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INNOBIOVC

REPORT

Deliverable D.1.2.2

Summary

This report elaborates upon the good practices and lessons learned from the Value Chain Generator.

Version 0.1, 20/12/2023

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

CBE	Circular Bio-economy
CBE JU	Circular Bio-based Europe Joint Undertaking
IECS	Innovation Express Call Scheme
LGCA	Lombardy Green Chemistry Association
PLA	Polylactic Acid
SAT	Sustainability Assessment Tool
S3	Smart Specialization Strategy
TRL	Technology Readiness Level
VCG.AI	Value Chain Generator AI

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EXECUTIVE SUMMARY

The good practice examples draw upon the lessons learned from work conducted with InoBioVC partners. The lessons learned provide critical aspects to be taken into account for InnoBioVC partners in the rolling out of the Value Chain Generator. The report presents an analysis of the selected value chains and potential strategies for enhancing circular economy practices in these regions.

Three significant obstacles hinder the evolution of circular value chains in the InnoBioVC partner regions. The first is the suboptimal use of advanced technologies that can convert residues, by-products, or waste into high-value products. The second barrier is the inadequate engagement of potential suppliers of these residues and by-products in new value chains. The third challenge is the advanced circular bioeconomy, which relies on technologies that enable value chains to extend beyond traditional bio-sectors. These chains can incorporate sectors such as pharmaceuticals, plastics, automotive, construction, and machinery, all of which can benefit from high-value products created from bio based residuals, by-products, and waste.

Key lessons learned are summarized:

- Importance of broader perspective of circular bioeconomy for effective carbon management, the creation of resilient European supply chains, and the achievement of climate targets by 2030 and include:
- Strategic Partnerships for Technological Integration: To advance circular value chains, regions must pursue strategic partnerships that facilitate the integration of advanced TRL level technologies, drawing on the collective strengths of the Alpine Space.
- Engagement for Supply Chain Stability: The efficiency and commercial success of circular value chains depend on the active engagement of companies capable of providing stable and high-quality supplies, underscoring the importance of collaborative stakeholder relationships.

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1.GOOD PRACTICE EXAMPLES

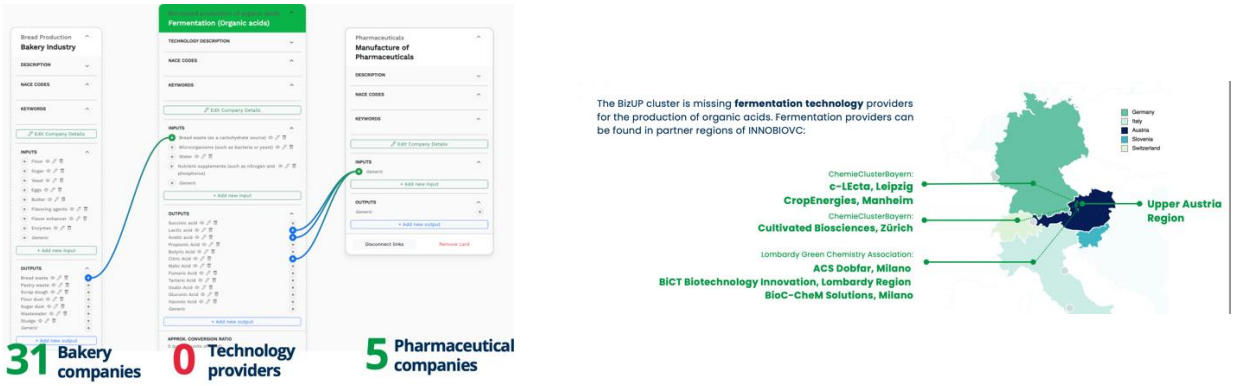
1.1. BAKERY INDUSTRY FOOD CLUSTER, UPPER AUSTRIA

The Food Cluster in Upper Austria is composed of a significant amount of bakeries. The size and capacity of this industry allows it to provide a significant quantity and quality of organic waste for the fermentation process, which converts this waste into valuable organic acids. These acids are raw materials for pharmaceutical production.

Box 1: Bakery circular value chain in Upper Austria

Potential for circular solution - bakery

Gaps in technology can be filled with cooperation from other InnoBioVC regions.



While Upper Austria is home to bakery and pharma companies, the region currently lacks a processing facility for fermentation. The Value Chain Generator has identified strategies to fill this gap.

- One strategy is to partner with organizations such as the Chemi Cluster in Bayern and the Lombardy Green Chemistry Association. These partnerships could accelerate the integration of fermentation technology from cluster members into Upper Austria's circular value chain, leveraging the technological capabilities and synergy potential of the Alpine Space.
- An alternative strategy is to promote technology development within Upper Austria. While the region shows potential for technological progress, realizing this potential requires time, financial resources, and the involvement of key stakeholders.

Implementing these strategies could provide bakeries with additional income through the valorization of by-products and increase the resilience of the value chain by providing locally sourced inputs for the

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pharmaceutical industry. It would also help reduce CO2 emissions and waste in line with the Green Deal targets 2030.

1.2. POLYLACTIC ACID, LGCA

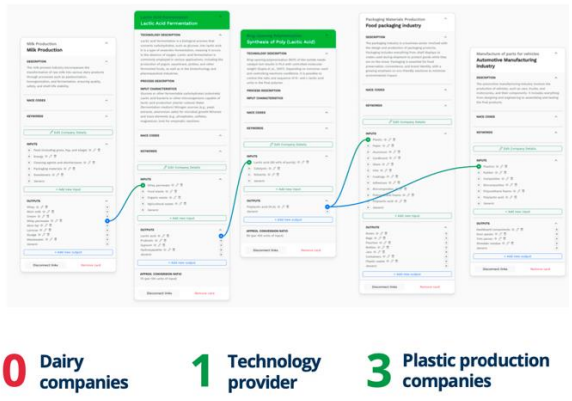
The Lombardy Green Chemistry Association (LGCA) is at the forefront of promoting sustainable materials, with a particular focus on polylactic acid (PLA), a biodegradable and sustainable alternative to traditional plastics. The versatility of PLA is evident in its application in various sectors, including automotive and packaging, which are integral to the economy of the Alpine region. This initiative represents a significant shift to environmentally friendly resources; utilizing waste, residue, and byproducts from the food and beverage industry, such as milk production.

LGCA members are instrumental in providing the necessary technology for lactic acid fermentation, a critical process in converting dairy waste into PLA. Despite these strengths, there is a notable gap in the LGCA cluster—the absence of dairy companies. This gap represents a missed opportunity for more integrated and efficient PLA production and use.

The way forward for the LGCA is to expand the cluster by directly engaging dairy producers. This includes collaboration with clusters in Lombardy and partners across Alpine Space. The Alpine Space region is one of the key producers of milk; partnerships across this region could bridge this gap. Such partnerships can improve the stability of the supply, streamline the production process, and make PLA not only a technically feasible material, but also a commercially viable one in the region. By addressing these strategic areas, the LGCA can consolidate Lombardy's position as a leader in green chemistry, contribute to a more sustainable industry, and stimulate economic growth in the Alpine region.

Box 2: PLA circular value chains. LGCA

Fermentation - Plastic Acid PLA – LGCA



Gaps in supply can be fulfilled by collaborating with dairy producers which have homes in Alpine Space.

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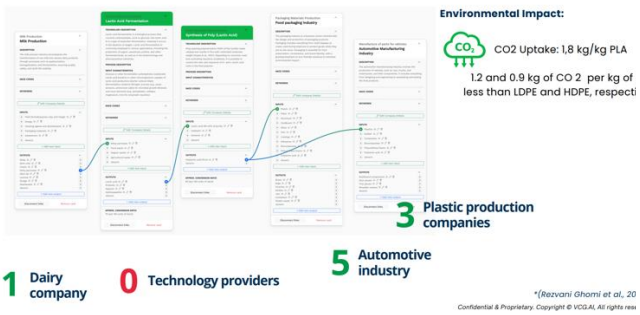
1.3. POLYLACTIC ACID, Heilbronn, BW

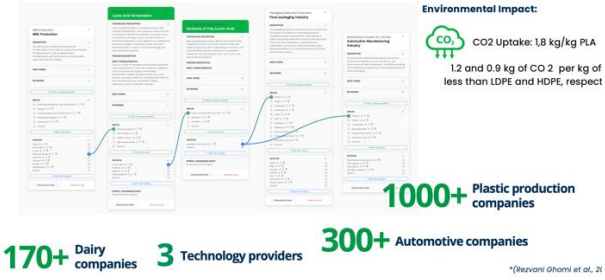
The plastic and automotive industries are important off-takers of PLA. They utilize it for manufacturing biodegradable components and interior elements as part of their sustainability initiatives. There is great potential for connecting residuals from dairy companies to the plastic and automotive industry in Baden Wurttemberg. This is presented in the box below.

Box 3: PLA circular value chains for Heilbronn/Baden Wurttemberg

Heilbronn



Baden Wurttemberg



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1.4. Sustainable Wine Production—Pyrolysis Heilbronn, BW

Heilbronn is renowned for its robust automotive and machinery sectors. However, it is also a significant wine-producing area, which presents a unique opportunity to foster a circular bioeconomy, particularly within the viticulture sector. By leveraging pyrolysis technology, Heilbronn can transform organic waste from winemaking into biochar and syngas, thereby reducing greenhouse gas emissions, improving soil health, and generating renewable energy.

Pyrolysis, the process of decomposing organic material at high temperatures in the absence of oxygen, is central to this initiative. It yields biochar, a substance with potential to significantly reduce CO2 emissions, and syngas, which can be used as a renewable energy source or in chemical production. The International Biochar Initiative underscores biochar's role in decarbonizing agriculture and other sectors, with the potential to offset up to 6% of global emissions annually.

Despite the technological capabilities and potential demand within Heilbronn, the broader market potential for biochar and syngas is more pronounced at the regional level of Baden-Württemberg. This is shown in the box below.

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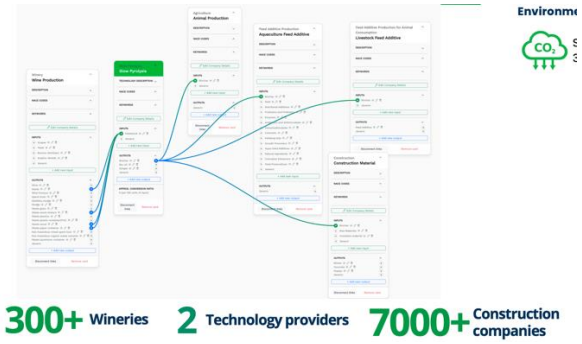
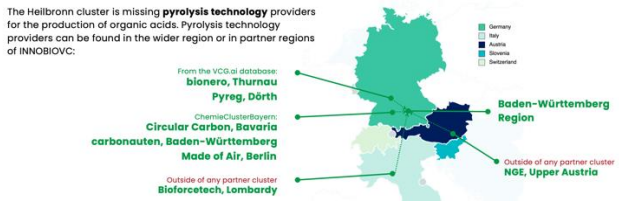
Box 4: Wineries as supply for Biochar for construction and agriculture



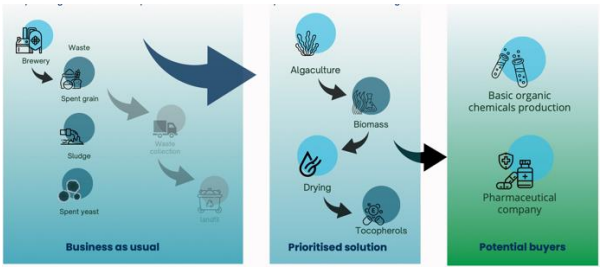


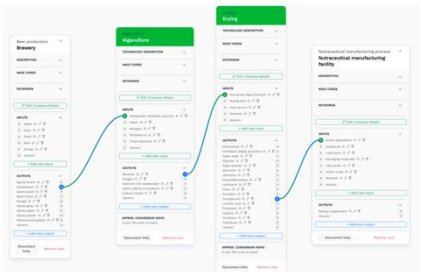
1.1. BREWERY FOR PHARMA and FEED—CHEMIE CLUSTER, BAYERN

Bavaria, a region known worldwide for its beer production, is poised to leverage its brewery residues and by-products to fuel other sectors, particularly the pharmaceutical, nutraceutical, and cosmetic industries. The key ingredient of interest is tocopherols, a group of organic compounds with antioxidant properties that are in high demand in these industries.

The Chemie Cluster in Bayern does not currently include any brewery companies, which represents a missed opportunity for the use of this technology. To address this gap, the Chemie Cluster in Bayern could expand by directly engaging breweries and pharmaceutical companies throughout Bavaria. Such partnerships create both a market for high value-added products and a high demand for a high quality supply of brewery by-products. The box below illustrates this potential.

Box 5: Brewery as supply for chemicals and pharma





0 Breweries in the cluster
2 Technology providers
30+ Chemical and pharmaceutical companies
600+ Breweries in Bavaria

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2. LESSONS LEARNED

The INNObioVC project illustrates how imperative it is to integrate circular economy principles into regional value chains. By identifying and addressing gaps, cultivating strategic partnerships, and harnessing sustainable technologies, regions can foster resilient economies aligned with the European Green Deal objectives. INNOBIOVC workshops underline the multifaceted nature of building circular bioeconomy value chains. They highlight the importance of identifying and bridging gaps in the value chain, fostering cross-regional cooperation, and promoting technology deployment. They also underscore the need for direct engagement with key stakeholders and potential partners to ensure the successful implementation of circular bioeconomy initiatives.

Embracing Cross-Regional Collaboration for technology deployment

The workshops highlighted the importance of cross-regional collaboration to fill gaps in the value chain. For instance, the bakery industry in Upper Austria could benefit from partnerships to integrate fermentation technology with organizations like the Chemie Cluster in Bayern and the Lombardy Green Chemistry Association. This approach not only leverages the technological capabilities of neighboring regions but also fosters synergy and accelerates the adoption of circular solutions.

Engaging Key Stakeholders

The absence of certain stakeholders within clusters, such as dairy companies in the LGCA, can hinder the efficiency of circular value chains. Engaging these key stakeholders directly is crucial for creating timely value chains to reach climate targets by 2030. For example, by involving dairy producers, the LGCA can improve the stability of the supply chain for PLA production, making it not only technically feasible but also commercially viable.

Leveraging Local Strengths

Regions should capitalize on their local strengths while also addressing technological gaps. In Upper Austria, the bakery industry's organic waste can be converted into organic acids for pharmaceuticals, but the lack of fermentation facilities is a barrier. Strategies to overcome such gaps include forming alliances with technology providers or fostering regional technology development. Also, the integration of advanced technologies is essential to promote a circular bioeconomy. For example, pyrolysis technology can convert organic waste from wine production in Heilbronn, Germany, into biochar and syngas, helping to reduce greenhouse gases and generate renewable energy. This demonstrates the technology's potential to create value from waste and support sustainability goals.

Expanding the scope of the circular bioeconomy

The circular bioeconomy goes beyond traditional bio-sectors and can encompass a wide range of industries, including construction, automotive, and machinery. Discussions from the workshops suggest that the Innovation Express Call should not be limited to traditional sectors, but should be open to a broader scope that contributes to effective carbon management practices.

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