circular businesses and project through the definition of adequate incentivising instruments and funding lines.

Local and regional authorities also have a privileged connection with citizens and local businesses and can impact consumption patterns to make them more circular, through awareness-raising and information. A powerful way to boost the demand for circular, biobased products is circular public procurement (CPP). By including circularity in their public procurement policy and training their procurement staff, public authorities have the possibility to make CPP a significant market-pull instrument to stimulate the market of biowaste-based products.

2.3.3. KEY REGULATIONS

Biowaste management is subject to several EU regulations, the main important being the [Waste Framework Directive \(2008/98\)](#), which includes several provisions specifically on biowaste:

- The mandatory separate collection or on-site recycling of biowaste, starting from 1st January 2024
- The impossibility to consider composting and anaerobic digestion of the organic fraction coming from mixed municipal waste (e.g. through mechanical biological treatment) as recycling by January 2027.

The Waste Framework Directive (WFD) and the Landfill Directive also include provisions that indirectly affect biowaste management, such as the 65% recycling target by 2035, and the maximum of 10% landfilling for municipal waste by 2035. Both targets require significant efforts on the collection and recycling of biowaste to be met.

The WFD also lays down the principles for the end-of-waste criteria that specify when waste becomes a product and ceases to be subjected to the waste regulation. There are currently no European end-of-waste criteria applying to biowaste, and some European Member States have defined it at national level, which lead to the fragmentation of the European market for products originating from the recycling of biowaste. The last revision of the Fertiliser Product Regulation ([2019/1009](#)) partly addressed this issue by setting requirements for placing fertilisers and soil amendments, including compost and digestate, into the market by using the CE label, which automatically grants the end-of-waste status to the products.

The Waste Framework Directive is under revision (as of March 2024), with a target on the reduction of food waste by 30% in stores, restaurants, and households by 2030. In February 2024, the European Parliament's Environment Committee proposed to increase this target to 40% in a vote on the revision of the WFD.

Other European regulations impact the management of biowaste, such as the Animal By-Product Regulation ([Regulation \(EC\) No 1069/2009](#)), which sets sanitary rules for the handling and processing of animal by-products and derived products, which includes food waste. Producers of animal by-products are requested to keep track of the products that they transport or receive and meet hygiene standards for their processing.

3. Assess your baseline situation

The identification of the use of water, materials, energy, and nutrients, provides insights into the changing metabolism of cities. This concept is instrumental to inspire design of sustainable cities, helping to promote quantitative approaches for assessing urban material and resource streams.

In order to plan a bioeconomy strategy at the level of a city or a region is necessary to start from a clear assessment of the local context. The HOOP project has produced a detailed analysis of the 8 cities and regions following a methodology based on a multi-layered indicator set.

The analysis of the baseline situation should focus on the flow of bioresources into the city system (mainly food, water and wood), the production of biowaste and urban wastewater sludge and how they are collected, treated and used. This requires also to examine the current infrastructure involved in waste recovery processes, treatment processes or technologies to obtain valuable products from residual waste streams. The baseline assessment will help to identify main barriers and opportunities in the current system.

THE HOOP KEY RECOMMENDATIONS

1. **Define the urban metabolism:** collect data that can guide to identify the material flow in the city/region. Clarify what is coming in, how it is being used and the output. Clarify the collection and treatment methods applied to biowaste and water. This research will give you the right information to draw the urban metabolism of your city/region.
2. **Use the right indicators:** the analysis should be supported by key indicators that provide a description of the initial situation in terms of policy, society, biowaste management, water management, and generated output. The HOOP Bio-Circularity Label provides a free tool that can guide the analysis.
3. **Connect and exchange with other territories:** making comparisons with other territories can be a relevant method to identify room for improvement, identify achievable performances, and highlight successful instruments. By joining the HOOP Network, you will be able to identify cities and regions with similar challenges, initial situations and goals.

3.1. Key recommendations

3.1.1. HOW TO ASSESS ITS INITIAL SITUATION?

The HOOP project developed an excel spreadsheet that helped to address the key questions to the 8 cities and regions analysed. It lists the following topics:

- **Collection of municipal solid waste:** the HOOP project focused on the following waste categories: mixed municipal waste, separately collected biowaste (food waste, garden and park waste, post-consumer wood waste) and other municipal waste. Information should be gathered on the amount of waste collected and type of collection (private vs municipal; central vs collection points).
- **Treatment of municipal solid waste:** type of waste treatment and disposal methods (recovery, re-use, disposal, export of waste).
- **Urban wastewater management:** number of water treatment plants, amount of wastewater generated, quantity of sewage sludge produced and the destination of it (anaerobic digestion, composting, etc.).
- **Additional information:** This last part is related to waste collection (collection scheme, quality of biowaste, sorting and pretreatment, valorisation processes and development of bio-based products, type of bioproducts produced) and treatment and wastewater value chain (wastewater facilities).

The data gathered in the excel spreadsheet aim at providing a description of each territory based on 5 topics:

- **General characteristics:** information on the context, the biophysical characteristics and relevant policy.
- **Waste collection:** how waste collection is organised. Furthermore, it presents the main waste streams and their amounts.
- **Waste treatment:** waste infrastructure of the biowaste and wastewater treatment. Waste flows are described and illustrated by a flow chart.
- **Urban metabolism:** flows of food, wood and water into the region, the waste generation and treatment. A Sankey diagram illustrates the results from the material flow analysis. It displays the inflow of material, the production of urban municipal biowaste and urban wastewater sludge and their treatment methods.
- **Pilots:** developing new valorisation chains. This section presents the ambitions of each city and region for biowaste valorisation and the commitment.

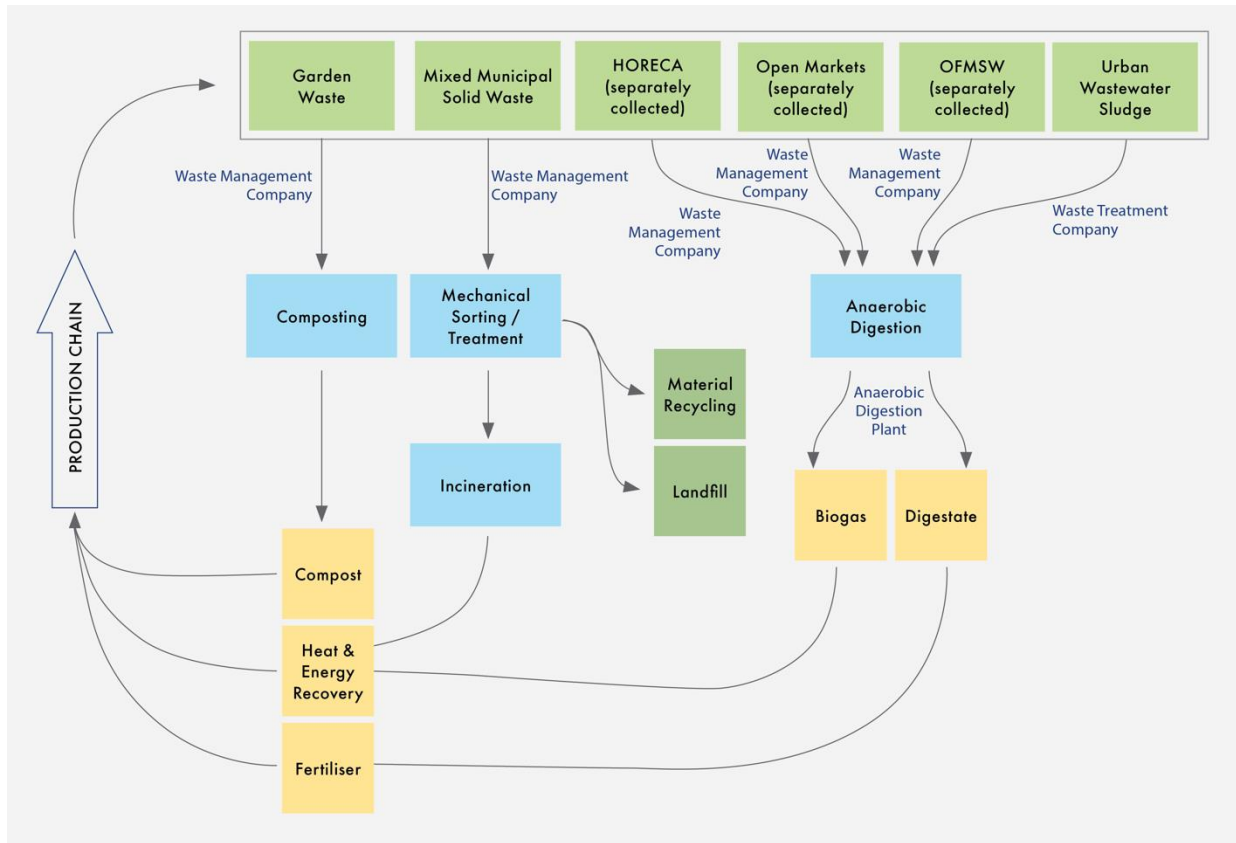


Figure 3. Example of visualisation of urban metabolism of urban biowaste and wastewater

3.1.2. WHAT INDICATORS TO USE?

HOOP developed specific indicators in line with those presented in the report *Indicators for circular economy transition in cities – issues and mapping* presented in Brussels in 2019 by the Urban Agenda for the EU. The HOOP Urban Bioeconomy Indicators focuses on the assessment of the circularity in urban bioeconomy for cities and regions based on six different dimensions: Waste, Water, Energy, Economy, Society and Policy. It is important to specify that the set of HOOP Urban Bioeconomy indicators does not claim to be a general toolkit applicable in all those regions interested in conducting a circular economy baseline analysis. Nevertheless, this analysis could be considered as an interesting methodology to guide the HOOP Network of Cities and Regions and other cities interested in HOOP approach. The HOOP project provided a self-assessment tool, the HOOP Bio-Circularity Label, available for all the cities and regions interested to define their own baseline. More information about the tool is provided in the 3.2 "Interesting resources" section.

Table 1: List of the HOOP Bio-Circularity Label indicators for the baseline assessment

Indicator	Unit	Explanation
Policy		
Circular Economy Action Plan	Qualitative	Is there a Circular Economy Action Plan and/ or strategy published in your city/region?
Circular Policies implemented	Qualitative	Are there relevant circular policies implemented on biowaste, wastewater and the activities of its processing e.g., related to targets in the Circular Economy Action Plan?
Circular Public Procurement	Qualitative	Are there circular indicators/ requirements integrated in the public procurement processes e.g. material use, emissions indicators, total amount of waste produced etc.?
Existing Public-Private-Partnerships	Qualitative	Do any public-private partnerships exist that focus on (bio-)circularity projects? (This may include the waste management company itself if it is a public-private organisation)
Public financing support	Qualitative	Does the city/ region offer dedicated business angels for companies, start-ups/ NGOs in the area of the circular (bio-)economy?
Planned public budget for a green and circular economy	Qualitative	Is there an annual planned budget for green and circular expenditure (e.g., sharing services, renewable energy production, urban greenery, waste reduction, energy efficiency, responsible tourism, and commerce)?
Taxation for landfilling/incineration	Qualitative	Are there taxes on incineration and/or landfilling?
Collection and waste prevention incentives	Qualitative	Are there any incentives for citizens to participate in the collection and waste prevention (e.g., Pay as you throw/ earn as you recycle schemes, sorting obligation for food waste, reduced collection frequency for residual waste)?
Society		
Coordination entity to engage stakeholder in circular economy	Qualitative	Is there a dedicated online platform or a physical bureau that coordinates industry, academia, financiers, and citizenship to foster bio-based circularity?
Initiatives/awareness campaigns at a city level for the reduction of waste	Qualitative	Is the city actively supporting initiatives/awareness campaigns at a city level for the reduction of waste, return schemes for packaging, sharing models (circular economy citizen participation)?

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

Indicator	Unit	Explanation
Initiatives/awareness campaigns for waste collection	Qualitative	Are there any initiatives for separate waste collection systems (e.g., pre-collection equipment (kitchen bins and/or bags for food waste)) or convenient drop off stations for a variety of material streams (e.g., batteries, furniture, textiles, electronics, cooking oil)?
Innovation and co-creation spaces/ platforms	Qualitative	Does the city or region have e.g., fab-labs, crowd-sourcing platforms where citizens engage in developing new circular solutions?
Environmental education at schools	Qualitative	Do (public) schools and other educational institutions and programmes have year-lasting classes/courses on environmental education integrated into waste subjects?
Water		
Total water consumption by households	m ³ /cap	Quantity of household water use from public water supply per capita and per year.
Implementation rate of wastewater collection	%	Share of the city population served by wastewater collection infrastructure.
Reuse of water	% of treated water	The amount of water that is reused over the maximum that is allowed to be reused (and not given back to the environment) by law. (Amount of actually reused water) / (Amount of water available for reuse purposes (irrigation, industry, other non-potable urban applications)) x 100 = %.
Total reuse and recycling of sludge	% of total sludge generated	Recycle/reuse rate of sludge (e.g., soil amendment in agriculture, composting, anaerobic digestion, excludes incineration for energy recovery).
Biowaste		
Total biowaste produced	kg/cap	Total municipal biowaste produced per capita.
Implementation rate of biowaste separate collection	% of total households	Share of households serviced with biowaste separate collection/% of the city population with regular biowaste collection (residential) / availability of infrastructure.
Biowaste separately collected	% of total biowaste	Share of biowaste that is separately collected/ not mixed solid waste.
Recycling of biowaste	% of total biowaste generated	Share of biowaste that is recycled (e.g., compost, anaerobic digestion; other technologies, according to EU legislation: excludes incineration for energy recovery) of total collected biowaste.

Indicator	Unit	Explanation
Number of specific bio-waste streams	Number	Number of selectively collected biowaste streams (e.g. used cooking oil/green waste/spent coffee ground/fruit + vegetable excluding animal biowaste from market/municipal biowaste from households and catering).
Quality of the selectively collected bio-waste	% weight	% in weight of improper material (glass, plastic, metals, etc...) in the selectively collected organic fraction of municipal solid waste (average of all specific collected biowaste streams).
Output		
Innovative bioproducts	qualitative	Are there apart from compost and biogas innovative bioproducts generated from the organic material streams (biochemicals e.g., for plastics production, feed...)
Local use of bioproducts	qualitative	Are there any produced bioproducts staying in the local community (e.g., chemicals used as building blocks in local production, sold as compost for local gardening/agriculture, feed for local fishery, fertilizers in green spaces)?
Biogas production per capita	kWh/cap	Biogas production per capita e.g., from anaerobic digestion of UWWs and/or municipal biowaste (not biogas recovered from landfills).
Compost	%	% of selectively collected municipal biowaste and garden waste transformed into compost rather than other innovative bioproducts.

3.1.3. HOW TO BENCHMARK WITH OTHER TERRITORIES?

Making comparisons with other territories can be a relevant method to identify room for improvement, identify achievable performances, and highlight successful instruments. However, there are different aspects that can make benchmarking challenging: contextual parameters that can hinder performances (such as high population density, high-rise buildings, etc.), different scope for municipal biowaste collection (food and/or garden waste, non-household waste, etc.), the level of implementation of biowaste collection, etc.

The creation of the HOOP Network of Cities and Regions aimed at providing an exchange platform for territories to proactively compare basic data with each other. Within the HOOP Hub, cities and regions can define a summary of their baseline situation by providing data on:

- Density (inh/km²)
- Separate collection available for food waste (Yes/No)
- Separate collection available for garden waste (Yes/No)
- Are there any incentives for citizens to participate in biowaste collection and/or prevention (Yes/No)
- Quantity of household water use supply per capita per year

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

- Total municipal biowaste produced per capita
- Recycle / re-use rate of sludge (%)
- Share of recycled biowaste (%)
- Innovative bioproducts generated from organic materials (Yes/No)
- Share of households serviced by biowaste collection (%)
- Share of biowaste separately collected (%)
- % of improper materials in separately collected biowaste

Thanks to the selected indicators, members of the HOOP Network have the opportunity to have a first idea of the context of territories located in the same region, or in the same national context, and compare the data, with the aim to start a discussion on barriers and, especially, potential solutions. Furthermore, cities and regions can express their specific interests, which could guide a benchmarking of the territories, even beyond national boundaries. Having read the selected indicators, the territories part of the Network are encouraged to contact a specific city/region asking for advice to improve. This sort of exchange has been favoured by the organization of various study visits, online meetings, and workshops.

The proposed indicators consist in a very first approach to engage in comparisons. A consistent benchmarking approach requires more in-depth analysis of:

- **Contextual parameters**, e.g. the density, presence of vertical housing, touristic and economic activity, etc., which play a role on biowaste generation but also on sorting performances and options for collection, by e.g. conditioning the collection and transport distances, the accessibility to sorting infrastructure, etc.
- **The organisation of waste collection**, especially the scope of municipal waste collection and whether it includes a share of commercial activities besides household waste.
- **The generated quantities of food and garden waste**, including the share that is not sorted and collected in residual waste, or managed in decentralised systems (home and decentralised composting). Biowaste arising can be very different from one place to another depending on the presence of garden, consumption patterns, etc. This helps to put in perspective the sorted quantities to assess the performance of the collection system.
- **Data on collected quantities along with impurity levels** that have a strong impact on recycling rates.
- **The actual use of processed biowaste**, which represents a significant aspect of the success of a given waste management system.

A special attention should be given to cost comparisons, which generally proves to be quite challenging. Cost reporting is very inconsistent among European local authorities, leading to generally incomparable data. Economic framework instruments such as landfill and incineration tax and levy or financial subsidies/bonuses, or charging systems defined by collection operators might also impact the economic balance of a given collection system for a municipality.

3.2. Interesting resources

HOOP Reports and resources			
	Title	Description	Link
HOW TO ASSESS ITS INITIAL SITUATION?	Urban metabolism of HOOP Lighthouses	Factsheet presenting the research made for the 8 HOOP Lighthouses to define their urban metabolism	Factsheet-Urban-Metabolism.pdf (hooproject.eu)
	HOOP Lunch Talks Season 3 Episode IV: The HOOP Bio-Circularity Label	Webinar presenting the HOOP Bio-Circularity Label. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks Season 3 – Episode IV: The HOOP Circularity Label HOOP (hooproject.eu)
WHAT INDICATORS TO USE?	The HOOP Bio-Circularity Label	A tool supporting cities and regions to show to what extent they can improve their circular measures, policies, and initiatives. The Label defines 9 Circularity Levels (CL) depending on the level of maturity of the circular bioeconomy on a European level (Figure 4).	HOOP Urban Circular Bioeconomy Hub (hoop-hub.eu)
HOW TO BENCHMARK WITH OTHER TERRITORIES?	HOOP Lunch Talks Season 2 Episode III: The HOOP Network becomes Virtual through the Urban Circular Bioeconomy Hub	Webinar presenting the HOOP Hub and its functionalities. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks Season 2 – Episode III: The HOOP Network becomes Virtual through the Urban Circular Bioeconomy Hub HOOP (hooproject.eu)



Figure 4: The HOOP Circularity Labels

4. Engage your stakeholders

Stakeholder engagement is a guided process in which relevant actors are involved in frequent exchanges and join forces to achieve a common goal. Stakeholder engagement is an ongoing, inclusive dialogue among all actors that can contribute directly or indirectly to a given goal. It is a process of agenda-setting and collective implementation of activities that are shaped according to the stakeholders' needs and expectations. In fact, the main benefits of this process are:

- Identification of concerns and interests
- Building relationships and trust
- Mitigating risks
- Enhancing decision-making
- Facilitating collaboration and cooperation
- Managing conflicts

A complex topic such as circular urban bioeconomy needs the involvement of various actors, from ordinary citizens to initiatives and organisations already active. The HOOP project implemented this important process through the instrument of the Biowaste Clubs, involving the stakeholders representing the quadruple helix: Industry/Business, Academia/Research, Policy/Government and Society (Media, Associations, NGOs).

THE HOOP KEY RECOMMENDATIONS

1. **Identify all the key stakeholders:** the identification of the stakeholders to involve in the new strategy should consider actors from the political government, the civil society, the academia, and the industry/business. None of them should be left outside and the stakeholders engagement process will include everyone needs and goals. This will make the bioeconomy strategy stronger and shared.
2. **Keep them involved:** meeting and exchange opportunities should be organised to foster local commitment. The meetings, organised as participative workshops, or online meetings, should aim at sharing experience and knowledge, collecting feedback, building a shared vision. For this, the format needs to adapt to the request, spirit and needs of the group.

4.1. Key recommendations

4.1.1. HOW TO IDENTIFY KEY STAKEHOLDERS

The stakeholder mapping immediately follows the definition of the baseline, during which the city can already understand the key aspects on which the strategy will focus. Based on these topics and general objective, the city/region can proceed with a stakeholders mapping. This phase has to consider all relevant stakeholders at

local, regional, national, and European level included in the quadruple helix. During the mapping, key stakeholders can be listed based on:

- potential interests on the topic
- needs and challenges
- role to cover in the project
- potential engagement mechanisms (benefits for the stakeholders)

Following this first analysis, a first group of stakeholders should be involved in a meeting aiming at defining the base of a Stakeholders' Engagement Plan, defined as a living document defining and monitoring the process and the activities implemented by the actors involved.

HIGHLIGHTS FROM THE HOOP LIGHTHOUSES

Albano Laziale, Almere, and Münster to use different strategies for stakeholder engagement.

The city of Albano Laziale based the mapping on the results and contacts gathered within a previous project. The previously identified stakeholders have been contacted and engaged to support the identification of actors that could bring relevant inputs to the HOOP project.

The city of Almere organised a meeting with a first small group of stakeholders and identified other potentially relevant stakeholders from public authorities and agencies on local and regional levels, project developers, private companies involved in the sector of interest (construction and bio-based products). The stakeholders identified were then mapped according to their relevance and influence in bio-based construction material.

The city of Münster has identified citizens as the focus actors to involve in their activities. The mapping process focused on the identification of “key persons” seen as facilitators and access points to citizens groups still struggling with proper biowaste sorting. Another important group identified by Münster are the technical experts, ranging from university representatives to profiles working in the technical facilities.

4.1.2. LIST OF KEY STAKEHOLDERS

Building a local or regional bioeconomy strategy requires the involvement of all stakeholders across the quadruple helix of industry and business, the scientific community, political and societal actors. All these stakeholders are – directly or indirectly – impacting the biowaste value chain and are vice versa also affected by it. For this, the dialogue among them should be at the core of the local engagement activities. Ownership of the project activities is given to the local and regional actors, and it will be in their hands to co-create circular solutions and to establish new forms of collaboration and exchange.

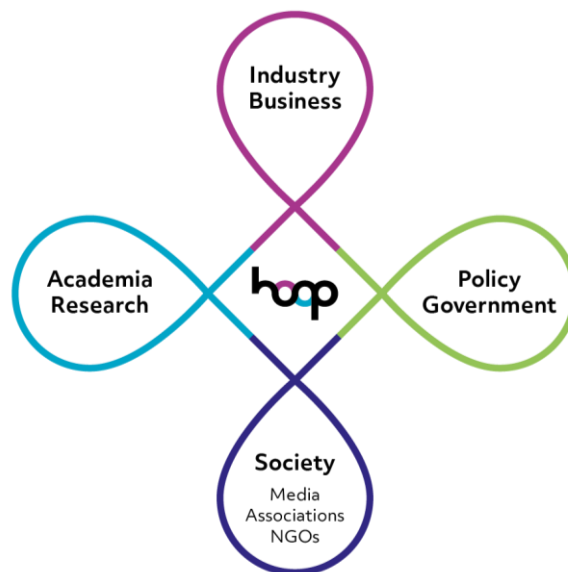


Figure 5: *The quadruple helix.*

The selection of the stakeholders should be based on the local context as described above. Nevertheless, following the quadruple helix (**Figure 5**), some key stakeholders should be always included:

- Regional and local authorities (including as well neighbouring cities)
- Local government associations
- Waste management companies
- Wastewater treatment operators
- Energy providers
- Universities and research organisations
- Food-related industries
- HoReCa actors/federations
- Non-governmental organisations
- Local businesses and SMEs
- Consumer organisations
- Citizen groups
- Open market vendors and producers
- Specialised organisations or experts working on specific valorisations routes

4.1.3. HOW TO APPROACH AND ENGAGE THEM

As mentioned above, there are several stakeholder's engagement methodologies. These guidelines will focus on the experience gathered within the HOOP project through the activities implemented by the HOOP Lighthouse Cities and Regions.

The Biowaste Club Meetings are designed as spaces of discussion to foster local commitment and engagement for a more circular biowaste and wastewater value chain. The objectives of the Biowaste Clubs are:

- Develop a shared local (biowaste) vision
- Foster local leadership
- Share knowledge and experiences
- Institutionalise a regular exchange among stakeholders
- Monitor the implementation and testing
- Collect feedback

Biowaste Clubs can be conducted following different methodologies: as interactive workshops, regular meetings for small groups, online or in presence. Nevertheless, each meeting should follow a preparation and a set of phases that can ensure a successful and fruitful exchange:

- **WHY: defining scope and objectives of your Biowaste Club.** The key questions you need to ask yourself are when start the planning are: what do I want to achieve with this meeting? What are the goals of this meeting and what should be the outcomes?
- **WHO: identifying key stakeholders to engage and set an initial timeframe.** Since each meeting will cover different issues, it is clear that not every topic will be relevant to every stakeholder. For this reason, selecting the participants based on the key topics and objectives of the discussion is crucial to have a fruitful exchange.
- **WHEN: Format and duration of the Biowaste Club.** Now you can focus on the logistics aspects, the definition of a draft agenda, the registration process, the format and the duration of the meeting.
- **HOW: Preparing the Biowaste Club.** Once logistic details have been clarified, it's time for the promotion of the meeting (send invitations and reminders), a finalised agenda and it's also important to consider a feedback questionnaire.
- **LET'S ENGAGE: The day of the Biowaste Club.** It's show time. Do not forget to take notes and pictures. Collect feedback to guide the organisation of the next meeting.
- **WHAT'S NEXT: Following up.** Keep the motivation high by sending a thank you email, and all the material used during the meeting. Start planning the following activities.

The main outcomes of the HOOP stakeholders' engagement process can be summarised as follows:

- The concept of circular economy should be clearly presented and explained to the stakeholders, by translating complex or academic terminology into accessible language.
- The possibility to join remote meetings increases the chances to have a higher participation of the stakeholders. In any case, beyond the level of interest, the lack of resources and time of stakeholders to participate in the meetings has to be considered.
- Clear objectives have to be identified since the beginning of the process in order to activate the interest of the stakeholders.

- A regional collaboration among cities facing same or similar challenges and interested in the topics investigated should be facilitated.

4.1.4. DRIVERS AND BARRIERS

Conducting successful stakeholder engagement activities may be hindered by different barriers that have to be addressed from the very first phase of the process to adopt the right measures to overcome them.

- **Lack of resources:** stakeholders often do not have enough time or budget to participate in extra activities on top of their daily job. It is extremely important that the engagement activities are as closely aligned as possible with the stakeholders' core work and motivations.
- **Lack of motivation and conflicting interests:** stakeholders might have different priorities and/or conflicting objectives. It is important to understand their key drivers during the stakeholder mapping phase and approach individuals directly to explain why their involvement is key to the success of the activity and how they can benefit from joining.
- **Lack of political commitment:** elections can cause uncertainty regarding the commitment of policy-makers. To create networks, momentum, and a solid base for future operations, move quickly before the election period starts. After a change in leadership, take into account any potential new risk or opportunity and evaluate how they can impact your project.
- **Lack of inclusivity:** the stakeholder identification should be as inclusive as feasible to avoid unintentionally excluding pertinent groups. Through site visits, talks with already identified stakeholders, and interviews with key actors the original list of stakeholders should be confirmed, amended, and continuously updated. Reaching out to groups that are generally out of decision-making processes is crucial, especially in the case of vulnerable or marginalized groups that may be affected by the project.
- **Lack of right skills:** the process of engaging stakeholders requires a variety of capacities from the actors involved, including facilitation and leadership skills from the organization leading the process, technical knowledge about the subject matter, as well as a cooperative attitude from the stakeholders taking part in it.

Stakeholders' engagement is key to build a successful bioeconomy strategy. Implementing this sort of process allows to understand, address, and balance the interests and expectations of various stakeholders. It helps in making more informed decisions, building positive relationships, and ultimately achieving sustainable and mutually beneficial outcomes.

The methodology of the Biowaste Clubs can help to co-design strategies and actions with the involvement of all key local stakeholders at the same time. A way to harness the stakeholders is true technology as the app that utilises gamification developed within the project to engage people on the topic of biowaste. Finally, both in person and online meetings should be considered to meet the needs of the various stakeholders.

4.2. Interesting resources

HOOP Reports and resources			
	Title	Description	Link
	Engaging stakeholders for the urban bioeconomy. Tools and resources for cities and regions.	A handbook that introduces the topic of Stakeholder Engagement and presents tools and resources available to cities and regions on the topic.	https://hoop-hub.eu/virtual-academy-fil-ter.html?i1=1&i2=1&i3=0&i4=1&topic=&keyword=#
HOW TO APPROACH AND ENGAGE STAKEHOLDERS	HOOP Lunch Talk S2 Ep VI How to bring stakeholders together?	Webinar presenting how local and regional stakeholders can be engaged to develop a common vision and actions for circular biowaste management. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks Season 2 – Episode VI: How to bring stakeholders together? HOOP (hoop-project.eu)
	What is a Biowaste Club	Video describing the methodology implemented by the Biowaste Clubs organised by the Lighthouses within the HOOP project.	https://youtu.be/0qoHvxW8lhg
DRIVERS AND BARRIERS	Engagement activities implemented through the Biowaste Clubs in the Lighthouses Cities and Regions	Report presenting the results of the Biowaste Clubs organised during the first 3 years of the HOOP project, attended by 790 stakeholders across all eight Lighthouses.	https://hoop-hub.eu/virtual-academy-fil-ter.html?i1=1&i2=1&i3=0&i4=1&topic=&keyword=#

5. Boosting biowaste prevention and collection, through citizen engagement

The recycling of biowaste requires an adequate supply of feedstock, which must be sorted by waste producers, including households and commercial activities, and has to respect a certain level of quality. Capturing a significant amount of high quality biowaste can prove to be challenging and requires the involvement of all waste producers, that might face different challenges to properly sort their waste. Besides, a significant share of food waste is avoidable and must be targeted by waste prevention actions in priority.

THE HOOP KEY RECOMMENDATIONS

1. **Prevention first:** make sure to give the priority to the reduction of avoidable fractions such as “edible” food waste, with intervention targeting the purchase, storing, cooking, and donation of food. Comprehensive local prevention strategies linked with local food strategies can include the promotion of prompts, training programmes, awareness raising activities, etc.
2. **The “right” collection system:** getting the participation of all inhabitants and other waste producers is only possible if they are informed pro-actively on the collection organisation and objectives, if they are offered collection modalities that fit their specific constraints (e.g. in terms of available space or accessibility of collection points), and if incentivising instruments making sorting “the preferred option” over residual waste.
3. **Quantity AND quality:** the quality of the feedstock is essential for most recycling technologies. Quality controls associated with appropriate responses and correction measures must be implemented to reduce the impurities in the collected waste as much as possible.
4. **Continuous communication:** communication with inhabitants must be a continuous effort to keep their involvement high, and to involve newcomers. Feedback gathering mechanisms and consultations can be relevant to better understand their perspectives, motivations, and behaviours, and adopt relevant messages.

5.1. Key recommendations

5.1.1. BIOWASTE PREVENTION

Food waste prevention has not been directly addressed by the HOOP project but considering the importance of the challenges associated with it, it is essential to provide short recommendations and resources from other initiatives and projects. Eurostat estimates that around 10% of the food made available to EU consumers may be wasted. Food waste represents about 131 kg/cap y and 50% is generated by households⁴, generating about 16% of the greenhouse gas emissions of the entire EU food system⁵. While the recycling of food waste can yield relevant environmental benefits, it is unlikely that it will offset the embodied impact of food that is wasted.

Food waste generation is linked with different, interlinked factors that are challenging to identify. It is the result of different behavioural and contextual factors occurring when consumers buy, store, prepare, and consume food, e.g.: the motivation of consumers to avoid it based on their negative perception of “avoidable” food waste, their competences and knowledge regarding the handling and cooking of food (how to store them, how to assess the quantities, how to deal with leftovers, etc.), but also different contextual elements such as the local food offer, unforeseen events, the price of food, etc. It is important to note that these different actions occur before waste generation, and thus are more connected to a local food strategy rather than to a local waste strategy. There are however potential synergies between food waste reduction and waste sorting that include public awareness raising or nudges, with waste management being an entry point to households for reduction actions.

Several types of actions have proven to be effective to reduce avoidable food losses. The JRC recently proposed a compendium on tools and practices to reduce consumer food waste that listed priority interventions⁶:

- 1. Prompts and tools for households:** physical or visual prompts that work as daily reminders for households to promote reduction behaviours. They can be cooking equipment to assess the number of portions, prompts to remind of food about to expire, menu planners, etc.
- 2. Coaching for households:** training courses and information workshops to teach practical food management practices and how to integrate the prompts/tools in their kitchen, that can be embedded in broader courses (sustainable eating, food safety, etc.)
- 3. Local awareness campaigns:** they should be targeted to local context and needs, possibly targeting specific audiences, and relying on local community networks.
- 4. Classroom education programmes and actions in school canteens:** these activities combine the actual reduction of food waste generated in canteens and awareness raising activities targeting children, with the support of guides or trained organisations, and consist in lessons on food value and food waste, and practical

⁴ European Commission, https://food.ec.europa.eu/safety/food-waste_en#about-food-waste, accessed in February 2024

⁵ Joint Research Centre (2023), *Assessing the economic, social and environmental impacts of food waste reduction targets*

⁶ Joint Research Centre (2023), *Tools, best practices, and recommendations to reduce consumer food waste*

activities and actions (co-creation of menus with children, longer seating time, adaptation of serving methods, etc.).

5. Nudges out-of-home: these interventions target food services (retailers, restaurants, etc.), with actions implemented by the food services targeting consumers: proposing adapted (reduced) portions, doggy-bags to take home the leftovers, etc.

6. National food waste prevention programmes: they are especially important to coordinate and deliver a comprehensive strategy and thus creating an enabling environment for local initiatives and individual behaviours. They can also entail coordinated efforts to improve knowledge, lift legal barriers (e.g. on food marking), and involve bigger producers and media.

The compendium also suggests local policy makers to define food waste reduction plans, such as HOOP Network Member Brussels (as a part of their [“Good Food” Strategy](#)) or the city of [Paris](#), and systems to monitor its impact, for which the Food and Agriculture Organisation of the United Nations and the city of Milan proposed a monitoring framework.

As mentioned above, food waste generation is the consequence of many factors, among which individual knowledge, awareness, motivation, consumption patterns, but also contextual factors play a role. It is difficult to know “in advance” the importance and characteristic of food waste for a given territory according to its characteristics, considering that these many different socio-demographics, economic, and contextual parameters might all have a different influence. It is therefore recommended to collect information and data on food waste, especially the avoidable fraction, to try to identify key target audiences (e.g. young parents, single households, etc.), the nature of food wasted (linked with purchase, storing, or cooking behaviours), the type of food wasted, etc., in order to design adequate interventions. Such data can be collected through waste composition analysis, or food waste surveys in which household monitor and weight their wasted food for a given period of time.

Food donations is also an important instrument to reduce food waste while supporting disadvantaged populations. Promoting food donations can be achieved through different actions, such as the facilitation of the compliance for donors and recipients of surplus food (through the clarification of roles and responsibilities, adapted regulation, and financial incentives), or the support of local redistribution organisations e.g. on the logistics.

HIGHLIGHTS FROM THE HOOP LIGHTHOUSES

Dose Certa”, Lipor helping restaurants to fight food waste by providing the “right amount” to consumers

HOOP Lighthouse Porto Region represented by the public waste management company Lipor has implemented this support scheme targeting the catering sector since 2008. In partnership with the Portuguese Nutritionists Association, Lipor has developed a process analysing the practices of a restaurant, setting actions to reduce the losses and waste generated during the storing, cooking, and consumption of food (e.g. by proposing “adapted portions”), and measuring the improvements and savings. Over the years, Lipor supported more than 50 establishments to reduce their waste, while also proposing a doggy-bag system.

[More information here](#)



5.1.2. BIOWASTE COLLECTION

Source-separation of biowaste is an essential step to unlock suitable feedstock for innovative recycling processes. Successful collection schemes achieve both a high capture rate, meaning that most of the generated food waste quantities are sorted by waste producers, and high quality, meaning that the level of impurities present in the collected food waste is sufficiently low to allow a proper recovery. To do so, the contribution of waste producers is essential, yet many of them might face difficulty with source separation.

Overall, successful collection systems combine different interventions to ensure a “proper sorting environment” for the waste producers. It consists in:

- **The right information:** knowing what to do is an essential requirement for waste sorters. Information should not only be available: it should reach the households through pro-active activities, especially more challenging populations (people living in high-rise buildings, newcomers, foreigners, etc.). Information should include clear sorting guidelines (dos and don'ts), the sorting rules (when and where to take out its bins, the location and opening time of collection points, etc.), but also what happens to the sorted waste or why the sorting guidelines exclude specific fractions. Communication activities should also be a continuous effort to remobilise inhabitants and ensure that newcomers are well aware of biowaste source separation.
- **A convenient system:** sorting must be accessible and convenient for all inhabitants, regardless of where they live and the typology of their housing. Several practical constraints might make source separation more challenging: lack of space in the housing or in the building to store waste before collection, accessibility and proximity to collection points, etc. Collection modes should ideally be adapted to the typology of their housing and take these constraints into account. Food waste might prove to be more challenging to sort due to possible nuisance: odours, flies, etc. Providing equipment for waste producers to conveniently sort their food waste in their kitchen, including for instance compostable bags and an aerated kitchen bin, can be recommended. Proposing adapted collection frequencies is also recommended, possibly higher during warmer months.
- **A motivation to sort waste:** incentivizing instruments are known to be extremely effective to achieve high capture rates. The most common instrument is pay-as-you-throw, which consists of taxing the generation of unsorted (residual waste) to make sorting less expensive. Other incentives are known to give good results: the reduction of collection frequencies for residual waste, making biowaste collection a better option to evacuate biodegradable waste, implementing a system that limits the anonymity of waste (with individual bags or bins, that can simplify controls of individual behaviours), or sorting obligations with controls of the presence of biowaste in residual waste bins. All these instruments also require controls to ensure the quality of the sorted fractions, and limit noncompliance (such as illegal dumping).

Other general recommendations can be given to optimize the capture rate and the quality of the sorted waste:

- **Collection mode:** door-to-door schemes generally give better results than bring schemes (using “road containers”), both in terms of collected quantities and quality. This might be connected to the fact that door-to-door systems gives more emphasis to individual responsibility and enable individual controls compared to open containers. Open road containers generally entail higher amounts of impurities. Containers equipped with a control access (e.g. a door that can be open with an individual pass) generally gives a higher quality than open containers, but lower than door-to-door schemes.

- **Use of compostable bags:** as mentioned above, the use of bags seems to make source separation more comfortable for waste producers. However, the use of conventional plastic bags is known to negatively impact the quality of sorted biowaste, despite the opening systems equipping biowaste treatment units. The use of compostable bags provided by the waste authority (compostable plastics, paper) tend to give higher capture rate and quality, especially in combination with vented caddies⁷. To avoid confusion regarding the type of plastic bags, some municipalities such as the HOOP Lighthouse Münster banned the use of bags (compostable or not) and collect biowaste in bulk. In other countries, confusions were avoided thanks to the ban of non-compostable plastic bags, meaning that all plastic bags used in shops can be used for biowaste collection. Therefore, the use of bags depends on these particular contextual parameters; in areas where the weather is warmer, it can be relevant to promote their use to reduce nuisances in the kitchen.
- **Quality control:** this is a key aspect for biowaste collection. Despite the possibility to pre-treat biowaste before processing, these systems have limitation, and the input quality is essential for the production of quality end-products, and more impurities mean also significant losses of food waste that is removed with the impurities. Quality controls can be achieved during or before collection for door-to-door systems, by visual inspection. A protocol can be implemented with the inspection team for the detection of contaminated bins and the responses (non-collection, information, fines, or extra collection charge, possibly increasing the severity of the response with the occurrence of non-compliance). In general, quality controls are eased when the system is not anonymous.
- **Specific context:** certain areas can be more challenging than others. For instance, vertical housing is generally considered more challenging than single houses, for many different reasons: lack of space to store biowaste, difficulty to deal with nuisances such as odours and flies, difficulty to control the contribution of individual behaviours, etc. The provision of pre-collection equipment such as vented kitchen caddies and compostable bags, adequate collection systems allowing the frequent evacuation of waste (shared containers, high frequency of collection, etc.), and specific communication (e.g. involving caretakers and building tenants or housing organisations) can be recommended in this context. In touristic areas, the involvement of the touristic players (accommodations, HoReCa, tourism offices) to provide collection equipment and instructions, and pro-active communication (in different language, easily accessible) can be recommended.

HIGHLIGHTS FROM THE HOOP LIGHTHOUSES

High capture rate, high quality: food waste collection in Albano Laziale.

HOOP Lighthouse Albano Laziale managed to reach a capture rate above 80% for biowaste, while keeping impurities around 1.5%. Biowaste is collected via a dedicated door-to-door system, and households are provided with bioplastic bags and brown bins available for each house or building block. Collection is organised three times per week. Since 2020, the municipality has implemented a Pay-as-you-throw scheme.

[More information here](#)

⁷ Zero Waste Europe (2022), Unwrapping the biowaste potential

5.1.3. CITIZENS ENGAGEMENT

Households are key players for biowaste reduction and collection. Securing their engagement and participation on the long run is an essential pre-requisite for a successful biowaste management system. Citizen engagement can take many different forms, from general communication to public meeting, direct interactions, or training sessions, and can be used to transmit information but also to gather feedback and propositions on how to improve the system.

The HOOP project designed “citizen science activities” using a gamified app called “[HOOP Trainers](#)” adapted to each local context of the Lighthouses, to identify and co-design solutions to increase the efficiency of waste collection and recycling. This process allowed to identify common drivers and barriers in the Lighthouses where it was tested, even though some differences are also visible:

- **Drivers:** the positive environmental impact associated with biowaste management and recycling is the main driver for all Lighthouses. The opportunity to generate new products, the cleanliness of the city, and the possibility to pay less tax are then cited in this order of importance. Few people (less than 3%) mentioned that they did not plan to sort their waste.
- **Barriers:** users mostly reported logistical challenges (lack of space at home or availability of collection points), a lack of information, and distrust with the waste management system (e.g. believing that sorted materials are sent to disposal anyway)
- **Means of information:** most users consider the municipality’s website as the main source of information, along with social media accounts, for waste sorting.
- **Propositions:** the main recommendations included the accessibility of collection point, with compost bins in public area, in apartment blocks, and the need for dedicated space for waste sorting in new buildings. Other propositions were about incentives and information, e.g. improving labelling for recyclability on products.

Besides inhabitants, it is also interesting to consider connecting with other key players, such as tenants or building managers, who generally play an important (and sometimes operational) role in waste management and collection. They can also be very good contacts points to engage tenants of high-rise buildings that prove to be challenging for waste collection.

The HOOP projects designed and implemented several communication and engagement activities targeting the inhabitants of the 8 Lighthouses, and covering various topics related to urban circular bioeconomy: food waste reduction, behavioural change, or the acceptability of biowaste-based products. Different actions were implemented by the Lighthouses, ranging from information campaigns to focus groups, workshops, or activities involving schools. Some mobilised “local champions”, citizens already very active within their communities on circular economy and zero-waste (local businesses, associations, individuals) and willing to collaborate on awareness raising activities. They were involved via practical workshops, testimonials where they could share their own best practices, etc.

Mobilising inhabitants on circular bioeconomy can be challenging, but there were some positive outcomes within the experiences of HOOP Lighthouses:

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

- **Bio-based products exhibitions** are useful to give a direct contact to bioproducts and let people experience them in a very practical way, casting a positive light on their performances and environmental impact.
- **School activities** proved to be quite an effective way to disseminate key messages to children and to their families, with a good impact on the audience reached.
- **Topics of interest:** the different audiences tend to show interest to various topics connected with circularity, including sustainable consumption patterns, circular models like the sharing economy, etc.

In general, it is advised to follow several key principles to promote the engagement of inhabitants:

- **Organise feedback-gathering processes** (surveys, public consultation, focus groups) to consult inhabitants and get a better understanding of their behaviours, perceptions, and challenges with waste. Consulting inhabitants e.g. prior to the installation of a collection point can help identifying local barriers and secure their participation.
- **Make continuous efforts on communication:** repetitions are important to get the attention of inhabitants, who might lose interest at some point. Continuous communication is also an important process to engage newcomers.
- **Try to develop more targeted communication activities:** they can focus on specific (challenging) areas, specific population facing various difficulties (young parents, households speaking a different language, etc.), and/or rely on more direct communication schemes (face-to-face discussions, information booths, etc.) to address doubts and questions that users could have.
- **Communicate on “why” and not only “how”:** inhabitants might be more willing to get involved if they understand the purpose of sorting behaviours and why the system is designed in a specific way.

HIGHLIGHTS FROM THE HOOP LIGHTHOUSES

Biopatrols: direct engagement of inhabitants with waste ambassadors in Murcia.

HOOP Lighthouse Murcia has implemented many different activities to reach out to inhabitants as well as commercial food waste producers, including media campaign or the production of communication material. To go one step further, they initiated the “biopatrols”, trained teams of officers positioned in different parts of the city to directly engage with citizens. This initiative proved to be very effective since it gave the opportunity for inhabitants to directly address their doubts and needs for information on the newly implemented collection system. The biopatrols were also used to tackle more challenging areas where performances and quality were low to directly engage with the local households.

[More information here](#)

5.2. Interesting resources

HOOP Reports and resources			
	Title	Description	Link
BIOWASTE PREVENTION	HOOP Lunch Talk Season 2 Episode II: Key recommendations for local authorities to prevent food waste in households	Webinar showcasing general recommendations and good practices to address household food waste prevention. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks Season 2 - Episode II: 4 key recommendations for local and regional authorities to prevent food waste in households HOOP (hooproject.eu)
BIOWASTE COLLECTION	Collection and valorisation of urban biowaste	A short guide summarising key recommendations and resources on urban biowaste collection	https://hoop-hub.eu/virtual_images/155-981b3b5d4f7389ba99d50230386389cf.pdf
HOW TO PREPARE THE IMPLEMENTATION OF A NEW VALORISATION ROUTE?	Webinar on selective collection of urban biowaste	A one-hour webinar presenting local good practices on biowaste collection from various European cities	https://hoop-hub.eu/virtual_academy_filer.html?vi=69
	HOOP Lunch Talks Season 1 Episode II: Engaging citizens in food waste collection	HOOP Lighthouse Bergen presents their different actions to promote food waste sorting behaviours to the inhabitants. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks - Episode II: Engaging citizens in food waste collection HOOP (hooproject.eu)
CITIZENS ENGAGEMENT	Co-designed Citizen Science Interventions	A report presenting how the gamification app was used to support the interactions with inhabitants in the Lighthouses	https://hooproject.eu/wp-content/uploads/2023/10/D6.4_Outcome-reports-of-the-co-designed-citizen-science-interventions.pdf
	Engaging stakeholders for the urban bioeconomy	A short collection of key recommendations, good practices, and resources for the engagement of stakeholders.	https://hoop-hub.eu/virtual_images/150-60b941d666ef2b97139fb25ed08ea66e.pdf
	Report on the education and awareness raising & acceptance activities	It presents the approaches developed by the Lighthouses to reach the inhabitants.	https://hoop-hub.eu/virtual_images/149-ebc36ca0e5157fd1578f70bca1787176.pdf

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

HOOP Lunch Talks Season 3 Episode 1: HOOP trainers, neighbours shape circular bioeconomy playing and debating	A webinar summarising the work on citizen science organised by the project. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks Season 3 – Episode 1: HOOP Trainers: neighbors shape circular bioeconomy playing and debating HOOP (hooproject.eu)
HOOP Webinar: stakeholder engagement and citizen awareness	Webinar focusing on strategies for engaging these stakeholders, changing mindsets and behaviour, and establishing local leadership.	https://hoop-hub.eu/virtual-academy-filter.html?vi=36

HOOP tools

	Title	Description	Link
CITIZENS ENGAGEMENT	HOOP Trainers: shaping circular bioeconomy through play	A citizen science activity where inhabitants of each Lighthouse were invited to design an optimal collection system for biowaste via an online app consisting in a game around urban circular bioeconomy.	https://hooproject.eu/hoop-trainers-shaping-the-circular-bioeconomy-through-play/

Other resources

	Title	Description	Link
BIOWASTE PREVENTION	Tools, best practices, and recommendations to reduce consumer food waste	A compendium (JRC, 2023): the report lists general recommendations and several good practices tackling consumer food waste	https://publications.jrc.ec.europa.eu/repository/handle/JRC133004
	EU guidelines on food donation (European Commission, 2020)	Infographics summarizing key principles, safety and hygienic rules, and financial rules for the promotion of food donations	https://29september.eurofoodbank.org/wp-content/uploads/2020/09/Infographics_EN.pdf
BIOWASTE COLLECTION	How to best collect biowaste, (Zero Waste Europe, 2022)	A guide highlighting the best solutions to collect biowaste, with quantitative elements.	https://hoop-hub.eu/virtual-images/109-6eae0bc7c1154160b52998b3d418dee1.pdf



D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

Best practices for biowaste management (SCALIBUR project, 2021)

The report presents 34 good practices addressing different aspects of biowaste collection.

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adf9d4f5647da62b54910f5e.pdf](https://hoop-hub.eu/virtual_images/127-293b60ab-adf9d4f5647da62b54910f5e.pdf)

Key factors for the successful implementation of urban biowaste selective collection schemes (CEN Workshop agreement, 2022):

This report lists key elements for designing and implementing selective collection of biowaste.

[https://hoop-hub.eu/virtual_images/125-
afc71e6b7319117cb62e4c7f8
0537725.pdf](https://hoop-hub.eu/virtual_images/125-afc71e6b7319117cb62e4c7f80537725.pdf)

Life Biobest project (2023-2025)

This Life project focuses on the selective collection of municipal biowaste and its recovery for the production high-quality fertiliser and soil amendments. It will produce guidelines based on existing best practices focusing on the different aspects and contextual factors of biowaste management.

<https://zerowasteurope.eu/project/life-biobest/>

CITIZENS ENGAGEMENT

Citizen Involvement on Circular Economy (Force Project, 2019)

This guide list 5 key criteria to engage citizens and provide concrete illustrations from different cities

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a150f04.pdf](https://hoop-hub.eu/virtual_images/25-97d10b7f781eaf00a76c58a37a150f04.pdf)

Urban metabolism and participatory processes (UrbanWins Project, 2019)

A guide explaining how public authorities can develop a participatory process to improve local policies in circular economy and waste management, with 70 good practices.

[https://hoop-hub.eu/virtual_images/27-
36fe18a4f1a1249667bab777c
209b082.pdf](https://hoop-hub.eu/virtual_images/27-36fe18a4f1a1249667bab777c209b082.pdf)

Toolkit: intervention for change (WaysTUP project, 2021)

A practical toolkit to implement behaviour change for selective biowaste collection.

[https://hoop-hub.eu/virtual_images/112-
0b8ef7aca3fa38f611c6cceab7
192e59.pdf](https://hoop-hub.eu/virtual_images/112-0b8ef7aca3fa38f611c6cceab7192e59.pdf)

6. Identify and design ways to valorise your biowaste

Urban circular bioeconomy is also based on technologies treating biowaste and sludge as raw material for the production of bioproducts with higher circularity and added value than the existing ones. The increase in the availability of urban biowaste related to the separate municipal collection imposed by the Waste Framework Directive provides a potentially high-quality and stable feedstock. Even though composting and anaerobic digestion can be regarded as valuable and proven recycling routes for biowaste, it can be interesting to consider alternative, innovative valorisation routes; there might be a lack of local users/market for alternative fertilisers, and other innovative valorisation routes might yield higher environmental and economic benefits, also considering the possible lack of market or the low price of compost and digestate. The HOOP project investigated several technologies and processes that the HOOP Lighthouses considered as part of their Project Development Assistance.

This chapter will provide a short description of the existing technologies and of the tools that could be used to better select the right technology.

THE HOOP KEY RECOMMENDATIONS

- 1. Identify and map available feedstock:** map and characterise the available biowaste flows for both quantity and quality, and identify the most critical ones (causing problems in the current management system, with low collection rates, for which current valorisation routes yield little economic and/or environmental benefits, etc.)
- 2. List and pre-select matching technologies:** several criteria can be used, such as underlying interest, potential impacts, local needs, the maturity of the technology, the potential market for end-products, and an enabling legal framework, etc.
- 3. Identify potential market of the end-products:** identify the (local) demand, the social acceptance and readiness of end-users to adopt the end-products, and the possible competition of e.g. virgin-based products. An important point is the potential legal barriers preventing from their use, or from the use of the considered feedstock for the foreseen application.
- 4. Investigate the financial feasibility:** Evaluate the best capital seek option, investigating its own investment capacity, structural funds, grants, etc.

6.1. Key recommendations

6.1.1. EXISTING TECHNOLOGIES

The HOOP project identified about 25 technologies applicable to biowaste, green waste, urban wastewater sludge, digestate from anaerobic digestion, or more specific fractions (used cooking oils, spent coffee grounds, etc.). The HOOP guidelines mostly focus on the most technologically ready solutions, with technology readiness level (TRL) of 8 or 9 (meaning that the systems are at least complete and qualified, and possibly proven in operational environments).

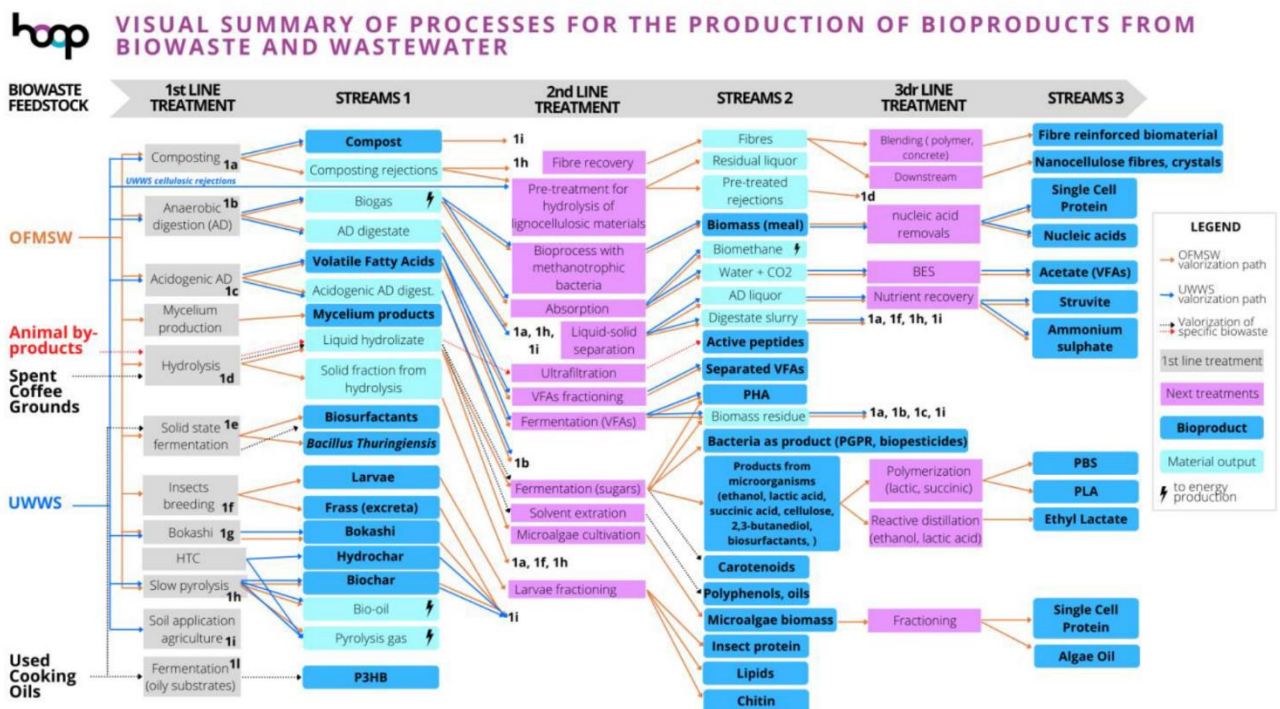


Figure 6: HOOP technologies for material valorisation of biowaste and urban wastewater sludge (CETENMA, 2023)

More technologies are available at various stage of development. Many of them applicable to biowaste are included in the [Tech4biowaste technology database](#) along with detailed information.

The technologies identified by the HOOP project with high TRL are presented in **Table 2:**

Table 2: List of high-TRL technologies to process urban biowaste and wastewater sludge identified by the HOOP project (CETENMA, 2023)

Technology	Description	Input	Output	Commercial scale implementation and legal considerations	Environmental considerations
Biowaste					
<u>Insects breeding</u>	Insects such as black soldier fly larvae or yellow mealworm are fed with biowaste, the larvae can then be used as a fat or protein source in animal feed, or for the production of biofuel.	Biowaste Digestate	Larvae can be converted to high-protein food and feed (1 tonne of fresh larvae for 6 tonnes of bio-waste)	Existing commercial units in EU, capacity up to 60,000 t/y, with a focus on downstream rather than nutrition value-chain. Use as food currently restricted, use as feed possible or restricted depending on Member States.	The produced proteins require up to 10 times lower land use than meat protein. End products include live larvae, dried and grinded larvae, that can be used as feed for domestic animals or livestock and chitosan that can be used for agro-chemicals
<u>Fermentation of used cooking oils into biodegradable polymers</u>	Used cooking oil is processed by bacteria into biodegradable polymer (P3HB, a Polyhydroxyalkanoate) to be used in cosmetics, biomedicine, packaging, agriculture and in 3D printing.	Used cooking oils	0.7 kg of PHA for 1 kg of used cooking oil	Commercial plant in Ostrava (Czech Rep.) with 45000 L/y producing 35 t PHA/y, expected to increase to 227,500 L/y producing 175 t PHA/y. No legal restrictions for the use as P3HB.	Production of a high-value product (higher than bio-fuel), substitution to fossil-based polymers.

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

Technology	Description	Input	Output	Commercial scale implementation and legal considerations	Environmental considerations
Mycelium production	Mycelium is the filamentous structure produced by fungi. Spores are inoculated to a substrate, that can be lignocellulosic waste, that is then used a such or combined with part of the substrate into construction, insulation, or packaging materials.	Green waste	The mycelium can be turned into packaging, foam, leather, construction material, and even vegan meat	<p>Units in the United States, with important diversity of products. A focus on vegan leather and food. Commercial plant for vegan leather in Mexico from agrifood waste.</p> <p>Restrictions for the use as food in the EU. For application such as food-contact packaging or construction material, compliance with the specific EU regulation is required.</p>	Substitution to virgin materials or animal-based products, production of insulation products.
Bacterial cellulose (BC) production	Bacterial cellulose is a natural fibre that is an excellent raw material for the manufacture of composite materials and a substitute from the vegetal one, with application in the paper, food, cosmetics, biomedical and electronics industries.	Biowaste	Bacterial cellulose with many different applications	<p>Most commercial scale technologies are based on fermentable sugars. Industrial scale with applications to biomedicine in Canada. Commercial scale BC is used in food industry from South-East Asia based on coconut by-products.</p> <p>Legal requirements depend on the end application. Use as cosmetics possible if compliance with the specific EU regulation. Use as food restricted if the feedstock is animal by-products</p>	Substitute for vegetal cellulose, with better properties (in terms of resistance) and lower environmental impact

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

Technology	Description	Input	Output	Commercial scale implementation and legal considerations	Environmental considerations
Isolation of fibres from green waste	Processing of lignocellulosic-based biomass into fibres, through cooking and bleaching of sieved biomass.	Green waste	Cellulose fibres for paper industry, signs, urban furniture or isolation panels.	Several companies developing large-scale processes to valorise fibre from waste, high TRL for fibre isolation. Process is still in scale-up phase.	
Urban wastewater sludge					
<u>Volatile Fatty Acids (VFA) production from sewage sludge anaerobic fermentation</u>	Acidogenic digestion of sludge or biowaste produces volatile fatty acids such as acetic, propionic or butyric that have many applications in the chemical industry to produce plastics, paints, etc.	Urban wastewater sludge, other biowaste suitable for AD	VFA to be used for the production of plastics, paints, lubricants, etc.	Demo plant (ChainCraft) from waste in Amsterdam (20,000 t waste/y to produce 2,000 t VFA/y). Legal restriction for nutrition, otherwise no legal barriers. Some specific requirements depend on application.	Substitution of fossil based VFA, with reduction of greenhouse gas emission of 70%.
Slow pyrolysis	Thermochemical decomposition process (pyrolysis) in which biomass is heated in absence of oxygen to a moderate temperature range (350-650 °C). Biochar is classified as negative emissions technology (NET)	Urban wastewater sludge, other biowaste	Biochar, to be used as soil amendment and biooil that can be condensed and used as biofuel.	Large scale project in construction (Futerra: 200,000 t/y for biomass / Ireland 75,000 t/y). Significant problems in pyrolysis plants from municipal waste in the past. No legal restriction for the use as fertiliser. Use as animal feed only possible if it comes from vegetal sources.	Avoid decomposition of sludge and associated adverse impacts. Biochar is a soil amendment contributing to carbon storage after consistent application, and has significant phosphorus content and liming effect

Technology	Description	Input	Output	Commercial scale implementation and legal considerations	Environmental considerations
Hydrothermal carbonisation	Thermal process consisting in the heating of biomass in absence of air but in presence of water. A series of reactions leads to the production of a carbon-rich solid called hydrochar that can be used as fuel or bio-fertilizer.	Urban wastewater sludge, bio-waste	Hydrochar that can be used as biofertilizer or fuel.	<p>Mainly applications with UWWS. The hydrochar in most cases is used for energy purposes. Nutrient recovery required in water effluent. Large scale pilots in Valencia, Heinola (Finland), Jining (China), capacity ranging from 14,000 to 21,000 t/y</p> <p>Hydrochar could be regarded as bio-char according to the Fertilising Product Regulation, but UWWS is currently not included as allowed feed-stock. No restriction for the use as fuel.</p>	Production of an alternative fertiliser.

Output from biowaste and sludge treatment processes

<u>Nutrient recovery (struvite, ammonium sulphate)</u>	The residual dewatering liquid is converted in different by-products via cascading processes: struvite and ammonium sulphate, that can then be used as alternative fertilisers.	<p>Digestate AD</p> <p>Urban wastewater sludge</p>	Struvite and ammonium sulphate that can be used as biofertilisers	<p>Implementation on commercial scale (2.5 t/d) with wastewater and other specific waste as UWWS digestate for both struvite and ammonium sulphate. Several patented technologies.</p> <p>No legal restriction if compliance with the requirements set by the EU Fertilising Product Regulation.</p>	Removal of nitrogen and phosphorous from residual water, substitution to chemical fertilisers.
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The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000836

6.1.2. HOW TO IDENTIFY RELEVANT TECHNOLOGIES?

The selection of relevant technologies and valorisation route depends on various criteria linked with the local context and political agenda of the territory. Several key criteria can be listed:

- **The available feedstock:** technologies can be applied to certain types of feedstocks (biowaste, wastewater sludge, more specific fractions, etc.). Besides, the available quantities (that depend on the total generation but also the efficiency of the separate collection), potential fluctuation (linked with seasons or other parameters such as local production/consumption, weather conditions, etc.), and its quality (also related to the efficiency of the collection scheme) all conditions the selection of technologies. As an example, insect breeding can be applied to low quality biowaste, but animal by-products have to be excluded. On the contrary, composting requires high quality biowaste to produce satisfying soil conditioner. Certain technologies might require sufficient quantities to be implemented in a cost-effective way. The presence of other treatment units whose output can be recovered (e.g. digestate from anaerobic digestion) can be considered.
- **(Local) demand and needs:** innovative biocircular technologies can produce a high variety of bioproducts that can substitute the conventional (e.g. fossil-based) ones. It can be relevant to investigate the demand and (possibly local) needs for specific bioproducts and materials to select the right valorisation route. The stakeholder consultation can highlight specific needs and interest for such bioproducts, or an urban metabolism analysis of the territory can show particular criticalities that could be addressed. As an illustration, the European Union is very dependent on imports for phosphorus for agriculture, crude oil for chemistry, and protein-rich vegetables for animal and human nutrition. The identification of a clear demand is also highly beneficial for the overall economic balance of the system. Potential (economic, technological, and legal) barriers should also be investigated.
- **Political agenda and priorities:** biocircular technologies yield different kind of (environmental) benefits. Alignment with local environmental strategies can help to identify technologies according to their environmental performances, e.g. on climate change, energy efficiency, or any other environmental topic (air, water, and soil quality, human health, etc.).
- **Regulatory feasibility:** some innovative application routes are not necessarily covered or severely hindered by the existing regulation. Some general information is presented in **Table 2**, but the situation can also depend on the national laws and regulations. It is important to check if both the feedstock and the end-application are allowed both at EU and national level.
- **Other considerations:** the economic dimension is an essential aspect of the selection process, with key criteria to be considered such as the possibility for the project promoter to invest, the availability of fund schemes, the existence and sustainability of funding mechanisms to support operational costs. Other elements can be important to consider, such as the possibilities of collaboration with other biowaste producers or processors, or the expected economic performances of the system (e.g. its expected return on investment, etc.)

6.1.3. HOW TO PREPARE THE IMPLEMENTATION OF A NEW VALORISATION ROUTE?

The different sections of the HOOP guidelines all include valuable information to prepare the implementation of a new valorisation route for biowaste or urban wastewater sludge. Even though the identification and implementation of a new valorisation route might be an iterative process, the following steps can be proposed to prepare the process:

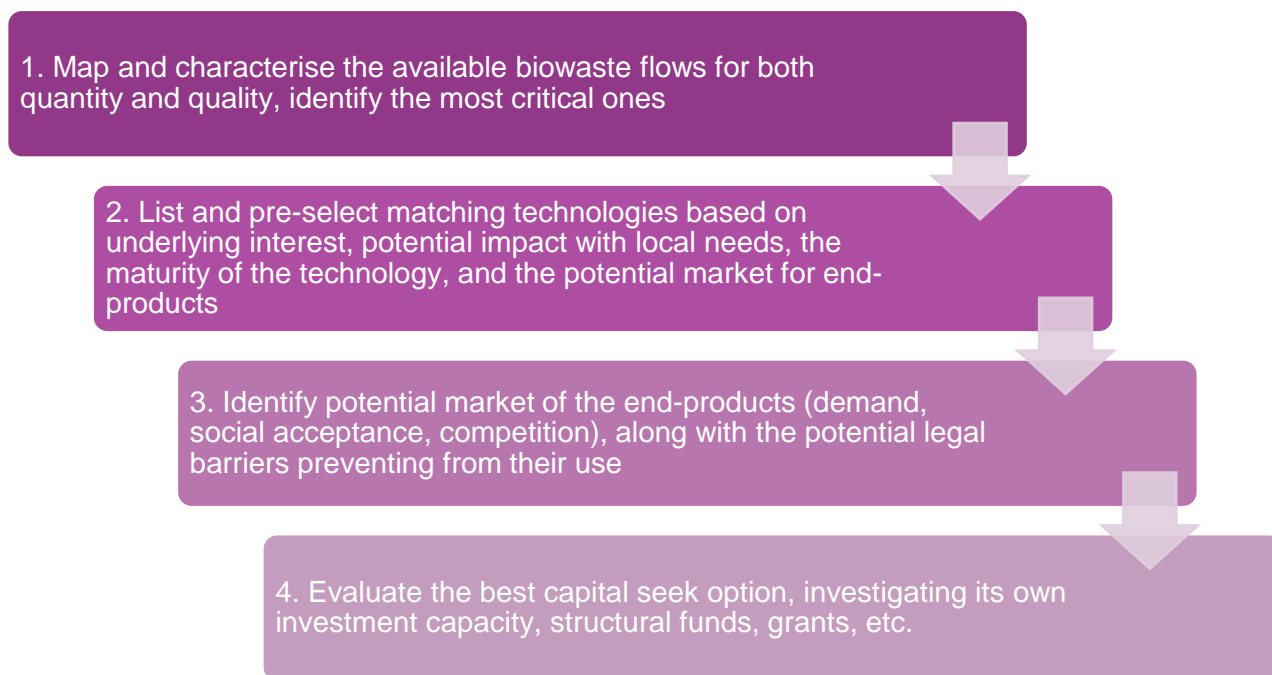


Figure 7: Key steps to identify and implement a new valorisation route

HIGHLIGHTS FROM THE HOOP LIGHTHOUSES

The different approaches taken by HOOP Lighthouse to select valorisation routes.

Albano Laziale identified the fermentation of used cooking oil as a relevant valorisation route, and a positive dialogue with the Italian Consortium for the collection and treatment of used vegetable and animal oils and fats CONOE, potential investors, and interested parties from the cosmetic sector confirmed the possibility to find investment. A study visit to Prague focusing on this technology, supported by the HOOP project, also greatly contributed to the process.

In **Bergen**, two valorisation routes are explored, through a collaboration with two start-ups working on larvae being fed with food waste and microalgae to be cultivated with food waste. The higher valorisation potential offered by these technologies, and their potential profitability, make them a relevant supplementary route for food waste beside the existing anaerobic digestion.

Greater Porto identified pyrolysis and nutrient recovery as relevant technologies to address two key waste streams: green waste from invading species that cannot be composted, and liquid digestate from their future anaerobic digestion plant.

In **Kuopio**, one key driver is the national goal of carbon neutrality by 2035, which guided them to focus on the necessity to reduce the energy use of peat. Biochar is regarded as one possible substitution to peat. This and the fact that the market for alternative soil conditioners is expected to expand due to National policies made them apply to funding for a Biochar Pilot Reactor.

Münster decided to investigate pyrolysis of composting rejection and green waste since it fits well into the existing processes and would allow for a better valorisation of the existing waste streams. The outputs, biochar and energy, can also contribute to the city’s goal of reaching climate neutrality in 2030.

Murcia investigated valorisation of urban wastewater sludge, first to produce volatile fatty acids, which proved unfeasible. Currently, nutrient recovery is being investigated.

In **Western Macedonia**, dialogue with local businesses helped to understand how e.g. local distilleries could benefit from spent coffee grounds to produce oil. The fact that these streams are also easy to collect or are already collected supported these selections.

More information in the National Replication Manual

6.2. Interesting resources

HOOP Reports and resources			
	Title	Description	Link
EXISTING TECHNOLOGIES	HOOP Technology fact-sheets	Factsheets summarising key figures on different bioeconomy technologies.	insect larvae farming , nutrient recovery from residual dewatering from anaerobic digestion , Volatile fatty acids from acidogenic digestion of solid biowaste , and fermentation of used cooking oils
	Webinar on technologies for urban biowaste and wastewater valorisation	Webinar highlighting some of the most promising technologies currently emerging from EU-funded research projects.	https://hoop-hub.eu/virtual-academy-fil-ter.html?vi=61

HOW TO PREPARE THE IMPLEMENTATION OF A NEW VALORISATION ROUTE?

Summary of the state of the art for the production of bioproducts from biowaste and wastewater

The report describes and evaluates 17 technologies, mainly coming from H2020 projects (especially SCALIBUR, Value-waste and WaysTUP!), with a TRL of at least 5, which means that there are existing pilots.

[D2.2 V2021 State-of-the-art-of-technologies-for-the-production-of-bioproducts-from-biowaste-and-wastewater.pdf](#) (hooproject.eu)

Other resources

	Title	Description	Link
HOW TO PREPARE THE IMPLEMENTATION OF A NEW VALORISATION ROUTE?	Biocircularcities webtool	A tool to identify relevant technologies for the valorisation of different types of biowaste based on information on the available feedstock, type of end-product expected, expected environmental performances, and local political considerations.	https://bcc.list.lu/page-1
	Tech4biowaste technology database	Online database providing information and data on biowaste valorisation technologies.	https://www.tech4biowaste.eu/wiki/Main_Page

7. Find capital for your bio-waste projects

Circular bioeconomy projects aiming to develop innovative valorisation routes generally requires important investments, e.g. for the equipment and units processing waste into new products and for the research and development required to upscale a biowaste valorisation technology. Securing investment can prove to be challenging depending on the size of the foreseen unit, or the technological readiness of the processes involved.

Identifying a sustainable business model is also very important and can be made difficult due to different parameters: the fluctuation in the availability of the input biomass, the lack of market for bio-based products, or the competition of linear models whose negative environmental/social externalities are not necessarily penalised in a financial way.

The HOOP project investigated various methods of investments and developed several tools to support public authorities with the identification of financing schemes.

THE HOOP KEY RECOMMENDATIONS

1. **Identify potential business models:** the two main requirements are the availability of the feedstock (in sufficient quality and quantity, and over time), and the existence of a sufficient end-market for the targeted end-products. Public authorities can decide to invest their own capital in the biocircular technology or engage in a joint venture with private companies.
2. **Identify relevant investment possibilities:** this should be done according to the maturity level of the considered project and its risk assessment.
3. **Align with EU Taxonomy:** if private capital is considered, it is essential to consider the alignment of the project with the EU Taxonomy, especially if it complies with the “Technical Screening Criteria”, e.g. if it makes a substantial contribution to circular economy, one of the 6 environmental objectives.
4. **Find investors:** using Due Diligence to get a good appraisal of the project and make a comprehensive risk assessment, defining a solid and sustainable circular business model, and considering increasing the Project Maturity Level can contribute to convince investors. HOOP defined specific and comprehensive tools to do so.
5. **Considering Public Procurement of Innovation:** to foster the deployment of innovative or emerging technologies, public authorities can engage in such procedure that can be facilitated by an Open Market Consultation, allowing a dialog with potential supplier to better understand opportunities and risks of innovative technologies.

7.1. Key recommendations

7.1.1. BUSINESS MODELS FOR CIRCULAR BIOECONOMY

The HOOP project has investigated [circular business models](#) for the valorisation of biowaste, in relation with the different innovative technologies analysed by the project. There are two main elements to consider when investigating for such business models:

- **The existence and availability of biowaste as feedstock** is a strong driver. At the same time, the lack of a proper collection system (in terms of capture rate, seasonal variation, and quality) is regarded as one of the main barriers hindering circular business models for waste valorisation.
- **The existence of a sufficient market to sell the end-product(s)** is also an important point. In this regard, the maturity of the applied technology is perceived as a key factor that will strongly influence the market acceptance and the potential benefits of the sales of the end-products. Another important point is the competitive price of conventional products compared to circular ones.

Circular business projects can have significant operational costs, which might impede their financial viability, in addition to possible regulatory barriers.

Municipalities can either consider circular business as a joint venture, meaning that they will collaborate with a private organisation that will process the recovered biowaste to make a marketable end-products, or can use a vertical integrated model, meaning that they will invest its own resources in a technology and either use or sell the produced end-products. In the first case, the municipality might save money on the treatment of waste, while in the second case they will get financial resources based on the sales of end-products.

The HOOP project also investigated potential business models for the innovative valorisation routes considered by the different Lighthouses. This allowed to determine the core business models to be considered (joint venture, vertical integrated, individual entrepreneurship), as well to characterise the markets. Further analyses were conducted, yet the lack of data proved to be a major challenge to obtain reliable business models. The four analysed value-chains show very different levels of profitability, with payback times ranging from 3 to 10 years. Other elements are important to take into account, such as the social acceptance and market readiness on innovative biowaste-based products. It might take time and resources to raise awareness on the end-products.

7.1.2. INVESTING IN NEW PROJECTS

Identifying and securing investment for a circular bioeconomy project involve several steps that depend on the public or private nature of the organisation managing it, as well as the technology readiness of the solution and the foreseen business models, among other factors. The investment strategy is closely linked to the project nature, and generally intervene when several technical, environmental, and economic assessments are conducted (feasibility study, market research, due diligence analysis, project maturity level assessment, environmental assessment, circular business plan and projections, engagement of local stakeholders, etc.).

7.1.2.1. Identification of investment possibilities

To secure an investment, it is important to take into consideration how the funders will assess the fund seeker and the biocircular project. Among the different criteria, risk assessment is very important. Different funding and financing categories available for bioeconomy projects are presented in **Table 3**.

Table 3: Main funding and financing categories

Funding/financing category	Description
Alternative funding	Different types of fundings such as crowdfunding (pooling resources of different actors against the repayment after the project is active, rewards, or shares), green municipal bonds (debt investment issued by municipalities to fund green investments, that can be made attractive via tax-exemption), financial lease (the lessee becomes the legal owner of an asset after the contract), operational lease (the assets return to the lessor after the contract), or social impact bonds (bonds issued by public organisations that enable private investments in project tackling social challenges, with the return or repayment depending on the social outcomes of the project).
Equity & quasi-equity	Funders invest money to get a share in a project, to earn dividend or the possibility to sell the share at a higher price. Quasi-equity offers non-dilutive equity risk capital paid back based on the performances of the project
Grants & subsidies	Funders provide money to support a project without expecting a payment back
Guarantees	Funders take over part of the obligations in case of non-payment. With collateral guarantees, the funder receives a claim to the asset of the company. Loan guarantees can be provided by third parties that assure the payment of the debt if the project cannot do it.
Debts	Funders lends money to a project against a repayment with interests (loan). The company can also issue bonds that can attract capital in case of the impossibility to cover the costs with a bank loan.

As mentioned above, these different types of funding and financing will be accessible or not depending on the level of risk, and on the maturity of the project or its status. For instance, debts are more adapted to low to high-risk assessments and thus more mature projects, when grants and guarantees are more dedicated to very high-risk project, e.g. research and development or start-ups. **Table 4** summarises the matches between funding categories and risk assessment:

Table 4: Risk assessment and funding categories for several types of circular bioeconomy projects (RdA, 2022)

Project type	Cash-flow characteristics	Risk assessment	Funding and financial categories				
			Alternatives	Equity	Grants	Guarantees	Debt
Research & Development	Pre-revenue	Very high	●	●	●	●	
Start-up	Pre-profit	Very high		●	●	●	
Scale-up	Pre-profit to profit	High		●			●
Growth	Profit	Medium		●			●
Mature	Profit	Low					●
Advisory	N/A	N/A			●		●

There are many different funding and financing instruments available for circular bioeconomy projects proposed in different categories. The full list of available funds is presented in the HOOP investment package presented below. **Table 5** lists some of the ones available to local and regional authorities for biocircular projects focusing on municipal biowaste. More funding schemes are listed in the HOOP resources mentioned below.

Table 5: Examples of funding schemes for biocircular projects (RdA, 2022)

Name	Description	Type of funding	Funding size and rate	Beneficiaries
Shared management funds				
Cohesion funds	Support to investments in the field of environment, including water and waste management. Applicants should first check with the national authority managing the fund	Grant; Technical assistance; Financial instrument: loan, guarantee, equity	Different size, ranging from 1 M€ to over 20 M€ Funding rate of 85% of project cost	Cities and regions from EU Member States with a gross national income per capita below 90% EU-27 (among others)
European Regional Development Fund (ERDF)	Enable investment in bioproduct valorisation from biowaste and wastewater. To be financed, project must be in line with the Regional Operational Programme.	Grant; Financial instrument: loan, guarantee, equity.	Variable, co-funding depends on the operational programme	Cities and regions (projects to be aligned with operational programme (among others))
Just Transition Fund	Provide productive investments in SME, R&I activities, aligned with the Just Transition objectives that include new green jobs for circular bioeconomy.	Grant; Technical assistance; Financial instrument: loans, others.	Different size, ranging from 1 M€ to over 20 M€	Cities and Regions from EU Member States that prepared a strategic Territorial Just

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

Name	Description	Type of funding	Funding size and rate	Beneficiaries
	A designated national managing authority provides information on the programme, selects projects and monitors implementation.		Co-funding depends on the operational programme	Transition Plans. (among others)
European Funding Programmes				
Horizon Europe	<p>EU's key funding programme for research and innovation. It includes HE Cluster 6 is Food, Bioeconomy, Natural Resources, Agriculture and Environment.</p> <p>Areas of intervention related to urban circular bioeconomy: food systems; bio-based innovation systems in the EU's bioeconomy; circular systems.</p> <p>The calls are published yearly.</p>	Grant	<p>Different size, ranging from 1 M€ to over 20 M€ depending on the call</p> <p>100% co-funding for public authorities</p>	Any legal entities based in the EU and other participating countries.
LIFE	LIFE circular economy and quality of life sub-programme includes several funding lines, among which recovery of resources from waste and water services and focuses on the implementation of innovative solutions and technologies. Other Life sub-programmes addressing circular bioeconomy also exist.	Grant; Technical assistance.	<p>2-10 for circular economy projects; 0.7-2 for Environment governance actions.</p> <p>60% co-funding</p>	Cities and regions (among others)
Financial institution instruments				
EIB Municipal Framework Loans	EIB can provide loans for urban and regional projects in the area of circular bioeconomy for waste and water sectors, through investments loans for single large investment projects	Loans	<p>> 25 M€</p> <p>50% of project's total cost</p>	No requirements
InvestEU Fund	A market-based and demand-driven instrument supporting circular economy on sustainable infrastructure and R&I. Project promoters can get direct and intermediated financing solutions by contacting the Implementing Partners .	Loans, guarantees and equity investments.	Not available	No requirements

Name	Description	Type of funding	Funding size and rate	Beneficiaries
Other				
European Circular Bioeconomy Fund	The investment projects on valorisation of municipal biowaste and wastewater sludge into bio-based products and bioenergy production are eligible for financial support. It funds bioeconomy projects and companies in the demonstration and commercial development phases (late phase)	Equity, quasi-equity, and debt funding	2.5 to 10_M€	Projects and SMEs, focusing on TRL of 6 to 9

7.1.2.2. EU Taxonomy

For projects fuelled with private capital, an important European tool for sustainable finance is the **EU Taxonomy**. It classifies sustainable activities and aims to orient capital flows in sustainable investment and provide help to investors to identify economic activities that qualifies as environmentally sustainable. Thus, the EU Taxonomy is a useful framework for European cities and regions to identify potential progress in terms of climate change mitigation and adaptation, and more generally sustainable investment, including 6 general environmental objectives, among which stands a “transition to a circular economy”. Ensuring the alignment of the investments with the EU Taxonomy is regarded as fundamental; for that, 4 overarching conditions that an urban circular bioeconomy (UCBE) project has to meet to be recognised as Taxonomy-aligned:

- *The activity has to be covered by the EU Taxonomy, i.e., it has to be Taxonomy-eligible. These are included in the [Taxonomy Environmental Delegated Act](#) and the [Climate Change Delegated Act](#). It must also comply with the applicable “**technical screening criteria**” set for the environmental objectives, also set in the Delegated Acts as described below.*
- The activity has to make **a substantial contribution** to at least one of the 6 environmental objectives, i.e., the UCBE project must demonstrate Taxonomy-alignment. For circular economy, the criteria include increasing the circularity of products and materials, reducing their hazardous content, prolonging their life, increasing the use of secondary raw materials, and in general applying the Waste Hierarchy. It must not “**significantly harm**” any of the other 5 environmental objectives (do-no-significant-harm, DNSH). When it comes to circular economy, this mostly means that the activity must not lead to inefficient use of (raw) materials, go against the Waste Hierarchy, and that the long-term disposal of waste does not cause long-term harm to the environment.
- It must comply with the “**minimum safeguards**”, meaning an alignment with the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights, which includes provisions against forced labour, workers’ rights to organise, etc.
- It must apply the reporting requirements set in the [Disclosure Delegated Act](#).

The European Commission proposes a [EU Taxonomy Navigator](#) that offers a user-friendly interface and different tool to make the EU Taxonomy more accessible to the interested organisations.

7.1.2.3. Finding investors

The HOOP Lighthouses conducted a thorough search for investment, which highlighted the following findings:

- Investors are interested in **strong financial forecast and project with a comprehensive risk assessment**. The HOOP project has defined a [Due Diligence Standard Procedure](#) applied to urban circular bioeconomy that can be [requested](#) by HOOP Network Members
- Investors might **be reluctant to invest in biocircular projects for two main reasons**: the risk linked with the **availability and quality of the feedstock** that depends on the collection system, and the fact that **circular businesses are generally start-ups** that lack track record of profitable businesses. Project developers might secure the feedstock via contracts with providers.
- There are also **funding gaps, especially for low-technology readiness level** (TRL) projects which generally have a higher level of risk, for which business models are less clearly identified, and/or for which there is no clear local market for the products. Increasing the Project Maturity Level is fundamental for unlocking investments. To do so, the [HOOP Project Maturity Level Tool](#) can give interesting propositions.
- **To attract investors, key elements should be included in the pitch of the project**: the problem addressed, the status of the activity and the planned actions, its expected impact (on the environment, social aspects, etc.), the current competitors and market size, and what the activity compete with them, and the type of financing required along with the co-investors already involved (possibly illustrated with existing best practices).

7.1.2.4. Finding European funds

European funding programmes might be an interesting resource for circular bioeconomy projects. Several steps can be recommended, based on the comprehensive [online manual](#) made by the European Commission:

1. **Identify a relevant funding programme**: there are several funding programmes (LIFE, INTERREG, HORIZON, etc.) that all have their specific focus, scope, funding rates, conditions, and application procedures. Each programme has also specific priorities that are very important to identify, since projects will only be funding if they are aligned with these priorities. It is also important to identify both internal resources for drafting the proposal, and financial resources available as co-financing if the funding rate is below 100%. Drafting proposals is extremely time-consuming and calls can be highly competitive.
2. **Choose a call**: the online manual mentioned above allows to quickly scan existing calls that can meet your requirements. Highlighting the key information is very important before moving to the application: objectives, eligible actions, eligibility criteria (countries, budget, eligible expenditures and activities), co-financing rules, administrative requirements, application form needed, selection process and evaluation methodology, and the deadline for submission.
3. **Develop a project**: a first step is to draft a 2-page document listing the key objective, main output, ideal partnership, and in general what the project aims to solve/improve. Then, a workplan should be elaborated, with a logical and interconnected course of actions. Results and expected impacts should be determined as clearly as possible.
4. **Identifying partners**: partners should be selected depending on the required expertise or needs in relation with the project's objectives and workplan. The European online manual includes a [partner search page](#).

5. **Communication, dissemination, and exploitation:** how the project's outcomes will be made available to a larger audience and have an impact on them is a key criterion for the selection process.

7.1.3. INNOVATION PUBLIC PROCUREMENT

Public procurement is an important instrument in the hand of public authorities to make sure that the public expenditures are aligned with the European environmental strategies. For instance, Green Public Procurement can promote sustainable products and services either by making their environmental performances a key criterion for the selection, along with price, or by restricting market access to products and services reaching a certain level of environmental performance.

Innovation public procurement is the application of the procurement process to ensure the development or the deployment of innovative or emerging technologies. By engaging in an innovation procurement process, procurers can contribute to “create the demand”, while keeping competition conditions. To engage in such innovation public procurement, the following steps can be listed:

1. **Circular need elicitation and description:** using functional and performance-based requirements leaves the possibility for alternative technical ways to address the needs. It is very important to be specific regarding the expected functions and performances to ensure that they are considered by tenderers, while avoiding excessing customisation and requesting interoperability and open standards to create a wide potential market for new technologies and enable economies of scale.
2. **Circular ambitions assessments and validation:** circular ambitions and impacts achievable must be validated with a good business case. Involving internal departments (management, decision makers, internal customers, technicians, logistics managers, internal operators etc.) to discuss key points such as the reasons behind circular investment, the link with existing circular policies/programmes, or the KPIs and general goals that the public authority wishes to achieve) is recommended.
3. **Open market consultation:** this process consists in a two-way dialogue with suppliers to assess key elements such as the technology readiness level, the risks, and to give a possibility to suppliers to help shape plans and requirements. This step can contribute to engage a more diverse range of suppliers, provide early insights into business opportunities, and increase the visibility on risks.
4. **Innovation Public Procurement procedure(s) design:** following the previous steps, a procurement strategy can be defined, as well as the procurement instruments to be implemented, as for instance **pre-commercial procurement (PCP)** for R&D activities ranging in between TRLs 2-8 and **public procurement of innovative solutions (PPI)** for solutions with high TRL (8–9). Several points can be listed, such as how the circular goals can be embedded in the call, what criteria can guarantee the validity of the offer while keeping an open competition, what criteria can be flexible enough to enable innovative solutions, the possibility to adopt a life-cycle-cost approach, etc.

HIGHLIGHTS FROM THE HOOP LIGHTHOUSES**An Open Market Consultation process for the nutrient recovery of liquid digestate in Porto.**

HOOP Lighthouse Lipor launched an Open Market Consultation to identify solutions for the nutrient recovery of liquid digestate for the upcoming anaerobic digestion plant that will be implemented in Porto. The challenge for the market is to find a solution for the liquid digestate obtained after its phase separation, that can secure both the legal requirements for discharge in a wastewater treatment plant and the recovery of phosphorus and ammonia nitrogen for fertiliser products.

Overall, the market consultation aims to understand if technologies are commercially available, their advantages and disadvantages, identify potential market risks, and provide an overview of the intended contract objectives and tendering process.

To do so, Lipor issued a [prior information notice \(PIN\)](#), published in the EU [Tenders Electronic Daily \(TED\)](#), including also the [market consultation prospectus](#) and listing the key information and requirements, both in Portuguese and English. To gather feedback, an [online survey](#) was launched, and an open meet-the-market event managed is to be organised in hybrid form.

[More information here](#)

7.2. Interesting resources

HOOP Reports and resources

	Title	Description	Link
BUSINESS MODELS FOR CIRCULAR BIOECONOMY	Novel circular business models applied in the value chain of biowaste valorisation	The report investigates business models for biowaste valorisation and analyses 15 technologies.	https://hoop-hub.eu/virtual_images/74-acfdbba9f767c8d1312b2d18a2f5bf9e.pdf
	New business models	Webinar on new business models centred on the valorisation of urban biowaste	https://hoop-hub.eu/virtual_academy_filer.html?vi=70
	HOOP Lunch Talk S1 Ep IV: Circular Business Models (CBMs) applied in the Value Chain of Biowaste Valorisation	Presentation of the four-level methodological approach that HOOP Partner DRAXIS has applied to develop a new integrated CBM typology focused on biowaste. The recording and the presentation are available for HOOP members in the Hub.	https://hooproject.eu/hoop-lunch-talks-episode-iv-circular-business-models-cbms-applied-in-the-value-chain-of-biowaste-valorisation/

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

INVESTING IN NEW PROJECTS

HOOP Investment package	3-volume manual guiding organisations developing biocircular project into the different financing and investment opportunities: Volume I provides a description of the EU Taxonomy concepts, methodology, objectives, technical screening criteria and Do Not Significantly Harm assessment applied to circular bioeconomy activities Volume II gives a selection of funding and financing programmes and instruments available at European level for circular bioeconomy projects, as well as success stories on circular bioeconomy investments Volume III provides a selection of national and regional funding schemes in the 8 countries of the Lighthouses.
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Webinar on technologies for urban bio-waste and wastewater valorisation	Webinar highlighting some of the most promising technologies currently emerging from EU-funded research projects.	https://hoop-hub.eu/virtual-academy-fil-ter.html?vi=61
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INNOVATION PUBLIC PROCUREMENT

Webinar: understanding open market consultation	A webinar targeting public procurers and focusing on what an Open Market Consultation entails.	https://hoop-hub.eu/virtual-academy-fil-ter.html?vi=152
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HOOP tools

Title	Description	Link
HOOP Project Maturity Level	This ranking tool evaluates the maturity of a given UCBE project in order to improve their maturity and bankability to mobilise green financing.	https://hoop-hub.eu/project-maturity-level.html
HOOP Circular Valuation Method	This tool provides a simple method for public and private entities to assess the sustainability of circular projects.	https://hoop-hub.eu/circular-valuation.html

INVESTING IN NEW PROJECTS



The HOOP project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°101000836

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

HOOP Lunch Talk Season 3 Episode V: Tools to empower financial investments	Presentation of several tools developed in order to improve the maturity and bankability of circular bioeconomy investment projects. The recording and the presentation are available for HOOP members in the Hub.	HOOP Lunch Talks Season 3 – Episode V: Tools to empower financial investments HOOP (hooproject.eu)
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Other Resources

	Title	Description	Link
	First insights on new business models (ValueWaste project, 2021)	The report analyses business models for three different biocircular value-chains.	https://hoop-hub.eu/virtual-images/118-2308d6b4c3fa05b41088a1f734f9f6de.pdf
BUSINESS MODELS FOR CIRCULAR BIOECONOMY	Circular Business Models, A study to classify existing and emerging forms of value retention and creation (Ministry of Economic Affairs and Climate Policy of the Netherlands, 2022)	This report provides a classification of circular business models	https://hoop-hub.eu/virtual-images/137-ba7f6b8c63364c6412af91a105e76e08.pdf
INVESTING IN NEW PROJECTS	Circular cities funding guide (EIB)	This website provides guidance for funding seekers and funding providers focusing on circular economy and include concrete illustrations and success stories.	https://www.circularcityfundingguide.eu/

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- Due Diligence Standard Procedure: https://hoopproject.eu/wp-content/uploads/2023/12/D5.5_Due_Diligence_Standard_Procedure_Guidelines.pdf
- SCALIBUR project: <https://scalibur.eu/>
- Life Biobest project: <https://zerowasteurope.eu/project/life-biobest/>
- Force project: <https://www.ce-force.eu/>
- UrbanWins project: <https://urbanwins.eu/>

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9. Annex

Annex 1. Feedback from the HOOP Members

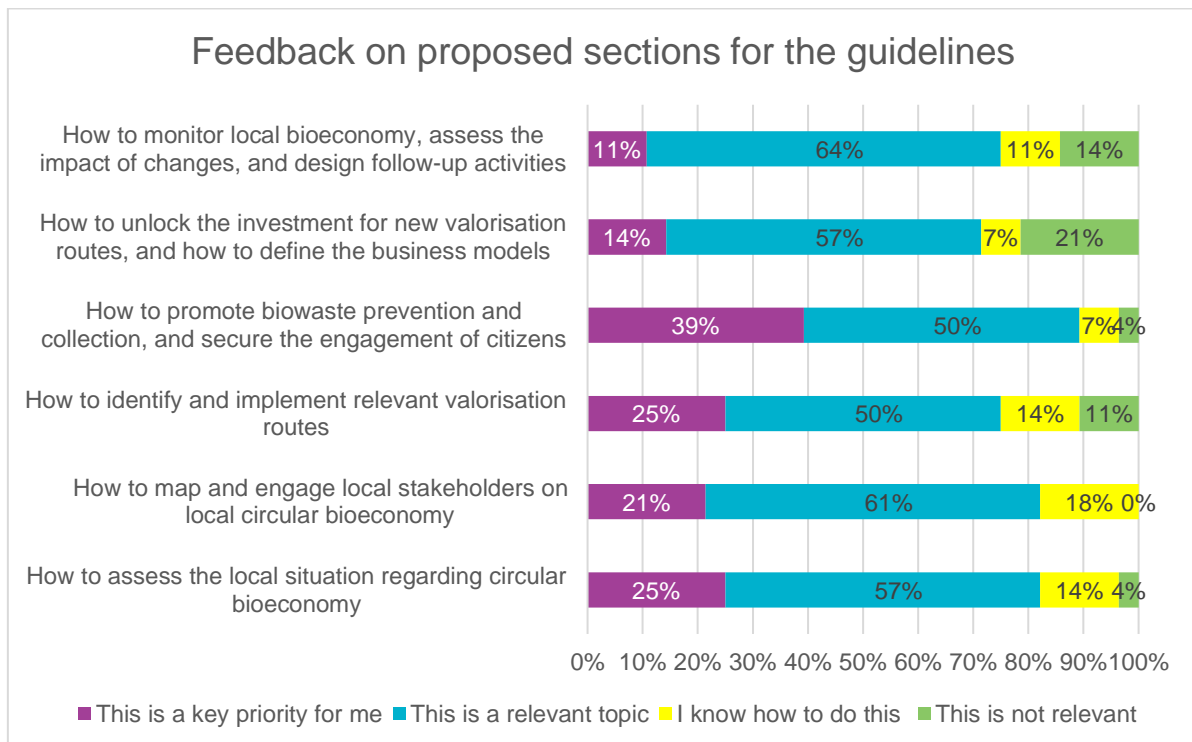
To better align the HOOP Guidelines with the expectations and needs from the key target audience, the HOOP Network of Cities and Regions, a survey was launched in June 2023 to collect feedback on their main interest. The questions of the survey were based on the first proposed outlines: respondents were asked to assess the relevancy of each of the proposed section and then select or propose relevant content. Few questions were also asked for on the desired format and how the guidelines could be promoted.

Feedback was received from 28 anonymous participants, all Members of the HOOP Network (out of about 70 registered HOOP Members when the survey was launched). This represents about 35% of the HOOP Members.

FEEDBACK ON THE GENERAL SECTIONS

Respondents were asked to assess the relevancy of each proposed section, with different possibilities.

- *The topic is a key priority for the respondent*
- *The topic is relevant*
- *The topic is not relevant*
- *The respondent does not require guidance for this specific topic*



The graph shows the distribution of replies for the different sections.

Overall, not key topic is regarded as irrelevant or uninteresting for the majority of participants. The topic focusing on the **prevention and collection of biowaste, and citizens' engagement**, is the one that gathered the most positive feedback. Three topics received slightly lower positive feedback: **how to assess the local situation**, **how to engage local stakeholders**, and **how to identify and implement valorisation routes**, with more respondents stating that they already knew about them.

Two topics were more labelled as “irrelevant” by respondents: the one on **investment and business models**, and the one on **monitoring**. No details were asked to respondents on the reasons behind these replies; it is possible that they are not concerned by the investment in valorisation routes (e.g. they are only in charge of collection, or valorisation routes might be under the responsibility of the private sector).

Overall, most topics received positive feedback from most of the respondents with 70% respondents labelling them as “priority” or “relevant”. Therefore, it seems relevant to keep them all in the guidelines. It might be relevant to give a bit more space to citizens' engagement which is a key priority for many respondents.

FEEDBACK ON THE CONTENT

For each proposed section, respondents were asked to choose from a list of propositions for content that could be relevant to their interest. Participants were also given the possibility to propose topics of their own, but none did so. Only the respondents that showed interest to the predefined sections were offered to list their topic of interest, so the number of respondents varies for each section.

The overall results are presented in the following table:

D8.5 HOOP GUIDELINES FOR LOCAL AND REGIONAL AUTHORITIES

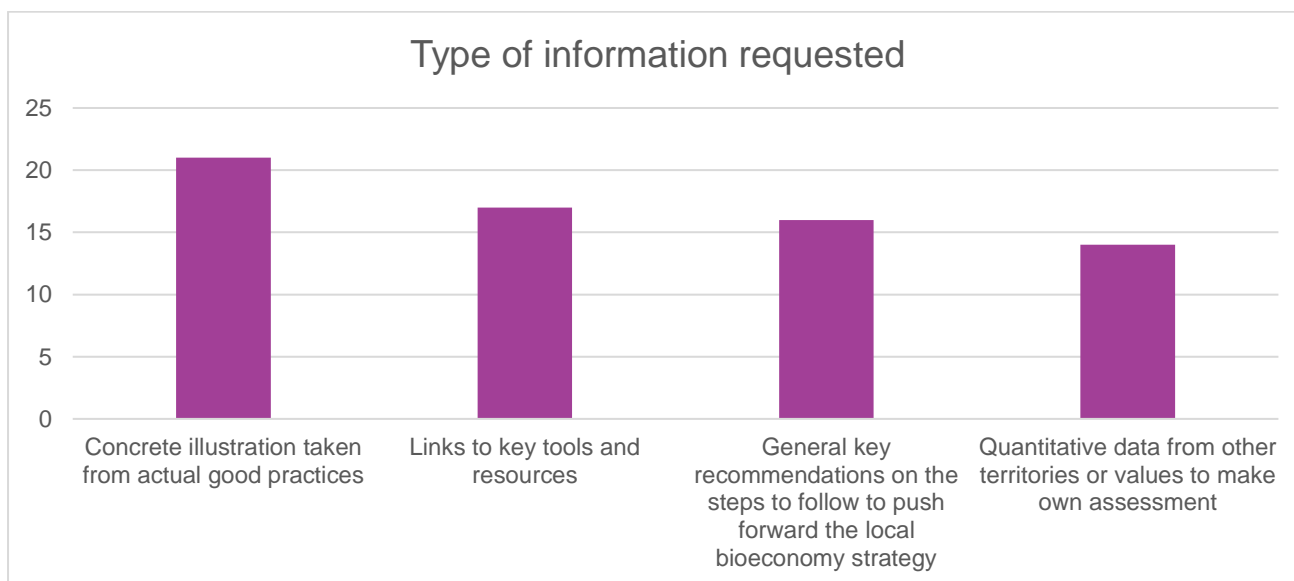
Content	Nb of responses	% of positive responses
How to assess the local situation regarding circular bioeconomy	22	
Comparisons with other territories	15	70%
Indicators to assess the local circular bioeconomy	13	61%
Benchmarking elements to assess its local situation	12	57%
Methods for data collection and calculation of indicators	10	48%
How to identify and implement relevant valorisation routes	20	
Technologies that are already working at industrial scale	14	71%
A list of available technologies for biowaste and wastewater sludge	13	67%
Key information on the technologies: feedstock, outputs and potential end-users, economic and environmental impact, maturity level	13	67%
How to identify relevant valorisation routes depending on the local context (key criteria to do so)	10	48%
How to map and engage local stakeholders on local circular bioeconomy	22	
Drivers and barriers for stakeholder engagement	16	74%
How to approach and engage with local stakeholders	15	70%
How to set local governance on circular bioeconomy	13	57%
What key stakeholders should be considered	11	52%
How to identify key local stakeholders	9	43%
How to monitor local bioeconomy, assess the impact of changes, and design follow-up activities	20	
Environmental impact assessment	13	62%
Economic impact assessment	12	57%
Data collection and monitoring	11	57%
Indicators for the monitoring of local bioeconomy	11	52%
Define follow-up activities	9	48%
How to promote biowaste prevention and collection, and secure the engagement of citizens	24	
Prevention of food waste	17	72%
How to secure the participation of inhabitants in biowaste collection	15	64%
Incentive instruments	14	60%
How to improve the capture rate of biowaste collection	12	52%
General recommendations on biowaste collection	10	44%
How to unlock the investment for new valorisation routes, and how to define the business models	20	
Main potential sources of investment	13	62%
Circular Bio-based Business Models	10	48%
Business models for key valorisation routes	9	43%
How to develop a business model for a new valorisation route	9	43%
European investment packaging on circular bioeconomy	8	38%
Reaching private investors	8	38%
Investments costs for key valorisation routes	5	24%

For each topic, it is possible to highlight the most voted topic, which is marked in bold in the table. Besides, all topics receiving less than 50% of interest were marked in grey. It is suggested to make an extra focus in the guidelines on the most voted topics and to leave aside the one in grey.

FORMAT OF THE GUIDELINES

Several questions were asked on the format of the guidelines, e.g. how the information should be presented, the desired length, the type of report expected, or information on its promotion.

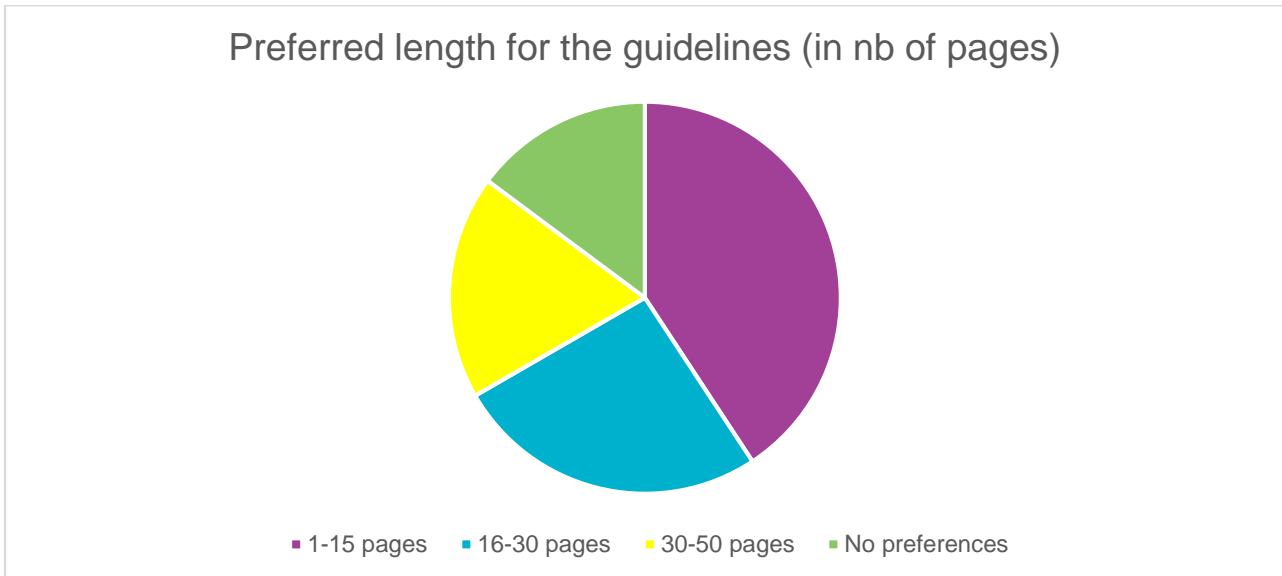
The first question was on the type of information that the end-users would be interested in finding. The responses can be found in the following graph:



21 respondents expressed interest in concrete illustrations, e.g. actual case studies and examples that could inspire them. 17 and 16 respondents reported interests in respectively links toward tools and resources, and more general recommendations, while only half demonstrated interest in quantitative data from other territories. One respondent also proposed to present **barriers, typical mistakes, and figures on economic performances**.

When it comes to the expected format, respondents were divided: **18 expressed their interest for a webpage guiding readers to the different sections, while 15 mentioned a more traditional report** (6 respondents selected both options). One respondent also suggested to share quantitative data in a spreadsheet. There seems to be a strong interest in having a more flexible document under the format of an online guide.

When it comes to the preferred length, the distribution of responses is the following:



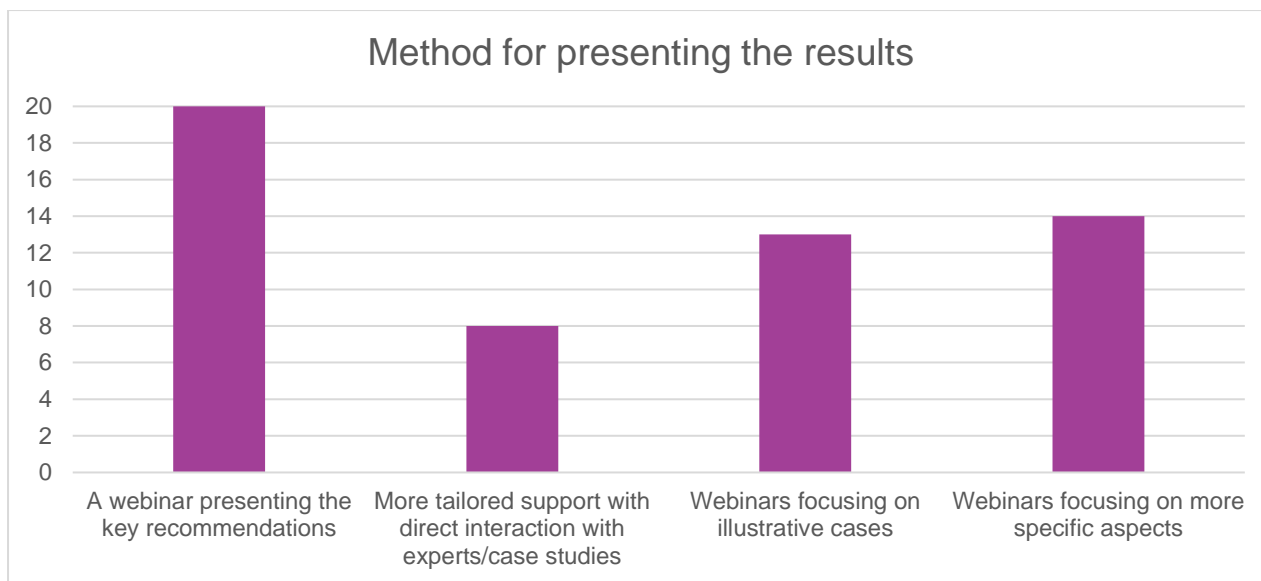
Participants tend to favour shorter reports (1 to 15 pages) over longer ones, so the reports should be as concise as possible to be appealing to its target audience.

Participants were also asked whether it was necessary to provide a translated version for the guidelines. Their responses are presented on the following graph:



A bit less than half of the respondents does not wish to have translation, but one third considers it interesting, and a bit less than one quarter would be in favour of having the public summary in English. If the guidelines are a short document directing to external resources that are likely to be in English, ensuring a full translation might prove challenging and inadequate. It is proposed to find an alternative solution, such as to have a shorter version (e.g. a checklist of key recommendations) translated in various languages to favour its uptake.

Finally, participants were asked to give their opinion on how the guidelines and lessons learnt could be promoted. The following responses were provided:



Most respondents expressed interest for the presentation of key recommendations during a webinar, but many were also interested in webinars on more specific topics or concrete cases. 8 respondents expressed interest in tailored support as already proposed by the HOOP Network, and one suggested the organisation of study visits.

These different points could be addressed during the HOOP City conference taking place in June 2024 in Brussels, where:

- *the key recommendations could be presented in plenary session*
- *more specific aspects could be tackled in smaller break-out sessions*
- *interactions between experts, case studies (e.g. the Lighthouses), and HOOP Members could be promoted either during these break-out sessions or with*

CONCLUSION OF THE SURVEY

The survey allows to refine the outlines of the HOOP guidelines by narrowing down the topics of interest and clarifying the expectations when it comes to the content and format. Overall, respondents expressed interest in a **short document**, possibly **also presented online**, highlighting **key recommendations** but more importantly **concrete good practices**, and possibly **partly translated**.

When it comes to content, the general outlines proposed by ACR+ were for the most part validated, even if some specific sections on investment appeared to be less relevant to some respondents. More importantly, the survey allowed to highlight topics that required specific focus, and the ones that were considered as less relevant.