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D3.1 – Development of the factsheet template for the biobased catalogue

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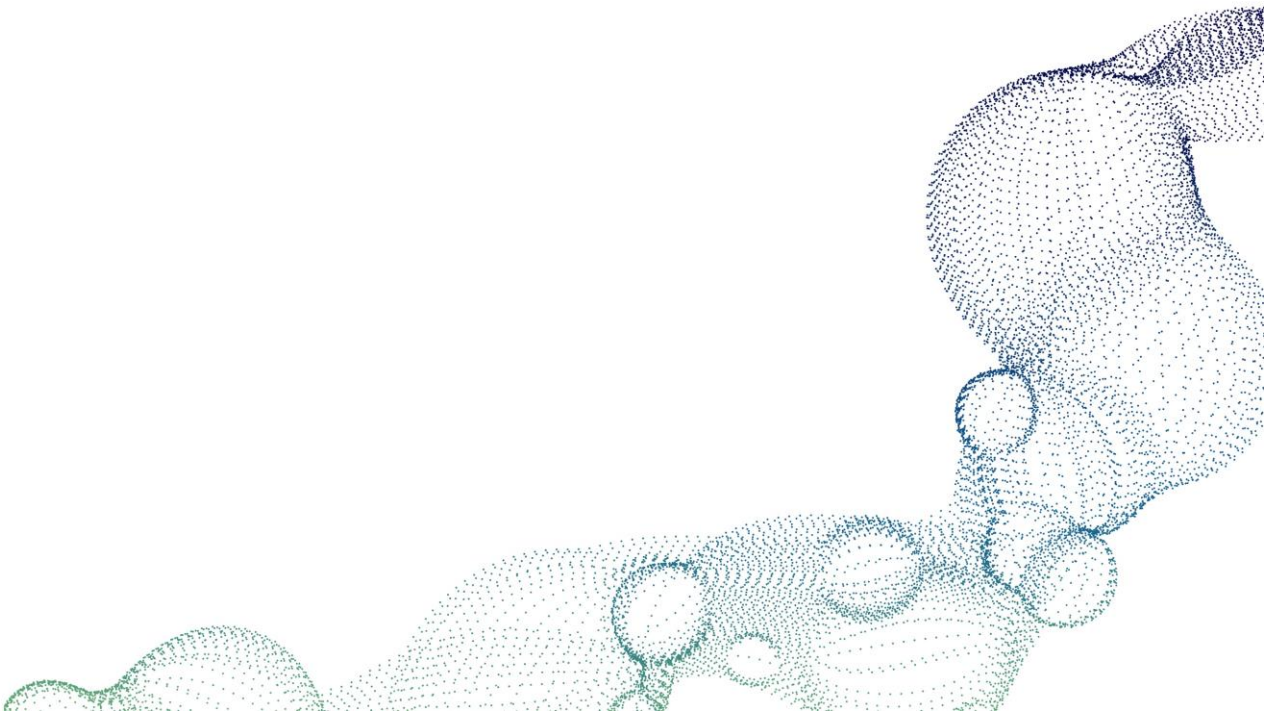

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DISSEMINATION AND UPTAKE

The document is confidential only for members of the consortium (including the Commission Services). It shall be used by all partners within the project.

VERSIONS AND HISTORY OF CHANGES

Version	Due date	Author/Editor	Contributors/ Reviewers	Description
V1	27.10.2023	WR	CIRCE, INCE	First version of the D3.1 was provided to the work-package leaders for their revision and feedback
V2	21.11.2023	WR	UHOH, CERTH, AUP, RCISD	Second version of the D.3.1 was send to the regional partners representatives
FV	11.01.2024	WR		Final Version

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1. Introduction

BIOLOC has the objective to inspire and support the communities of twelve European regions (BIOLOC regions) to unlock and propel local development potentials pathways towards Circular Bioeconomy.

The Bioeconomy uses renewable biological resources from land and sea, like crops, forests, fish, algae, animals and micro-organisms to produce food, materials and energy. It is also a mean to modernise and strengthen the EU industrial base, creating new value chains and greener, more cost-effective industrial processes, while protecting biodiversity and the environment (European Commission , 2023). The main objective of the Bioeconomy is transitioning from fossil resources and from a linear economy to a sustainable biobased future with circular economy principles. A business or technology operating within the circular economy principles must function within environmental and social limits while being economically viable. (Holden N.M., 2022).

The successful implementation and/or commercialization of biobased solutions cannot only be focussed on technological innovations and profitability, without addressing the social challenges faced by European communities (e.g., depopulation, ageing population, difficult access to infrastructure and services, social exclusion for certain groups and unemployment) which call for inclusive business models and an inclusive business environment.

WP3 'Catalogue of biobased solutions and good practice examples', aims to summarize realistic biobased solutions and best practices developed by European Circular Bioeconomy frontrunners (including techno-socio-economic parameters and concepts) that are relevant to the 12 BIOLOC regions, and that are in alignment with their bioeconomy's strategies. By providing information on sustainable, innovative, tangible and participatory biobased solutions, BIOLOC expects to contribute to the revitalization of the local economy and to support its local needs.

WP3 is composed of four different tasks that will provide different deliverables as shown in table 1. The deliverable D.3.1 is the development of the factsheet template. Originally, this deliverable would also include the Societal Readiness Level (SRL) concept to assess of readiness of the solution in terms of social and societal aspects of innovations; innovation landscape of circular biobased economies and societies; conditions for behavioural change; regional perspective. However, the SRL concept is still under development and work is still in progress. For this reason, an additional document will be presented (D 3.1 b). Both deliverables D 3.1a and 3.1b will be used to build the main deliverable of WP3, D.3.3 'Catalogue of biobased solutions with potential social inclusion'.

This document (D 3.1) describes the results of Task 3.1 'Development of the factsheet template for the biobased catalogue'. This task is about setting up the list of relevant aspects of different biobased solutions to get a holistic view and good understanding of the solutions to be included in the biobased catalogue (D 3.2/3.3). This report describes the general approach and methodology that is followed for the preparation of the factsheet template for BIOLOC Biobased Catalogue.

Table 1: WP3 tasks and deliverables.

Tasks	Deliverables
3.1 Development of the factsheet template, list of different concepts of the biobased catalogue	D 3.1a Factsheet template for biobased catalogue (D 3.1b Development of the SRL concept)
3.2 Development of the catalogue of biobased solutions according to the concepts established in task 3.1.	D 3.2 Draft catalogue of biobased solutions
3.3 Inclusion of good practices section to the catalogue	D 3.3 Final catalogue including good practices
3.4 Presentation of final version of the catalogue (guidelines and recommendations to the users)	

Task 3.1 and D3.1, were mainly developed by WR. The revision of the first version of D 3.1 was done by several partners involved in WP3 (CIRCE, INCE) while the second draft version was reviewed by the BIOLOC regional partners representatives (UHOH, DGA, CERTH, AUP, BICB, ACIS, DOOR, RCISD, BUAS, AVO, GA, SPRI).

The last deliverable D 3.3 'Catalogue of biobased solutions and good practice examples', will include technologies and social innovations that can contribute and provide guidance to regional challenges of the BIOLOC regions with a balanced perspective (considering economic, environmental and social and organizational aspects).

D 3.3 will contain useful information on the technology, the operation, the challenges and considerations in the development process of the biobased solutions, as well as their environmental and social impacts, including a description of identified linkages of the main technology with other technologies, social and/or financial institutions with which it cooperates or interact. To accomplish this, in task 3.2 information on the regional strategies, the local needs, applicability of certain business sectors in the regions will be collected from WP2 like D 2.1 'Report of the analysis of the variety of bioeconomies at local communities', D 2.2 'Report with regional biobased systems description' and D 2.3 'Report on local needs conditions and from talks with the representatives of the 12 BIOLOC regions.

2. Biobased Solution Catalogue-Factsheet Preparation

Twelve different countries participate in this project. Each country proposed a specific area(region) to be evaluated and supported. These areas are named BIOLOC regions. A BIOLOC region can be represented on the level of a municipality but also a whole country could be the scope of the study and support. Table 2 shows the participating regions.

Table 2: BIOLOC regions and corresponding NUTS-2 regions

	Country	BIOLOC regions	Corresponding NUTS-2 regions
1	Bulgaria	Plovdiv region	South Central Bulgaria (Yuzhen Tsentralen)
2	Czech Republic	Moravian-Silesian region	Moravian Silesian (Moravskolezsko)
3	Germany	Baden-Württemberg region	Stuttgart Karlsruhe Freiburg Tübingen
4	Greece	Western Macedonia region	Western Mazedonia (Dytiki Makedonia)
5	Spain	Aragón region	Aragón
6	Croatia	Adriatic region	Adriatic Croatia (Jadranska Hrvatska)
7	Italy	Campania region	Campania
8	Hungary	Northern region	North Hungary (Észak-Magyarország)
9	Netherlands	Apeldoorn region	Gelderland
10	Romania	West region	Western Romania (Vest)
11	Slovenia	Whole country	Eastern Slovenia (Vzhodna Slovenija) Western Slovenia (Zahodna Slovenija)
12	Slovakia	Nitra region	Western Slovakia (Západné Slovensko)

The different needs and requirements of the BIOLOC regions require specific analysis of the solutions. The information about their needs and the inclusion of the good practices will be collected in task 3.2 and will be presented in D 3.2/3.3. However, to present in structured way the selected biobased solutions to the regional stakeholders, the first step is to develop the catalogue's factsheet.

During the development of the factsheet (D 3.1), it was decided what is the most important and essential information to describe the biobased solution and how to organize the information to communicate it to the regional partners. Furthermore, it is important to consider that sufficient information should be available to give a reliable description of the selected biobased solutions.

In D 3.1, the list of content topics to be addressed in the factsheets was proposed by WR and jointly reviewed and modified by several partners of the project, including representatives of the targeted end-user groups.

The BIOLOC catalogue will standardize aspects like feedstock names and product names of the solution and will also include the social aspects. To accomplish this, three relevant projects, Power4bio[1] , MainstreamBio and Biorefinery Outlook 2030 are used as main references in development of D 3.1.

The first two projects already reported biobased solutions' catalogues The Power4bio project focused on biobased solutions for resource-efficient biorefineries with tested potential for market uptake (high TRL) while the MainstreamBio project addressed small-scale bio-based technologies, business models and social innovations. The concepts included in the BIOLOC catalogue are aligned with the descriptions of these two projects. Additionally, a close collaboration was ensured during the preparation of the BIOLOC catalogue's factsheet template with Bert Annevelink and Martien van den Oever experts of Wageningen Research involved in the Power4Bio and MainstreamBIO projects.

The Biorefinery Outlook 2030 project was used as a starting point for the identification and categorization of technologies and products.

For deliverables (D 3.2 / D 3.3) of WP3, the following European projects will be used as main references to the biobased solutions catalogue: AgriForValor(2016), Bioways (2018), SIMIRA (2020), BE-Rural (2019), CELEBIO (2020), BioEast (2022), WaysUP (2020), BLOOM (2020), Power4Bio (2020) and MainstreamBio (2023).

[1] "emPOWERing regional stakeholders for realising the full potential of European BIOeconomy'

3. Description of concepts, approach and methodology of factsheet template

The descriptions of the different concepts and sections included in the factsheet template are presented in this section. For each section, information on the approach and methodology is provided. The template format is presented in Section 3.1.

In this project, we need to define the concept `biobased solution'. A **biobased solution** in the BIOLOC context is defined as a technological innovation or a social innovation that aims to contribute to the updated EU Bioeconomy strategy (European Commission , 2018), the EU Green deal in 2020 (European Commision , 2019) and the Circular Economy action Plan in 2020 (Commision, 2020), which are clearly integrating food and non-food production as part of a strategy to develop a single coherent bioeconomy (Philippidis, 2018). To deploy local and circular bioeconomies, BIOLOC supports and promotes all types of innovations and practices for sustainable food and farming systems and biobased products[2] (e.g. biobased chemicals, plastics, materials and heat and energy).

In the context of BIOLOC, focusing only on the technological, economic and environmental aspects of a solution narrows the scope of the biobased solution. The development of sustainable solutions in the bioeconomy should also consider the social innovation and institutional sustainability. Social innovation is a means for addressing a number of social, economic and environmental challenges that neither classic tools of government policy nor market solutions are able to solve (OECD, 2023) and it requires the participation of various stakeholders to tackle global and local issues, including environmental challenges and their impacts on people's lives, health, and wellbeing. Therefore, it is important to identify how the biobased solutions are contributing to solve social challenges (e.g. depopulation, difficult access to infrastructure and services, social exclusion for certain groups) and more institutionalised societal aspects.

The social aspects to be covered in this catalogue may include information on triple[3] or quadruple helix[4] model on actors' involvement in the solution, their contributions, required education and skills for the solution, information on social and legal drivers and barriers for the implementation of the solution, civil society awareness and engagement.

The factsheet contains a short description and several characteristics of the solution, as well as info regarding suitability of biomass feedstock for production of the target product, benefits of the solution related to the value chain and specific constraints for implementation.

[2] In this report biobased products refer to bio-based chemicals and materials which is in aligment with the definition of biobased product reported Biorefinery Outlook 2030.
[3] The Triple Helix Model refers to a set of interactions between academia (university), industry and government, to foster economic and social development.
[4] The Quadruple Helix Model of innovation recognizes four major actors in the innovation system: science, policy, industry, and society. In keeping with this model, more governments are prioritizing greater public involvement in innovation processes.

The specific content of the factsheet is presented in the following sections/themes:

- General description
- Feedstock
- Technology
- Products
- Environment impact
- Financial aspects
- Institutional and Organizational aspects
- Public perception and Social impact
- Challenges for implementation

The collection of information will be done from bibliographic references, expert knowledge from project partners and if feasible by contacting solution owners for further information. More detailed information on the requirements of the different section of the template are reported next.

Section A-General

This section provides a concise description of the solution and keywords to facilitate the users to identify and navigate through the catalogue, and provide the reference link to the owners of the solution in case more information is required.

Section B-Feedstock

The use of biomass to achieve a sustainable, low carbon, competitive or cooperative model of growth and employment is an important aspect of EU policies to implement the Circular biobased economy (European Commission, 2018) (Mazzucato, M., 2023). The characteristics of the feedstocks, such as type, quality, availability and price are covered in this section.

Section C- Technology

In this section, we provide a short description of the conversion technology (ies) to transforms a certain biomass feedstock or a mix of feedstocks (inputs) into a mix of products (outputs) which may also be seen as intermediate products for further processing. The technology description needs to be searchable in online sources (including the website of the technology provider) and public documents for the end-user but also needs to be aligned with terminology used in previous relevant projects.

The technology list reported on the Biorefinery Outlook 2030 project (Platt, 2021) will be used as a starting point for identifying and categorizing technologies. The list contains four main categories of technologies: biochemical; mechanical-thermomechanical, chemical and thermochemical. As recommended in the MainstreamBio catalogue, we also included the subcategory 'cultivation technology' (e.g., mushroom, algae,

and conventional methods for food production) to the biochemical technologies. Technologies related to biogas upgrading could be considered a mechanical - thermomechanical as separation process.

The technology implementation is usually a costly aspect of the biobased solution. To get an impression of the economic hurdles that could influence the viability of the solutions some cost information should be provided if available. In this catalogue, the Technological Readiness Level (TRL) for implementation of a particular technology as defined by NASA and adapted by the European High Level Expert Group on Key Enabling Technologies (HLG-KET, 2011) will be used to express the maturity of a technology. TRLs are based on a scale from 1 to 9 with 1 the most pre-mature and 9 being the most mature technology.

Section D- Product(s)

The Biorefinery Outlook 2030 project was taken as a reference for the products' classification. The product criteria are arranged in five general categories: Chemicals, Materials, Food, Animal feed and Energy. There are also sub-categories for the chemicals, materials, and energy products based on different application markets as shown in Table 3 (Platt et al., 2021).

Table 3: WP3 Product categories and subcategories as reported by Biorefinery outlook 2030 project.

Products categories and sub-categories		
Chemicals	Materials	Energy
Additives	Composites	Fuels
Agrochemicals	Fibres	Heat
Building blocks	Organic fertilizers	Power
Catalyst &Enzymes	Polymers	Cooling agents
Colorants	Resins	Other energy products
Cosmeceuticals	Other material products	
Flavours and Fragrances		
Lubricants		
Nutraceuticals		
Paints & Coatings		
Pharmaceuticals		
Solvents		
Surfactants		

Section E-Environmental Impact

A brief assessment on the environmental impacts (benefits and/or drawbacks) generated with this biobased solution should be mentioned (most of them linked with the Sustainable Development Goals). E.g. reduction of the use of virgin materials or fossil feedstocks, reduction of GHG gases, promotion of the use of green fertilizers, reduction of the carbon footprint of the product, reduction the amount waste that ends up in landfills. Evidence has to be provided of the claims made or a note has to be made that this has not been proved and it is hypothetical.

Section F-Financial Aspects

In this section, important financial aspects related to the management, acquisition and utilization of financial support and resources for the development and implementation of the biobased solution are described. This information is especially relevant for SMEs and/or start-ups.

Section G- Institutional and Organizational Aspects

In section G, important institutional and organizational characteristics of the biobased solutions are reported, like the governance model and the actors involved. The governance model is relevant to understand how stakeholders have their say, how decisions are taken and how the different governance models serve different needs. A typical governance model gears towards corporate board, and it is profit oriented. Other governance models better fit for non-profit organization (cooperatives, foundations, community-engagement) where there is less hierarchy, and the balance of power is more equitable among the members. There are also non-profit organizations where staff may not have too much business experience and most of the members are volunteers, and of course it is also possible to adopt a combination of various board governance models (Hoy T., 2023; Guy G, 2002). The Societal Readiness Level (SRL) concept that is currently being developed will be included in this section in the final catalogue.

Section H-Public perception and Social Impact

Information on public perception and social benefits are reported in this section. The identification of social impacts is important to assess the potential effects of bioeconomy in aspects of social equity and to develop strategies for further market penetration of biobased products and biobased solutions.

Section I-Challenges for implementation

A successful implementation of a biobased solutions requires a realistic view of the capacity and resources. All businesses have finite capacity and resources and the identification of possible restrictions and/or limitations are key information to overcome these challenges.

Section J-References

In this section the most relevant sources used to describe the biobased solution are reported.

3.1 Factsheet Template

A. General

Title

Concise description of the innovation, including feedstock, technology/ies and product(s). Acronym between brackets at end, if available.

Location

Country, region

Keywords:

To facilitate finding related innovations with similar aspects. E.g. Urban areas, rural areas, industrial scale,

Example user / provider of technology

Relevant website(s)regarding the users or providers of the technology

B. Feedstock

Main feedstock

Main feedstock that is converted by the example user of the innovation.

Additional feedstock

Often technologies can handle a range of feedstocks. Mention if there are several feedstocks that can/could be used.

Required feedstock quality

Technologies may require specific feedstock quality, e.g. achieved by pre-treatment.

Feedstock source, price, trade spot and location

General information on feedstocks' origin (imported or produced locally) and price (if available) to facilitate translation of useful cost-benefit data from elsewhere to own situation.

C. Technology

Technology Name

To facilitate quick discrimination of technology applied.

TRL

TRL scale of the solution from 1 (the basic principles are documented) to 9 (the technology is released, and industrial production is started).

Description of Technology

Short description of the main applied technology/ies in short but full sentences. Attention for the following topics:

- Process steps (conversion processes: Biochemical, Chemical, Mechanical and thermomechanical, thermochemical. E.g. milling, hydrolysis, fermentation, purification), the conditions (temperature, time, additives needed), what is converted into what, conversion yields and purity.
- Feedstock flexibility: Elaboration on which type of feedstocks may be used and their limitations.
- For which applications and sectors can they be used.
- Innovativeness: Including patents filed or granted

Capacity

Feedstock input and product output, in ton/annum, at given dry matter content.

Investment and Operational Costs

Give an indication of capital Investment and/or operational cost. By proving these information is relevant to make a quick assessment for potentially interested stakeholders, entrepreneurs/investors.

D. Product(s)

Product Name(s)

List main products and side products and its application/purpose. Eventually also indicate waste streams which need to be disposed.

Price, trade spot and location

To facilitate translation of useful cost-benefit data from elsewhere to own situation.

E. Environmental Impact

Environmental Benefits

Indicate quantitative or qualitative benefits e.g. impact to the ecosystems (e.g. promote sustainable forest management, protection to biodiversity, sustainable use of resources), contribution to the reduction of GHG emissions, substitution of fossil based raw materials or fossil based products, promote good air quality.

F. Financial Aspects

Financial Support

Provide info on the type of funding or public support for establishing the solution. For example: Private investment, self-investment of agricultural cooperative, tax reduction during first some years, loan for 50% of investment costs from Regional Investment Fund (with 0% interest), project supported by crowdfunding.

G. Institutional and Organizational Aspects

Type of Organization and Governance Structure

Describe the type of organization and provide a general information on the governance structure associated to the biobased solution or innovation.

Actors Involved

What are the main actors involved in the biobased solution. E.g. from business, government, research and broader society (NGOs), local farmers, regional authorities, volunteers, companies, civil society.

H. Public Perception and Social Impact

Indicate the local societal impact and public perception of the solution. For example: improved health outcomes, reduced crime rates, increased educational attainment, enhanced social cohesion, enhance job creation, social inclusion, provides an alternative business-economic model for a group of people that has decrease/stop with a current economic activity or supporting asylum seeker and new commers in the region to facilitate their adaptation.

I. Challenges for Implementation

Indicate potential hurdles when setting up the solution. These ones could be environmental, social, legal or economic. For example: (waste) legislation, market readiness level, weakness of value chain (e.g. transportability), farmers not willing to guarantee multi annual supply, etc.

J. References

Numbered references ([1], [2], etc.) that can be mentioned in the description above. Each technology starts numbering at [1] again.

4. Conclusions

As reported in WP2, each region has different needs and degrees of bioeconomy development. The BIOLOC project wants to support them to address these needs and to promote the revitalisation of local communities, therefore choosing suitable solutions describing relevant aspects for their implementation is important for the development of the main deliverable, D3.3 'Final catalogue of biobased solutions including good practices'.

In this report, the deliverable D.3.1 'Development of the factsheet template for the biobased catatalogue' is presented. The factsheet document contains a short description of concepts and characteristics that should be reported for the different biobased solutions, including, the biomass feedstock processing to the target biobased product, the benefits and the challenges of the solution from an environmental, economic and social perspective and it aims to provide facts and key points in a clear and concise way so the BIOLOC regions can use this information.

The biobased solution catalogue (D 3.3) will include a range of biobased technologies and social innovations that aim to reinforce the bioeconomy in the twelve BIOLOC regions. The selection of biobased solutions reported in D3.2 'Draft catalogue of biobased solutions' has to show a good overview of the available alternatives matching the needs of the BIOLOC regions and it is expected that by examining the biobased solution in the catalogue, different stakeholders of the different BIOLOC hubs can support their choice of a suitable technological solution for their specific case. Therefore, close communication with the different regional partners will be held and via meetings and interviews during the implementation and development of D 3.3.

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