D8.4
National action manuals for local uptake and replicability

Author: CSCP

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Authors	Diedrich, Anna-Carina; Jungnickel, Meike; Schumacher, Felix; Woo, Fiona
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List of acronyms

Acronym	Description
ACEA	Electricity and water municipal utility (Italy)
AD	Anaerobic Digestion
AEMA	Association of environmental companies in Murcia Region (Spain)
ANCI	National Association of Italian Municipalities
awm	Münster waste management company
BC	Biowaste Club
BCM	Biowaste Club Meeting
BE	BioEconomy
BEW	German Federal funding on efficient heating grids
BIC	Bio-based Industries Consortium
BImSchV	German Federal Immission Control Ordinance
BIR	Bergen intermunicipal company for renovation
B2B	Business to business
CCRI	Circular Cities and Regions Initiative
CE	Circular Economy
CluBE	Cluster of Bioeconomy of Western Macedonia
CNR-IRSA	Italian National Research Council – Water Research Institute
CONOE	Italian national consortium of collection and treatment of used vegetable and animal oils and fats
DüMV	German Fertilisers Ordinance
ERDF	European Regional Development Fund

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Acronym	Description
ESF	European Social Fund
ESG	Environment Society Governance
EU	European Union
EWC	European Waste Catalogue
FOAK	First-of-a-Kind
HoReCa	Hotel/Restaurant/Catering
H2020	Horizon 2020
ICER	Dutch Integral Circular Economy Report
INFO	Development Institute of Murcia Region (Spain)
Kg/ cap y	Kilograms per inhabitant and year
KPI	Key Project Indicator
KrWG	German Circular Economy Act
kWh	Kilowatt hour
LAP3	Dutch National Waste Management Plan
LCA	Life Cycle Assessment
LD	Landfill Directive
LHs	HOOP Lighthouse Cities and Regions
MBT	Mechanical-Biological Treatment
MMSW	Mixed municipal solid waste
MSW	Municipal Solid Waste
m^3	Cubic meter
nº	Number

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Acronym	Description
NGO	Non-Governmental Organisation
NOK	Norwegian Krone
OFMSW	Organic Fraction of Municipal Solid Waste
PAYT	Pay As You Throw
PCW	Post-Consumer Wood
PDA	Project Development Assistance
PERSU	Portuguese Strategic Plan for Urban Waste
PHA	PolyHydroxyAlkanoates
PML	Project Maturity Level
PNPR	Italian National Waste Prevention Plan
PNRR	Italian National Recovery and Resilience Plan
RDI	Research Development and Innovation
ROI	Return on Investment
SCG	Spent Coffee Grounds
SITRA	Finnish Innovation Fund
SIVA	Norwegian Industrial Development Corporation
SME	Small and medium-sized enterprises
SWOT	Strengths Weaknesses Opportunities Threats
TRL	Technology Readiness Level
TSE	Transmissible Spongiform Encephalopaties
UCO	Used Cooking Oils
UM	Urban metabolism

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Acronym	Description
USD	United States Dollar
UWWS	Urban wastewater sludge
VKU	German Association of Local Public Utilities
WFD	Waste Framework Directive

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1. Executive summary

Who is this manual for?

This manual is for anyone who wants to know more about urban biowaste sorting and collection and also play an active role in converting it into high value-added products, transforming linear resource chains into circular loops where biowaste becomes an input in generating a new product.

This manual is written for you if you are involved in the biowaste value chain of your city – for example, in the municipal administration's waste department, the waste management company, the municipal wastewater treatment plant – or if you are outside the value chain interested in engaging stakeholders and bringing people together – for example, someone from a local community group or NGO.

How should you use this manual?

The purpose of this manual is to guide the user through the process of engaging stakeholders in their cities' and regions' biowaste value chain. It is a step-by-step guide of how to identify stakeholders, understand their motivations, bring them together for exchange and discussion, find opportunities for action, and mobilise for change. This guide will also introduce the user to how to do a baseline assessment of your urban circular bioeconomy and explain how the assessment can be useful. With an understanding of the baseline situation and the key stakeholders, the reader can learn about various technologies and ways to valorise the biowaste, as well as how to find financing to implement them.

The goal of this process is to increase biowaste collection rates and promote the conversion of biowaste into high value-added products. You could also use this manual if you are working in a regional or national public authority and would like to replicate successful experiences of pilot cities and innovative biowaste projects in your region or country.

This manual starts by providing background information on the state of (circular) bioeconomy in the country, including relevant legislation and policies (chapter 3). In chapter 4, you can learn why it is useful to assess your initial situation by conducting a baseline assessment, and how you can make use of this assessment.

Throughout this manual, a focus will be on country-specific learnings and experiences as well as on the insights from the respective HOOP Lighthouses.

Last but not least, you may want to consider reading this manual back-to-back with D8.5 the "HOOP guidelines for local and regional authorities", which follow a similar structure and will give you more background and additional guidance.

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2. Welcome!

What is this manual about?

The HOOP project sets out not only to support its 8 Lighthouse Cities and Regions in fostering their local and regional bioeconomy projects, but also to share the Lighthouses' learnings and experiences with all European actors that are interested in improving the biowaste recycling and circularity in their own cities and regions.

These national action manuals are one tool for learning about the Lighthouses' journeys with a view on replication. These manuals - targeted at representatives from municipal and regional governments as well as representatives from public and private waste service providers – give an overview of the Lighthouses' learnings along different stages of the HOOP project. This report is, thus, a starter's guide, taking you through the different phases of fostering your circular bioeconomy projects. To get into more details – and learn more in-depth from a specific Lighthouse or a specific activity – the report will refer you to the respective deliverables and tools of HOOP where you can find more information.

This manual does not stand alone. But can and should (from May 2024 onwards) be read back-to-back with HOOP Deliverable D8.5 "HOOP guidelines for local and regional authorities", written by ACR+. Both these documents follow the same structure. The manual at hand (D8.4) focuses on country- and Lighthouse-specific learnings, best practises and experiences, as well as on insights from the HOOP technical partners. D8.5 in turn gives you hands-on step-by-step exercises and tools how to walk the bioeconomy journey, stepping into the HOOP Lighthouses' shoes.

While the English version contains the learnings from all 8 HOOP Lighthouses – and hence perspectives on all 8 HOOP focus countries - from May 2024 onwards you can also find translated versions – each focusing on one of the 8 countries – in the HOOP library. These translated manuals can and should be read back-to-back with the respective translated versions of D8.5, too.

Where to find what?

This manual is structured as follows: In Chapter 3, you'll find an introduction to circular bioeconomy, including insights from the respective Lighthouse countries and what these mean for actors working on their local biowaste value chains. Chapter 4 illustrates how a city or region can start developing its baseline and assess its current status quo in terms of biowaste recycling. In a next step, Chapter 5 outlines various methods of stakeholder engagement and takes you the learnings and experiences our HOOP Lighthouses and technical partners made in each step of the stakeholder journey. Once you have understood your baseline and talked to your stakeholders, you might want to assess further which technologies and innovations best fit your local or regional context. For this, Chapter 6 gives an outline of the HOOP learnings on identifying and designing relevant valorisation routes. From choosing fitting solutions, it will be a natural next step to also look for funding options to implement the solution. Chapter 7 will support you on this endeavour. Finally, the conclusion will wrap-up our main findings and point you at helpful HOOP tools, reports and events to continue your circular bioeconomy journey together with us.

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3. The circular bioeconomy

The concepts of Circular Economy (CE) and Bioeconomy (BE) have a huge potential to make our societies more sustainable through reducing the impact on the planet's resources. The European Union (EU) has demonstrated a strong commitment to these concepts by launching a number of strategies and initiatives following the introduction of the first package of measures related to CE in 2015 (Suárez et al., 2023). While the concept of CE focuses on the reduction of resource input and waste, BE is centered around utilising renewable biological resources which substitute fossil fuels (Geissdoerfer et al., 2017; Vivien et al., 2019). The combination of the two notions towards the concept of circular bioeconomy implies the cascade usage of biomass (Gottinger et al., 2020). Given that up to 50% of municipal garbage in Europe is organic, one of the main components of a circular bioeconomy involves the valorisation of biowaste.

In fact, cities are expected to develop into important circular bioeconomy hubs under the EU Bioeconomy Strategy (2018), where biowaste serves as a feedstock for sustainable and safe bio-based goods (Suárez et al., 2023). Currently, however, huge amounts of biowaste are still incinerated or landfilled in the EU, which means that the full potential of biowaste valorisation remains untapped (Eurostat, 2020). The Waste Framework Directive's five-step "waste hierarchy" serves as a basis of EU waste management. It creates a hierarchy for the management of (bio)-waste, where the prevention of waste is followed by reuse, then recycling and the least preferred treatment options, such as recovery and disposal. Changes in the EU waste legislation (The Waste Framework Directive (WFD) and Landfill Directive (LD)) are expected to drive the enhanced valorisation as well as prevention of biowaste (Research 4 Life, 2021). Some of the key changes affecting the management of biowaste are:

- Mandatory separate collection or recycling at source of biowaste by 31st December 2023 (WFD)
- Composting or anaerobic digestion of organic fraction coming from mixed urban waste (through mechanical-biological treatment) will not be considered as recycling by January 2027 (WFD)
- 65% recycling of municipal waste by 2035 (WFD)
- Maximum 10% landfill of Municipal Solid Waste (MSW) by 2035 (LD)
- Reduction of food waste by 30 % in stores, restaurants, and households by 2030 (WFD).

While the HOOP project focuses merely on a few key aspects of the circular bioeconomy – namely innovative valorisation routes for municipal organic residues – it is important to understand the overall concepts and different visions for a circular urban bioeconomy in Europe. On this wider level, the Bioeconomy Strategy (2018) and the updated Circular Economy Action Plan (2020) set the course for biowaste valorisation on EU level. In several countries national CE and BE strategies have been introduced, which are described for the respective HOOP Lighthouses in the following.

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3.1. Albano Laziale

Italy has established both national and regional strategies to promote bioeconomy and circular economy practices. The national circular economy strategy focuses mainly on the construction, textiles, plastics and electronics sector as well as industrial symbiosis projects. The national bioeconomy policy for Italy, was created in 2017. This first bioeconomy strategy was revised in May 2019, leading to "Bioeconomy in Italy: A new bioeconomy strategy for a sustainable Italy". The goals of this revised strategy are to improve the interconnections between Italy's diverse bioeconomy industries and their value chains (Draxis, 2021). The country aims to significantly boost bioeconomy production and employment by 2030. The importance of achieving a bioeconomy in Italy is embedded in a shared vision for environmental, economic, and social development. These strategies align with national and regional development plans, aiming to harmonise economic growth with environmental sustainability.

Regarding the circular economy policies, the Legislative Decree 116/2020 "Waste Decree" transposes in Italy in a single decree two of the four European directives (2018/851 and 2018/852) contained in the “Circular Economy Package” concerning waste, packaging and packaging waste. In the context of public policies to support the transition to a circular economy, the redefinition of the Industry 4.0 Plan aimed at encouraging green investments by enterprises in circular economy; the expansion of the Revolving Fund for the support of enterprises and investments in R&D and investment programmes and operations in the field of decarbonisation of the economy, circular economy, urban regeneration, sustainable tourism, adaptation and mitigation climate change measures.

Furthermore, in May 2019 the update of the National Circular Bioeconomy Strategy was presented, aligned with the new "European Bioeconomy Strategy", which strongly emphasises the need to reorient all economic sectors into bioeconomy circularity and environmental sustainability.

The Lazio Region, as part of the new 2021-2027 programming, has also the "Smart Specialization Strategy - RIS3", which aims at promoting growth and employment in the most competitive areas and sectors of activity in the territory.

Italy’s Recovery and Resilience Plan supports the green transition with key investments in, among others, development of renewable energies and the circular economy and improvement in waste and water management **with € 15.05 billion of funding (protection of the territory and water resources)**.

In Italy, however, there are sometimes many different local and regional bioeconomy and circular economy strategies addressing the same industry sector, but suggesting different approaches, which leads to non-harmonised and uncoordinated processes (CSCP, 2022). The regional strategy in Lazio, known as "Lazio, Sustainable and Participatory Region," reinforces the focus on composting, especially after increased funding following recent energy crises. Albano has an urban Circular Bio-based Economy Strategy that includes the valorisation of urban biowaste by aerobic digestion, generated by citizens and to produce bio-based products (CETAQUA, 2022).

There is different legislation which supports recycling and waste management system in the whole value chain, from collection to valorisation, most importantly the Environmental code (April 2006). This legislation contains the rules on waste management and builds on principles such as precaution, prevention, sustainability, proportionality and the “polluter pays” rule. Further this code lays out specific targets for recycling targets for

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municipal and packing waste, reduction in landfill disposal and separate collection in line with EU legislation (CETAQUA, 2022).

In 2019 7.23 million tons of biowaste were separately collected in Italy. Growth estimates lead to a target of 9.2 million tons of organic waste collected in Italy by 2025, or more than 150 kg/inhabitant/year. The Lazio Region is in fifth place in Italy for the production of organic waste with approximately 550,000 tons per year. The most common treatment forms of biowaste are anaerobic digestion and composting.

In Italy, certain regions stand out as pioneers in the circular bioeconomy. Tuscany, Marche, and Friuli Venezia-Giulia have demonstrated proactive utilization of biological resources, including waste, to produce goods and energy. Their distinctive approach sets them apart, making them forerunners in the country's circular bioeconomy initiatives. Their success is attributed to a combination of fully bioeconomic sectors, such as agri-food, wood, paper and water, together with a significant technological transition towards fully bio-based production. In contrast, regions such as Lombardy and Lazio are in a less favourable position, with an even lower bioeconomic footprint and variable levels of technological transition, often associated with greater production diversification which could impact the assessment of their actual contribution to the bioeconomy. The reasons for the primacy of Tuscany, Marche and Friuli Venezia-Giulia are also to be found in the fact that they have traditionally supported high-quality and sustainable agriculture, supporting the bioeconomy in the agri-food sector. Furthermore, in these regions there is effective sustainable management of forest resources, for the production of wood and paper processing which contribute significantly to the bioeconomy.

Despite those efforts, there are barriers hindering the progress of circular bioeconomy initiatives in Italy. Restrictive regulations, insufficient investment in biotechnology, and the complexity of bioeconomy value chains pose significant challenges. For instance, excessively complex and restrictive regulations do not take into account new emerging technologies and methodologies such as those envisaged for the HOOP PDA[1]. Restrictive regulations impose high requirements for the treatment or certification of new products made from organic waste, making it difficult for businesses to adopt innovative and sustainable approaches. Furthermore, the lack of uniformity in regulations between different Italian regions adds complexity to circular bioeconomy activities, especially when companies operate on a national scale.

The current focus on biocomposters (as a well-known and tested process that requires relatively little investment and meets growing demands for soil improvers) and biodigesters (due to the international energy crises), might inadvertently hinder investment in more innovative biotechnologies. Additionally, the collaboration among various stakeholders remains a challenge in implementing these strategies effectively. Moreover, there is a need to address the lack of skills and knowledge in the field of circular bioeconomy. In the sphere of bioeconomy and biotechnology, a general skills deficit among policy makers and local administrators can be considered. These professionals generally do not have in-depth knowledge of the opportunities, challenges and implications of biotechnology and the bioeconomy in public policy decisions at the local level. For example, municipal employees and policy makers may not be fully aware of emerging technologies in the sector, such as genetic modification, the production of bioplastics or the use of biotechnology for waste treatment. These skills are essential to develop local policies that encourage the adoption of sustainable and innovative practices related

[1] PDA – or project development assistance – is the main focus of the HOOP project. As part of the PDA, the HOOP consortium offers technical, legal, environmental, economic & financial and administrative assistance to the 8 HOOP Lighthouse Cities and Regions, for the development of urban circular bioeconomy projects, bridging the gap between the plans/strategies and the investment.

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to the bioeconomy. Therefore, enhancing expertise and understanding among stakeholders is pivotal to bolster the uptake and success of circular bioeconomy initiatives across Italy.

3.2. Almere

The Netherlands have national strategies both on Circular Economy and Bioeconomy, which provide general roadmaps on those topics. The National Circular Economy Program from 2023 to 2030, emphasises voluntary agreements like the Plastic Pact. However, it contains few compelling measures. The prospective Circular Material Plan (LAP3) might introduce mandatory rules for waste treatment, potentially benefitting HOOP projects utilising natural fibres. The National Bio-based Building Approach for 2023-2030 primarily focuses on experimental projects and lacks a direct link to the HOOP initiatives. Similarly, the Flevoland Province's vision, "Omgevingsvisie FlevolandStraks", does not directly relate to HOOP projects objectives on biowaste valorisation. With regards of the waste management, at national level there is a National Waste Management Plan (LAP3) which was updated in March 2021. With this legislation, one of the challenges is that everything has the legal label 'waste' as soon as it is on the grounds of the Upcycling Centre (and other recycling stations). As soon as it is waste, a company that wants to work with this must have a waste management certification, which is not so easy to get (CETAQUA, 2022).

In the Netherlands the amounts of collected and processed biowaste remained almost the same in recent years. A total of 1.9 million tons of waste was processed at biowaste processors in 2021. Besides 1.7 million tons of biowaste, this includes green waste, kitchen waste and food leftovers from catering establishments. Regarding biowaste treatment, compost and anaerobic digestion remain the predominant options. In 2021, 0.7 million tons of compost was delivered. Digestion plants processed 0.4 million tons of biowaste.

The Netherlands has a culture rich in innovation and entrepreneurial spirit, fostering a dynamic environment supported by substantial funding for circular activities. However, several socio-economic challenges present significant hurdles on the path toward a flourishing circular bioeconomy. While technological advancements have diminished the relevance of technical Product Development Agreements, signaling a shift in the landscape of technological influence there remain some open challenges. The socio-economic challenges are diverse and multifaceted and range from labor market constraints, agricultural unrest related to the need to decrease cattle farming, restrictions to urban and industrial development and energy grid congestions.

Further barriers for the Dutch circular bioeconomy include the limited influence of local governments due to a lack of funds and authority, resulting in enforcement predominantly resting at the regional or national level and the scarcity of local initiatives. For instance, the Integral Circular Economy Report (ICER) has indicated a stagnant percentage of circular companies at 6%, signaling a lack of substantial local initiatives in this domain. Moreover, many initiatives within the circular bioeconomy domain face uncertainties concerning their economic viability, necessitating an active and interventionist role to facilitate a turnaround.

Proposed activities and roles for regional and national authorities entails the establishment of legally binding targets for recycled and bio-based content, along with the enforcement of stricter minimum standards for waste treatment. Moreover, intensified law enforcement is recommended to monitor and sanction non-compliant entities. Prioritising the purchase of products and materials sourced from residual streams in public procurement to reduce reliance on fossil resources is another key activity. This could include issuing purchase guarantees to support circular entrepreneurs, involving start-ups, is also pivotal in this role. Further more information and

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education are needed about the available financial and non-financial instruments for circular entrepreneurs, and how they can combine them to support their business. Providing support for circular entrepreneurs to evolve into attractive investment or financing prospects is a catalyst for success. Transparent and accessible data collection within organisations to measure objectives is pivotal for a data-driven operation. Collaboration on a national level for the development and sharing of critical data for monitoring, as well as establishing indicators and data for goal monitoring, is proposed.

3.3. Bergen

Norway's focus on a green circular economy is evident through its national strategy and regional initiatives. The country has a green circular economy strategy and a roadmap for a green industry.

The country's unique geographical and economic landscape influences its approach to circular bioeconomy. In particular, the sparsely populated regions and varied industries, such as farming, forestry, and fish farming, present both challenges and opportunities for circular initiatives. In Norway the amounts of collected and processed biowaste were 0.58 million tons in 2022. While food and garden waste is primarily composted and anaerobically digested, wood waste is mainly incinerated.

The significance of achieving a circular bioeconomy in Norway lies in capitalising on resources that are currently lost in the existing linear economy. The vision of producing high-quality protein from biowaste instead of merely compost or energy, underlines the economic and environmental potential of more innovative approaches. The National Act on food production and food safety (food law) with accompanying regulations is eminently influencing this vision. The purpose of the law is to ensure safe food (in terms of health) and promote health, quality and consumer considerations along the entire production chain, as well as provide for environmentally friendly production. The law must further promote good plant and animal health. This has implications for the acceptable treatment of household food waste so it can be valorised, as today only vegetable products and certain animal products like milk, eggs and honey can be used for insect feed. Complementing the legal framework for the circular bioeconomy in Norway are the national regulations on waste from households and similar waste from the business community, which prescribes increased material recycling of household waste and similar waste from the business community to ensure access to limited resources (CETAQUA, 2022).

For the HOOP project partner BIR[2], both the national but even more so the international level will be keys to support here. This is due to the fact that many of the hindering legislations are based on EU legislation that have been taken up by Norway. BIR has been active in the ROOTS policy group and advocates for clearer legislations to overcome existing uncertainties. Ultimately the goal for BIR would then be for the legislation to change, e.g., allowing more options for the production of insects and algae on biowaste and also giving clarity on those topics (CSCP, 2022).

Next to the time-consuming process of changing legislation, which requires thorough research there are other substantial barriers, including the time and effort needed to engage stakeholders across the entire value chain and challenges in raising capital for investments in private companies. Looking ahead, the establishment of

[2] BIR is the project partner in charge of running the HOOP activities in the Lighthouse Bergen. BIR is Norway's second largest waste management company and is responsible for waste handling from 356,000 inhabitants in the municipalities owning BIR.

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bioparks is seen as pivotal for Norway's future circular bioeconomy. These spaces will likely play a central role in innovation, research, and the practical application of circular principles.

Cities like Fredrikstad, Drammen, and Tønsberg stand out for their industrial parks, research activities, and biogas production, showcasing the potential of industrial symbiosis and research-driven progress in the field. These places demonstrate innovative approaches for fostering circularity in their industries.

3.4. Greater Porto

In 2019 Portugal reported 192,867 tons of biowaste, which were separately collected. It is estimated that around 10% of biowaste was collected separately in 2019. The reported share of biowaste in residual waste is 43 %, meaning that a total of 1.7 million tons biowaste is present in residual waste. In order to create compost from mixed MSW, additional 698,530 tons of biowaste are removed from residual waste that is handled in MBT facilities in 2019 (APA, 2021). Separately collected biowaste is mainly treated by two different approaches, composting and anaerobic digestion (European Environmental Agency, 2022).

The current landfill tax in Portugal is 22 €/ton and the tariff is expected to rise to 35 €/ton by 2025. The fee will encourage the distinct collection and recycling of other recyclables and biowaste starting in 2023 (European Environmental Agency, 2022) Decree-Law no. 102-D/2020, effective from 7th January 2021 serves as the domestic transposition of Directive 2008/98/EC, commonly referred to as the Waste Framework Directive. It establishes the legal parameters for waste prevention, production, and overall management. The legislation defines methodologies for the accurate documentation of waste treatment, formulates explicit targets for waste recycling, and mandates the obligatory collection of biowaste until the conclusion of 2023. It is noteworthy that while this legislative framework has been partially implemented, further measures are deemed necessary to facilitate the requisite conditions for the separate collection or on-site treatment of biowaste by the stipulated deadline of 2023 (CETAQUA, 2022).

The BIC report highlights Portugal's strong innovation ecosystem, its growing influence as a biotech leader, its thriving marine sector, and the significant opportunities to create value from resources and organic waste. Portugal will finalise its first-ever national bioeconomy strategy.

The Government of Portugal approved the Action Plan for Sustainable Bioeconomy 2025, which aims to accelerate the transition of the Portuguese economy to a sustainable and circular bioeconomy model. Portugal has a high potential for this transition, given that it has a strong primary sector in forestry, agriculture, fishery and aquaculture sectors, with a sovereignty and jurisdiction over an extensive maritime territory.

In addition to the soon to be released bioeconomy strategy, there are several other noteworthy national strategies, including the Action Plan for Circular Economy (Plano de Ação para a Economia Circular), the Biowaste Strategy (Biorresíduos - Contas Certas nos Resíduos), and the Strategic Plan for Urban Waste (PERSU 2020 / PERSU 2020+). An updated plan for the strategy extending until 2030 is presently under development.

Under the Portugal 2030 Strategy, Portugal established four thematic agendas of investment till 2030, among others, the “Agenda 3: Climate Transition and Resource Sustainability” where is included the circular bioeconomy and bioenergy calls for projects.

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Portugal's Recovery and Resilience Plan responds to the urgent need of fostering a strong recovery and making Portugal future ready. The plan is supported by € 13.9 billion in grants and € 2.7 billion in loans distributed through 3 pillars/axis: climate transition, digital transition, economic and social resilience. Regarding the "climate transition" line, 38% of the plan will support climate and circular objectives.

For urban waste management, several municipalities have distinct municipal regulations. These laws govern the disposal, collection, transportation, treatment, and recovery of urban waste as well as the cleanup of urban areas in Portuguese municipalities (CETAQUA, 2022).

3.5. Kuopio

Finland's approach to circular bioeconomy is underpinned by both national and regional strategies. At the national level, the "Finnish Roadmap to a Circular Economy 2016-2025" by SITRA serves as a pivotal document. This strategy emphasises a fundamental shift in consumption, advocating for service-based models that include sharing, renting, and recycling. The country renewed its bioeconomy strategy for the period 2022-2035, aiming to increase resource-wise practices through circular economy methods. This strategy is not only crucial for Finland but also aligns with broader goals of supporting the green transition of both Finland and the EU region. Emphasis is placed on ensuring the fair distribution of benefits and harms of the bioeconomy to promote societal well-being.

The City of Kuopio aims for a zero-emission, zero-waste and sustainable consumption level by 2050. One of the key objectives is to decrease the amount of household waste in the Kuopio region and increase the recycling rate to 65% by 2030. The City of Kuopio's guidelines for resource wisdom work have been defined in the Kuopio Resource Wisdom Programme, which was approved in 2017. The city's Climate Policy Programme is also a notable initiative. Within its five main areas, agriculture and food take precedence. This programme directly ties into the city's activities concerning energy production, consumption, and material flows, thus impacting the focus and trajectory of HOOP project.

In Finland, the Jätelaki, or Waste Act, serves as central legislation with a primary focus on averting hazards to human health and the environment posed by waste and waste management. The legislation aims to diminish the quantity and harmfulness of waste, foster sustainable natural resource use, ensure effective waste management, and prevent littering. An integral facet of this legislation involves the establishment of new biowaste collection points and waste collection points for small houses. The National Waste Plan of Finland establishes specific objectives, indicators, measures, and resource allocations to propel the circular economy and bring about systemic change (CETAQUA, 2022).

In Finland in 2021 470,848 tons of biowaste were collected separately. The most common treatment method in Finland remains anaerobic digestion. Considering Finland's unique features, the northern climate poses distinct challenges to agriculture and food production, requiring careful consideration in circular bioeconomy projects. Another feature are logistical distances which require tailored approaches. The bioeconomy is an exceptionally important sector for Finland. In 2019, the value added created by the bioeconomy was € 26 billion, i.e. 13 % of added value created in the national economy.

The strategic objectives outlined in Finland's Bioeconomy strategy for 2022-2035 include doubling the value added, recycling of materials and the utilisation of side streams, generating business on both domestic and

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international markets, and reducing dependence on fossil fuels and non-renewable raw materials. These objectives collectively aim to strengthen Finland's position in the bioeconomy sector and contribute to broader sustainable development goals. However, fostering the transition to a circular bioeconomy is not without challenges. A significant barrier is the shortage of innovative companies in the bioeconomy sector. On the other side, key drivers towards development include the bioeconomy strategy itself and the allocated funding in Research, Development, and Innovation (RDI).

3.6. Münster

Germany has developed both a Bioeconomy and Circular Economy strategy. The Circular Economy strategy in Germany emphasises the efficient use of resources, waste reduction, and a closed-loop system. The strategy also promotes recycling, reusing materials, and minimising waste generation, aiming to create a more sustainable and environmentally friendly economy. On the other hand, the National Bioeconomy strategy aims to promote the sustainable use of renewable resources and the transition towards a bio-based economy. It focuses on utilising biological knowledge and innovations to generate new products, processes, and businesses, with the goal of reducing dependence on fossil resources.

The Circular Economy Act (Kreislaufwirtschaftsgesetz – KrWG) in Germany, initially established in 1996 and revised in 2012 for EU harmonization, has undergone a significant update in February 2020. The Act prioritises a "prevention, recovery, disposal" approach in waste management and measures like strict separate collection and treatment of waste for recovery. In parallel, the State Waste Act of North Rhine-Westphalia complements the Circular Economy Act, aiming to implement recycling management to minimise waste, conserve resources, and ensure environmentally compatible waste disposal. It outlines regulations for waste management authorities, waste management concepts and waste statutes for the municipalities (CETAQUA, 2022).

In 2020 about 10 million tons of biogenic municipal waste in 2020 were collected. This biowaste consisting mostly in kitchen and green waste is valorised currently mainly by anaerobic digestion and composting.

Germany has several unique features that impact the implementation of circular and bioeconomy practices. Firstly, there is a strong environmental consciousness in the civil society. Next to a robust industrial sector, the country has a balance between urban and rural areas, each facing its own challenges in waste management and resource utilization. Germany has stringent environmental laws and regulations, which, while fostering sustainability, can also pose challenges in implementing new circular models, requiring compliance and adaptation. With a strong focus on technological innovation, Germany has the potential to lead in the development and implementation of advanced technologies supporting circular and bioeconomy practices. While Germany is proactively addressing climate change, it also faces challenges such as extreme weather events that affect agricultural production and, consequently, bioeconomy initiatives.

Further barriers for the German circular bioeconomy include navigating regulatory complexities, as compliance with existing regulations and adaptation to new, stringent environmental standards can be challenging. Moreover, achieving a behavioral shift in both consumers and businesses towards embracing circular practices requires time and comprehensive education efforts. The reliance on specific raw materials, particularly in certain industries, acts as a constraint, impeding the transition to bio-based alternatives due to limited availability or higher costs. In general, the initial investment costs in transitioning to circular practices represent a barrier.

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On the other hand, there are some driving factors facilitating the shift towards a circular bioeconomy to report upon. Government support plays a pivotal role, with strong political will and the implementation of policies, incentives, and funding accelerating the transition towards a circular bioeconomy. Growing environmental consciousness among the public fuels the demand for sustainable, circular products and practices. Advances in technology and innovation drive the development of efficient recycling, waste management, and bio-based production methods. Industry collaboration, through partnerships between businesses, research institutions, and governments, facilitates knowledge exchange and enables scalable, sustainable solutions. In a similar way the rise of circular economy initiatives and collaborative platforms, encouraging businesses and industries to adopt circular practices.

3.7. Murcia

In Spain the Circular Economy strategy focuses on different themes, which are connected to the objectives of the HOOP project. In particular the fields of action of waste management, reuse and treatment of water, research and innovation, awareness raising as well as employment and education are related to the activities of the HOOP project. The strategy also prescribes some targets which are affecting HOOP such as increasing the reuse of urban waste, improving the water cycle by 10% and reducing food waste to 50%. Parallel to the national CE strategy the circular economy strategy of Murcia Region is under preparation.

In 2020 approximately 1.25 million tons of biowaste was collected separately in Spain. Methanisation, employing anaerobic digestion, and composting are the primary treatment methods for biowaste in Spain, reflecting the strategic direction outlined in the national waste management plan.

Spain offers favourable preconditions for a circular bioeconomy as it has a strong primary sector that generates a lot of biowaste. Some of the generated biowaste is highly pollutant (like manure) and, from the other side, the soil in Spain is often degraded. Therefore, the long-term sustainability of the sector relies on the good management of bioresources.

Cities and regions leading the charge in circular bioeconomy in Spain are Barcelona and the Castilla y Leon Region. Barcelona is characterised through substantial investments in biowaste valorisation, particularly innovating in wastewater sludge treatment. On the other hand, the Castilla y Leon Region, with its robust agriculture, farming, and wood sectors, is actively implementing a cohesive circular bioeconomy strategy based on the integration of entire regional value chains and is also a Circular Cities and Regions Initiative (CCRI) pilot.

Spain faces several and connected barriers when it comes to urban biowaste management and the production of circular bioproducts. In terms of urban biowaste, a key challenge is, for instance, the citizenship's awareness and motivation. Additionally, in terms of circular bioproducts, the South of Spain is semi-desertic and soils need lots of organic matter, therefore compost is a must. However, only very high-quality compost (i.e. not polluted with glass, plastics, etc.) is suitable to be spread on soil, therefore we need better sorted urban biowaste to produce it. Turning to industrial by-products, upcycling can also represent a challenge. There the bottleneck is legislation due to the long (months/years) procedure to obtain the end-of-waste status from the competent authority. Overall, the innovation on biowaste upcycling relies on the good quality (purity) of biowaste flows and on the achievement end-of-waste status.

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The Spanish Bioeconomy Strategy and the Circular Economy Strategy have stablished the financing schemes in bioeconomy for the near past and coming years. Within their planned actions and budget there are defined several calls for funding which will be managed by different national agencies. In the Region of Murcia, the Development Institute (INFO) is the main body dependent of the regional government to manage and support companies to reach financial support.

Further barriers for the Spanish circular bioeconomy include the lack of investment on effective collection and treatment process from the local authorities' side. For industrial biowaste in particular there is a lack of upcycling and treatment solutions and dynamics to build up industrial symbiosis evident. Landfilling biowaste is oftentimes still cheaper than proper treating biowaste. Overall, to transition to a circular bioeconomy a shift from a short-time perspective to a long-term perspective is needed. Investment should not only focus on providing infrastructure but also on raising awareness.

3.8. Western Macedonia

In 2020 approximately 0.14 million tons of biowaste was collected separately in Greece. This means only 5.7% of the estimated biowaste generated is separated at source and most biowaste is still landfilled (GIZ, 2020).

The National Circular Economy Strategy, designed for implementation within 2020-2030, is built on three pillars. Firstly, Sustainable Resource Management aims to enhance efficiency, review value chains, implement rational waste management, and promote the reuse of buildings and water resources. Secondly, Circular Entrepreneurship is strengthened by encouraging eco-design, producing durable goods, supporting innovative entrepreneurship, and promoting green and circular public procurement. Lastly, Circular Consumption encourages citizen awareness, ecological labeling, sustainable food consumption, prevention of excessive resource use, and the promotion of service-based consumption over product supply.

The primary goal of the National Waste Management Plan 2020-2030 is to develop and define a strategy, goals, directions, and actions that aim to protect the environment and public health. The plan places significant emphasis on waste prevention, the minimisation of waste production, and the reduction of the use of natural resources to align with the principles of a circular economy. Specific targets include achieving 55% recycling by weight of municipal waste in 2025 and increasing it to 60% by 2030. The plan also aims to achieve energy production rates of 10% in 2025 and over 25% in 2030, along with reducing landfill rates to 10% by weight of municipal waste in 2030, five years ahead of the EU directive target.

The legislative objectives of the Regional Waste Management Plan of Western Macedonia, 2016, include stabilising waste production at 2011 levels with a decreasing trend. The plan emphasises the priority of sorting waste materials at the source and aims to complete and expand the necessary network, incorporating the development of the Green Points network in waste management infrastructure until 2020. Furthermore, the plan seeks to minimise the total amount of recoverable waste available for landfill, particularly focusing on plastics. It underscores the reinforcement of separate collection for recyclable materials, extending beyond packaging, and advocates for the development of separate biowaste collection. The revision of the regional waste management plan in 2021 focuses on setting targets for collected biowaste and recycling, determining the number of households targeted, and establishing environmental objectives.

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4. Assess your baseline situation

In order to understand the status quo, a baseline analysis of the current biowaste value chain should be carried out. This includes barriers and opportunity areas, current consumption behaviour and the key steps and actors along the waste management chain. Assessing the key data on recycling rates, urban biowaste fractions separated, management routes, citizen engagement, etc. will help you to identify main barriers and opportunities in the current system and, thus, will serve as a basis to decide on the most fitting stakeholder engagement activities in each pilot. The baseline analysis - as the name indicates - will also serve as a benchmark to assess and compare developments and improvements during your action's lifetime, thereby helping you evaluate its success and impact.

A baseline assessment contains the basic facts about the biowaste system in your city or region and important factors that can influence it. Use this information as a fact-based starting point in your Biowaste Club (see Chapter 5) and to plan actions for improving biowaste valorisation. It will help you and your stakeholders understand the strengths and weaknesses of the existing political, economic, social and legal systems. Examples of the most important types of data is presented in Annex 11.1. This information can help indicate where the opportunities along the value chain are for creating high-value products from urban biowaste by providing insights on which aspects your city or region seems to be doing well in, and which aspects seem to need improvement.

This baseline analysis and the stakeholder mapping (Chapter 5) of the urban biowaste sector will contain a lot of data. It can therefore be helpful to map the biowaste value chain in a diagram in order to have a visual aid showing which organisations are involved, what their roles and functions are, the flow of the biowaste streams, and where the streams currently end. It might look something like Figure 1.

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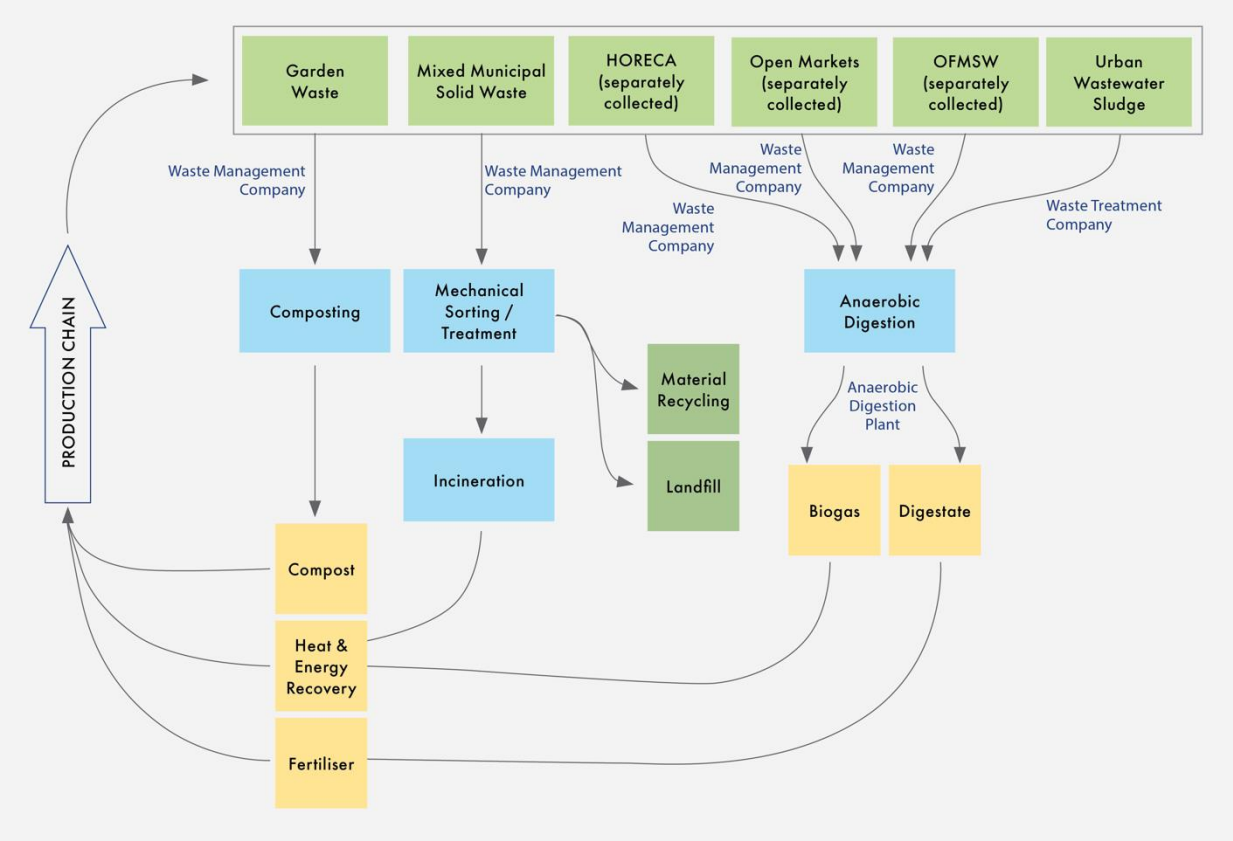

Figure 1 Example of visualisation of urban metabolism of urban biowaste and wastewater

Learnings and challenges

When planning an analysis of the urban metabolism (UM), the first step is the definition of the geographical boundaries, that must be set strategically and clearly. To guarantee the representativeness and usefulness of the UM analysis, the input (resources) and output (waste and by-products) flows must be defined taking into account the scope of the study and the economic profile of the city/region under study. For a circular bioeconomy-oriented UM study, get inspired by the work done in our 8 Lighthouses. The most time-consuming part of the study is the gathering of data. Most probably, some pieces of data are not available for many reasons: no records; the material flow is managed by a private company that has no obligation to disclose the information; it's difficult to get in contact with the source; the value is the sum of a huge amount of independent data. In this case, use statistics reports (FAO for food consumption, etc.).

The baseline analyses run for the 8 Lighthouses are described in the following sections. Please notice that both the diagrams and the comments refer to the situation in 2019, which was used as reference year for establishing the baseline in HOOP.

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4.1. Albano Laziale

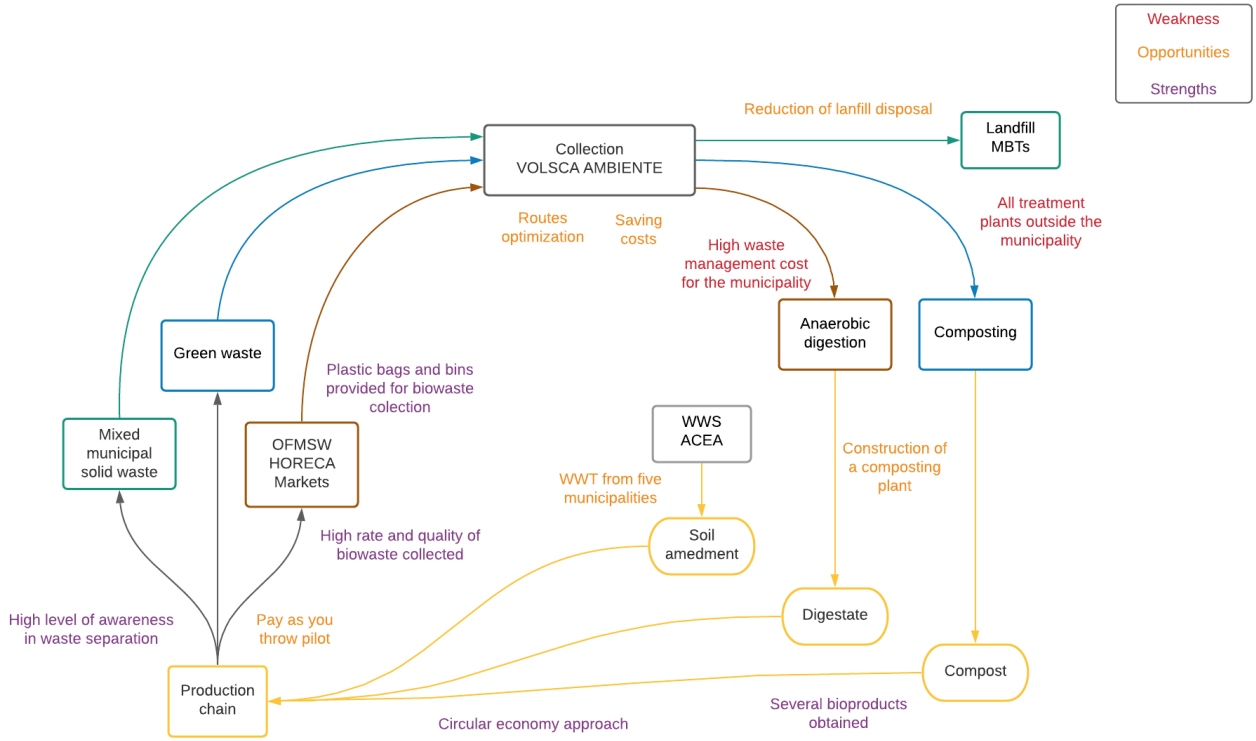

Figure 2 Baseline diagram of Albano Laziale, 2019 (ITENE, (CETAQUA, 2022)*)*

Figure 2 highlights the existing strengths in terms of the implemented waste management system which displays a high rate of quantity and quality of the biowaste collected as well as high level of awareness and engagement of citizens. Nonetheless, concurrently the city of Albano Laziale is still facing a challenge posed by the quality of biowaste collected from the HoReCa sector. This is due to the fact that a pay-as-you-throw-tariff (PAYT) for the HoReCa sector has not been implemented yet, given the complexity of the process and the outbreak of the Covid-19 pandemic. In addition, another key challenge is connected to the wastewater treatment system which is managed by a private company resulting in no control over the process from the municipality.

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4.2. Almere

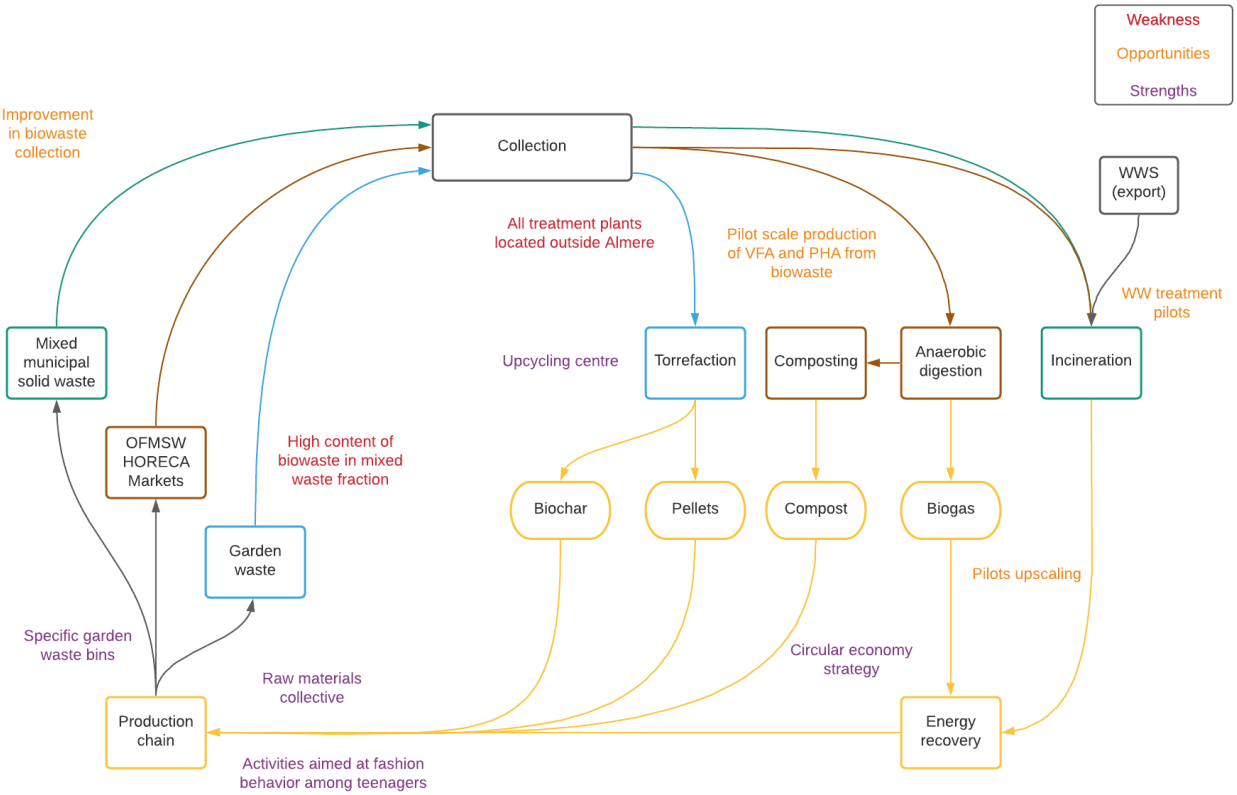

Figure 3 Baseline diagram of Almere, 2019 (ITENE, (CETAQUA, 2022)*)*

In Almere, annually 42 kg of biowaste per inhabitant are separately collected from households. This is comparably less than other big cities in the Netherlands (91 kg) and less than the national average (47 kg) (Central Bureau of Statistics). With only 52% of biowaste collected separately, there is still a large amount of biowaste in the city's mixed waste fraction. Separately-collected household biowaste is used for anaerobi digestion and composted (Figure 3). In addition, there are currently 10 bio-based products being produced on a pilot scale from Almere's biowaste, including green concrete, traffic signs and activated carbon. Although the production of bio-based material from biowaste is becoming more common, the feedstock is usually commercial food waste rather than household waste. Notably, the collection and treatment of household waste is a legal task of local governments.

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4.3. Bergen

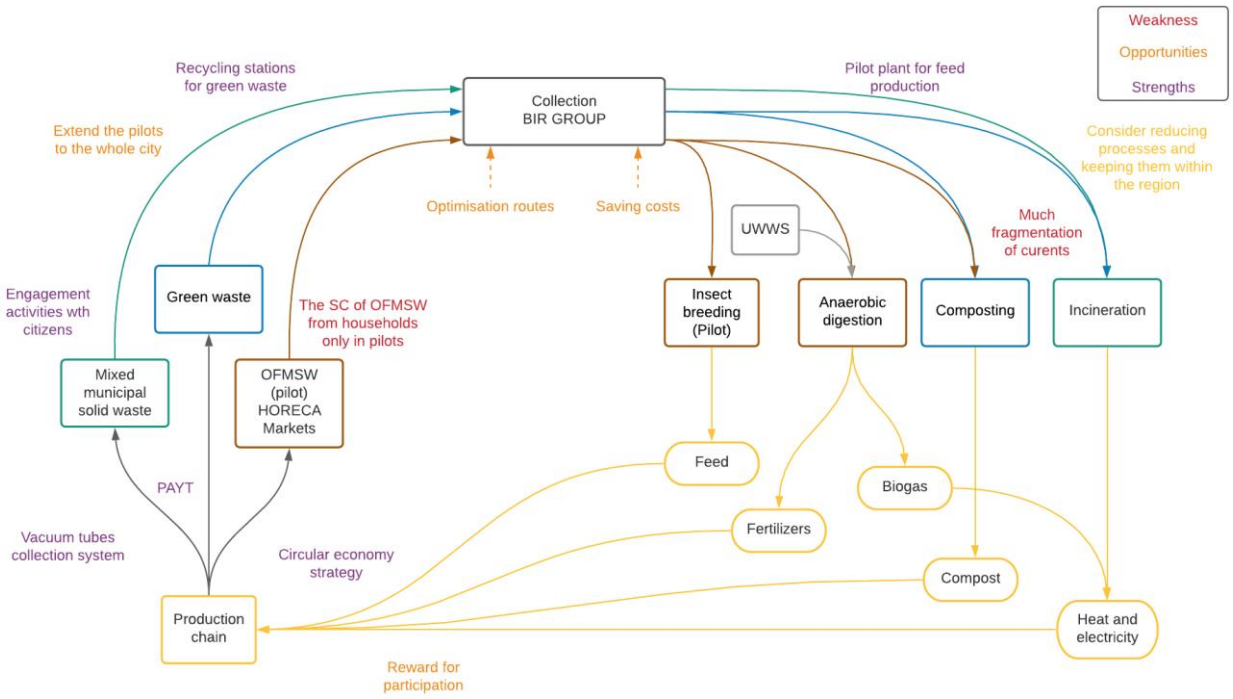

Figure 4 Baseline diagram of Bergen (ITENE, (CETAQUA, 2022)*)*

The value chain applied by BIR (Figure 4) in general follows the emphasis of working in the direction of “from food to food”. Both the collection and valorisation routes are diverse and offer multiple options. The main focus of its engagement is the innovative valorisation. In addition, collection is also considered, especially in relation with citizens as waste producers and the new pilots for separate collection.

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4.4. Greater Porto

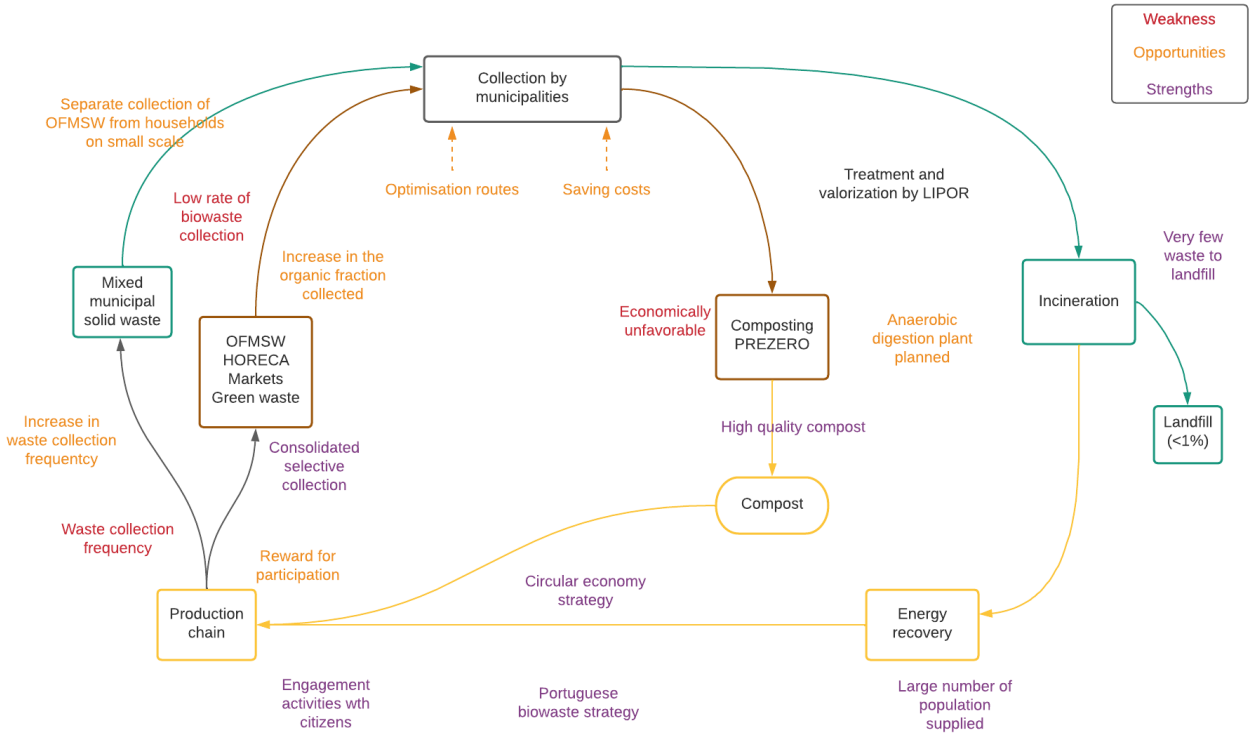

Figure 5 Baseline diagram of Greater Porto, 2019 (ITENE, (CETAQUA, 2022)*)*

Across the 8 municipalities of the region of Greater Porto (Figure 5) there are different collection systems in place, which results in inefficiencies. Both frequencies and routes are not yet optimal and need further coordination across the municipalities. Additionally, while the quality of the produced compost is of high quality – and as such certified for organic agriculture and commercialised as a premium product - the composting process is still unfavourable for Porto economically.

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4.5. Kuopio

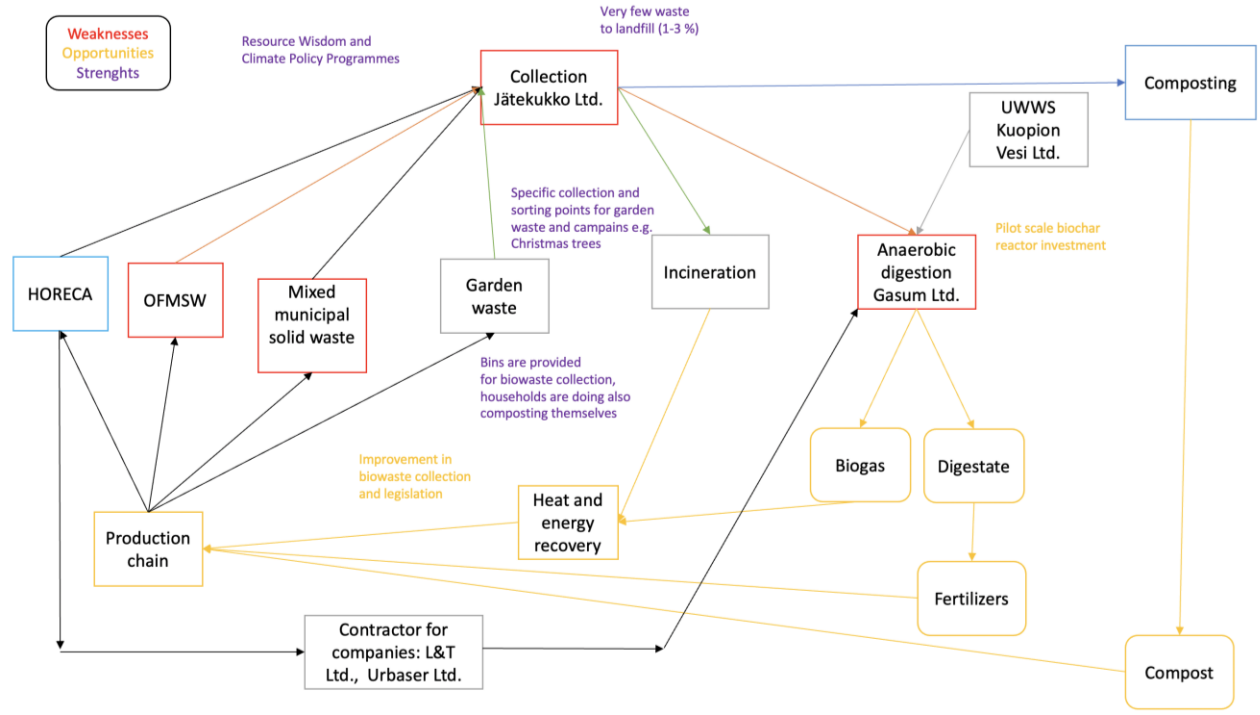

Figure 6 Baseline diagram of Kuopio, 2019 (ITENE, (CETAQUA, 2022)*)*

The rate of separate collection of biowaste is relatively low, at 52%. Approximately 35% of mixed waste is biowaste. The organic fraction can be potentially mechanically separated in the treatment facility; however, this will contain a high share of impurities from plastics and inorganic materials. Nevertheless, the quality of the biowaste stream is very high. Currently, Kuopio produces compost, anaerobic digestate used as fertiliser, and biogas from its biowaste (Figure 6). One of the main weaknesses of the system is the low percentage of biowaste that is separately collected: close to 50% (D2.3). The rest ends up in the mixed municipal solid waste stream, which is incinerated.

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4.6. Münster

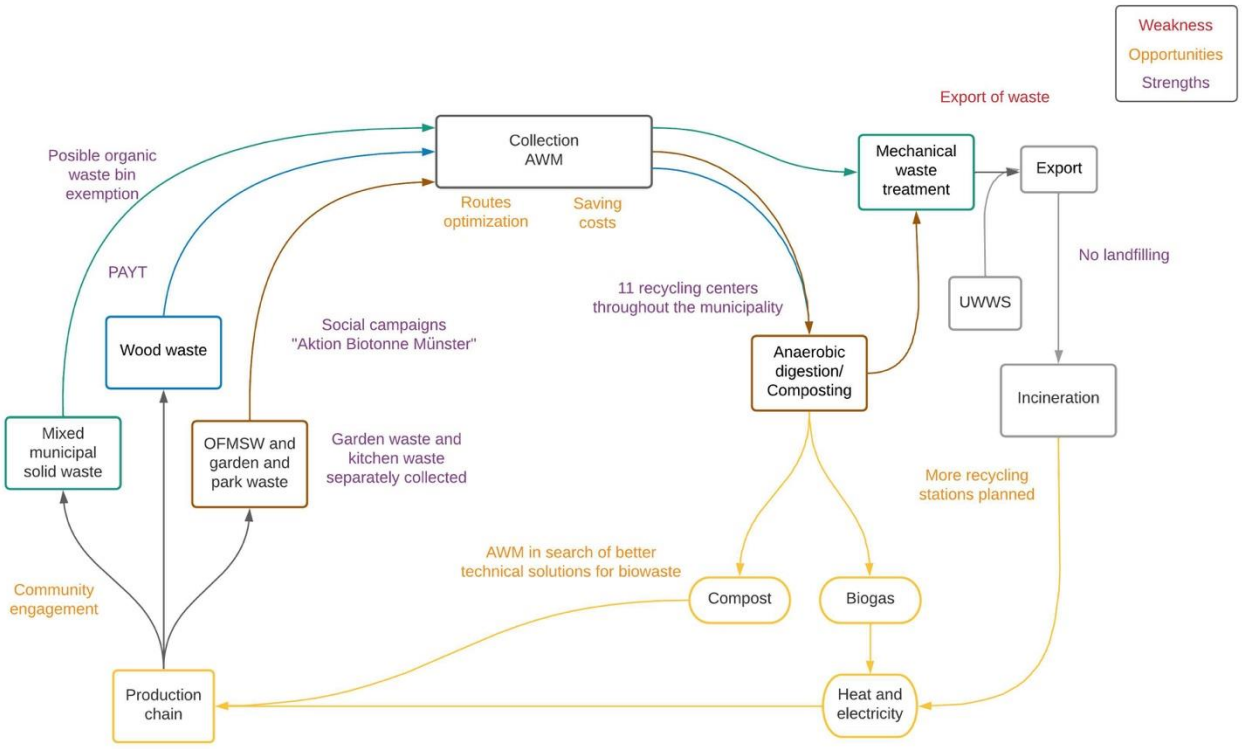

Figure 7 Baseline diagram of Münster (ITENE, (CETAQUA, 2022)*)*

After the collection in Münster, the biowaste fraction gets prepared for the different treatment streams (Figure 7). The wet kitchen waste is converted to biogas in the anaerobic digestion (AD) while the processed green waste is used for composting together with digestate from the aforementioned AD process Through the separate collection of kitchen waste and garden waste, the division of the waste fractions in good and less good fermentable material is already realised at the citizen level and allows for an optimised use of the respective material flows. The most fermentable and wet fraction undergoes anaerobic digestion in order to produce high quality biogas/digestate. The fraction of green garden waste directly brought to the recycling stations has, in general, a rather low percentage of impurities and is used for classic green waste composting (without digestate) to produce compost. Currently, the biogas is mostly used for heating and electricity, while the two different compost products (green waste or digestate compost) are being sold to citizens and other users in the regions such as farmers.

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4.7. Murcia

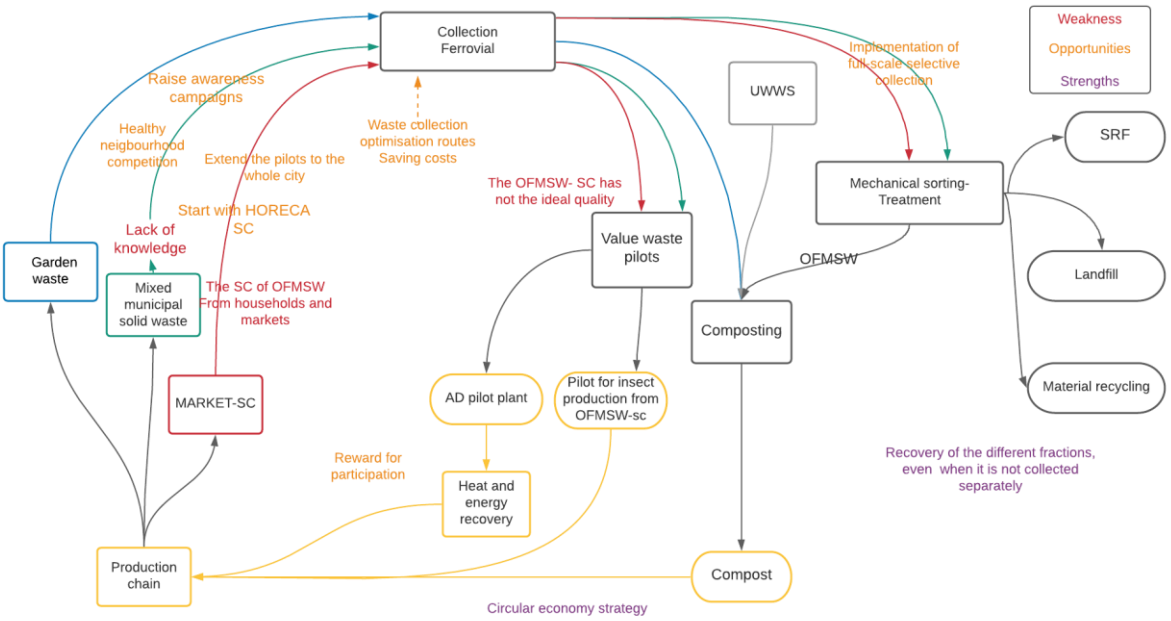

Figure 8 Baseline diagram of Murcia (ITENE, (CETAQUA, 2022)*)*

In Murcia (Figure 8), the organic fraction of municipal solid waste (OFMSW) is so far only collected in a few pilot neighbourhoods of the city (having started in the neighbourhood of La Flota in the project VALUEWASTE and later on expanding to surroundings suburbs) and food markets. This makes the system still inefficient in terms of routes and costs. It is a first key opportunity for the HOOP project, to extend this collection to more parts of the city. With extending the collection, also household engagement activities will have to be upscaled and improved accordingly. Additionally, and despite the good figures, the quality of the already collected OFMSW still needs to be improved in order to be able to use it for further valorisation into high value bioproducts and profitable value chains.

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4.8. Western Macedonia

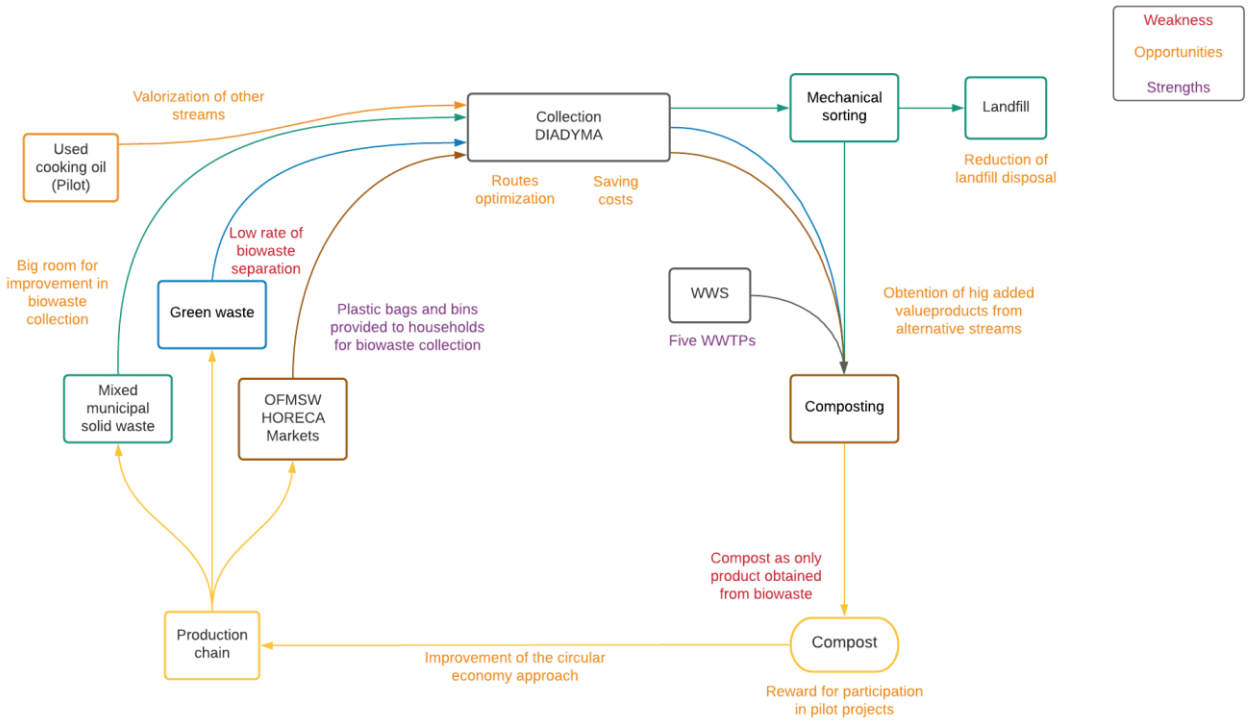

Figure 9 Baseline diagram of Western Macedonia, 2019 (ITENE, (CETAQUA, 2022)*)*

There are several weaknesses in the current waste management of Western Macedonia (Figure 9) that pertains to collection, separation, valorisation and engagement. The main challenges are:

1. Separate collection of biowaste does not yet include all households. For example, in Kozani in 2019 approximately 2.8% of the households participated in the separate collection scheme of biowaste.
2. There is a lack of bins at household level which leads to worse source separation
3. There are no financial incentives in place to encourage proper source separation
4. Separation rates are low, due to the need for more effective information campaigns, affecting the quality of the biowaste collected
5. Currently only compost is being produced by valorisation processes as other bioproducts are not profitable

However, next to the weaknesses, lie several opportunities, such as introducing a PAYT incentive for better at source waste separation. Another opportunity is triggering positive behaviour change through a number of citizen engagement activities.

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5. Engage your stakeholders

Each city and region has actors that are highly relevant for the successful transition toward a circular bioeconomy and no one can take up complex topics such as urban circular bioeconomy on their own. From ordinary citizens to initiatives already working intensely towards achieving specific goals, depending on the context, almost every citizen as well as many initiatives and organisations can become relevant. They all can be considered stakeholders and engaging them is vital. The process of engaging them - for example by running joint or dedicated activities such as workshops or events - is termed stakeholder engagement. Stakeholder engagement is a guided process in which relevant actors are included in frequent exchange 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.

The eight HOOP Lighthouse Cities and Regions bring local stakeholders together in a dialogue platform called a **Biowaste Club** (BC). They are made up of key local stakeholders, such as representatives of the municipality, of waste collectors or of citizens' initiatives (Diedrich et al., 2023). Specific goals of the Biowaste Clubs may be to:

- Increase consumer awareness and acceptance of novel biowaste-derived products.
- Change behaviour to increase quality and quantity of the biowaste collected.
- Discover and align on goals set by different stakeholders and initiatives in the city or region.
- Initiate new local and national policies and initiatives.
- Build regional collaboration between cities and regions facing the same challenges.

For a long-lasting change of the biowaste value chain, it will be crucial to involve all key actors from the start in all local and regional project activities and ensure that both the impact that the activities may have on the different actors as well as – the other way around - the influence that the actors will have on the success of the project activities is considered. Figure 10 outlines the process of engaging stakeholders followed in HOOP.

In order to understand the impacts and influences of each relevant stakeholder, stakeholder mapping is a collaboration tool to determine a key list of stakeholders and assess their role in the project. Naturally, the mapping of the stakeholders will not be a one-time activity, but should rather be considered as an ongoing process during the entire project lifetime. The Annex 11.2 gives detailed insights and concrete tools on how to conduct stakeholder mappings.

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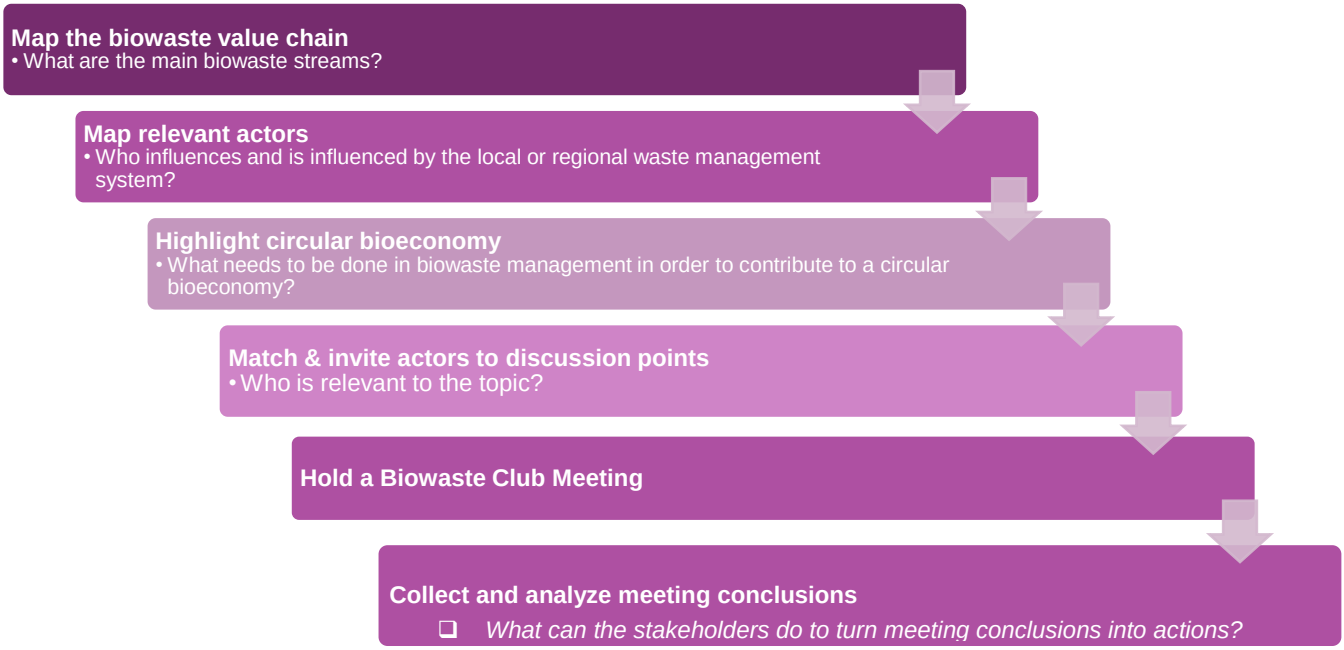

Figure 10 Process of organising Biowaste Club Meetings

Amongst the many stakeholders in a city or region, citizens are crucial due to many factors reaching from their inevitable place in the circular value chain to their potential to get active themselves. Thus, working together with citizens remains central in a cross-cutting scope such as the circular bioeconomy. The HOOP Lighthouses each have their own ways of approaching and working together with citizens. Murcia, for example, follows an approach termed biopatrols. With this, trained teams were positioned in different parts of the city to engage directly with citizens about biowaste related topics. This face-to-face contact proved to be a vital concept for success as citizens received chances to ask questions while also receiving much clearer guidance from the patrol teams. The patrols are as one of the many good practices in HOOP that show that engaging stakeholders (in this case, citizens) leads to fruitful exchange and breaks down communication and knowledge barriers and thus has a positive impact. Biowaste Clubs also act as a catalyst to spur new business models and investment by engaging economic stakeholders. In the following Lighthouse specific chapters, more inspiring examples of bringing together stakeholders will be presented. In addition, find more examples and guidance in the HOOP Virtual Academy.

Stakeholder engagement can also take a more specific turn to not only run activities together with stakeholders but actually also communicate about those who lead the way. The concept of “Local Champions” builds on engaging and highlighting the activities of those citizens and organizations. Local champions are therefore pioneers involved in the sphere of sustainability, circular economy, zero waste lifestyles and neighbourhood improvement locally or regionally within their communities. They can be (social) entrepreneurs, local businesses, start-ups, associations, or individual citizens who are motivated and willing to collaborate with other actors towards a common goal. Involving these Local Champions in citizen engagement activities can aid in sharing their already collected knowledge and increased awareness raising. Again, a process starting with the identification of the Local Champions is the key to starting a collaborative process together with them. In the HOOP project the realised collaborations focused on disseminating the Local Champions’ stories and best

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practices in the LHs and collaborating in workshops. Best Practices were disseminated in video formats in the LHs of Bergen and Münster (For example with a nature children s education program).

All in all, the HOOP project has proven that stakeholder engagement can take many shapes and forms. Despite the formalised approach, sometimes a conversation with a colleague outside of the HOOP project team could lead to new inspiring ideas on how to best engage stakeholders further. In addition, it is not about reinventing the wheel. In every city and region, motivated citizens, initiatives, companies, public bodies and others exist and sometimes stakeholder engagement is more about bringing those together, who have the motivation and energy to further drive processes. By following a systematic approach, such as provided within the HOOP project, those who just begin the journey of engaging stakeholders as well as those already experienced, can sort the process, keep an overview and plan strategically to foster circular bioeconomies in our cities and regions.

5.1. Albano Laziale

INTERVIEW WITH HOOP-PARTNER ANCI-LAZIO:

ANDREA VIGNOLI, Project Manager and member of the ANCI Lazio Technical-Scientific Committee

GIORGIO SCAVINO, Communication and Technical Support Manager

1. **What was in your view the key success of your HOOP Biowaste Club so far? What achievement are you most proud of?**

First of all, the experience gained at HOOP can confirm that the "behind the scenes" work, i.e. the dialogue with key stakeholders, has been fundamental to the success of our Biowaste Club, so far. Above all, the availability of information material, even if little, on how to support biotechnological innovation was very helpful for us to attract the attention of stakeholders.

For example, the factsheets on the target technologies are very helpful to attract the attention of potential investors and experts on the topic. Specifically, the technologies considered most interesting for the territory of Albano Laziale and for the stakeholders of the Lazio Region are those described by the HOOP factsheet "Technology #1 Fermentation of used cooking oils (UCOs)"; "Technology #2 Volatile fatty acids from acidogenic digestion of solid biowaste" and "Technology #3 Nutrients recovered from residual dewatering liquid from anaerobic digestion".

There are 2 aspects that make us particularly proud of the work in progress at HOOP:

- Thanks to the Lazio-region being a Lighthouse in HOOP, we are now carrying out a strategic pilot action at regional level. With this strategy for electromechanical composting we will implement a 600 ton/year digester owned by the municipality for the treatment of waste code EWC 20.01.08, with an alleged decrease in the quantity of material to be delivered to the industrial anaerobic composting plants, equal to 13% of the total and an estimated saving of 7,000.00 €/month (84,000.00 €/year).

- The second element that we are particularly proud of is the nationwide dialogue achieved through the ongoing work on the solution for the treatment of UCOs. The dialogue with CONOE (“National consortium for

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the collection and treatment of used vegetable and animal oils and fats") and with potential investors is maturing profitably and in the upcoming Italian National Replication Workshop we are planning the creation of a Protocol to promote and facilitate the agreement with municipalities for the collection of waste oil from domestic users. We would be the first Italian region to take such a step. In addition, the PDA path offered through HOOP is strongly monitored by the Lazio Region and other stakeholders at national level.

2. **Which "new" stakeholders did you engage with for the first time since the start of HOOP? What new insights did you gain from talking to them?**

For the first time ever, we have engaged in a dialogue with three 'new sectors' on innovative issues: 1) on wastewater treatment we have engaged with the for us most important stakeholders in Italy and Europe, namely ACEA (Municipal Energy and Environment Company) and CNR-IRSA (Water Research Institute). In a Biowaste Club Meeting we also had the participation of representatives of both "ACEA Elabori" and CNR-IRSA.

With ACEA Elabori, we learned in particular that although Italy is one of the best EU countries for organic waste management, it is important to work for the use and development of small-scale composting and it is also very important to work so that there is a lot of data on local composting. An innovative widespread composting project for the management of organic waste: "ACEA Smart Comp" which is a mini-composting plant equipped with innovative sensor technology capable of transforming wet waste into compost directly on site through an aerobic process. In approximately 90 days it produces fertiliser ready for use. With this initiative, a new proximity approach is created, which brings the place of waste production closer to its treatment. Widespread composting is aimed at large users (shopping centres, canteens, airports and stations) that need to manage large quantities of organic waste. Based on the observations that emerged in the Biowaste Club, regarding the composting plants, in the future it is necessary to move towards both strategies, i.e., proximity and centralisation, and therefore have a part of the waste managed in a decentralised way and a part instead destined for large plants.

With the CNR-IRSA, it was possible to deepen the research approach from a sustainable bioeconomy perspective for the integrated valorisation of sewage sludge and the organic fraction of urban waste with exploitation of the production potential of high added value compounds such as fatty acids medium-long chain such as caproic acid, precursor of bioplastics and lubricants and plasticisers, which has a market value of approximately 2,000 USD per ton (market of approximately USD 45 million).

The CNR IRSA as a supplier of analytical services and scientific expertise is supporting ACEA Elabori for the integration of a suitable pre-treatment (which "extracts" greater quantities of sugars and proteins, precursors for the production of caproic acid) and the anaerobic co-treatment of the sludge with the organic fraction. The goal is to significantly increase the conversion yield.

2) Also, for the sector of vegetable waste oils, as part of our Biowaste Club and the consequent PDA development, we are very happy to have started a dialogue with CONOE (National consortium for the collection and treatment of used vegetable and animal oils and fats) and with the companies associated with it in Lazio. Together with all of them, we are currently working on the PDA for the feasibility study of an investment for the treatment of a biotechnological solution for upcycling vegetable oil into the biopolymer PHA and its applications in cosmetics and biomedicine (Nafigate Patent). The feasibility is based on the recycling of exhausted vegetable oils collected in Albano Laziale and throughout Lazio region.

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Furthermore, the Municipality of Ciampino has also joined the HOOP Network, improving the collection of used vegetable oil. It should also be specified that before the HOOP Biowaste Club engagement the 2 municipalities of Albano Laziale and Ciampino did not have a clear strategy for the collection of used vegetable oil, while now for every kg of used oil collected these municipalities receive 0.40 € of benefit. This is an achievement truly thanks to the work in the HOOP project.

3) Also with the Cosmetics sector ANCI Lazio had not previous cooperations before HOOP. Specifically, a dialogue has developed with Cosmetica Italia, the only association representing the sector in the Confindustria panorama and is the largest at European level as a member of Cosmetics Europe (European association of cosmetic industries). Furthermore, we have made contact with the “Poliestetico di Milano”, (“Polyestetico of Milan”), a stakeholder particularly interested in the impact of innovation on training in the Cosmetics sector.

3. **Which stakeholder group was particularly difficult for you to engage with? How did you nevertheless manage? Or why didn't you?**

ACEA was really difficult to engage as the executives are extremely busy and had little capacities to interact and deepen the topics covered within HOOP. The level of technology maturity (TRL) identified in HOOP for the technology (HOOP Technology #3 Nutrients recovered from residual dewatering liquid from anaerobic digestion) that was most interesting for ACEA was also not conducive to dialogue. However, we have had a great first dialogue with ACEA and have remained on excellent terms. ACEA is keen to engage further as soon as we have any relevant news to share.

4. **What do you think are unique features of the stakeholders (or of their challenges or motivations) in your country?**

In the context of the biotechnologies identified by HOOP related to the valorisation of wastewater and organic municipal waste, there may be some unique characteristics of stakeholders in Italy, including in the Lazio region:

- First of all, regarding environmental regulation, since in Italy there are strict environmental laws and regulations that govern the management of wastewater and waste, stakeholders face challenges related to regulatory compliance and adherence to environmental standards. For example, in Italy, a specific and particularly rigorous law regarding wastewater management is Legislative Decree 152/2006, known as the "Consolidated Law on the Environment". This legislative decree establishes detailed rules for the management of wastewater and their treatment, defining quality standards and emission limits that must be respected. One specific aspect of this law that can be particularly difficult to comply with involves emission limits for certain pollutants in wastewater, such as hazardous chemicals or high concentrations of nutrients such as nitrogen and phosphorus. Water treatment companies and facilities must invest in advanced technologies and purification processes to ensure compliance with these limits. Key stakeholders who must comply with these regulations include industrial enterprises with production processes that generate wastewater containing specific pollutants. These companies must implement more advanced treatment technologies or modify their production processes to meet the standards established by Legislative Decree 152/2006. Furthermore, local and regional authorities, responsible for the enforcement and implementation of these regulations, face challenges in overseeing and enforcing environmental laws, ensuring that companies and facilities comply with established requirements. Compliance requires close collaboration between companies, authorities and other actors involved in wastewater treatment.

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Due to the rigidity of existing environmental regulations, obtaining regulatory approval to test or implement innovation in the wastewater and organic waste sector requires addressing the following obstacles:

- Lengthy and complex approval process for regulatory clearances and approvals. This can discourage investment in innovative technologies, especially if stakeholders face long periods of uncertainty related to regulatory approval.

- Additional compliance costs that stakeholders face to ensure that new technologies meet all regulatory requirements. This will increase the overall costs of implementing innovative solutions, making them less attractive in financial terms.

- Overly stringent regulations do not take into account the diversity of possible approaches to wastewater treatment. More flexible regulation could instead foster innovation by allowing stakeholders to adopt solutions suited to specific local needs.

To overcome these challenges, it is essential to promote an open dialogue between regulatory authorities, businesses, and the scientific community.

- In some parts of Italy, such as the Lazio region, water scarcity is a major concern, which makes wastewater management even more critical.

- The Lazio region includes 33 municipalities with coastal areas. Sustainable wastewater management is essential for preserving the coastal environment and protecting the tourism industry, which is a significant part of the regional economy.

- Italy is known for some institutions of excellence in scientific and technological research and this could encourage the development of new technologies and approaches in the field of biotechnology related to wastewater and organic municipal waste.

- Collaboration between public and private entities is often crucial to address the challenges related to the management of wastewater and organic waste, as in the case of HOOP, in which ANCI Lazio is promoting and encouraging investments in industrial sectors such as for UCO treatment and cosmetics as part of the ongoing PDA.

5. Which stakeholder engagement activity or activities in HOOP was/ were most useful to you?

Participatory processes with engagement tools such as the HOOP Trainers app or simply digital participatory processes held with an active and participatory stakeholder engagement methodology were most useful for us and brought practical, hands-on results.

Through the HOOP Trainers app, for instance, it was possible to understand that if well involved, citizens participate with great interest in the challenges to be faced in the city, such as for example the challenges covered by the recreational activity through the app: a) how to improve the collection of used oil; b) how to improve separate waste collection in the HoReCa sector; c) what main obstacles are encountered for separate waste collection. By analyzing the results that emerged from the HOOP Trainers app (Escarrabill, 2023), it was also possible to understand the degree of interest and acceptance of products derived from organic waste, and

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their recommendations for building greener and more circular cities and regions. The high acceptance of bio-based products is significant and encouraging for us to move forward in this direction.

6. What other learnings did you have in engaging stakeholders in biowaste recycling?

The dialogues initiated in the webinars (starting from the Biowaste Week in Albano Laziale (from 17th to 20th May 2022) and in particular with the webinar dedicated to the participatory process on 19th May 2022 and after that with the subsequent online meetings (Biowaste Club meetings held on 27th March 2023 and 9th June 2023 under the EU Green Week) and the informal exchange had starting from the Biowaste Week in Albano (in particular "Reware" and "Riscarti Festival", with whom it was possible to continue a collaborative dialogue also with the App HOOP Trainers), on the basis of valid information offered by HOOP have opened up new opportunities for dialogue with niche stakeholders such as start-ups or even small but successful projects curated by Local Champions.

In particular, regarding the dialogue with "Reware", it is important to mention their important contribution on the topic of recycling electronic components and this will be an important topic in the future ecological island of Albano Laziale.

During the "Riscarti Festival" it was possible both to appreciate the artistic works created with waste material and to establish a great contact to the organisers, using their annual festival to raise awareness and disseminate the HOOP results.

The participatory processes conducted with the Science for Change methodology were also particularly suitable for having an excellent dialogue with citizens, in general and with students. Thanks to the open and creative workshop formats, these actors really opened up and discussed very vividly. The participants brought forward many smart ideas on how to improve biowaste recycling in Albano Laziale, for instance, it was suggested the creation of an exhibition at schools on good practices implemented in Albano Laziale and a newsletter edited by students on the themes of the circular city and what ideas to create the circular city of the future. Prizes and incentives to create start-ups that enhance bio-based products will also be particularly appreciated. Finally, advertising signs to increase and improve the quality of separate waste collection in the HoReCa sector (so that tourists and citizens are more attentive to waste separation in the HoReCa sector) were encouraged.

7. What would you recommend to a city or region that is only at the beginning of the circular economy journey? What are in your view the most important first steps to take? What would you have done differently in your stakeholder engagement journey, if you could start again?

It is important to start the stakeholder engagement immediately through a democratic participatory process, ideally through a digital platform that offers interactive dialogue between citizens, stakeholders and experts, providing key and concrete information on the project side. It is, for instance, very helpful if stakeholders are provided with in-depth information about the opportunities for improved waste sorting behaviors and for the adoption of innovative technological solutions suitable for the reference area. On the citizens' side, they can best be engaged by giving them opportunities to bring forward their own ideas and inputs to make the identified solution adoptable and accepted or to design the strategies for a local bioeconomy in a participatory and creative way together with the citizens.

In an innovation project like HOOP, clarity and transparency are crucial when adopting solutions and presenting technological features. This transparency not only fosters trust, but also ensures that the dialogue with

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stakeholders is effective and collaborative. Comprehensive fact sheets, including cost estimates, key challenges for investigation, and considerations for the adoption phase, should be a primary focus in the context of an innovation and research initiative.

To facilitate an open dialogue, it is imperative that researchers, citizens, and stakeholders engage on equal footing. This approach prevents communication from becoming unidirectional or solely focused on technological or political aspects, ensuring a well-rounded discussion that incorporates scientific references.

5.2. Almere

Recommendations from Almere for engaging stakeholders:

1. Get in touch with your entrepreneurs. Create a common base of needs.
2. Help entrepreneurs with vital side issues by operating as a raw material counter for circular entrepreneurs. Help them with time-intensive and specialist activities such permit requests, guidance on end-of-waste, creating an overview on funds, subsidies.
3. Create a coalition of the willing, different type of stakeholders to work on new business models, experiments, pilots and upscaling.

The Biowaste Club in Almere has found an established place as part of the structure of the existing initiative Raw Material Collective Almere. In nearly all Biowaste Club meetings with public and private stakeholders, ideas on valorisation of biowaste materials were exchanged. The meetings were frequent - eight times a year - and the meetings ensured participation of different stakeholders. The Biowaste Club engaged with the Raw Material Collective Netherlands, Climate Signs, Krinkels and Van Werven.

There was a high level of enthusiasm on natural fibre-based material. Van Werven has a great history of product and business development with recycled plastics. An important insight gained from them is how difficult it is to establish a steady market and that having a good, robust and sustainable product is not a condition to establish a steady economic model – demand is needed. This is either created by needs from consumers or stimulated by law and regulations.

It was difficult to coordinate cooperation between the core members of the Biowaste Club. The City of Almere is careful with engaging in new projects (e.g. by guaranteeing feedstock or purchase of materials), which affects solution owners at Cirwinn who need guarantees to invest.

Almere's Biowaste Club made a strong effort to close the loop of the value chain by connecting the different stakeholders in the bioeconomy. These are the disposer of biowaste, the receiver of biowaste, the treater of biowaste, the companies who can create products out of biowaste, companies who can sell these products, and organizations (governments) that can buy these products. Only by having the whole loop together is there a possibility to create common ground to develop business models.

All good intentions aside, governments that are engaged in stakeholder networks do not always provide a clear direction. Current policy in the Netherlands focuses on voluntary agreements and support for experimental projects. More push and coercion are needed. The government will have to oblige (in tenders) companies to

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incorporate a certain proportion of bio-based or recycled materials in products – or at least introduce significant advantages for the companies who are willing to do so.

5.3. Bergen

In Bergen, the stakeholder engagement has proven to be useful. The HOOP Biowaste Club has been successful in gathering stakeholders across the bioeconomy value chain. The biggest accomplishment was the creation of a common meeting place for local government, big industry and start-ups. In this process, it has been valuable to understand the challenges of start-ups and stakeholders that strive for achieving circular value chains. It seems like the challenges are similar with most stakeholders. Two examples include the lack of investment and the lack of predictability. On the flip side, stakeholders in Bergen are motivated and engage actively in activities such as the Biowaste Club meetings. The stakeholders show the will to be part of the transition to a circular economy, and even though this is not a unique feature and can be found elsewhere, it remains a necessity for the success.

In general, the Biowaste Club is a successful format in Bergen. Due to the creation of a formal meeting place, awareness could be increased and further collaboration fostered. The circular bioeconomy needs local champions, stakeholder engagement and communication to a wider audience and the meetings offer the right platform. Another key to the success of the stakeholder engagement is to gather those who are motivated and to let them lead the way as ambassadors and champions.

5.4. Greater Porto

Interview with HOOP partner LIPOR: Tania Pinto, Project Manager, Logistics and Infrastructure Division, Operations and Logistics Department.

1. **What was in your view the key success of your HOOP Biowaste Club so far? What achievement are you most proud of?**

Promoting a dialog between the different stakeholders, from all over Portugal, bringing them together in the same room, getting their insights and feedback. The Biowaste Club was an interesting way of promoting cooperation under the theme of circularity.

2. **Which “new” stakeholders did you engage with for the first time since the start of HOOP? What new insights did you gain from talking to them?**

LIPOR has a continuous stakeholder engagement strategy, but HOOP allowed us to engage with some of our stakeholders through a “new lens”. For example, in November 2023 we organised a Biowaste Club meeting (BCM) with representatives from our Nutrimais® clients (Nutrimais® is an existing range of products - compost and growing media – commercialised by LIPOR and made from our recycled biowaste). In this meeting, we did a SWOT analysis for the potential future products biochar, ammonium sulfate and struvite.

This meeting gave us new and interesting insights on the bioproducts market, not just compost and growth media: while before the meeting we had the feeling it could be difficult to get new bio-based products on the

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market, according to the feedback of our BCM participants the market seems to be receptive to new products for agriculture and they were keen to work further on them.

At the same time, we must not forget that price is key. So as a next step, we will do a series of market studies to be able to decide on the best business models.

3. **Which stakeholder group was particularly difficult for you to engage with? How did you nevertheless manage? Or why didn't you?**

While putting a lot of effort into developing the app/game with HOOP, and dedicating space to its communication through different channels and various approaches, we still could not get statistically representative feedback. It was, thus, very difficult to motivate enough citizens to play the app and provide us with their feedback.

4. **What do you think are unique features of the stakeholders (or of their challenges or motivations) in your country?**

Waste management, circularity and innovation (waste, resources, products) are broad themes and it is a continuous challenge to be able to inform correctly the whole population in an integrated way.

5. **Which stakeholder engagement activity or activities in HOOP was/ were most useful to you?**

There were 2 Biowaste Club meetings that were particularly interesting for us:

In 14th April 2023, we organised a BCM at Católica University and backed it up by an exhibition on bio-based products. In this event, we had many interesting interactions with stakeholders and participants were very eager to know more and get involved. A clear focus of the discussions was on business and innovation.

In addition, the recent BCM (November 2023) with our Nutrimais® client was in our view particularly successful. As the sales representatives from Nutrimais® put it "biochar is a topic that always is nice to work on and gives us motivation to carry on!" For more information on this BCM, see below in Chapter 6.

6. **What would you recommend to a city or region that is only at the beginning of the circular economy journey?**

Choose a tool that fits your needs, like the HOOP Bio-Circularity Label, and just start – there is lots of information available and it can sometimes be overwhelming, but if you just start somewhere, things will get clearer with time.

5.5. Kuopio

Recommendations for engaging stakeholders:

- All relevant stakeholders should be met at the very beginning in order to clearly understand their needs, and thus target activities to them.
- Make a strong business case of why the invitee should join and what value they will get out of it.

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- Have concrete content in stakeholder meetings. The HOOP 'Haihuli' recycling game app is a good example of how to gauge interest in the topic.

- Collected detailed case studies of successful practices and pilots.

In Finland, there is generally a positive mindset to create technological solutions. Long distances in some parts of the country may cause hindrances; hence, reducing waste enables the development of new business models and the saving of resources and money.

In Kuopio, a multi-stakeholder group participated and engaged actively in the Biowaste Club to exchange knowledge on up-to-date solutions and ideas. They included Gasum Ltd., Kuopio Water Ltd., Savonia UAS Canteen Antell school teachers, university lecturers, design students, company representatives, and city authorities. The city board is discussing how to encourage food waste avoidances. Through the Biowaste Club, discussions and exchange with city representatives, waste companies and teachers took place more frequently and became institutionalised. The main focus of the Biowaste Club meetings was on obstacles, such as attitudes towards recycling, logistical issues, and bin locations, as well as possible solutions, like increasing involvement of parents, making the recycling chain easier, using robots, modifying pricing models (e.g. for food, and applying biocomposite technology in composting. However, the Kuopio Biowaste Club faced a major challenge when trying to engage representative of waste companies. The discussions took place on a level too general for their interest, and they did not see the value in participating further.

5.6. Münster

Dr. Christoph Baumann, Project Manager HOOP, Abfallwirtschaftsbetriebe Münster (awm)

1. What was the key success of your HOOP Biowaste Club so far?

In the German Lighthouse Münster, the Biowaste Clubs proved successful by offering a way to established communication and to build relationships with numerous essential stakeholders. In addition, more holistic understandings of the problems and issues were acquired by gaining insights into the perspectives of various interest groups. A good example for this is the contact and collaboration that was established with highly active small garden associations that already have extensive experience with the sustainable use of organic products such as compost and biochar substrates (Terra Preta). New insights into potential target markets and niche-specific requirements were gained through this exchange.

2. Which stakeholder group was particularly difficult for you to engage with?

Within the scope of a Biowaste Club meeting, potential measures to improve the quality of organic waste in densely populated urban areas were discussed. A key stakeholder group that needs to be involved in this context are individuals that we at awm have termed as "key persons", which are, for instance, caretakers of high storage building blocks or engaged tenants. Unfortunately, no participants from this group could be recruited yet. The reasons for this were mainly a lack of time or motivation to participate in such a specific meeting but we are continuously looking for solutions.

3. What do you think are unique features of the stakeholders in your country?

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In general, there is a strong environmental consciousness in Germany which shows for example in the fact that stakeholders in Germany are increasingly focused on the circular economy, aiming to minimise waste and promote the sustainable use of resources. Often the mindset favours sustainability and quality.

4. **Which stakeholder engagement activity or activities in HOOP were most useful to you**?

From my experience in HOOP so far, our hands-on pyrolysis workshop has proven to be the most effective approach so far. In this workshop, citizens of Münster had the opportunity, under guidance, to build their own small pyrolysis oven (Kon-Tiki) allowing them to produce biochar for personal garden use at home - and in community garden projects - while also disposing of scrap wood. Through this hands-on experience, the benefits and sustainability of bio-based products were easily conveyed, sparking engaging conversations and providing us with valuable insights into existing challenges and untapped potential in this field.

5. **What other learnings did** you have in engaging stakeholders in biowaste recycling?

Despite extensive and intensive campaigns to inform citizens that waste bags made of bioplastics or compostable plastic must not be disposed of in the organic waste garbage can, citizens are still hardly aware of this. The knowledge conveyed through the campaigns must be deliberately refreshed on a regular basis, and often, the well-known approaches are not sufficient, so new methods must be tested here.

5.7. Murcia

Interview with HOOP Partner Municipality of Murcia: Manuel Valls, Deputy Head of EU Department.

1. **What was in your view the key success of your HOOP Biowaste Club so far?**

1) Engage relevant actors to define the challenges of urban circular bioeconomy in Murcia municipality and regions (BCM with agrifood industries, BCM to discuss the results of HOOP Trainers App).

2) discussions of the problems related to the implementation of a circular bioeconomy in Murcia (with students, Mothers for climate, etc…) For this, we had a special Biowaste Club Meeting where we discussed the data of the HOOP Trainers app. Part of this was, for instance, to understand the motivation of citizens to separate their biowaste at home and the reasons for not doing it, such as lack of space, lack of awareness or the lack of knowledge that organic separation contributes to the fight against climate change. Some of the measures proposed by the participants were the creation of green areas with compost stations, positive incentives for citizens who separate at home and the implementation of more bins in the city.

3) Also thanks to the Biowaste Club, we managed to raise more awareness and speak with many citizens about their perspectives on new bio-based products.

2. **What achievement are you most proud of?**

The visibility given to HOOP on local and regional level. The high amount of stakeholders engaged. Working with different stakeholders: companies, students, associations, citizen in general.

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Last, but not least, we are very proud of the LOOP Circular Economy Fair, that was organised in Murcia in 2022. We were inspired by what other HOOP partners had already done (such as the Circular Weeks in Albano and Western Macedonia) and hence organised our circular economy fair as a cooperation between different projects and initiatives that the city of Murcia is involved in.

3. Which "new" stakeholders did you engage with for the first time since the start of HOOP?

With several actors from the agrifood industry, we engaged thanks to the HOOP activities. Through the dialogues with them, we learnt that there's a huge unlock potential for industrial symbiosis in Murcia Region, in terms of agrifood by-products and waste stream, but there's also still a lack of coordination and investments. With our HOOP activities we aim to decrease this lack of coordination as much as possible.

Also with different associations, such as Mothers for Climate, we engaged for the first time thanks to HOOP. Their contributions were very valuable to better understand our citizens' behaviour and challenges. Based on these insights, we shaped our follow-up engagement activities accordingly.

4. Which stakeholder group was particularly difficult for you to engage with?

Small- and medium-sized enterprises were very difficult to engage. We tried (for September 2022) to launch a BCM specifically for SMEs with circular bioeconomy proposals, counting on the help of AEMA-RM (Murcian association of enterprises for the environment) for the call dissemination and also for framing the BCM in one of their events, but despite all our promotion efforts, we had very little responses. We have learnt from this experience that engaging small- and medium-size enterprises takes a lot of time and effort and needs to start with trust-building. Also, one needs to have an in-depth understanding of the enterprises' current needs and sustainability challenges, so that we can frame our offers in the Biowaste Club accordingly.

Additionally, it was challenging to engage with representatives from other Spanish cities and regions. A reason why it was so difficult to engage the public actors could be that public contracts for waste collection are usually quite tied and last up to 20 years, so the degree of freedom and influence that the municipalities have, might seem small to them. They might think that it is mostly the private service providers' responsibility to engage and change their systems, since they are responsible for managing the treatment plants.

Moreover, sometimes civil servant at a local level are not used to attending this kind of meetings, even to study cutting edge actions. In the case of biowaste, everyone is thinking of compost and biogas, so the HOOP solutions may seem out of scope for some public actors and the feasibility of these new "HOOP ways" of revalorisation is not tested completely yet either. This makes it difficult to convince civil servants who are used to going the "save and known pathways". Finally, while at local level it is always interesting and motivating for public actors to attend face to face meetings and side visits, at regional and national level it is really difficult to motivate these actors to travel, especially if their working time or travel costs are not covered.

5. How did you nevertheless manage to engage these actors?

Through sending personal e-mails to representatives working in the targeted public administration, establishing direct contacts and finding out their needs and interests.

However, the number of personal contacts one can reach is limited and the number of attendees to the respective events was, thus, also limited.

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6. **What do you think are unique features of the stakeholders (or of their challenges or motivations) in your country?**

Citizens: lack of awareness about the importance of separate collection and also lack of trust (an often-pronounced sentence is: “the waste management company mixes up everything in their facility, so why should I bother to separate?”).

Industries: lack of market-ready solutions to valorise biowaste and the by-products of different waste streams.

Local administrations and policy makers: lots of enthusiasm, but limited knowledge on mechanisms of implementing a circular bioeconomy.

7. **Which stakeholder engagement activity or activities in HOOP was/ were most useful to you?**

The Biowaste Club Meetings in which we discussed the results of the HOOP Trainers App. Both the app itself and the discussions that followed in the BCMs, were extremely useful to identify challenges and tackle them in future actions. Check the HOOP Virtual Academy and D6.4 for all our learnings and insights from the HOOP Trainers.

8. **What would you recommend to a city or region that is only at the beginning of the circular economy journey?**

To replicate Murcia’s strategy: make a comprehensive diagnose first - together with all relevant stakeholders - and build an action plan on it. In Murcia, we have actually already before the start of HOOP started with a stakeholder engagement process, which then continued in the HOOP project. A very practical and tangible result of the different engagement processes – and surely helpful to replicate – is our CE strategy and action plan.

9. **What are in your view the most important first steps to take?**

Ensure a proper budget and resources for the monitoring of the circular economy actions and their implementation. No budget, no action, no circular improvement. Also it is very important to assign qualified personnel to the task of following the implementation and manage the action plan.

10. **What would you have done differently in your stakeholder engagement journey, if you could start again?**

Murcia Municipality has always had a close relationship with their stakeholders, this makes thing easier. However, the engagement of the citizenship should see allocated much more resources if we want to ensure that every citizen is properly informed and not only those who already have an intrinsic motivation to act environmentally friendly.

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5.8. Western Macedonia

Interview with HOOP-partner CluBE:

Ioannis Fallas, Managing Director & Theodoros Gkiourkas, Project Manager.

1. **What was in your view the key success of your HOOP Biowaste Club so far? What achievement are you most proud of?**

In our view, one key success of our Biowaste Club in Western Macedonia is that we already had very many Biowaste Club meetings – both within the HOOP project, as well as within the mother project SCALIBUR - and the stakeholders by now know the format and potential of such meetings very well. A second success, which we are very happy, is that through the Biowaste Club Meetings we finally achieved to convince the HoReCa sector about the importance of collecting the coffee residues and we finally started the pilot collection.

2. **Which "new" stakeholders did you engage with for the first time since the start of HOOP? What new insights did you gain from talking to them?**

Thanks to the HOOP Biowaste Club, CluBE managed to significantly increase cooperation with the HoReCa sector. We understood their needs and the challenges that they face in order to separate the coffee residues from other biowaste. For example, each owner had a different opinion on how they want to undertake the collection. This depends on the structure of their business and on the amount of coffee consumed. After the implementation of 3 Biowaste Club Meetings with the representatives of the Association of Coffee shop owners, it was decided to separate the spent coffee grounds (SCG) in specific bags and DIADYMA (the waste company of Western Macedonia) will collect these bags every two days or if the loads are very big, the owners will contact DIADYMA and the collections will be every day. Furthermore, CluBE and DIADYMA proposed to create a sign stating that "This business is separating the SCGs and disposes them for recycling".

3. **Which stakeholder group was particularly difficult for you to engage with? How did you nevertheless manage? Or why didn't you?**

The HoReCa was particularly challenging to engage with. It took onsite visits where we conducted surveys as well as 4-5 BCMs from HOOP and SCALIBUR projects in order to engage with them. They already have a local association, but it is not very active. In the end, we were successful because we had decided to visit the coffee businesses one by one in order for everyone to know about our work and to trust CluBE and DIADYMA. So, the keys to success were trust-building and making it as easy for the businesses as possible.

4. **What do you think are unique features of the stakeholders (or of their challenges or motivations) in your country?**

Actually, in our experience, in Greece there is no incentive that could increase the motivation of businesses for collecting biowaste and for separating specific parts, such as their coffee residues. The government has a national strategy for the separate collection, but there are no reward schemes. Moreover, even when a separate collection is in place, there are still many challenges for the owners i.e. lack of space for the extra bins.

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At the same time, if Greek businesses were motivated enough, in our perspective they would also have the ability to comply with the law. As we have proven in HOOP, through cooperation across stakeholder groups, it is possible to solve any problems that may arise.

5. **Which stakeholder engagement activity or activities in HOOP was or were most useful to you?**

The most useful stakeholder engagement activity was, in our view, the Biowaste Club meetings with the board of directors of the association of the Coffee Shops. Thanks to everything that followed these meetings, as described above, we made visible impact on our local and regional biowaste value chains.

Additionally, CluBE is organising events each year to promote the recycling and upcycling behavior. In June 2022, for instance, we had organised the Climate Neutral Week in Kozani – this was a collaborative effort between the SCALIBUR and HOOP projects. It was a 7-day event and each day was dedicated to a different topic related with Climate Neutrality taking, advantage that Kozani was selected to be one of the 100 Climate Neutral and Smart Cities until 2030 (EU Mission). During the weekend of that eventful week, we organised various actions for children and youth in order to raise awareness on waste prevention and sorting, such as games made from wastes and Do-it-Yourself upcycling workshops. We are proud to have reached more than 1.000 local children and teenagers in both days of the weekend.

6. **What would you recommend to a city or region that is only at the beginning of the circular economy journey? What are in your view the most important first steps to take? What would you have done differently in your stakeholder engagement journey, if you could start again?**

CluBE had the opportunity to organise many BCMs in the Region of Western Macedonia. We understood that the most important thing in order to achieve the best results from engaging the stakeholders is to make different meetings with different stakeholder groups, to build trust and to give all actors enough space to voice their concerns. Also you have to be open and flexible to develop and adapt solutions that fit all actors' needs.

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6. Identify and design ways to valorise your biowaste

Anaerobic digestion (AD) and composting are very valuable solutions to get value from the organic fraction of municipal solid waste (OFMSW) and urban wastewater sludge (UWWS): they allow to convert the otherwise rotting organic matter that causes greenhouse emission and pollution into useful products, like compost and biogas. However, composting and AD may not be the most advantageous waste treatment solutions mainly for the following reasons:

- In most places the business model for compost is not attractive or simply does not apply. Compost is given away for free or at very low price, or even accumulated on the landfill for landscape conditioning purposes (not all lands need compost application and social acceptance of compost is not always positive)
- AD, beyond the sought-after biogas, produces big amounts of digestate, a mud-like substance which valorisation in Europe does not go beyond its use as a fertiliser or soil improver.
- The feasibility and financial benefits of AD and composting processes depends much on the quality of the feedstock, which makes the social awareness crucial for the successful performance of this treatments.

To summarise, AD and composting of the biowaste are viable alternatives for waste stabilisation and energy and material recovery, but the evolution of new technologies for material and energy recovery and the evolution of legislation can make it possible to create economic value out of biowaste through the obtention of high added value bioproducts like fertilisers, bioplastics and chemical commodities. Want to know “What is the menu for biowaste valorisation options”? Check this resume of the H2020 HOOP project’s state-of-the-art. (Suárez et al., 2023)

Overwhelmed? Don’t panic.

If you ask yourself the right questions it will be easier to choose the available technologies that best suits the waste valorisation needs of your city or region. Be aware that most high-added value valorisation are at medium technology readiness levels (TRL) and need an upscale. Here are some key questions that will help you but keep in mind that waste management is a multidisciplinary matter: do not hesitate to involve in the debate technical partners with technological, business, financial and stakeholder engagement expertise.

1. What are the biowaste flows available? In which quantity and purity? This information should be extrapolated from an urban metabolism analysis (see Chapter 4). What flows claim for a more urgent valorisation process?
2. Take a list of valorisation technologies and pre-select options:
    a. is there an underlying interest/previous work done in some of them?

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b. Does the expected impact solve problems in the city/region? Is it aligned to the city/region strategy?
c. How technologically mature and scalable is the technology? You may need to look for funds or launch a public procurement of innovation process to get to your final solution.
d. Is there a potential market or local/ regional end-user for the new products?

3. Check the market possibilities for the bioproduct: are there legal barriers? is the market ready? No market, no economy.

4. With this in mind, evaluate the best capital seek option (own funds, structural funds, grants, lends, etc.)

Table 1 and Figure 11 below summarise the technologies in the HOOP portfolio for valorising biowaste.

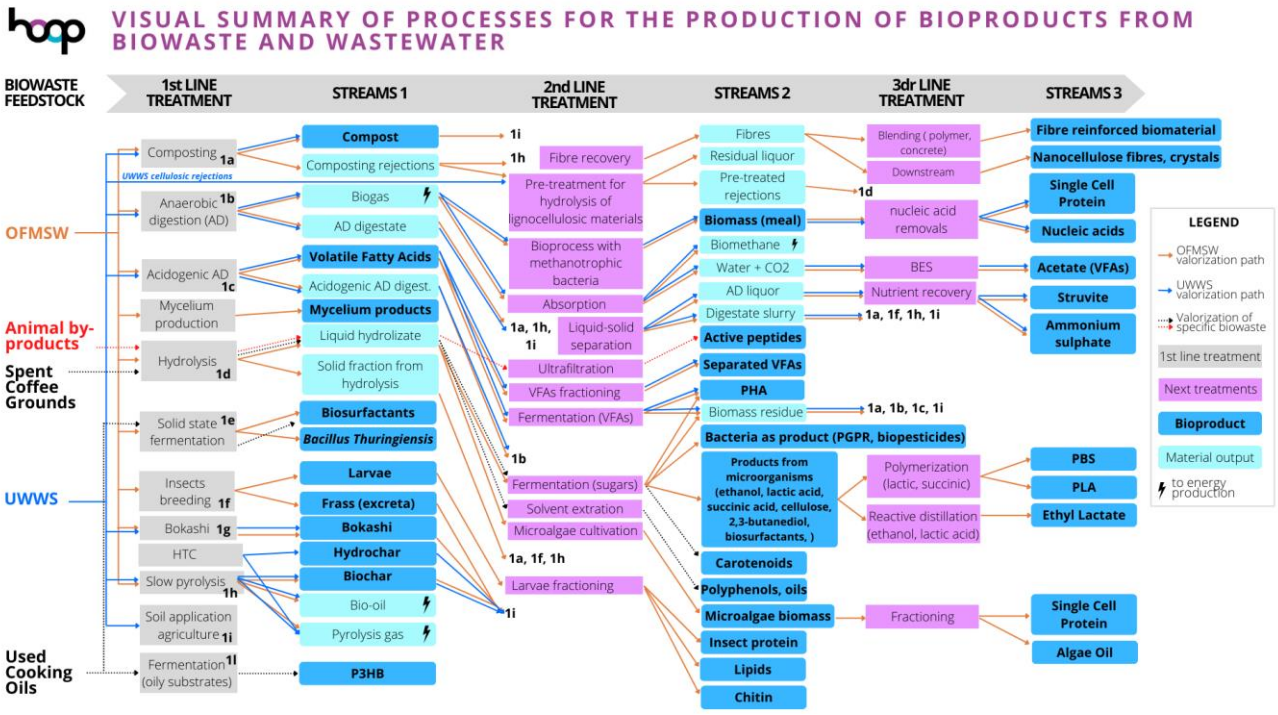

Figure 11 HOOP technologies for material valorisation of biowaste and UWWS (CETENMA, 2023)

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Table 1 Technologies to valorise biowaste (updated September 2023) (CETENMA, 2023)*)*

Technologies to valorise biowaste (updated September 2023)	Possible inputs
Bioprocess involving methanotrophic bacteria using biomethane arising from the AD	OFMSW, UWWS
Insects fed with OFMSW or digestate from anaerobic digestion	OFMSW
Nutrients recovered from residual dewatering liquid from anaerobic digestion	OFMSW, UWWS
Microalgae cultivation from biowaste	OFMSW, especially “pure” streams like vegetable market waste
Fermentation of used cooking oils (UCOs) to bioplastics	Used Cooking Oils (mostly vegetable)
Volatile fatty acids (VFAs) production from UWWS	UWWS, OFMSW
Ethanol and derived biosolvents from biowaste	OFMSW, cellulosic rejections of wastewater treatment plants
PolyLactic Acid (PLA) production from fruits and vegetables waste	vegetable market waste, agri-food industry side streams
Bioprocess production 2,3-Butanediol by fermentation of biowaste	OFMSW, garden waste and UWWS
Slow pyrolysis	Garden waste, composting rejections and other lignin-rich streams
Production of functional ingredients from spent coffee grounds (SCG)	Spent coffee grounds
Biochemical production of functional ingredients from animal by-products	animal by-products from slaughter houses
Biochemical conversion of OFMSW to biopolymers	OFMSW
Production of biotic pesticides from OFMSW	OFMSW
Production of biofertilisers and biostimulants from OFMSW and UWWS	OFMSW
Bioconversion of UWWS: CO_2 fermentation with bioelectrochemical systems	UWWS, OFMSW
Bioconversion of UWWS: production of PHBV and other PHAs	UWWS
Hydrothermal carbonisation	UWWS, OFMSW
Succinic acid production	OFMSW
Production of microbial biosurfactants	OFMSW, used cooking oils

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Technologies to valorise biowaste (updated September 2023)	Possible inputs
Mycelium production	Green waste, lignocellulosic waste
Nitrogen recovery from wastewater with ion exchange and membranes	OFMSW, UWWS, wastewater
Bacterial cellulose production	OFMSW
Isolation of fibres from green waste	Green waste
Fermentation with purple photobiotrophic bacteria	UWWS, wastewater, OFMSW

6.1. Albano Laziale

1. **Which new insights did you gain into your biowaste valorisation thanks to HOOP activities (e.g. thanks to urban metabolism analysis, HOOP Bio-Circularity Label, Circular Investors Board or other)? How did these insights help you in your work?**

We really appreciated the well-structured matrix with urban metabolism indicators. This data structure can encourage administrations to collect this data over time to provide greater awareness of the functioning and impact on the territory of different consumption and items related to municipal waste, wastewater and energy.

2. **Which technologies and biowaste valorisation routes did you choose to focus on in HOOP? Why?**

The PDA for Albano Laziale is active on three main topics:

- The first concerns the electromechanical composting plant acquired by the Municipality of Albano Laziale and in the authorization phase for start-up (80 ton per year in a first phase and when it is at full capacity: 600/ton per year). PDA will be important also to support collection strategies (for example towards local canteens/HoReCa sector) and for sales to stakeholders in the agricultural sector. HOOP Technology #2 "Volatile fatty acids from acidogenic digestion of solid biowaste" is certainly of great interest even if the costs are currently very high, but from a technical point of view the in-depth analysis is very useful.

- The second concerns HOOP Technology #1 "Fermentation of used cooking oils (UCOs)" for this technology several meetings were held also with the presence of CETENMA, and a positive dialogue was created with CONOE (National Consortium for the collection and treatment of used vegetable and animal oils and fats in Italy), potential investor and other stakeholders from Cosmetic sector. So, a clear interest in investing in the UCO solution proposed by Nafigate has emerged. A study visit planned for 1st December 2023 is scheduled in Prague at the Microbiological Institute where Nafigate is operational (thanks to the support of ACR+, 2 interested stakeholders from the HOOP Network will be added to the study visit).

- The third HOOP technology for the PDA concerns Technology #3 "Nutrients recovered from residual dewatering liquid from anaerobic digestion". Here, however, the interest was only initial on the part of ACEA and given the low level of TRL the dialogue did not continue yet.

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3. **Which biowaste valorisation routes are currently most popular/ used in your country? Why?**

Composting at home/proximity level and on a larger scale, for its possible uses: quality compost, which can be used to return nutrition and organic matter to the soil or by converting it into renewable energy, biogas.

In Lazio, 138,000 tons of compost and 107,000 tons of aerobic and anaerobic treatment are produced; 19 plants are operational, of which 2 are aerobic and anaerobic treatment.

4. **What advise(s) would you give to a city or region in your country that wants to improve biowaste collection (quality and quantity)? What can they learn from you?**

We would be happy to share our learnings on how to facilitate the introduction of innovative plants for the bioeconomy and biotechnology, replicating the PDA activity in the HOOP course.

5. **Where do you see biowaste valorisation in your country by 2030? What needs to happen to achieve this?**

In order to achieve a truly circular bioeconomy in Italy, we need to support the reduction of material consumption and waste through the modernisation and enhancement of infrastructures for the management, collection, reuse and recycling of waste and organic and processing waste, with the aim of filling the structural gaps that hinder the transition to the circular economy in Lazio. In addition, it would be useful to make greater use of digitalisation and the most advanced technologies in this area.

6.2. Almere

Recommendations for improving biowaste collection:

1. Harmonise collection system

2. Apply ‘yes/no’ list Wel/niet lijst - VANG Huishoudelijk afval

3. Use personal communication methods, such as a yellow/red card system and waste coaches

In the Netherlands, the most common biowaste valorisation routes are recycling to compost. Approximately one-third of the compost material is preceded by anaerobic digestion. Almere is focusing on a higher step on the biomass pyramid (Figure 12) and to “higher” valorisation than anaerobic digestion and composting. It is focusing on material recovery through applying natural fibre in different types of (construction) material.

Considering the short to medium-term trajectory of biowaste valorisation in the Netherlands, there will be slightly more collection of biowaste by 2030 because of the Waste Directive. In addition, contamination of biowaste will slowly decrease due to more personal communication and more monitoring (and feedback) by waste collectors and waste treatments

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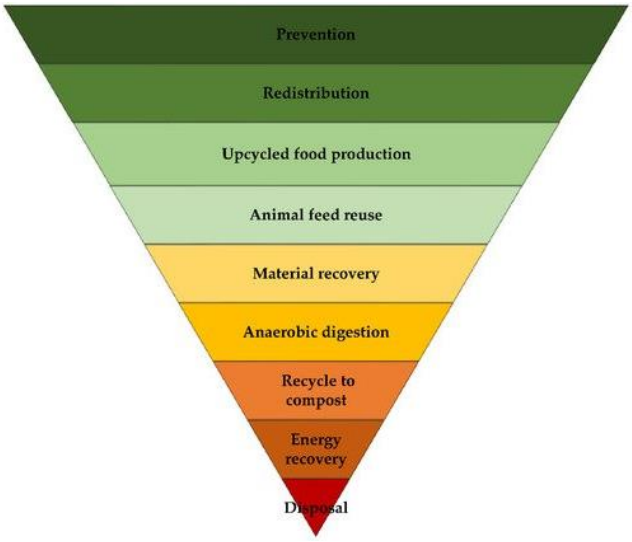

Figure 12 Ladder of Moerman

6.3. Bergen

Interview with HOOP partner BIR: Toralf Igesund, Ulrikke V. Hernæs, Emilia H. Bjånes.

1. Which new insights did you gain into your biowaste valorisation thanks to HOOP activities?

Instead of running the innovation ourselves, we invested in and are collaborating with start-up companies as a tool to faster innovation. Some of these start-ups are based on chosen technologies in the HOOP project. They have received help to develop LCAs and have been given the opportunity to pitch for the Circular Investors Board. They urgently need capital to grow and hopefully this will help them get more investors.

2. Which technologies and biowaste valorisation routes did you choose to focus on in HOOP? Why?

Here, two valorisation routes are being explored. Larvae are being fed with food waste, through our collaboration with the start-up Invertapro. In addition, microalgae are being cultivated from biowaste, through our collaboration with Greentech Innovators, another start-up. Both technologies give a higher valorisation of food waste than the traditional treatments (e.g., waste-to-energy, biogas fermentation or compost). Production of larvae is getting close to being profitable.

3. Which biowaste valorisation routes are currently most popular/used in your country? Why?

Biogas fermentation, compost and waste to energy. Biowaste from households is collected separately and the amounts increase slowly every year. Separately collected food waste is not allowed for landfilling or incineration anymore. Hence, biogas plants are expected to soon treat all food waste in Norway. Biogas fermentation is increasingly being more used due to the value of the gas. The amount of biowaste that needs to be treated and legislation also have an impact.

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4. **What advise would you give to a city or region in your country that wants to improve biowaste collection?**

Implement a PAYT as an incentive to separate the biowaste in the waste collection. Use paper bags in the collection of food waste to improve quality.

5. **Where do you see biowaste valorisation in your country by 2030?**

By 2030 we hope that several bioparks will be established in Norway. Biogas fermentation will be supplemented with other methods, such as insects, single cell protein, biochar and aquaphonics, etc. Bioresources are taken care of in circular value chains with little loss of materials and energy. BIR will develop our industrial area at Voss and invite partners with relevant technologies and business models to take part in the Biopark. The infrastructure in the park, like roads, buildings, water, energy supply etc. must be developed.

6.4. Greater Porto

Interview with HOOP partner LIPOR: Tania Pinto, Project Manager, Logistics and Infrastructure Division, Operations and Logistics Department.

1. **Which new insights did you gain into your biowaste valorisation thanks to HOOP activities? How did these insights help you in your work?**

It will be a very useful experience for us when we finalise the Open Market Consultation for the technology for nutrient recovery (Nitrogen and Phosphorus) from digestate for the future anaerobic digestion plant. We are doing this comprehensive process for the first time now and are learning a lot on the way. We will be glad to share our experiences for the Portuguese version of D8.4 in Spring 2024.

2. **Which technologies and biowaste valorisation routes did you choose to focus on in HOOP? Why?**

Pyrolysis and nutrient recovery. Both could solve very specific challenges and waste streams we (will) have, namely with green waste that cannot go to composting (because it is from invasive species), and liquid digestate from the future anaerobic digestion plant.

3. **Which biowaste valorisation routes are currently most popular/ used in your country? Why?**

Most cities and regions in Portugal focus on composting. It is a comparably simple and easy process, easy to control and monitor, resilient and hence most commonly used in our country.

4. **What advice would you give to a city or region in your country that wants to improve biowaste collection (quality and quantity)? What can they learn from you?**

We have a lot of experiences to share on establishing a collection system that is convenient to the citizen, with an efficient and reliable service; frequent monitoring and constant citizen engagement.

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5. **Where do you see biowaste valorisation in your country by 2030? What needs to happen to achieve this?**

Biowaste valorisation in Portugal should grow significantly. For this to happen, funding and investment programmes are key. At LIPOR, we will expand the separate collection of biowaste significantly, whilst developing new ways to valorise biowaste and produce high quality bio-based products.

6.5. Kuopio

1. **Which new insights did you gain into your biowaste valorisation due to HOOP activities?**

One of our HOOP activities was to run a questionnaire with companies in the field of circular economy. We gained new insights from their answers: for example, that regulation has played a crucial role in creating demand for biogas, which directly affects biowaste collection. In 2024, the regulation changes and it is compulsory to organise biowaste collection in all households in some way. This opens up new possibilities with biowaste valorisation in the future. Citizen engagement feedback also let us know that there is lack of viable circular business models, low prices in virgin material prices, low demand of high price circular products and lacking of product standardization.

We also learned from their questionnaire answers that they would like to hear more about public education and awareness on biowaste; how to better utilise biowaste like egg shells and coffee grounds; how to separate biowaste from mixed waste; and whether there are better solutions than what we have now.

2. **Which technologies and biowaste valorisation routes did you choose to focus on in HOOP? Why?**

The Finnish government has set a goal of carbon neutrality for Finland by 2035, and efforts have been made to reduce the energy use of peat. For this reason, we must look for new materials to replace peat, such as growth substrates. Savonia UAS has been involved with the biochar research and there are interesting and potential applications for the usage of biochar. We therefore applied funding for the Biochar Pilot Reactor together with our industrial partners.

Biochar improves the structure of the soil and the living conditions of microbes, creating good conditions for micro-organisms and providing them with nutrients. Due to the policies made by the Finnish government, the market conditions for soil conditioners will expand in the future and there are a lot of possibilities for businesses.

3. **Which biowaste valorisation routes are currently most common in Finland? Why?**

Organic fertilisers and biogas from biowaste. The organic waste can be transformed into value-added products. Thereby processing costs lessen and additional revenues are generated. Reuse, recycling and composting enable converting waste materials into more beneficial products, such as chemicals, fuels, materials and energy sources.

4. **What advice would you give to a Finnish city or region that wants to improve biowaste collection?**

International collaboration and learning from best practices from other countries and regions is valuable. It allows for sharing of concrete examples and acquiring ideas for innovations.

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5. **What needs to change in Finland to increase biowaste valorisation by 2030?**

We need more multistakeholder engagement; innovations and incentives in the private sector; legislative development; digitalisation across all services; and among the general population, educational development and involvement of schools at all levels.

We need to create and organise Biowaste Club meetings and seminars on various topics, and identify the unique needs of the different stakeholders.

6.6. Münster

The HOOP Bio-Circularity Label helped Münster identify areas with potential for improvement in the processes. These areas include the number of bioproducts and the amount of renewable energy. While composting and anaerobic digestion remain the most established practices and are rather cheap in comparison, especially compared to more recent innovations, Münster decided to follow these new paths within the HOOP project. As a novel valorisation route, Münster has decided – with support of the HOOP PDA - to pursue pyrolysis of composting rejections or green waste since it fits well into the existing processes and would allow for a better valorisation of the existing waste streams (composting rejections). Both products (biochar and renewable energy) can help the city of Münster to reach its goal of climate neutrality in 2030.

Besides the openness to follow new valorisation routes and technical innovations that fit the processes, there are several key learnings. With the limited potential to technically remove impurities in biowaste, citizen awareness and willingness remain critical and require intense and repeated public relations campaigns and co-creation activities. In general, there remains a lot of potential in Germany and to become the European capital in waste reduction, strict rules need to be in place to enforce that materials are easily reusable/recycle. To achieve this, more emphasis also needs to be put on circular product design.

6.7. Murcia

Interview with HOOP Partner Municipality of Murcia: Manuel Valls, Deputy Head of EU Department.

1. **Which new insights did you gain into your biowaste valorisation thanks to HOOP activities? How did these insights help you in your work?**

We understood that the quality of the urban biowaste is essential to create marketable bioproducts (compost) and that we must invest in effective collection systems. From the HOOP Bio-Circularity Label we also learnt that, even if we are already a reference in wastewater sludge circularity, our performance in terms of biowaste collection and treatment needs significant improvements.

2. **Which technologies and biowaste valorisation routes did you chose to focus on in HOOP? Why?**

We focused on high added-value bioproducts from urban wastewater sludge (UWWS). In terms of circularity of sludge management our performance was already excellent, but we wanted to focus on innovation. First, we

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pushed for volatile fatty acids from UWWS, but the techno-economic feasibility study demonstrated the unfeasibility of the project. Then we pushed for nutrient recovery, which is currently under assessment.

At the very beginning, we also encouraged the upscale of the VALUEWASTE pilot action for the production of insect larvae from agrifood by-products, but finally the promoting company decided to upscale the projects beyond Murcia Region boundaries, on national level.

3. **Which biowaste valorisation routes are currently most popular/ used in your country? Why?**

Composting is most common in Spain because there is a huge demand for high-quality compost in our region and in Spain in general. Anaerobic digestion, especially of UWWS, is also very popular since wastewater treatment plants are very energy-demanding and the produced biogas can be used to produce electricity to fuel the plant.

4. **What advice would you give to a city or region in your country that wants to improve biowaste collection (quality and quantity)?**

Dedicate resources to awareness raising activities, like Murcia's biopatrol. Work closely with the waste management company. In our experience, face-to-face interaction is the best way of informing citizens and achieving behaviour change for an improved biowaste sorting and collection.

5. **Where do you see biowaste valorisation by 2030? What needs to happen to achieve this?**

I see a Murcia where organic waste is a new raw material for other products, not only for biogas or compost, but also more innovative solutions. The next steps to get there are:

(i) Looking for national / EU funds in order to build a specific organic treatment plant made of: Pretreatment station, Biomethanisation Plant and Compost Plant. Murcia has a small one now, but higher quantities of organic waste are expected with the implementation of the new container for the organic fraction in the entire city. The new plant is estimated to costs us around € 7 million.

(ii) Construction of the plant

(iii) At the same time, communication campaigns are needed, so that the quality of the organic fraction is high enough to be recyclable.

6.8. Western Macedonia

1. **Which new insights did you gain into your biowaste valorisation thanks to HOOP activities? How did these insights help you in your work?**

We developed proposals for funding that helped us to understand more about the valorisation and the benefits that will provide in our Region. Moreover, we were in touch with local businesses that can absorb the final products and this helped us to understand more the local economy such as distilleries that can create oil from the SCGs, cosmetics and business that sell such products. For example, we submitted a project application for

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funding pre-commercial procurement in order to support the actions selected by Western Macedonia in the HOOP Project for valorisation of the SCGs to polyphenols and used cooking oils (UCO).

Western Macedonia is a Region in transition from lignite to renewable energy sources. From the 5 power plants that used to provide electricity to the whole country, only 2 are operating now and these will be closed in 2028. The European Union supports these regions with several funding instruments. Additionally, the Just Transition Fund and the Green Fund can be used for the development of local and regional bioeconomy.

2. **Which technologies and biowaste valorisation routes did you choose to focus on in HOOP? Why?**

Valorisation of spent coffee grounds and used cooking oils. We chose these 2 different streams because SCG is a stream that can provide high added value products and it is easy to collect from businesses. Furthermore, regarding the UCO's there is a collection system already developed in our region and we want to valorise them as well. Looking beyond our HOOP Lighthouse Western Macedonia, the biowaste valorisation route currently most used in Greece is composting.

3. **What advice would you give to a city or region in your country that wants to improve biowaste collection (quality and quantity)? What can they learn from you?**

We know from our own experience that establishing a new biowaste collection system in your city or region is a challenging task and it is not an easy job to convince people to separate their biowaste, but with creative and on-going awareness-raising activities, as well as with a well-designed collection system one can achieve a well-working separate collection system.

4. **Where do you see biowaste valorisation in your country by 2030? What needs to happen to achieve this?**

I can see that people are changing their behavior and environmental awareness is constantly increasing. It is a new way of living and it is very encouraging to think that until 2030 more and more people will have all the means (such as frequent bins or using bioproducts) from the public authorities to play an active part in their local and regional bioeconomies. This will not only be beneficial for the environment, but also allow Greek citizens to save money. To achieve this, it is crucial to increase the funding opportunities, not only from EU sources, but from National Funds as well.

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7. Find funding for your biowaste projects

There are several steps you should take to find and secure investment into your bioeconomy project. The process varies depending on whether the entity promoting the project is public or private. Steps may include:

- Market research and feasibility studies
- Techno-environmental assessments
- Circular business model and plan
- Engaging relevant stakeholders and increasing the public awareness for the project (communication plan)
- Public consultation
- Financial projections and budgeting
- Investor identification and matchmaking for private investments for funding cases
- Proof of concept
- Due diligence
- Risk mitigation strategies
- Leveraging private and public investments and tools (grants, subsidies, guarantees, soft loans…)
- Pre-commercial procurement in bridging the “valley of death” between applied research and market demand for innovation, facilitating the transition from concept to market implementation.

Typical structure/procedure for funding applications to European funding programmes/calls:

1. Identify a relevant funding programme that matches the scope of the project proposal.
2. Choose amongst the call for proposals, selecting a call for proposals that best fits the description of the project. The most important elements to consider in a call for proposals are the objectives, eligible actions, eligibility criteria, co-financing rules, administrative requirements, application form needed, selection process and evaluation methodology, and the deadline for submission.

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3. Developing a project (objectives, scope, target groups, work packages, milestones/deliverables, budget, KPIs, impacts, etc.).

4. Identifying partners to establish the consortium of the project.

5. Communication, dissemination and exploitation strategy.

While this sounds like a lot to do, fear not! The HOOP project provides many tools and services that help with these steps. These are summarised in Annex 11.3.

Spotlight on… the HOOP Hub

The HOOP Hub is a digital platform with tools, resources, networking opportunities, and access to expertise for entities seeking to accelerate bioeconomy initiatives. The Hub is a one-stop solution for cities and regions to transform biowaste and wastewater into valuable resources, fostering economic growth and sustainability. For investors and businesses, we provide access to a curated network of projects and a deep pool of expertise in the bioeconomy sector.

- Networking Hub: Connect cities, experts, companies and investors.
- Knowledge Sharing: Facilitate the exchange of information and experiences.
- Circular Economy Promotion: Provide tools and resources to help cities and businesses transition to a circular economy.
- Biowaste Tech Education: Offer insights into biowaste valorisation technologies.
- Resource Hub: Serve as a source of valuable information and best practices.

Hub Tools:

Circular Valuation Method

The Circular Valuation method is a clear a simple method for companies and public bodies to assess whether circular projects are financially attractive. The indicators are adapted to the characteristics of circularity and biowaste resulting in a multidimensional assessment method covering domains including financial, circularity, environmental, social, and a comparison to the previous situation. The results can be downloaded to show the circular potential of your project.

Project Maturity Level

The HOOP Project Maturity Level is a tool that evaluates the level of maturity of the projects in order to improve their maturity and bankability to mobilise green financing and funding. As guidance, there is the document “Circular Evaluation Framework Guidance Report” (Ramos Silva et al., 2023) also available to support this tool.

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Spotlight on… the HOOP Bio-Circularity Label

The HOOP Bio-Circularity Label tool is an instrument with which to understand the current performance of a city/region in implementation of bio-circular measures. This tool is available in the HOOP Hub.

Main challenges faced by HOOP Lighthouse Cities and Regions

Mediocre waste management practices, both in the private and public spheres, was one challenge faced by some HOOP Lighthouses. They believe the EU needs to emphasise waste valorisation and the bio-circular economy more as a path to a more sustainable future.

Additional challenges[3]:

- Government needs to play an even more active role in developing the circular market and to create the right context for innovation
    - Innovation comes from regulating waste markets
    - Innovation comes from penalties for polluters
    - Enforcing a standardised environmental due diligence and reporting
- Technological risks:
    - The logistics of biowaste is still a main barrier
    - Low TRL: Early-mover externalities due to low diffusion of technologies and underdeveloped supply chain and distribution networks
    - Availability risks (more fragmented supply chains compared to linear business models)
- Project developers face prejudices and have to invest considerable efforts in communicating and lobbying.
- Wide valley of death: Communication issues, too little funds available, lack of customer awareness…
- Cultural & behavioural risks:
    - Insufficient market participation by consumers
    - Social manifestation against the projects
- Regulatory risks:
    - There is too much regulation in some areas and too little in others.

[3] See HOOP Deliverable 2.4 subchapter 4.9 for an extended list of main barriers and risks

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- Environmental externalitites are not priced
- Permitting and tendering risks (Circular economy models tend to have longer implementation time)

Tip: What to pitch to potential investors

What do potential investors need hear in your pitch?

1. **The problem to be addressed/mission**

Brief description of the problem(s) – current or prospective – the pilot will solve (e.g., water scarcity, waste, energy poverty), which region and which population is or will be affected; what future risks the project is trying to alleviate. If applicable: Key data on the city/region

2. **Planned actions**

Status quo of the product/service; and which actions and milestones are planned to implement it, route to market

3. **Impacts**

What impact do you expect? What is the timeline for this impact to be realised? Succesful storytelling of the environmental and social impacts.

4. **Competitors/ Market-size**

Who are the competitors and how do you go beyond what they offer? Any insights on the market that you target?

5. **Financing challenges**

Brief description of the main challenges to secure financing; what risks the project may face; any best practices that the project can build up on. What type of financing do you need (debt, equity, etc.) and what is your specific ask (investment volume needed)? Clarifying who are the co-investors.

What we learned in our search for investment:

What investors want

- Investors look for projects with strong financial forecasts and a comprehensive risk assessment to assess profitability and understand associated risks. Engaging in a rigorous due diligence process is recommended and the HOOP Due Diligence Standard Procedure is an excellent tool to support this achievement.

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- Tools and guidelines such as the Circular Evaluation Framework and Circular Valuation Method will allow investors to better navigate the intricacies of the Urban Circular Bioeconomy sector, ensuring the alignment of projects with investor expectations and the broader sustainable development goals.

What investors may fear

- Availability of feedstock as a risk: Project developers often lack contracts with feedstock providers, and the quality of the biowaste in some cases is very low and heterogenous.

- Circular businesses in particularly start-ups, are perceived as high-risk profiles, lacking track record of profitable businesses.

Funding gaps and TRL-levels

- There is a significant funding gap at the TRL7 stage for up-scaling circular technologies and processes, with most investment needed for infrastructure. Addressing this gap should focus on reducing risk and time to market, rather than just increasing funding.

- In some projects, it is a key challenge to increase the project maturity level (PML) and TRL, as well as the quality and acceptance of bio-based products. In order to overcome this challenge, it is important to have a business model and plan very clear supported by feasibility and market studies. The projects actually should comply with several environmental and circularity requirements from European (e.g., EU Taxonomy regulation, sustainability reporting, ESG criteria, etc.) and National (e.g., waste management general regulation, etc.) regulations and standards.

- Some funds also require risk analysis to the projects (e.g., due diligence). For some bioproducts, there is a high number of market competitors. Environmental and political awareness is necessary to be performed at local and national levels. Some projects should be integrated within other circular and energy projects in order to increase the ticket of investment – this aspect is targeted when the projects are seeking for private investment/support.

- In general, projects that require a high level of investment are facing more constraints for funding applications, given the low budget available in the majority of the European calls. These calls are based on large consortiums, which implies a lower budget to be distributed among partners.

- Projects with low PML and/or TRL have higher level of risk, as well as if the business model and plan are not clearly identified. It is also a risk if there is no local market for the bioproducts, which in some cases are not regulated within the countries. Other possible risk is the lack of political and social commitments to the UCBE projects.

- Return on investment of some UCBE projects is very low and, consequently, the business model is not very profitable and attractive. In some cases, the projects have too low ticket for private investors. Pilots should be more targeted to R&D funding programmes.

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7.1. Albano Laziale

1. **How did you get the necessary funding for your existing or planned biowaste valorisation technologies?**

Regional fundings. In particular, the 2021-2027 regional ERDF programme of the Lazio Region is very important for us. In this programme, increased budgets are foreseen compared to the past seven years, to support investments in favour of the competitiveness and sustainability of local businesses with a view to circularity.

The new Operational Program of the European Regional Development Fund of Lazio in total resources has gone from € 960 million in 2014-2020 to € 1.8 billion for the seven-year period 2021-2027.

Even more specifically, the general Objective of Policy n.2 (Greener Europe (OP2) provides € 510 million for initiatives to support the improvement of the energy performance of public buildings, hotels, businesses and production sites, to support the transition of production systems towards the circular economy, to which is added another € 116 million for interventions in favour of sustainable mobility.

2. **What was/ is most challenging for you in terms of funding and procurement?**

The complexity of the application processes to respond to the calls and the uncertainty about the receipt of funds, even if the project has been approved.

3. **What are risks that investors in your country usually discuss? Or in other words: Why are investors and politicians in your country hesitant to fund circular bioeconomy technologies? How to solve these doubts?**

As mentioned above, the energy crisis has not favoured a stronger outlook for biotechnology. In addition, a promotional activity should be carried out with clear and evident elements (data-evidenced based) by research centers and universities in favour of more far-sighted choices at the plant level.

4. **What are national funding possibilities/ events/ mechanisms to use?**

The National Recovery and Resilience Plan (PNRR), is in our view a key national programme for Italian cities and regions to look into.

5. **Which national (or EU) legislation was most helpful or hindering in your biowaste valorisation process?**

Some of the impactful laws and directives in Italy include, with regard to European Union legislation:

a) Waste Framework Directive (2008/98/EC) which lays down the basic principles of waste management in the European Union, promoting prevention, reuse, recycling and other forms of recovery. It has contributed to orienting waste management policies in Italy towards the optimisation of resources and the reduction of environmental impact.

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b) Directive on the management of biowaste (1999/31/EC) which set targets for the reduction of the landfilling of biodegradable waste, including biowaste. This Directive has prompted Italy and other Member States to develop biowaste treatment infrastructure, such as composting and anaerobic digestion.

c) Directive on packaging and packaging waste (94/62/EC) which aims to reduce the environmental impact of packaging and packaging waste and helps promote the recycling and reuse of packaging waste, including organic waste.

At the level of Italian legislation, we can mention:

a) Legislative Decree No. 152/2006 which established the regulatory framework for waste management in Italy and defines the responsibilities of regional and local authorities. It has helped shape organic waste management policies in the country.

b) The National Waste Prevention Plan (PNPR) sets out the objectives and measures for the prevention and sustainable management of waste in Italy. It has a direct impact on organic waste valorisation strategies.

In terms of obstacles, the main challenges are sometimes the interpretation of the standard or the lack of adequate incentives for the recovery of biowaste.

6. **What are in your view helpful new business models that can help cities and regions foster a circular bioeconomy?**

An interesting phenomenon concerns companies that are increasingly exploring models such as product-as-a-service, remanufacturing, and sharing economy platforms. These models are in line with the principles of waste valorisation and sustainable resource management.

As part of ANCI Lazio, we are proud to work to encourage the creation of a Collaboration Protocol with CONOE which has as its object the promotion and facilitation of the agreement with municipalities for the collection of used oil from domestic users. The ideal is to reach the approval of a framework agreement by sharing collection methods and payment in favour of the municipalities!

7.2. Almere

Almere's focus is natural fibres from pruning and post-consumer wood waste in a 'multi-fibre bank' – conceptualised in the Almere Biowaste Club - to produce biochar and syngas from torrefaction and biofuels from digestate. The largest barrier to this is the lack of a steady market: the market of natural fibre products will not be characterised by stable sales. There will be a long period where it is uncertain when and under what conditions natural fibre products can be stably marketed. Local policies, national and European regulations, economic and geopolitical situations 'disrupt' a stable path to mature livelihood model. A business model must take this into account.

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7.3. Bergen

1. **How did you get the necessary funding for your existing or planned biowaste valorisation technologies?**

BIR can fund necessary investments, but our partners Invertapro and Greentech Innovators are still missing funding to be able to move ahead.

2. **What is most challenging for you in terms of funding and procurement?**

Projects within BIR's statutory responsibility are no problem to finance (e.g., due to waste fees, but projects outside this are challenging.

3. **What are risks that investors in your country usually discuss?**

It is difficult to get financing for projects in the phase between pilot and full scale (the FOAK puzzle). Our experience is that this is a bigger challenge for bioprojects than for example digital solutions. In the transition from pilot to full scale the project needs a lot of capital and they often do not break even before full scale. The investors often have a short investment horizon and want the Return on Investment (ROI) short term. Bioprojects take a long time because of the need for research and often legislation changes during the project lifetime etc.

4. **What are national funding possibilities?**

Local:

- *Bergen Municipality supports projects that are in line with the current strategies and action plans for the municipality. In 2022, they had funding calls for green industry, innovation projects and business development initiatives.*

Regional:

- *Regional research fund Vestland* aims to strengthen the regions' research capacity through grants for research and innovation and through mobilization for increased R&D efforts. They have funding for preliminary projects, innovation projects and collaborative projects.

- *Vestland county* has several calls for funding, for example in 2022 one could apply for funding for local climate and environmental measures (grant up to NOK 50,000, equivalent to some 4,400 €) or to strengthen industrial symbiosis in green hubs.

National:

- *The Norwegian Research Council, invests in research and innovation projects.*

- *Innovation Norway, will realise value-creating business development. The aim is to help Norwegian companies to grow and to go international. Bionova is their investment in bioeconomy and climate measures for the agriculture, forestry and aquaculture industries. They fund solutions that contribute to the goal of a low-emission society. Example of a call: Tilskudd til bioøkonomiprosjekter | Innovasjon Norge.*

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- *Siva facilitates sustainable growth in industry and business. This, through developing, owning and financing a national infrastructure for innovation and business development consisting of incubators, business parks, catapult centers, innovation companies, as well as innovation centers and industrial buildings.*

- *ENOVA works towards a transformation into a low-emission society and has funding aimed at lowering greenhouse gas emissions, innovation and technology development. Enova works to ensure that new energy and climate technology is developed and adopted in the market.*

5. **Which national or EU legislation was most helpful or hindering in your biowaste valorisation process?**

The By-products/TSE-regulation limits which raw materials can be used as feed for insects. Today, only vegetable products and certain animal products like milk, eggs and honey can be used. Kitchen and food waste that contains meat or fish is not allowed. The legislation limits which valorisation technologies (for example insects and single cell protein) can be used on household food waste collected in Bergen region. The ROOTS policy paper created within HOOP proposes changes in the legislation regarding insects for animal feed and single cell protein. Details can be found in the ROOTS policy paper (Suárez et al., 2023) on circular policies for changing the biowaste system.

7.4. Greater Porto

The learnings in terms of funding and procurement in the region of Greater Porto are being collected and further discussed at the point of submission of this deliverable. After the upcoming national replication workshop in Portugal (scheduled for spring 2024) these learnings will be added and the deliverable will be updated accordingly. All learnings and experiences will be included in the translated version of the Portuguese national action manual.

7.5. Kuopio

1. **How did you get the necessary funding for your existing or planned biowaste valorisation technologies?**

For Biochar Pilot Reactor we applied successfully European regional development fund (ERDF) and simultaneously European Social Fund (ESF). The next investments should be taken care by industrial partners after the on-going piloting phase. In the future the Horizon Europe fund provides an international option to increase the impact in Finland and internationally.

2. **What is most challenging for you in terms of funding and procurement?**

Generally speaking, companies need to have their own financing in addition to project funding in technology development, because now with high energy prices, inflation, and lack of components, they concentrate on daily challenges and some companies invest less in development activities.

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Legislation development takes time, e.g. for farmers regarding biogas; if they want profit, they can only use 20 % themselves and they must sell rest in open markets. The other option is that farm uses 100 % of biogas they have produced and does not sell it at all in open markets. The law should be more flexible in order to attract wider interest in collecting biogas.

3. **What are risks that investors in your country usually discuss?**

According to research there are challenges with co-production: “the three main knowledge types – lay, expert, and scientific – are acknowledged by all actors, but are dealt with, to different extents, according to the roles played by different actors in the process of knowledge generation. Collaboration was reported to be largely project-oriented, enabled by funding, similar mindsets, and organisational/individual networks. Tensions included conflicting ideological positions held by various actors in the circular bioeconomy, mainly hampering the co-production of normative/target knowledge; funding-induced gaps and risks in inter-actor cooperation, mainly affecting process/system knowledge of the circular bioeconomy; and gaps and difficulties in cross-sectoral and cross-discipline engagement, mainly affecting predictive/transformative knowledge (D’Amato et al., 2022).

4. **What are some national funding mechanisms to look out for?**

In Finland these parties organise events for using funding instruments:

- The Regional Council of Northern Savo (regional): https://www.pohjois-savo.fi/
- Centre for Economic Development, Transport and Environment https://www.ely-keskus.fi/
- Business Finland https://www.businessfinland.fi/en/for-finnish-customers/services/funding
- European Commission https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home
- Finnvera loan provider: https://www.finnvera.fi/eng

5. **Which national (or EU) legislation was most relevant to your biowaste valorisation process?**

- European Green Deal, Environmental Protection Act, 527/2014, www.finlex.fi
- Waste law 17.6.2011/646, https://www.finlex.fi/fi/laki/ajantasa/2011/20110646
- The Circular Economy Action Plan (2015), The EU Bioeconomy Strategy (2018)

7.6. Münster

As of now, the German government is still reluctant to allow the technology of pyrolysis and the use of biochar in most of the related funding programs. Therefore, awm is currently looking more into European and other international funding opportunities. In general, they are searching for fitting grants but own equity could also potentially cover some of the costs. In terms of procurement, it is difficult to get used to the complex EU tools

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like open market consultations due to a lack of experience, skills and capacities. Overall there remain several interesting funding possibilities:

- Competition on energy efficiency
- Funding on energy and resources efficiency in the economy
- Federal funding on efficient heating grids (BEW)
- Investments on municipal climate protection models

In addition to funding, regulation also plays a crucial role. The Düngemittelverordnung (DüMV), a regulation on the use of fertilisers, is not harmonised with EU Fertiliser Product Regulation 2019/1009, which complicates the use of pyrolysis products in Germany unless they are derived from untreated wood. In addition, there are ongoing issues with the fact that pyrolysis plants are currently classified very inconsistently within the German Federal Immission Control Ordinance (BImSchV). If classified under 17th BImSchV, economic operation of the plants is significantly hindered due to much higher requirements (intensive exhaust gas monitoring, etc.).

7.7. Murcia

Interview with HOOP Partner Municipality of Murcia: Manuel Valls, Deputy Head of EU Department.

1. **How did you get the necessary funding for your existing or planned biowaste valorisation technologies?**

We received national funds for the pilot upscaling (for the nutrient recovery project). And also we received support from the ERDF at national level.

2. **What was/ is most challenging for you in terms of funding and procurement?**

In terms of procurement, the biggest challenge was the adaptation of the current budget to the new biowaste collection/treatment necessities and the procurement of additional services with the waste management company. For both of them we had to do an amendment in the respective contract.

In terms of national funds, we found no national funding line to implement the technological solutions identified in the frame of HOOP yet. So our funds seek is still an ongoing task.

3. **What are risks that investors in your country usually discuss? Why are investors and politicians in your country hesitant to fund circular bioeconomy technologies?**

There's a lot of funding for other strategic fields (energy efficiency, renewable energies) and not enough for circular bioeconomy.

R&D are in general not well funded in Spain. Circular bioeconomy technologies are state-of-the-art technologies, sometimes with a still low TRL. Also sometimes the bio-based products still face some legal barriers at EU level.

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The focus of Spanish policy and funding schemes currently lies on energy. So opportunities to have other resources of energy (biogas) is more relevant to investors than obtaining other innovative bio-based products.

How to solve these doubts?

We need to open a dialogue between the academia, the local administrations and national funding agencies. Academia, researchers, local, regional, and national administration should speak directly and exchange necessities from one side and provide solutions from the other.

4. **What are national funding possibilities/ events/ mechanisms to use?**

The NEXT GENERATION FUNDS and ERDF 2021-2027 were very helpful for us. Funding opportunities for Spanish cities and regions include:

- https://nextcarm.carm.es/
- https://next-generation-eu.europa.eu/index_es
- https://planderecuperacion.gob.es/
- https://www.fondoseuropeos.hacienda.gob.es/sitios/dgfc/es-ES/ipr/fcp2020/Paginas/inicio.aspx

5. **Which national (or EU) legislation was most helpful or hindering in your biowaste valorisation process?**

Some EU legislation was hindering to our HOOP (and preceeding VALUEWASTE) work. In the VALUEWASTE project, for example, we found some legal barriers to the usage of protein from larvae that was fed with organic waste. This protein can, according to current legislation, not be used as a feed and food, so this bioproduct cannot enter in the market.

7.8. Western Macedonia

1. **How did you get the necessary funding for your existing or planned biowaste valorisation technologies?**

We are in the process of searching the appropriate funding opportunity. Through the HOOP project DIADYMA submitted proposal for funding innovation public procurement with the contribution of Sara Bedin, who is an expert in that field. In the processes of applying for Greek funding, bureaucratic hurdles and the willingness of the Greek government to fund such projects, are always the main challenges to work with.

2. **What are risks that investors in your country usually discuss? Why are investors and politicians in your country hesitant to fund circular bioeconomy technologies? How to solve these doubts?**

After the economic crisis and the natural disasters that happened during the last years - such as earthquakes, wildfires and floods -, the Greek government is trying to recover or to give compensations to those who suffered

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most. Reacting to these multiple crises and establishing a more resilient system, has more priority to policy than circular bioeconomy policies or investments.

Therefore, EU funds are even more important for Greek municipalities and regions to promote circular bioeconomy projects.

Independent of whether we apply for national or European funding or engage with private investors, the main problem in Greece in the bioeconomy sector is the low quantity and sometimes also quality of biowaste collected. Therefore, focusing on citizen engagement and establishing efficient collection systems should, in our view, be the key first step and priority for Greek cities and regions on their bioeconomy journey.

3. **What are national funding possibilities/ events/ mechanisms to use?**

For us, most helpful are the following funding opportunities:

Just Transition Fund https://www.sdam.gr/taxonomy/term/56

the Green Fund https://prasinotameio.gr/

and Local – Regional Development Fund https://www.pdm.gov.gr/tag/topikos-poros/

4. **Which national (or EU) legislation was most helpful or hindering in your biowaste valorisation process?**

Very helpful for us is the national Strategy for Circular Economy from the Ministry of Energy in Greece. This strategy is a useful guide for the targets that must be met be each region.

You can find it here: https://ypen.gov.gr/perivallon/kykliki-oikonomia/16052-2/

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8. Reach out to us

Your journey to a more circular bioeconomy has already started. There are many cities and organisations eager to help you engage the right stakeholders in your city or region in order to convert more urban biowaste into high value-added products and increase the circularity of the biowaste streams. The project HOOP aims to support not only its Lighthouse Cities and Regions but also other cities and regions that are motivated to improve their biowaste value chains. Get support every step of the way and let's continue this journey together.

- Join the HOOP Network: https://hoopproject.eu/network/
- Join the HOOP Urban Circular Bioeconomy Hub: https://hoop-hub.eu/
- Engage with us on Linkedin: https://www.linkedin.com/company/hoop-project/

Unsure whom to approach first? Simply mail your questions to biowasteclubs@cscp.org and we'll be happy to help you and to connect you with the respective HOOP experts.

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9. Further reading

9.1. National Bioeconomy Strategies

Dutch National Circular Economy Program (2023-2030):

https://www.rijksoverheid.nl/documenten/beleidsnotas/2023/02/03/nationaal-programma-circulaire-economie-2023-2030

Dutch National Approach to Bio-based Building (2023-2030):

https://www.volkshuisvestingnederland.nl/documenten/publicaties/2023/11/07/nationale-aanpak-biobased-bouwen

The Finnish Bioeconomy Strategy:

https://www.bioeconomy.fi/facts-and-contacts/the-finnish-bioeconomy-strategy/

German National Bioeconomy Strategy:

https://www.bmel.de/EN/topics/farming/bioeconomy-renewable-resources/national-bioeconomy-strategy.html

Greek National Strategy for the Circular Economy:

https://circulareconomy.europa.eu/platform/sites/default/files/national_circular_economy_strategy_0.pdf

Italian Bioeconomy Strategy:

https://cnbbsv.palazzochigi.it/media/1768/bit1_en.pdf

Norway – "The Government's Bioeconomy Strategy":

https://www.regjeringen.no/contentassets/32160cf211df4d3c8f3ab794f885d5be/biookonomi-eng-kortversjon_uu.pdf

Portugal – "Portuguese Strategy for Sustainable Bioeconomy 2030 (under development):

https://www.gpp.pt/images/Destaques/Noticia/Bioeconomia/BioEconomia-RelatorioPrincipal-Visualizacao.pdf

The Spanish Bioeconomy Strategy - 2030 Horizon:

https://bioeconomia.chil.me/download-doc/102159

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9.2. Regional Bioeconomy Strategies

Bavarian Bioeconomy Strategy:

https://www.stmwi.bayern.de/fileadmin/user_upload/stmwi/publikationen/pdf/2021-02-15_FutureBioeconomyBavaria_BF_2020_02_15.pdf

Catalan Bioeconomy Strategy:

https://ruralcat.gencat.cat/documents/20181/9479472/EBC2030_EN.pdf/51d819d9-b139-4fb9-b297-278344bf72ea

Flevoland's Environmental Vision:

https://www.flevoland.nl/wat-doen-we/omgeving/omgevingsvisie-flevolandstraks

Sustainability Strategy Münster:

https://www.stadt-muenster.de/fileadmin/user_upload/stadt-muenster/67_umwelt/pdf/gnk_nachhaltigkeitsstrategie-muenster2030_entwurf.pdf

9.3. Other relevant H2020 or bioeconomy projects

AWARE Project: https://keep.eu/projects/25509/Against-Waste-Activate-Rese-EN/

BIN2BEAN: https://cordis.europa.eu/project/id/101113011

BIOCIRCULARCITIES: https://biocircularcities.eu/

CITYLOOPS: https://cityloops.eu/

FER-PLAY: https://fer-play.eu/

LIFE ENRICH: http://www.life-enrich.eu/

Raw Materials Collective Almere: https://amsterdamsmartcity.com/updates/project/upcyclecentrum-almere

ROBIN: https://robin-project.eu

SCALIBUR: https://scalibur.eu/

STARDUST: https://stardustproject.eu/

VALUEWASTE: https://valuewaste.eu/

WAYSTUP!: https://waystup.eu/

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11. Annexes

11.1. Baseline analysis template

Table 2 Example of indicators collected for baseline analysis

Indicator	Area	Unit	Explanation
Municipal biowaste	**Waste**	kg/cap. year	Total amount of biowaste produced in the region per capita. Includes: organic fraction from MMW + separate biowaste + green + PCW
Percentage of biowaste separately collected	**Waste**	%	Biowaste collected separately with respect to total amount of biowaste
Level of impurities in biowaste stream	**Waste**	%	When organic waste is collected separately, impurities in the biowaste stream
Municipal sewage sludge	**Waste**	kg/cap. year	Total urban wastewater sludge produced (dry basis) per capita
Biowaste sent to landfill	**Waste**	%	Total amount of biowaste landfilled annually
Bioproducts produced from waste	**Waste**	ton, m^3 or kWh	Quantity of bioproducts (biofertilisers, compost, protein, fibres, etc.) produced from OFMSW.
Water consumption	**Water**	million m^3	Total water withdrawn from the environment
Water reuse	**Water**	%	Reused water from sewage treatment plant
Renewable energy produced within the city	**Energy**	kWh/ year	Total renewable energy produced in the region per year

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Energy produced from biowaste	**Energy**	kWh/ year	Energy produced from biowaste
Awareness campaigns in the region	**Social**	nº	Number of initiatives/awareness campaigns at a city level for the reduction of waste
R&D projects related to biowaste management and treatment	**Economic**	nº/year	nº of R&D projects related to waste management and treatment in the region
Costs associated with OFMSW and or sewage sludge management	**Economic**	€/ton	Costs associated with OFMSW and sewage sludge management and treatment

Legislation – local/municipal/regional/national/EU level:

Question
Title of legislation (original language and translation if possible)
Date that it came into force/will come into force
Goals of the legislation
What are the implications for your Lighthouse? (Please answer in bullet points)
Has it already been implemented successfully in your Lighthouse? If not, what are the barriers? (Please answer in bullet points)
Other remarks

Circular economy strategies and policies:

Does your Lighthouse (or the wider region/ entire country – please differentiate on which level) have an urban circular bio-based economy strategy that includes the valorisation of urban biowaste and wastewater to produce bio-based products? YES/NO (All the following questions relate to this)

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Specify, if possible (you can support your explanations with links to the policies)

1. *Specific targets:*
2. *Implementation plans and timeframe:*
3. *Process monitoring activities:*
4. *Planned investments (€ and describe the investment objective, facilities affected/improved):*
5. *Role of the Lighthouse regarding the urban biowaste/ wastewater treatment facilities (is it the municipalities competence or is it managed by a private or public/private company):*

What type of stakeholder activities do you perform?

Please summarise the main plans regarding urban biowaste and wastewater

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Please explain the timeframe to implement the strategy in relation with urban biowaste and wastewater

Stakeholder engagement activities

What kind of engagement and awareness raising activities have been carried out or are currently being executed in your city or region? Who carries them out? Since when? Which are the target groups?

Main results

What influence did these activities have on the quality of the (bio-)waste?

What are in your view shortcomings in the current engagement activities and what are the main reasons for it?

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11.2. Stakeholder mapping details & template

As stakeholders within the HOOP project are considered any representatives of certain societal groups or of specific organisations – such as companies, industry sectors or public bodies - that are directly affected by or can affect the biowaste value chain. Following the quadruple helix model (Figure 13), the stakeholders can be divided into four main groups: civil society, academia, business and policy.

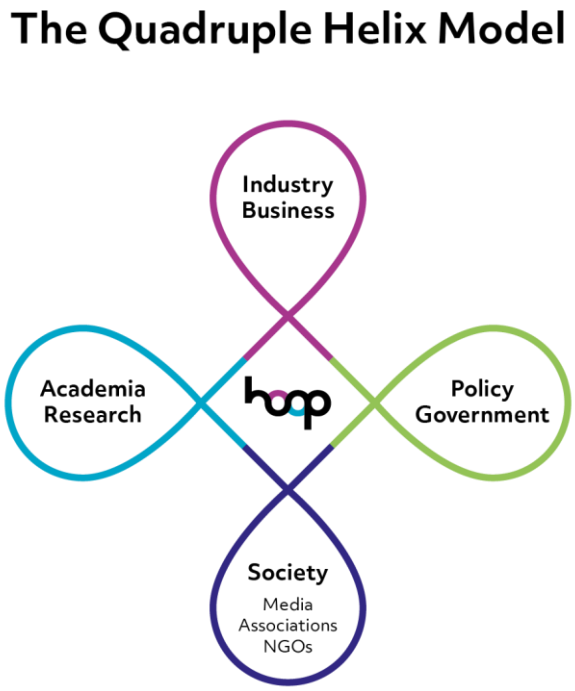

Figure 13 Sectors involved in multi-stakeholder engagement activities in HOOP

HOOP aims at bringing together stakeholders from all stages of the value chain. These include, for instance, the waste management companies, different public bodies and policy representatives, the local HoReCa sector, households and neighbourhood initiatives as well as the (potential) customers of the new biowaste-derived products

For the stakeholder mapping of the 8 HOOP Lighthouses, CSCP has – based on the work in the SCALIBUR project - developed a template which includes the following categories:

- Organisational details
- Type of organisation + main working areas
- Previous exchange and experiences with the actor
- Envisioned role in the project
- Ranking of the actor's influence on the success of the project + justifications for ranking

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- Ranking of the actor's interest in the project + justifications for ranking
- Impacts of Covid-19 on the actor and on collaborating with it
- Related activities of the actor in the fields of bio- and circular economy

Below the detailed template can be found including instructions on how to use them:

The stakeholder mappings per Lighthouse are shared as Microsoft Excel sheets among project partners.

Organisation name	website	Contact person(s)		Country	city
		Do you already have a contact to this organisation? Or in his other words: do you already have (a) specific person(s) in mind that you would approach first? IMPORTANT: please only indicate yes or no. Do NOT include any person's name or other contact data! (to comply with data protection regulations)	*if yes, his/her/ their role in the organisation*		

Type of organisation			Main fields of work	Previous exchange with this organisation	
1. chose from list	*2. if several apply or you can define the organisation type further, then please specify further*	*3. geographical outreach: where is this organisation mainly working*		If you have already been in touch, please give a few key words of the past cooperation	links to the most relevant previous shared projects, events, activities etc.

Dropdown menu on: Type of organization - 1. choose from list	
Consumer and citizens initiatives/Neighbourhood initiative/community leaders	
Non-governmental-organizations	
HoReCa sector (hotel, restaurant, catering)	
Retail	
Service providers, focus waste (e.g. waste collectors, treatment plants, waste management)	
Other service providers (e.g. energy)	
Industry large-scale (e.g. cooperation)	

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Business (medium- to small-scale): SMEs and/or local business owners	
Business (small-scale): entrepreneurs/start-ups	
Investors	
Research & Development	
Local public bodies /e.g. City council or municipality	
Regional public bodies (e.g. Regional government)	
National public bodies (e.g. ministries)	
Other	

Dropdown menu on: Type of organization - 3. Geographical outreach	
On neighbourhood level, in some parts of the Lighthouse	
On city level in the Lighthouse	
On regional level in the Lighthouse	
On local level somewhere else (NOT in Lighthouse)	
On regional level somewhere else (NOT in Lighthouse)	
On national level	

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On European level	
Other	

Envisioned role in HOOP project	INFLUENCE OF the stakeholder on the success of HOOP		INTEREST of the stakeholder in HOOP	
please rank if we should involve this organisation *1) in the Biowaste Club* *2) in other HOOP activities (e.g. online platform, network of follower cities) OR* *3) only relevant for outreach/ to keep them informed about HOOP activities*	*INFLUENCE 1: please* ***rank how much influence will this stakeholder have ON the success of HOOP*** *in your lighthouse. Or in other words: how crucial is it to involve this stakeholder successfully in HOOP activities?*	INFLUENCE 2: **WHY** is this stakeholder useful for HOOP in general (and if applicable: for the biowaste clubs in particular)? **WHAT** can they contribute to the success of HOOP (and the Biowaste Club) in your pilot city?	INTEREST 1: please **rank how interesting the HOOP project will be FOR the stakeholder**. Or in other words: how high can be HOOP's impact on the stakeholder?	*INTEREST 2: How do we win them for HOOP? Or in other words:* ***why*** *do you think the HOOP project is relevant and beneficial TO THEM?* *(Also helpful to consider: What is the stakeholder's wish with regard to bio-waste)*

Dropdown menus on: Ranking of influence and interest	
High	
Medium	
Low	

Impacts of Covid-19			Bioeconomy/circular economy projects	
How is the current Covid-19 crisis impacting this stakeholder? (e.g. in how far has the crisis changed the stakeholder's daily operations?)	Will it be easier or more difficult to work with this stakeholder in Covid-19 times?	*please explain (e.g. if stakeholder is open to and used to online events/ how your interactions with the stakeholder have changed due to Covid-19). // please also include: which engagement tools/ communication channels are you currently successfully using with this actor*	If applicable, please include keywords on **previous experience** in terms of bioeconomy/circular economy projects including the involvement of the stakeholder	Willingness of stakeholder to run **future initatives** on **bioeconomy/circular economy**

All of the categories and options can be adopted to the local context and in different scopes depending on the replication needs.

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11.3. Tools and services for securing investments

These can be found in the HOOP Hub: https://hoop-hub.eu/

Table 3 HOOP tools

Tool/ methodology	**Target stakeholder groups**	**Service description**
Circular Valuation Method (D4.2)	• *Investors.* • *Impact investors.* • *Regional and National authorities.* • *Municipalities.* • *Project developers.* • *Entrepreneurs that are doing pitches in e.g., investment boards.*	The Circular Valuation method is a clear and simple method for companies and public bodies to assess whether circular projects are financially attractive. Value for stakeholders: • *Seeing which projects are worth investing in.* • *The value lies in knowing how to get funding or financing.* • *Make the project more bankable.* • *Municipalities and other potential investors recognise the effort addressed to circularity.* • *To count on a self-assessment tool to evaluate different projects or different versions of the same project.*
Circularity assessment methodology (D3.5)	Cities & regions and bio-based industries.	Evaluation of circularity from a unified approach environmental and techno-economical
Due diligence process (D5.5)	Cities & regions, investors, and bio-based industries	This due diligence process was designed for the Lighthouses to identify, evaluate, proactively address, and reduce various risk factors that could impact UCBE projects. These established guidelines for due diligence are intended to offer HOOP's investors and project developers clear insights into the technical and financial risks associated with urban circular bioeconomy projects.
Citizen Science app HOOP Trainers (D6.3)	Cities & regions and civil society.	App developed to tackle key issues and research questions in a citizen science approach. Data gathering on behaviour and acceptance through the app

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Tool/ methodology	Target stakeholder groups	Service description
HOOP Bio-Circularity Label (D7.1)	• *European cities.* • *Regions.* • *Municipalities.*	This service offers the certification of the HOOP Bio-Circularity Label for cities that excel in biowaste valorisation. This process is needed to receive the "verified" label. Alongside the label, tailored consultancy services are provided to help cities develop a roadmap for improvement. Value for stakeholders: • *Have a common language to measure circularity.* • *Insights in performance (as a city).* • *Find areas to improve on.* • *Gearing towards a European standard for Circular Economy in cities.* • *Quantify the performance on bio circularity.* • *Compare performance with other cities.* • *Understand rooms for improvement.* • *Improve the attractiveness of the city.*
Ranking system for the financial maturity of projects (D5.3)	Cities & regions and investors	The HOOP Project Maturity Level (PML) is a standardised assessment, questionnaire, and ranking of six levels tool designed to gauge the maturity level of projects. It assigns a grade to each project based on several criteria, with the goal of enhancing their maturity and attractiveness for securing green financing and funding for implementation. The primary objective of the HOOP PML approach is to assist project developers, promoters, and investors in identifying which projects within their portfolio are investment-ready and which ones require further development. Simultaneously, this tool facilitates matchmaking between project developers/promoters and investors, aiding in the assessment and enhancement of the maturity and bankability of urban circular bioeconomy projects.
Online self-assessment tool (D5.4)	Cities & regions and bio-based industries.	Indicator of the bankability of a circular bioeconomy project

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Collaboration platforms

Table 4 HOOP online collaboration platforms

Platform	Target stakeholder groups	Service description
HOOP Network of Cities & Regions (D8.1)	• *Cities and regions.* • *Municipalities.* • *Associations of municipalities.*	• *Improvement of the circularity of the regions.* • *Gain access to state-of-the-art technologies and research.* • *A place to meet peers from across Europe.* • *To have a virtual place where relevant info on the urban circular bioeconomy can be found and exchanged.* • *Gain knowledge on urban bioeconomy initiatives.* • *Share experience and good practices.*
HOOP Urban Circular Bioeconomy Hub (UCBH) (D7.2)	• *European cities.* • *Investors.* • *Companies interested in new bioeconomy opportunities.* • *Public administration staff.* • *Academia.* • *SMEs.*	*A one-stop solution for cities and regions to transform biowaste and wastewater into valuable resources, fostering economic growth and sustainability. For investors and businesses, we provide access to a curated network of projects and a deep pool of expertise in the bioeconomy sector.* • *Networking Hub: Connect cities, investors, companies, and experts.* • *Knowledge Sharing: Facilitate the exchange of information and experiences.* • *Circular Economy Promotion: Provide tools and resources to help cities and businesses transition to a circular economy.* • *Biowaste Tech Education: Offer insights into biowaste valorisation technologies.* • *Resource Hub: Serve as a source of valuable information and best practices.*

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