BIO CIRCULAR CITIES

Exploring the circular bioeconomy potential in cities

Definition of the Scope of Circular Bioeconomy for biowaste management in urban areas

Public Summary

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Introducing the Biocircularcities guidelines

To foster the transition towards sustainable biowaste management system in compliance with the circular bioeconomy principles across Europe, the Biocircularcities project intends to develop guidelines facilitating the replication of the approaches defined and experienced in each of the three regional pilots involved in the project: the Pazardzhik Province (BG), the Metropolitan City of Naples (IT) and the Metropolitan Area of Barcelona (ES). Available through a web application, the Biocircularcities guidelines will aim at overcoming the lack of easily accessible tool helping public authorities and private entities to identify the available technologies for such transformation, depending on a set of criteria largely influenced by the local context.

What defines biocircular transition pathways?

The report "Definition of the Scope of Circular Bioeconomy for biowaste management in urban areas", available on the Biocircularcities website, identifies and structures the principles, concepts, contextual values and parameters of influence for the design of new biocircular value chains and technical pathways for biowaste valorisation and treatment. The analysis targets the generic context of circular bioeconomy implementation, with a particular care for the scope of the Biocircularcities regional pilots waste streams, which are the value chains for the valorisation of: (i) organic fraction of Municipal Solid Waste in Barcelona, (ii) organic residues from agro-industrial chain in Naples, and (iii) residual biomass from forestry and related wood transformation activities in Pazardzhik.

To identify these parameters, two elements were taken into consideration: the definition and scope of the global Circularity, Sustainability and Bioeconomy concepts on the one hand, and the associated European targets and incentives on the other hand. The ultimate purpose of a sustainable, circular bioeconomy strategy for biowaste valorisation is to support the transition towards systems whose environmental impacts are reduced to a minimum, and that bring societal benefits, through the development of economically viable technological solutions. The viability of any sustainable, circular bioeconomy value chain for the reduction or the valorisation of biomass waste, as well as the selection of the best technological option(s) to be implemented depend on multiple factors. Therefore, public and private decision makers belonging to the the Biocircularcities biomass waste value chains must be guided towards the most efficient strategy fitting their targets and interests.

Identifying the most suitable biocircular value-chain

The Biocircularcities guidelines will be developed as a supportive tool for the identification of the most suitable value chain, through the identification of the most suitable bio-circular technologies. The guidelines shall be

replicable to different types of biomass waste, given any geographical, political and socio-economic contexts. They intend to screen the socio-economic, political and environmental context of the territory in which the value chain shall be implemented, and to evaluate which technological pathway(s) for the biowaste valorisation would be potentially compatible with the described surrounding context.

In practice, a portfolio of technologies must be created, and each technology shall be characterised according to a list of criteria allowing to identify if the technology is compliant with the characteristics of the context in which it should be implemented. The list of criteria shall reflect the drivers and barriers systematically influencing strategic choices, decisions and operations along the biomass waste value chain.

Hence, the Biocircularcities partners conducted a state of the art of the main drivers and barriers towards the development of sustainable circular bioeconomy value chains for biomass waste management, together with a literature review. They identified seven "driving forces" for a successful sustainable, circular bioeconomy strategy, constituting categories under which the influencing drivers and barriers were grouped:

1. Appropriate and up to date policy framework;
2. Shift to more sustainable consumption patterns in support to the market transition towards sustainable circular bioeconomy;
3. Cross sectoral cooperation and innovation;
4. Development of a skilled and competent workforce at the European level;
5. Sustainable management and use of biological resources;
6. Funding and investment resources to support the development of a competitive, sustainable, circular bioeconomy;
7. Ensuring the transition to a sustainable circular bioeconomy.

Criteria of influence for decision making

This conducted to the definition of a set of almost thirty criteria of influence for decision making regarding the design and development of sustainable circular bioeconomy value chains and associated technological solutions. These criteria can be intrinsic to the feedstock properties (e.g. composition and quality in terms of content of high-value substances or molecules, presence of contaminants…). An overview of these criteria is available in the following page.

The efficiency of technological options for recycling or recovery is also of influence, as well as the potential associated technical constrains. The most convenient pathway towards waste biomass valorisation strongly depends on drivers and barriers related to the local political and socio-economic context such as the local political agenda or the availability of financial support, and on the potential sustainability strategic targets for the local authorities and private stakeholders endorsing the responsibility of waste biomass management.

List of influence criteria for the choice of a suitable bio-circular technology for the valorisation of organic and wood based biowaste, depending on cities and urban areas specific context, and on specific characteristics from technologies.

Criteria to be specified by the web application user in regard to the context of the waste stream under consideration at city or regional level	
1. Feedstock and current system characterisation	Compatible feedstock
	Continuous and regular availability of feedstock
	Sorting at source / Separate collection system
	Specific sorting after collection in order to separate the organic fraction
	Non-hazardous contaminant acceptance / High quality feedstock
	Capacity (in terms of feedstock acceptance) for one average single plant
	Price and price stability of feedstocks at the end of waste state compared to landfill tax
	Compatibility with multi-regional vs. local supply chain
	Waste hierarchy category (Recycling (high value), Recycling (medium and low value), Recovery (Energy and heat), Disposal)
	Potential contribution to EU targets for energy recovery from biowaste
	Potential contribution to EU biowaste recycling targets
2. Type of end product targeted	Category of the economic value of the end product
	Capacity (in terms of feedstock acceptance) for one average single plant
	Existing regulation regarding the product output (EU quality and safety standards…)
	Social acceptance of a new product
	Competitiveness compared to conventional products / market price for the bio-based products
3. Environmental performances	Conventional product counterpart / Substitution potential
	Target for CC Impact reduction (%) compared to conventional counterpart
	Process energetic yield (CED produced vs. CED consumed)
	Reduced land surface used compared to conventional counterpart bio-based resource
	Other significant sources of environmental impacts (toxicity, air emissions, waste…)
4. Political and economic incentives	Need for developing specific competences
	Additional specific equipment required (for any of the various processing steps) compared to the current situation
	Available subventions from the EU Commission /national or regional entities (Yes / No–- Which conditions?): taxes, fees, economic incentives, or subsidies
	Net benefits (Value added vs. life cycle costs, considering available subsidies)
Sustainability performances of technologies – Information provided by the tool for each technology identified as suitable for the specific city / region context	
Indicators provided for the potentially suitable technologies identified	Potential for job creation
	Purpose of the end product
	(When relevant) Possibility to recycle, recover or reuse the product at its end of its life

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