



## Policy Brief

# Valorisation and Use of Biological Waste and By-Products Support the European Bioeconomy

This policy brief aims to provide a concise overview of the valorisation, sustainability and tracking and traceability (T&T) of organic residues in four different case studies assessed by the Horizon Europe project BioReCer. In this policy brief, aligned with the Waste Framework Directive 2008/98/EC and other relevant regulations, BioReCer makes recommendations to policy makers and urges a concerted effort to reduce fossil feedstocks and associated greenhouse gas emissions. This can be achieved by increasing the use of sustainable organic residues in support of the EU circular bioeconomy and the European Green Deal. The application of adapted current certification schemes for bio-based value chains is emphasised as a central solution.

## The BioReCer Project

The Horizon Europe project Biological Resources Certifications Schemes (BioReCer) aims at assessing and complementing current certification schemes for biological resources according to the new EU sustainability goals in order to enhance bio-based circular systems. This will be achieved by including new criteria that align with EU taxonomy and EU corporate due diligence regulations into guidelines for certifying biological resources' sustainability, origin, T&T, and by ensuring applicability in the EU and at global scale. Also, standardisation plays a crucial role as a tool to support European legislation and policies, particularly to ensure the trust, safety and well-being of citizens and the protection of the environment. By promoting the sustainability and trade of biological resources (with a focus on organic residues), BioReCer aims at increasing the added value, use, as well as social acceptance of bio-based products.

The assessment of the four BioReCer case studies, i.e. waste(water) and by-products from agriculture, municipalities, industrial fishery and forestry, on value chains based on organic residues<sup>1</sup> provide the solid basis for the upcoming guidelines to adapt the current certification schemes for biological feedstocks and bio-based value chains.

<sup>1</sup> including agricultural waste from relevant fruits, waste and wastewater from fish canning industry, marine debris/algae, organic fraction of municipal solid waste (OFMSW), sewage sludge from municipal wastewater, forestry by-products and residues

## Recommendations

Based on the insightful results of the assessment of the four bio-based case studies, BioReCer presents the following concise recommendations:

### 01 Organic residues should be treated as resource and not as waste

The tapping of biological waste and other organic residues as valuable feedstock supports the sustainable transition of the EU and the compliance of the European Green Deal<sup>2</sup> in the following ways:

- i) Waste ceases to be waste, which aligns with the Waste Framework Directive 2008/98/EC, Art. 6.
- ii) Landfill is prevented and land use is optimised as according to the Landfill Directive 1999/31/EC.
- iii) Waste is prevented and the resources used are kept in the EU economy for as long as possible, which aligns with the Circular Economy Action Plan<sup>3</sup>.
- iv) The utilisation of food crops for energy or material is reduced.
- v) The EU recycling targets can be reached by making use of municipal waste as a resource.
- vi) In alignment with corporate due diligence, products become sustainable just by reducing greenhouse gas emissions and pollution, by conserving fossil resources, by creating jobs and stimulating the development of green technologies.
- vii) SDG17 can be reached by protecting air, soil and water quality thus counteracting climate change and biodiversity loss.
- viii) Furthermore, the use of organic residues reduces the dependency of the EU on non-EU countries and fossil feedstock providers.

### 02 The use of organic residues for bio-based products should be fostered in the EU

This should be enforced in all cases in which organic residues cannot be reduced or minimised. Currently, organic residues are mainly channelled into renewable energy production, and thus valuable feedstock for material use is already tied up there. Financial incentives should therefore either be newly created or diverted to encourage the production of bio-based products from biological waste and other organic residues.

### 03 The collection of organic waste and residues should become mandatory in all EU countries

The Waste Framework Directive 2008/98/EC, Art. 11(1) should therefore be adapted to enshrine organic waste collection in law. The Waste Framework Directive obliges member states to implement separate collection of bio-waste latest from the beginning of 2024<sup>4</sup>. In this context, the establishment of appropriate collection and management structures for biological waste and other organic residues should be promoted and supported.

### 04 Adapted certification schemes should be recognised as the central solution to avoid greenwashing and consumer deception, and to guarantee corporate due diligence

Concise certification will ensure T&T of biological feedstock and that global value chains are just and sustainable. Furthermore, certification of organic feedstock and bio-based products will ensure that green claims are based on generally recognised scientific evidence and relevant international standards (see proposal of the Green Claims Directive). It will then be easier for consumers to distinguish between sustainable and non-sustainable products.

<sup>2</sup> [https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal\\_en](https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en)

<sup>3</sup> [https://environment.ec.europa.eu/strategy/circular-economy-action-plan\\_en](https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en)

<sup>4</sup> European Compost Network, ECN Guidance on Separate Collection, 2022

(<https://www.compostnetwork.info/download/ecn-guidance-on-separate-collection/#:~:text=In%202024%2C%20EU%20member%20states,to%20save%20organics%20in%20soil>)

## 05 | Mass balance and free attribution (MBFA) should be implemented in EU policy to facilitate the transformation of the EU economy to a circular bioeconomy, to abstain from fossil resources and to tap and promote new renewable resources from organic residues

The term “mass balance” describes bio-based products for which biomass is used as a feedstock but where this sustainable feedstock is mixed with conventional material (e.g. if the biological feedstock is not available in sufficient amounts). “Free attribution” means that the share of fossil feedstock does not necessarily be specified as a percentage in certain selected end products. Thus, the MBFA approach enables the substitution of large quantities of fossil resources with biomass, while at the same time facilitating the gradual transition to a circular bioeconomy as according to the EU bioeconomy strategy<sup>5</sup>. Both, mass balance and the free attribution are based on solid and established certifications. Therefore, MBFA should be applied by the EU as an approach to defossilise the industry, i.e. to stepwise abstain from fossil resources and increase the share of renewable feedstock in products and materials.

## 06 | Concise consumer information and awareness activities on bio-based products should be promoted

Utilising organic residues for bio-based products represents a paradigm shift where waste is treated as a resource, aligning with EU directives and sustainability goals. However, consumer apprehension persists due to misconceptions and lack of trust. To address this, it is imperative to implement targeted consumer awareness and education campaigns. These initiatives should emphasise the value proposition of bio-based products, highlighting their environmental benefits, reduced carbon footprint, and contribution to circular economy principles. Moreover, clear communication on certification schemes and sustainability credentials will help consumers make informed choices. Such efforts are essential to dispel greenwashing and ensure consumer confidence in bio-based products. By empowering consumers with accurate information, we can foster a market environment conducive to the sustainable uptake of bio-based products and drive the transition towards a circular bioeconomy.

## Context

Organic residues are classified as either biological waste or by-products (see Waste Framework Directive 2008/98/EC, Art. 5). The differences in origin, for example from municipalities, industry, agriculture, forestry, and nature (liquid or solid) is a challenge for collection and waste management. Organic residues are not necessarily collected in all EU countries<sup>6</sup>, and there are heterogeneous national waste management regulations in different EU countries. Furthermore, while reuse, prevention or minimisation of waste is generally desirable (e.g. food waste reduction), it is difficult to impossible for organic residues.

**Organic residues in the EU are usually marketed with low added value and managed with the least favourable waste management options<sup>7</sup>.** For example, 24% of municipal waste in the EU was landfilled in 2018<sup>8</sup> which is in contrast to the Landfill Directive 1999/31/EC that encourages the use of recovered materials to prevent landfill and to avoid deleterious effects on human health and on the environment, e.g. through the release of methane, which is a potent greenhouse gas.

Another common end-of-life solution for biological waste and by-product streams in the EU is to make use of them for energy recovery such as biogas production. In addition, organic residues are often only recycled through composting, or recovered for soil amendment or as fertiliser, as in the case of sewage sludge. **This leads to the loss of organic residues as valuable feedstock, although their carbon content would make them ideal for replacing fossil resources.**

<sup>5</sup> [https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy/bioeconomy-strategy\\_en](https://research-and-innovation.ec.europa.eu/research-area/environment/bioeconomy/bioeconomy-strategy_en)

<sup>6</sup> Waste Framework Directive 2008/98/EC, Art. 11(1)

<sup>7</sup> As according to waste hierarchy, see Waste Framework Directive 2008/98/EC, Art. 4

<sup>8</sup> [https://environment.ec.europa.eu/topics/waste-and-recycling/landfill-waste\\_en](https://environment.ec.europa.eu/topics/waste-and-recycling/landfill-waste_en)

The systematic valorisation and use of organic residues in value-chains for bio-based products is still poorly developed in the EU. Therefore, a thorough assessment of different value chains based on organic residues is indispensable. For this assessment, certain criteria must be fulfilled: The use of biological waste and by-products must be sustainable<sup>9</sup>, corporate behaviour must guarantee that global value chains are just and sustainable and tracking and traceability (T&T) of feedstock through the whole value chain must be guaranteed, as provided for in the proposal for a Directive on Corporate Sustainability Due Diligence<sup>10</sup>.

Currently, the systematic assessment of organic residues as feedstock and bio-based value chains is challenging: There is a lack of data availability, T&T is difficult since value chains are often very long due to numerous intermediate processing steps, and the potential of biological resources produced in a region is often underestimated or unknown. Also, there is a lacking trust of consumers because of unsubstantiated green claims and because bio-based products from waste are often incorrectly associated with lower quality by consumers. To dispel these concerns, **appropriate certification of organic residues as feedstock and their value chains is required**. However, current sustainability certification schemes are not always sufficiently laid-out for bio-based waste streams and their value-chains.

## Results from Project

### Volume and management of organic residues

In the EU, agriculture and agro-industry are significant contributors to the overall available secondary biomass<sup>11</sup>, and nearly one quarter of the available industrial fisheries biomass is waste. In all four case studies, **substantial volumes of waste and by-products are generated** either directly during harvesting or downstream, e.g. during food processing or in the context of pulp and paper production.

**Biological waste and by-products are mainly treated via disposal, landfill, composting, anaerobic digestion, incineration or for energy generation.** Furthermore, in the case of forestry by-products, the material flow analysis carried out in BioReCer showed that approximately 50% is recycled as material for the traditional wood industry (panel production and pulp and paper industry), while ca. 33% of agricultural residues are used as animal feed. The management of sewage sludge is not well defined since the destination of ~17% is unknown or not specified.

### Collection of organic residues

The assessment of the case studies makes clear that **in the EU substantial volumes of organic residues are not collected and thus not accessible for the bio-based industry**: In agriculture, ca. 78% of the totally generated quantity of residues generated during harvesting (straw, stems and stalks) is not collected. This is because they are often left in the field for soil amendment purposes. Also, only 32% of the potentially generated organic fraction of municipal waste is separately collected and managed sustainably in the EU.

### Valorisation and applications

**The integration of residual biomass flows into higher-value applications is relatively low for all organic residues.** According to the material flow analysis in BioReCer, only a very small percentage of organic residues are valorised and proceed to the bio-based industry (e.g. forestry: 3%, OFMSW: 2%, sewage sludge: 0.3%). The bio-based industry based on agricultural by-products is still relatively small compared to the biological processing of primary agricultural products.

This is because of constraints that hinder valorisation; these are

- i) spatial distribution that renders logistics management complicated and incurs high costs,
- ii) seasonality in residue production, and
- iii) the production of large volumes and difficulties in their storage.

Also, the data on valorisation for the bio-based industry in fisheries is insufficient. **Thus, substantial volumes of valuable carbons and compounds are lost for the bio-based industry.** These are for example proteins, lipids, collagen and fat-soluble vitamins contained in fish waste.

The current applications of organic residues for bio-based products are agrochemicals including organic fertilisers, bioplastics, bio-composites, cosmeceuticals and surfactants. **However, there are many prospects of development of the circular bio-based industry, as many technologies are under development, already available or even on the way to commercialisation.**

<sup>9</sup> Taxonomy regulation 2020/852

<sup>10</sup> [https://commission.europa.eu/publications/proposal-directive-corporate-sustainability-due-diligence-and-annex\\_en](https://commission.europa.eu/publications/proposal-directive-corporate-sustainability-due-diligence-and-annex_en)

<sup>11</sup> i.e. biomass that does not originate from food crops or wood