



Collection and valorisation of urban biowaste

Tools and resources for cities and regions



Circular
Cities & Regions
Initiative

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1. Current situation

Biowaste (i.e. food and garden waste) is a key waste stream in the transition towards a circular economy.

The single largest component of EU municipal waste, with a share of 30-40%, biowaste contains valuable nutrients and organic compounds that can be recovered for further use and energy valorisation. When not disposed of responsibly however, it produces harmful greenhouse gas emissions.

Currently in the EU, biowaste is commonly either composted by households or treated at industrial scale via anaerobic digestion, which produces biogas, a renewable fuel. But there remains a large untapped potential: it was estimated that only around 16% of food waste was recycled in the EU in 2020. This indicates that most biowaste is currently not collected separately and is lost to landfilling or incineration.

Biowaste can also be the raw material for higher value products than compost or biogas. Research has shown the possibility to create safe and sustainable bio-products such as bioplastics and biofertilisers from biowaste, but few industrial scale activities have yet been launched.

2. EU regulation

1 January 2024 was a landmark date for biowaste. From then on waste managers across the EU are obliged to introduce separate collection of biowaste, or ensure recycling at source. This aims to dramatically speed up the capture and valorisation of biowaste.

And this is not the only change brought in by the [2018 Waste Framework Directive](#). New targets were introduced for landfill reduction and the preparation of municipal waste for reuse and recycling, which cannot be met without proper management of biowaste. An EU-wide target to recycle 65% of municipal waste by 2035 was put in place. Coupled with a ban on the incineration of separately collected biowaste, this will oblige waste managers to implement appropriate treatment methods to recover materials from biowaste.

To accelerate the EU's progress on food waste reduction, [the Commission proposed mandatory targets in July 2023](#). The targets state that, by 2030, Member States must reduce food waste by 10% in processing and manufacturing, and by 30% in retail and households.





Range of waste bins used for biowaste in Western Macedonia, Greece © DIADYMA



Truck for collecting biowaste in Western Macedonia © DIADYMA

3. Challenges

Urban biowaste is by nature a challenging material. Unlike other waste streams such as plastic or paper, biowaste decays quickly (especially in warmer climates), becoming a wet, fermented and smelly substance. This makes collection more time sensitive compared to any other waste fraction.

Collecting biowaste of sufficient quality is also a challenge. A homogenous substance, free from impurities, is needed to enable high quality recycling by downstream processes. But this is heavily reliant on accurate sorting by households and retailers.

The initiation of separate collection and management of biowaste requires strategic planning, taking into account local circumstances. There is no one-size-fits-all solution: each territory has its own specific considerations related to geography, demographics, waste composition, legal and financial constraints, etc.

A smorgasbord of innovative technologies are under development to convert biowaste into safe and sustainable bio-based products. But bringing these from the lab to the market poses a challenge for innovators. The upscaling of processes, financing issues, regulatory compliance, among other issues, create barriers to the adoption of many new technologies.

4. Meet the experts

CETENMA, the Technology Centre of Energy and Environment, is located in the South-East of Spain and they are the Coordinator of the HOOP project.

How does CETENMA support cities and regions to improve their biowaste management?

CETENMA supports cities and regions to improve their biowaste management through technical assistance and consultancy services, including laboratory studies for some technologies such as anaerobic digestion, fermentations or pyrolysis. We have elaborated circular economy strategies and action plans, for example for the [City of Murcia](#). In addition, and through the experience acquired in projects such as VALUEWASTE, we have a very good understanding of all the steps required for a successful biowaste management value chain, and access to examples from best performing territories.

What do you consider the most effective way to arrange the collection of biowaste?

Solutions can be as varied as the many characteristics of urban settings, like population density and logistics possibilities. However, the most successful cities and towns always have three factors in common: i) they accompany the collection with massive and constant awareness raising and motivational campaigns, ii) they arrange a door-to-door collection and iii) they adopt systems like pay-as-you-throw to encourage citizen to effectively separate waste. Some municipalities also count on surveillance and fining systems to discourage improper biowaste disposal. When door-to-door collection is not possible and containers in the street are required, an identified access (through an app, access card or key) reduces the dumping of improper material. Traceability is very important.

How does HOOP support the uptake of new valorisation technologies?

HOOP supports the uptake of new valorisation technologies by providing project development assistance (PDA) to urban circular bioeconomy (UCBE) projects in cities and regions, both from public and private initiatives. The UCBE project itself is the key dimension for the success of the uptake and therefore needs to be well defined. In case there is a public entity that has a clear problem/challenge, but no clear solution at high technology readiness, we recommend the innovation public procurement approach to allow the market to provide the most suitable solution. The assistance starts when HOOP provides the cities and regions with a portfolio of state-of-the-art technologies for valorisation of urban biowaste and, according to the territorial context, proposes the most suitable technologies for each place. This assistance is deployed by a multidisciplinary approach considering several factors. Then, together with the project-developers and the city/regional representative, a roadmap is established depending on the maturity of the project and the technology. This means building up technical and environmental studies, feasibility assessment, stakeholder engagement, life cycle assessment, and development of business models. This builds on the previous knowledge from mother projects (SCALIBUR, VALUEWASTE and WaysTUP!) and assistance from external advisors.

HOOP also engages the members of the [HOOP Network of Cities and Regions](#) in knowledge exchange activities, like webinars, study tours, and provides [financial or technical support](#). For them and for any user of the [HOOP Hub](#), HOOP develops resources, tools and methodologies to evaluate and tailor the assistance to boost the uptake of new valorisation technologies. This results in higher maturity and an increase in bankability, identifying the gaps and the opportunities to attract investors or to get funding.

Learn more about CETENMA

cetenma
Centro Tecnológico
de la Energía y del
Medio Ambiente

5. HOOP resources

The Urban Circular Bioeconomy Hub

The HOOP Urban Circular Bioeconomy Hub provides resources and tools to improve the valorisation of biowaste and wastewater by cities and regions. The section on '[Tools](#)' compiles a portfolio of tools to support investment decisions and the implementation of urban circular bioeconomy solutions. A number of relevant items can be found under the filter '[Technological Tools](#)', including:

- The [BioCircularCities tool](#), which supports the identification of the most suitable technological options for improving the biowaste management.
- The [Tech4Biowaste technology database](#). A dynamic database providing a complete overview of existing and emerging technologies for biowaste utilisation and valorisation.

Got a specific question or query about collection and valorisation of biowaste? Via the '[Request](#)' page you can ask for technical support from one of HOOP's expert partners.

[Go to the Hub](#)

Expert webinars

Experts from the HOOP project delivered two webinars addressing the collection and valorisation of biowaste. Recordings from each remain available as do the slides.

In the webinar '[Selective collection of urban biowaste](#)' technical experts and municipal representatives discussed common pitfalls and good practices for collecting a high quality organic fraction, with case studies from Lund (Sweden) and Murcia (Spain).

A following webinar '[Technologies for urban biowaste and wastewater valorisation](#)' highlighted some of the most promising technologies currently emerging from EU-funded research projects. Seven different innovations were presented, ranging from insect farming to biochar production.

[Explore the HOOP videos](#)

Technology factsheets

HOOP has elaborated a portfolio of alternative technologies for the valorisation of urban biowaste and urban wastewater sludge, to provide cities and regions with an overview of the available innovative circular solutions.

A number of technology factsheets have been produced, to describe in detail the process, the potential bioproducts, and the current stage of commercialisation. So far, four factsheets have been produced, focusing on the following technologies:

- Fermentation of used cooking oils (UCOs)
- Volatile fatty acids from acidogenic digestion of solid biowaste
- Nutrients recovered from residual dewatering liquid from anaerobic digestion
- Insect larvae farmed on biowaste or agri-food by-products

Look out for new factsheets on the HOOP Virtual Academy!

[Visit the Virtual Academy](#)



6. Dive deeper in the HOOP Virtual Academy

Key factors for selective collection

A [CEN Workshop Agreement](#) was produced within the VALUEWASTE project to provide guidance to city managers and waste managers about biowaste collection. The document sets out a step-by-step methodology for obtaining high quality biowaste and is intended to be of use to municipalities where separate collection of biowaste has not yet started, but who already have collection systems in place.

[Find out more](#)

Best practices for biowaste management

The SCALIBUR project collected best practices on different topics related to biowaste management, including collection and transport. The practices are compiled in this resource, which collates 34 of the most innovative practices. Each factsheet explains the practice in detail, and provides guidance on how to implement the action in another region.

[Download it here](#)

Urban biowaste solutions and good practices

This report, produced within the WaysTUP! project, shows a catalogue of urban biowaste valorisation solutions and good practices that are taking place in European countries. The main focus is technological, describing the advantages and disadvantages of emerging solutions.

[Access the report](#)

How to best collect bio-waste

This guidance document was created by Zero Waste Europe, a network organisation, and brings together best performing methods to separately collect biowaste. The paper focuses on door-to-door collection, which it argues to be the most effective method, and includes key recommendations intermixed with case studies from around Europe.

[Read more](#)



Waste collection on the Prinzipalmarkt, Münster, Germany - Rasmus Schübel ©AWM



Waste collection in the old town of Münster, Germany - Rasmus Schübel ©AWM

7. Key takeaways

1. The single largest component of EU municipal waste, biowaste (i.e. food and garden waste) is a key waste stream in the transition towards a circular economy.
2. Research has shown the possibility to create safe and sustainable bio-products such as bioplastics and biofertilisers from biowaste, but few industrial scale activities have yet been launched. Indeed most biowaste is currently not collected separately and is lost to landfilling or incineration.
3. From 1 January 2024, EU law requires waste managers to introduce separate collection of biowaste, or ensure recycling at source.
4. The most successful cities and towns at collecting biowaste have three factors in common: i) massive and constant awareness raising and motivational campaigns, ii) door-to-door collection and iii) adopting solutions like pay-as-you-throw to foster an effective separation at source.
5. A number of resources are available to help cities to launch and/or improve separate collection of biowaste, including step-by-step methodologies and an overview of best performing methods.
6. The HOOP Urban Circular Bioeconomy Hub provides resources and tools to improve the collection and valorisation of biowaste. Factsheets, plus a range of 'Tools', are available presenting existing and emerging technologies for biowaste utilisation and management.
7. HOOP expert partners are providing project development assistance support to cities and regions to launch urban circular bioeconomy projects. Specific requests for technical support can be made through a page on the HOOP Hub.

HOOP is a Horizon 2020 project that supports 8 lighthouse cities and regions in developing large-scale urban circular bioeconomy initiatives that will focus on making bio-based products from urban biowaste and wastewater.

[Visit our website](#)

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