



Value chain mapping of the dairy industry side-streams in Goriška (Western Slovenia)

September 2022

Table of contents

1. Introduction	4
1.1 Authors and collaboration team	4
1.3 Executive summary	4
2. Background.....	5
2.1 The BRIDGES project additional activities	5
2.2 Purpose of the task.....	5
2.3 Structure of the report	5
3. Dairy industries side-streams, desk research	6
3.1 What is the dairy industries side-streams sector?	6
3.2 Regional profile	6
3.3 Statistical analysis of the dairy industry and side-streams in Slovenia.....	8
3.4 List of funded initiatives with TRL results, and description of the TRL levels reached.....	8
3.5 Enabling policies and initiatives.....	9
3.6 Conclusions from the desk research	9
4. Dairy industries side-streams, field research.....	11
4.1 Methodology reminder	11
4.2 Dairy industry side streams supply chain grid.....	15
4.3 Field research and identification of competitive advantage.....	17
4.3.1 Analysis.....	17
4.3.2 Findings and recommendations.....	18

List of Figures

Figure 1 Models of re-shoring	12
-------------------------------------	----

List of Tables

Table 1 BRIDGES project additional activities, selected value chains	5
Table 2 Zahodna (western) Slovenija (SI04)	6
Table 3 Selected indicators of the Goriška Region	7
Table 4 The berry industry supply chain grid.....	13
Table 5 Criteria for identifying regional value-chain related peaks and valleys	14
Table 6 Summary of the value chain (VC) mapping approach.....	15
Table 7 Dairy industry side-streams supply chain grid.....	15
Table 8 Dairy industry, competitiveness mapping in the Goriška Region.....	17
Table 9 Summary of the value chain mapping, PP6 Western Slovenia	18
Table 10 Policy instrument improvement recommendations related to selected value chain, Western Slovenia	19

1. Introduction

1.1 Authors and collaboration team

- 1) Authors: Soča valley development centre, Miro Kristan
- 2) Collaboration and facilitation team: Regional Council of Kainuu, Ninetta Chaniotou
- 3) Contributions: Biotechnical centre Naklo

1.3 Executive summary

The value chain mapping in Goriška (Western Slovenia) focused on the side-streams of the dairy sector and in that sense, also allowed a deeper look at the dairy sector itself. There has been special care to consider the value chain mapping within the context, the characteristics of the place, and the long-term priorities. This perspective, opened up also new questions, beyond industrial considerations. It allowed to look deeper what a relatively small locality can sustainably (socio-economically as well as environmentally sustainable) do, to maintain its profile, sustain its growth and still be functional part of the larger transnational and interregional value chain trends.

The region is competitive in cheese production. Among the produced cheeses, a few are branded and protected, competing on an equal basis with strong, well-known brands of the Alpine area. Due to a geographical origin of the milk as the main precondition at production of protected cheeses it is already based only in the region. With an already high anticipation of the quality of the products on the market it is however possible to extend the production. In addition to a large dairy there are also several smaller producers (farmers) that produce and sell products on the market and are in a way creating a competitive (inshoring) environment.

Dairy side-streams are not explored. The majority of whey is not used at all. A small part of whey is used in local cuisine and in the production of whey drinks. Dairy producers, however, are aware of the whey potential and the value chain mapping was a well-received activity locally. The value chain mapping revealed that whey could be valuable for the production of (fish) food (spirulina algae) for local fish farms and bio-plastics. Through competitive production, there is potential better positioning in the foreign markets with production staying in the region.

These insights were translated into policy instrument recommendations, i.e. forthcoming development projects:

- [1]. Interregional cooperation projects within CLLD (the EU CLLD system allows it, but it has to be clearly mentioned in LAG strategies).
- [2]. Small scale R2B (regionally adjusted scheme to focus on selected sectors, supporting mainly SMEs)
- [3]. Funding of initiatives building on side flows from processing of (regional) natural resources
- [4]. Intensive food production and industrial processing has again started to follow resource efficiency in order to optimise processes and reduce impact. A focus will be given to new (value chain mapping), innovative initiatives that build on traditional use of natural resources while seeking innovation in side streams. The measure foresees the value chain mapping approach identified in **(GP2)** and already successfully tested in dairy and aquaculture sectors as the initial step towards product development and higher value added.

2. Background

2.1 The BRIDGES project additional activities

On the 28.6.2021, the Interreg EUROPE programme approved BRIDGES project's application submitted on 31.5.2021, for additional activities (letter of approval Date: 28/06/2021, RE: Interreg Europe Call for additional activities (5th call) – decision Project: PGI00040 BRIDGES).

The purpose of the additional activities of the BRIDGES project is to enhance the resilience of regional economies. This is done by exploring value chains in two ways and in a coordinated, twofold way: a) enhancing the economic base of smart specialisation through inshoring and reshoring of value chains and b) benefitting from knowledge-based interregional complementarities & collaborations related to the selected value chains of the partner regions.

The following value chains were selected by the respective regions:

Table 1 BRIDGES project additional activities, selected value chains

Region & partner	Value chain selected
Kainuu, PP2 & LP; FI	Forest-industry sidestreams
Helsinki-Uusimaa, PP4; FI	Bio-based & recyclable textiles
Western Macedonia, PP5; GR	Diversification of the dairy industry
Soča Valley, SVDC, PP6; SI	Diversification of the dairy industry
Western Transdanubia, PBN, PP7; HU	Living lab testing facilities for physical rehabilitation.

2.2 Purpose of the task

Overall objective: The purpose is to map the selected value chains and propose in-shoring, re-shoring and near-shoring investments and development initiatives, as concrete ways for developing them further and positively impacting regional resilience.

Soča valley objective: analyse dairy value chain

2.3 Structure of the report

The value chain mapping report consists of the following chapters: [1. Introduction](#), [2. Background](#), [3. Dairy industries side-streams, desk research](#), [4. Dairy industries side-streams, field research](#).

3. Dairy industries side-streams, desk research

3.1 What is the dairy industries side-streams sector?

The result of the production of whey protein-based ingredients, a considerable amount of side-streams, containing substantial quantities of individual nutrients (lactose, milk minerals, phospholipid and specific proteins), are also generated. Most of these have potential as sources for enhanced nutritional (reduction of blood cholesterol levels) and techno-functional (good emulsifying properties or salt replacers) ingredients with a wide range of applications in food (dairy, confectionary and infant formula), pharmaceutical and cosmetic industries.

3.2 Regional profile

Since 2016, the Western Slovenia Cohesion Region (NUTS2) has regained its position as a developed region. Among the statistical regions, only the Central Slovenia region exceeded the EU average in 2019. Given the significant underdevelopment of most regions, especially the less developed ones, catching up with the European average seems to be a very challenging long-term goal for the regions.

Notwithstanding the fact that the is ranked among the more developed European regions, it is important to be aware of the development disparities and the existence of a number of less developed areas within it. They have different, often even conflicting, development needs and challenges, and development policies should therefore target resources to address the greatest development needs and challenges, which differ from one area to another.

Table 2 *Zahodna (western) Slovenija (SI04)*

Categories	Data	Normalised score	Relative to	
			SI	EU
Tertiary education	47.9	0.775	113	135
Lifelong learning	12.0	0.447	107	111
International scientific co-publications	3,244	0.923	135	164
Most-cited scientific publications	7.5	0.395	102	73
Above average digital skills	32.0	0.550	104	104
R&D expenditures public sector (GERD)	0.79	0.532	164	110
R&D expenditures business sector (BERD)	1.49	0.535	103	103
Non-R&D innovation expenditures	±	0.160	±	±
Innovation expenditures per person employed	±	0.503	±	±
Employed ICT specialists	5.3	0.700	140	140
Product innovators	±	0.816	±	±
Business process innovators	±	0.576	±	±
Innovative SMEs collaborating	±	0.633	±	±
Public-private co-publications	595.5	0.867	137	175
PCT patent applications	1.28	0.378	66	61
Trademark applications	8.84	0.651	125	143
Design applications	2.78	0.480	112	84
Employment knowledge-intensive activities	19.7	0.807	103	135
Employment innovative enterprises	±	0.559	±	±
Sales of innovative products	±	0.539	±	±
Air emissions by fine particulates	15.8	0.390	100	79
Average score	--	0.582	--	--
Country EIS-RIS correction factor	--	0.907	--	--
Regional Innovation Index 2021	--	0.527	--	--
RII 2021 (same year)	--	--	110.2	98.1
RII 2021 (cf. to EU 2014)	--	--	--	112.7
Regional Innovation Index 2014	--	0.500	--	--

Categories	Data	Normalised score	Relative to	
			SI	EU
RII 2014 (same year)	--	--	109.9	106.9
RII - change between 2014 and 2021	--	5.7	--	--

The Goriška region (NUTS3) is located on the western border of the Republic of Slovenia with Italy. Together with the Gorenjska Region in the north, the Obalno-Kraško Region in the south and the Osrednjeslovenska Region in the east, it forms the Cohesion Region West Slovenia (hereafter referred to as KRZS). It covers the area of the Julian Alps, the basin of the Soča River with the Idrijca and Vipava rivers, and the Vipava Valley. In the northern part of the region lies the only national park in Slovenia, the Triglav National Park (TNP), which also extends into the Gorenjska region.

In 2020, the region had 118,041 inhabitants, which is 5.6 % of the population of Slovenia, of which 59,676 were male and 58,365 were female (SURS, 2020).

The region covers 2,325 km², which is 11.5 % of the surface area of Slovenia. The population density in the region was 50.8 inhabitants per km², making it one of the regions with the lowest population density (SURS, 2020).

Table 3 Selected indicators of the Goriška Region

Statistical categories	GORIŠKA REGION	SLOVENIA
Population (SURS, 1 July 2020)	118.041	2.095.861
Population density (SURS, 1 July 2020)	50,8	103,4
Proportion of children in kindergartens in the 2019/2020 school year (SURS, 2020) (%)	77,5	81,2
Number of pupils in school year 2019/2020 (SURS, 2020)	10.766	190.156
Number of pupils in the school year 2019/2020 (SURS, 2020)	4.013	72.738
Number of students in the academic year 2019/2020 (SURS, 2020)	4.401	76.728
Average gross monthly wage (in EUR) (SURS, 2020)	1.741,82	1.856,20
Number of enterprises (SURS, 2019)	12.022	205.139
Tourist arrivals (SURS, 2018)	506.083	5.933.266
Overnight stays of tourists (SURS, 2018)	1.242.540	15.694.705
Building permits issued for residential buildings (SURS, 2018)	156	2.834
Number of agricultural holdings (SURS, 2016)	5.311	69.902
Share of population aged 0-14 (%) (SURS, 1 July 2020)	14,8	15,1
Share of population aged 15-64 (%) (SURS, 1 July 2020)	62,3	64,7
Share of population aged 65 and over (%) (SURS, 1 July 2020)	22,8	20,2
Ageing index (SURS 1 July 2020)	153,9	134,3
Registered unemployment rate (%) (ZRSZ, July 2020)	6,8	9,2
Labour force participation rate (%) (SURS, 2019)	68,0	66,0
Poverty risk rate (% of people) (SURS, 2019)	10,6	12,0
Gross domestic product in EUR per capita - current exchange rate (SURS, 2018)	19.930	22.083
Development Threat Index (SURS, 2019)	117,1	100
Number of passenger cars per 1 000 inhabitants (SURS, 2018)	614	549
Average size of the agricultural holding (ha) (SURS, 2016)	5,8	6,9
Municipal waste generated (kg/capita) (SURS, 2019)	537	509
Proportion of Natura sites (ZRVN, 2016) (Slovenia 2018)	1.157,4 km² 49,8 %	7.681 km² 37,46 %
Number of visits to general libraries per capita (NUK, SURS; UMAR calculations, 2018)	5,2	4,6
Number of doctors per 1,000 population (OECD, 2017) or general and family medicine doctors employed in general and family medicine per 100,000 population (NIJZ, 2018)	/59.4	3.1 48.3
Number of researchers (SURS 2019)	898	15.925

3.3 Statistical analysis of the dairy industry and side-streams in Slovenia

More than 580,000 tons of milk were collected from agricultural holdings in 2020 (2.9% more than in 2019). For the fifth year in a row the share of milk collected by Slovene dairies increased over the previous year, this time to more than 72%. Almost 418,000 tons of milk were collected, 3.3% more than in the previous year. Slovenian agriculture is characterised by small family farms. Average farm size is 7.5 ha. This is influenced by historical reasons. Largely due to mountainous and hilly terrain, almost 75% of the utilised agricultural area is characterised as less favourable area. This is especially the case in Goriška region where the majority of dairy production is based in the Alps.

3.4 List of funded initiatives with TRL results, and description of the TRL levels reached.

One of the most relevant and recent initiatives supported through the implementation of Slovenian Smart specialization strategy S4 are also so called 'Strategic research and innovation partnerships - SRIPs'. It is a new form of collaboration between research organisations, businesses and other stakeholders. They were established in several priority areas with one focusing on sustainable food production. The members of SRIPs are to identify value chains within selected priorities (deepen the relatively general priorities) through providing a continuous entrepreneurial discovery process. SRIPs should provide an environment for cooperation in joint R&D projects of various type and enable innovation activity eventually leading to market penetration in S4 priority areas. SRIP food is a long-term Strategic Research and Innovation partnership for Sustainable Food Production. It has developed into a dynamic community of agriculture holdings, companies, cooperatives, research institutions, investors and other interested parties, whose main interests are focused on improvement of research and development activities in the companies for the purpose of agri-food sector development.

Related to R2B in dairy sector there were two important projects that were a combined effort of both private and public sector. These are Laktika and LIFE for acid whey (c. Arhel d.o.o., Institute of dairy science and probiotics). In both projects, several possibilities for the reuse of whey in high-value-added products were demonstrated. For example, whey has been successfully used to produce probiotic biomass and metabolites such as nisin, vitamin B12, or kefir grains. A pharmaceutical formulation with enteric-coated pellets containing lactoferrin has been developed. Separation of IgG and LPO by cation chromatography using monolith columns was first optimised in the laboratory and later on a pilot scale, while α -lactalbumin was isolated from the remaining fraction by selective precipitation. The use of the protein-rich fractions as food or feed supplements and the production of the starter for organic waste treatment were also tested. Whey fractions were successfully incorporated into cosmetic products. Finally, cascade approaches of the whey treatment were proposed in order to obtain high-added value products and to approach as much as possible the goal of zero waste. The results obtained form the basis for further development of new functional foods and dietary supplements based on whey.

3.5 Enabling policies and initiatives

The macroeconomic projections for Slovenia are strongly affected by the worsening outlook in the external environment as a consequence of Russia's military aggression against Ukraine. The GDP growth will moderate at 2.4% and 2.5% in 2023 and 2024 respectively.

The situation in the domestic economy and the external environment is reflected in the projections for inflation, which is expected decrease to 4.5% in 2023 and 2.3% in 2024. The prevailing factor in inflation are high energy prices but the contributions of other price categories also strengthened.

RIS3 R&D (S5, 2021 – 2027) priorities and measures:

Improving research and innovation capacities and the deployment of advanced technologies (Strengthening investment in research infrastructure and research capacity, in particular in relation to national strategic development priorities, which is key to scientific excellence and to the conduct of cutting-edge research. In the priority areas of S5, support will be given to innovation clusters (SRIPs) and research projects along the whole Technology Readiness Ladder (TRL), with a particular focus on increasing the role of HOMs or enabling technologies, which will be further supported in terms of staffing and funding to allow for a greater penetration of technologies in the areas of all SRIPs. Large projects reflecting a high degree of technological multidisciplinary and collaboration with different knowledge institutions and industry will be supported. The continuation of successful projects across the TRL scale will be supported.)

Improving SME growth, competitiveness and job creation in SMEs (Upgrading of business support services and innovation environment for competitive entrepreneurship through the use of integrated business services (SPOT), with a focus on specific target groups (e.g. youth, women, elderly, cultural and creative sector). Internationalisation and trans-regional cooperation will be promoted, young enterprises and new business ventures (start-ups) will be supported for their initial operation, and business growth and development will be encouraged (general incentives and incentives for innovation, including social incentives).)

Skills development for smart specialisation, industrial transition and entrepreneurship (The main sets of actions will aim at strengthening skills for smart specialisation, industrial transition and entrepreneurship and supporting innovation for companies and other stakeholders in the economy; notably by building on the successful action of promoting Competence Centres for Human Resources Development in the S5 priority areas and horizontal themes, in particular towards greater openness and adaptability to the needs of the membership.)

Digital transformation (The digital transformation of enterprises will be supported, with a particular focus on SMEs, the digital transformation of research institutions, as well as of society as a whole, both from a supply and a demand side perspective.)

3.6 Conclusions from the desk research

Over the years Slovenia has developed a somewhat complex set of institutions for R&D and innovation policy implementation. These institutions were established based on proven concepts of Slovenian twinning partners in Austria, Ireland, Germany, and elsewhere. The institutional set up for R&D and innovation policy implementation was frequently changing over the years and is still evolving. The institutions are evolving to reflect good practices and the policy measure per se are becoming more focused and specific. The rather frequent

change of the policy framework is often felt by the stakeholders as a barrier to long term planning and assumption of initiatives; it also requires constant adjustments of the innovation ecosystem and networks and consistent development of support aimed at achieving policy goals. Different sub-systems of the Innovation system may be systematically grouped according to their origin.


The Slovenian innovation system remains highly internationalised in some respects, like participation in European R&D programmes with much less internationalisation in other aspects like attraction of foreign researchers and students or participation in international value chains.

4. Dairy industries side-streams, field research

The purpose of this section is to identify the competitive advantage of the dairy industry side streams in the Goriška Region in the framework of a systematic RDI – related value chain mapping. The work is based on a value chain – based competitiveness mapping methodology and on field research.

4.1 Methodology reminder¹

The value chain mapping was initially made in the context of the BRIDGES project 5th call, additional activities.

It is selected and contributes to the implementation of the BERRY+ S3 partnership ( <https://s3platform.jrc.ec.europa.eu/berry>).

The value chain methodology was selected for the following reasons: value-chains (i) can support long term interregional collaboration: the Phase 1 and Phase 2 of the BRIDGES project confirmed, on the one hand, the importance of interregional complementarities and, on the other hand, the lack of systematic approach towards them. Value chains can be an instrument, a carrier for interregional complementarities; (ii) can contribute to competitive advantage and through that to regional specialisation and diversification; (iii) can contribute to internationalisation of regional economies through the integration of businesses and innovation system actors integrate into collaborative efforts; (iv) are priorities of the EU's new industrial strategy as factors supporting European autonomy², confirmed also by the Council's conclusions 16.11.2020³ and further reinforced by the New Industrial Strategy update COM(2021)350final.

According to the approved BRIDGES project AF, the objective is to reinforce regional resilience by in-shoring and re-shoring value-chain based productive activities, while, at the same time, also identifying those activities that is best to be done in collaboration with other regions (near shoring). On the other hand, the whole BERRY+ effort is reaching and benefitting from interregional complementarities based on the value-chain approach.

The focus of the whole effort is on in-shoring and re-shoring competitive advantage in relation to specific value chains and, in parallel, to identify and invest in near-shoring value chain segments in which a region is not specialised or in which it is not interested. The terminology of reshoring is fundamentally territorial⁴. It is a question of where manufacturing is located, rather than by whom it is performed (that is, whether the manufacturing is insourced or outsourced). Much of the literature on reshoring also tends to present the concept

¹ All this section is an insert from the Value chain mapping methodology, available at https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1665901233.pdf and https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1665894064.xlsx

² "Updating the 2020 New Industrial Strategy: Building a stronger Single Market for Europe's recovery", 05 May 2021. https://ec.europa.eu/info/sites/default/files/communication-industrial-strategy-update-2020_en.pdf.

³ Council conclusions on "A recovery advancing the transition towards a more dynamic, resilient and competitive European industry" adopted by written procedure on 16 November 2020. <https://data.consilium.europa.eu/doc/document/ST-13004-2020-INIT/en/pdf>.

⁴ European Parliament Research Service (EPRS) (2021). Post Covid-19 value chains: options for reshoring production back to Europe in a globalised economy. Policy Department for External Relations Directorate General for External Policies of the Union PE 653.626 – March 2021. [https://www.europarl.europa.eu/RegData/etudes/STUD/2021/653626/EXPO_STU\(2021\)653626_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2021/653626/EXPO_STU(2021)653626_EN.pdf)

as a reversal of offshoring (Gray et al., 2013⁵). Near-shoring refers to manufacturing being relocated to a country closer to 'home'.

		<i>To: Onshore</i>	
		In-House	Outsourced
<i>From: Offshore</i>	In-House	In-House Reshoring	Reshoring for Outsourcing
	Outsourced	Reshoring for Insourcing	Outsourced Reshoring

Figure 1 Models of re-shoring⁶

During Phase 3 (additional activities) of the project, the initial grid was further developed into a value chain mapping methodology with policy-making linkages. The development steps consisted of linking the supply chain grid to regional and interregional development & investment initiatives, by building on regions' mapped competitiveness (peaks) and addressing weaknesses (valleys). The intended value chain integration ensures market access for final and intermediate goods, and it is a pull factor for orienting diversification and scaling up. Regional competitiveness can be measured in various ways, including entrepreneurship, technological readiness, and quality of institutions⁷.

The following value chains were selected to be mapped: forest industry side-streams (Kainuu, FI), recyclable and renewable textiles (Helsinki-Uusimaa, FI), dairy industry side-streams (Western Macedonia, GR and Western Slovenia, SI), and e-health equipment (Western Transdanubia).

The value chain mapping was done by applying a methodology devised by the BRIDGES project Phase 1, namely through the action plan of the LP/PP2, and the feasibility study for the renewal of the berry industry of Kainuu (Action 2)⁸. The feasibility study included a supply chain mapping of the berry industry as a whole, with detailed reference to technologies, end products, inputs, markets and policies, **Table 4**.

⁵ Gray, J. V. et al. (2013) 'The Reshoring Phenomenon: What Supply Chain Academics Ought to know and Should Do', *Journal of Supply Chain Management*, 49(2), pp. 27–33. doi: 10.1111/jscm.12012.

⁶ Gray, J. V. et al. (2013) 'The Reshoring Phenomenon: What Supply Chain Academics Ought to know and Should Do', *Journal of Supply Chain Management*, 49(2), pp. 27–33. doi: 10.1111/jscm.12012:p28.

⁷ Moirangthem, N.S. and Nag, B. (2022), "Measuring regional competitiveness on the basis of entrepreneurship, technological readiness and quality of institutions", *Competitiveness Review*, Vol. 32 No. 1, pp. 103-121. <https://doi.org/10.1108/CR-11-2020-013>.

⁸ Kainuu action plan; https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1565773671.pdf

Table 4 The berry industry supply chain grid⁹

	Key technologies		Products	Application	Key investment	Promotion	Policy, 3S, industrial modernisation/ agrifood	Partnership/ Markets
Input /raw material	Cultivation development in field an forest (wilderness)	Facilitative: ICT and logistics	Cultivars, lines, material from specified production	Correct raw material to correct process	Plant breeding	Economic sustainability	Rural (innovation) policy	Horticulture, agriculture, forestry,
Harvesting	Harvesting technology	Primary supply networks	Harvester: robot or hand-held tools	Intensification of the harvesting process	Automatic, robotics	Sustainability, naturalness	(Rural) innovation policy	Robotic, sensor technology markets
Storing	Storage manufacturing	Logistics	Optimization	Balancing of the input to processing	Renewable energy, material efficiency	Clean technology	Energy and climate policy	Energy technology
Processing	Sorting, cleaning, grading – utilization of side flows	Robotics, blockchain technologies	Fresh products	Food and food ingredients	Automatization	Naturalness, organic, freshness, cleanness, health impacts, sustainability	Nature-based innovation, clean investment, competition, health, SDG	Manufacturing
	Extraction – utilization of side flows, deoil	Assembling critical masses, stabilizing (drying and freezing)	Berry juice concentrates, berry rfc juices and syrups. Purees with seeds.	Food, feed, end ingredients	Extraction facilities- concentration –(hot water, ethanol, supercritical I-CO2 circulation	Naturalness, organic, freshness, cleanness, health impacts, sustainability, techn. quality	Nature-based innovation, clean investment, competition, health, SDG metrics	Food technology
	Dewater, dry, deoil, grinding		Berry powders for feed, food Grinded material for cosmetics compensate plastic beans	Food, feed, cosmetic ingredients	Mill/grinder, separator, drier, cocentrator SFE	Naturalness, organic, cleanness, health impacts, sustainability, techn. quality	Innovation (purity), clean investment, competition, transparency, health, SDG metrics	Food technology, cosmetics technology
	Functional food and cosmetic ingredient processing	Critical quality of the raw material, wide spectrum	Aromatic ingredients, functional polyphenolics, seed oil, fibre, stains	Cosmetics	Extraction facilities- concentration –(hot water, ethanol, supercritical I-CO2 circulation	Naturalness, organic, cleanness, health impacts, sustainability, techn. quality	Innovation (purity), clean investment, nature-based competition, transparency, health, SDG metrics	Cosmetics technology
Consumer product processing	Encapsulation (micro, nano) from the extract during the drying process	Consumer product for feed, for food, for cosmetic	Consumer products in combination with oat ingredients (together with Vallo and Dermosil etc.)	Food technology investments		Taste, applicability, naturalness, organic, health impacts, cleanness, sustainability, image building	Health, food, Innovation (purity), clean investment, nature-based competition, transparency, SDG metrics	Food, feed, health care, hotel services, sports, fashion and life style enterprises and NGOs

Researchers confirm that measuring regional competitiveness by GDP alone is not sufficient¹⁰. The definition of the criteria for mapping the value chains in the BRIDGES regions aimed at discussing regional strengths and weaknesses, as well as regional potential, i.e. strengths that can be revealed, realised in the future. We took into account baseline findings about value chains as expressed, e.g. by the IMF research paper on *Measuring competitiveness in a world of global value chains*¹¹, and the reference to Paul Armington who showed that “in a world in which goods produced by different countries were imperfect substitutes for each other” (page 6). We also took into account the discussion raised by Stöllinger et al 2018¹², indicating how industrial value chains turn into regional value chains and how they differ than global value chains.

⁹ Kainuu action plan, page 10. Grid developed by LUKE professor Dr. Sirpa Kurppa. https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1565773671.pdf

¹⁰ Barna, K. (2007). *Measuring regional competitiveness*. Journal of Central European Agriculture, CC BY-ND 4.0.

¹¹ Tamim Bayoumi ; Maximiliano Appendino ; Jelle Barkema ; Diego A. Cerdeiro (2018). *Measuring Competitiveness in a World of Global Value Chains*. IMF working papers, <https://www.imf.org/en/Publications/WP/Issues/2018/11/01/Measuring-Competitiveness-in-a-World-of-Global-Value-Chain-45544> . Page 6.

¹² Roman Stöllinger (coordinator), Doris Hanzl-Weiss, Sandra Leitner, and Robert Stehrer (2018). *Global and Regional Value Chains: How Important, How Different?*. Vienna Institute for International Economic Studies. Research report 427. <https://wiiw.ac.at/global-and-regional-value-chains-how-important-how-different-dlp-4522.pdf> .

We came up and tested a mix of criteria, quantitative and qualitative, and we relied on the Martin report, page 7-1¹³: “The competitiveness of a region resides not only in the competitiveness of its constituent individual firms and their interactions, but also in the wider assets and social, economic, institutional and public attributes of the region itself. Therefore, the notion of regional competitiveness is as much about qualitative factors and conditions (such as untraded networks of informal knowledge, trust, social capital, and the like) as it is about quantifiable attributes and processes (such as inter-firm trading, patenting rates, labour supply and so on). Furthermore, the causes of competitiveness are usually attributed to the effects of an aggregate of factors rather than the impact of any individual factor”. Our proposed criteria include business, product, research (on going + programmes), research results, solutions available, education and skills, and policies, **Table 5**.

Table 5 Criteria for identifying regional value-chain related peaks and valleys

Criteria ¹⁴	Competitiveness indicators	Data collection methods
Business	Turnover, exports, employment, location quotient	Statistical data and statistical analysis
Product	Product range, product added value, product innovation, exports	Statistical data and statistical analysis
Research	On-going research programmes dedicated to addressing the selected domain.	Field data (interviews) with research units in the region. We are seeking concentrations of research
Research results, solutions	Patents, registered IPR, TRL achievement level in projects related to the selected industry.	Review of patents; field data (interviews) with research units in the region.
Skills available	University faculties and educational programmes including technical education dedicated to improving entrepreneurship, management and implementation skills in the selected industry.	Review of educational programmes in the region; field data (interviews) with educational units in the region.
Policy enablers	Strategies and project calls for (i) increasing research inputs to product development; (ii) bringing innovations to market; (iii) commercialising research; (iv) supporting national & interregional collaboration for technology transfer; (v) entrepreneurship programmes in diversified domains of traditional sectors; (vi) incentives for attracting investments related to in- shoring and / or re-shoring evidence-based potential.	Field data (interviews) with educational units in the region.

These criteria, with selected competitiveness indicators¹⁵ are mapped against the supply chain grid categories. The value chain mapping approach is summarised in **Table 6 below**, and an excel template is also available to facilitate the application of this model and attached to the value chain mapping directory.

¹³ Cambridge Econometrics and ECORYS NEI, Prof. Ronald L. Martin (.....). A Study on the Factors of Regional Competitiveness. A draft final report for The European Commission, Directorate-General Regional Policy. https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/3cr/competitiveness.pdf .

¹⁴ Competitive advantage criteria.

¹⁵ At least one indicator selected per region.

Table 6 Summary of the value chain (VC) mapping approach.

Criteria	R&D-based supply chain references						
	Key technologies	Products	Application	Key investment	Promotion	Policy, 3S, industrial modernisation/ agrifood	Partnership/ Markets
Business							
Product							
Research (on going)							
Research solutions, transferable with or without IPR							
Skills in the labour force and in education							
Policies (enabling context)							

4.2 Dairy industry side streams supply chain grid

Table 7 Dairy industry side-streams supply chain grid

Key technologies		Products	Application	Key investment	Promotion	Policy, 3S, industrial modernisation/ agrifood	Partnership/ Markets
Input	Livestock farming	Facilitative: ICT and logistics	Dairy cattle	Collect material for processing	Farm animal breeding	Sustainability, mountain pasture	Rural (innovation) policy Agriculture, diary industry
Harvesting	Milking technology	Primary supply networks	Robot or hand-held tools	Intensification of the harvesting process	Robotics, tools	Sustainability, natural produce	Rural (innovation) policy Agriculture, diary industry
Storing	Storage manufacturing	Logistics	Optimization	Balancing of the input processing	Milk tank, milk container	Sustainability	Clean investment Storing technology, agriculture
Cleaning	Sorting, cleaning, utilization of side flows	Filter technologies	Fresh products	Food and food ingredients	Automatization, dairy	Naturalness, freshness, cleanness, health impact	Nature-based innovation, by product optimization Manufacturing
Processing	Food processing	Milk coagulation	Cheese	Food, feed, end ingredients	Cheese line production, food technology	Local produce, sustainability, organic, freshness	Food Food technology
		Milk coagulation	Cottage cheese	Food, feed, end ingredients	Separator, cottage cheese line	Local produce, sustainability,	Food Food technology

Key technologies		Products	Application	Key investment	Promotion	Policy, 3S, industrial modernisation/ agrifood	Partnership/ Markets	
					organic, freshness			
		Whey protein coagulation	Sweet album cottage cheese	Food, feed, end ingredients	Album cheese kettle	Sustainability, organic, fresh, by-product	Food	Food technology
	Utilization of side flows	Pasteurizing	Whey	Food, feed, end ingredients	Liophilisation, membrane filtration	Sustainability, by-product	Innovation, clean investment	Food technology
		Cultivation	Spirulina	Food, feed, end ingredients	Algae breeder	Sustainability, animal feed	Innovation, clean investment	Food technology
		Dissolution, methacrylation of whey	Whey plastics	Material production	Drum dryer	Sustainability, recycling	Innovation, clean investment	Clean plastics, green market

4.3 Field research and identification of competitive advantage

4.3.1 Analysis

Statistical and field research (the interviews with local actors. MITY has already done). Based on the information collected in item [1], describe upstream and downstream linkages. This is done in collaboration with cluster facilitators in the regions.

Agriculture in Soča valley is determined by the alpine mountainous landscape. Dairy is one of the oldest productions that have been known in the area and is considered both traditional, unique and of high quality. Two main products are Tolminc (cow milk) and Bovec cheese (sheep milk) and both are labelled by the EU Protected designation of origin. Branding is considered as the last step of the innovation process highlighting the origin and the level of quality. The value chain has been analysed to determine sidestreams and to identify innovation gaps where interregional cooperation could contribute to the increase of the value added of traditional and new products.

The key player in the area is Planika dairy that was established in 1995 by the Agricultural cooperative Tolmin on the bases of a former global milk manufacturing company. Its purpose was to secure the purchase of milk from farmers in Posočje area in western Slovenia, and to start new production. The new management faced many challenges at that time: outdated technology, premises with lack of appropriate maintenance, and above all, high level of competition on a relatively small Slovenian market. Therefore, a new product strategy had to be developed to secure the jobs of more than 50 workers and many farmers that were dependent from the dairy. There are about 1400 dairy cows in the Posočje region, producing about 84 000 hl of milk per year. Approximately 150 tonnes of fresh and ripe cheese are produced annually in Posočje. For every kilogram of cheese produced, 9 to 10 litres of whey are produced. It can be estimated that the quantity of whey produced in Posočje on an annual basis is approximately 1.425.000 litres.

The value chain competitiveness mapping gave the following results, **Table 8**.

Table 8 Dairy industry, competitiveness mapping in the Goriška Region

	Indicator selected (ref. to Table 5)	Domains (ref. to Table 7)
Business	Turnover, value added per litre of raw milk	Statistical data and statistical analysis
Product	Market penetration	Statistical data and statistical analysis
Research (on going)	Number of (inter)national research projects	Interviews with research staff in research units and in businesses
Research solutions, transferable with or without IPR	Marketable solutions, patents	Implementation of patents, interviews
Skills in the labour force and in education	Adjustment of adult education and training modules	Number of participants, satisfaction of attendees
Policies (enabling context)	CLLD strategy and calls dedicated to: -Small scale R2B initiatives -Internationalisation of R2B ecosystem -Skills development	Interviews with key stakeholders on regional level

4.3.2 Findings and recommendations

Summary

Table 9 Summary of the value chain mapping, PP6 Western Slovenia

<p>VALUE CHAINS DAIRY INDUSTRY & SIDE-STREAMS Region: PP6 SVDC, WESTERN SLOVENIA</p>
<p>Peaks (re-shoring and in-shoring potential)</p> <p>Traditional dairy products</p> <ol style="list-style-type: none">1. Cheese with European and other designations of origins and brands (Bovec cheese, Tolminc cheese)2. Other traditional dairy products (butter, yogurt, cottage cheese ...) <p>Due to a geographical origin of the milk as the main precondition at production of protected cheeses it is already based only in the region. With an already high anticipation of the quality of the products on the market it is however possible to extend the production.</p> <p>In addition to the large dairy there are several smaller producers (farmers) that both produce and sell products on the market and are in a way creating a competitive (inshoring) environment.</p> <p>Side products</p> <ol style="list-style-type: none">1. Whey (a smaller part is used as the raw ingredient used in nutrition products and local cuisine and in production of whey drinks). The majority of whey is not used at all.
<p>Valleys (near-shoring and in more rare cases, in-shoring potential)</p> <p>Traditional dairy products</p> <p>The main challenges:</p> <ul style="list-style-type: none">— Limitations in production (organic farming, summer mountain pastures, freshness of products)— The whole Alps are known for very good cheese products <p>Side products</p> <p>There are two main pillars of whey usage to be further developed:</p> <ul style="list-style-type: none">— Extraction of proteins and use for nutrition of humans (partly already in progress by the dairy)— Use of proteins for:<ul style="list-style-type: none">• Production of (fish) food (spirulina algae) for local fish farms• Bio plastics
<p>Interregionality (near shoring)</p> <p>Traditional dairy products</p> <p>There is potential in better positioning in the foreign markets with production staying in the region.</p> <p>Side products</p> <p>Dairy producers are aware of the whey challenges and are already thinking about new ways of using it. Some opportunities have been identified (both R2B and B2B) in the alpine arch neighbouring countries (Italy, Austria).</p>

Key findings of the analysis:

1. Commercial processing of raw milk is performed mostly by one dairy business that processes milk from the farmers and from their own organic farm. Their production is based mainly on traditional dairy products. The company is owned by a farmer's cooperative.

2. There are some individual farms that are also producing dairy products.
3. The biggest side product in dairy is whey that is currently especially an environmental and financial burden.
4. A part of whey is currently being sold on the market as a nutrient, some is used for animal food but the majority is not used at all.
5. The company is already investing in technology of microfiltration to extract proteins from whey.
6. Potential regional synergies have been identified for the possible use of whey in the production of fish food (to support regional fish farms and support circular economy). A case has been identified in Austria that could potentially support the development of the products (possible follow up project).
7. Specifics of the area:
 - Both labelled cheeses are perceived as very high quality and appreciated on Slovenian and cross-border markets.
 - The overall amount of milk in the area is low in comparison to other neighbouring regions where agriculture is more intensive. Economy of scope is the main focus as organic farming is the streamline of the area.
 - During the summer farmers move the cattle to the mountain pastures and also produce cheese with whey not being used.
8. CLLD as the 'regional' funding mechanism has been identified and addressed to support utilization of measures in dairy. PP6 is facilitating the process of the new CLLD mechanism for LAG Soča valley. It is responsible also for inclusion of stakeholders and integration of identified needs of the territory. Recommendations will be integrated into the process that will start and end in 2023.

Policy recommendations

Table 10 Policy instrument improvement recommendations related to selected value chain, Western Slovenia¹⁶

Policy impact
Dairy sector (PP6)
Policy instrument (strategy + funding source to be indicated)
The policy instrument is the 2021-2027 CLLD mechanism in the area of Local action group (LAG) Soča valley. It is currently in initial stage of the preparation. Funding sources are a combination of several EU funds.
How the policy instrument is impacted (can be call criteria, content of programme, new programme content)
PP6 is facilitating the process of the new CLLD mechanism for LAG Soča valley. It is responsible also for inclusion of stakeholders and integration of identified needs of the territory. Recommendations will be integrated into the process:
<ol style="list-style-type: none"> 1. Interregional cooperation projects within CLLD (the EU CLLD system allows it, but it has to be clearly mentioned in LAG strategies) <p>The CLLD is a place-based funding mechanism that addresses both the LAG as an umbrella representative of the stakeholders and single stakeholders as final users of the mechanism. In terms of international cooperation, it will be highlighted as a bridge towards R&D capacities from other EU regions, giving priority on Alpine arch (dairy sector). It follows the idea of reshoring (GP3) for higher flexibility and competitiveness in areas with special geographical features. Diversification of local production will be supported in CLLD.</p>

¹⁶ Policy instrument recommendations PP6, available at https://projects2014-2020.interregeurope.eu/fileadmin/user_upload/tx_tevprojects/library/file_1660982662.pdf.

Policy impact

We foresee bilateral and multilateral initiatives for the identification of interregional complementarities. We hope to further link these findings for the implementation of prioritised initiatives with further local projects as well as with transnational Interreg options, as also discussed below.

In the case of the Alps, it is feasible to apply reshoring (**GP7**) also on cross or trans-border areas (accessibility, traditional markets, R&D hubs, ...). There are other territorial funding mechanisms that are available beyond the scope of CLLD. Programming of European cooperation programmes (Interreg) is done and there are several priorities that support cooperation and inclusion of SMEs in the area of green, circular economy, focusing on natural resources. Related to the needs of the dairy sector a special focus will be given to cross border (Slovenia – Italy, Slovenia – Austria) and transnational (Alpine space) programmes. In this case implementation of the CLLD is an enabler for SMEs to access other funding mechanisms.

2. Small scale R2B (regionally adjusted scheme to focus on selected sectors, supporting mainly SMEs)

SMEs are often lacking staff/resources to invest in R&D. (Inter)national, and regional funding schemes are often too complex for them. CLLD offers an entry point for SMEs and small clusters/networks. It will be suggested to define a priority and an indicator related to projects improving accessibility of SMEs to R&D.

3. Funding of initiatives building on side flows from processing of (regional) natural resources

Intensive food production and industrial processing has again started to follow resource efficiency in order to optimise processes and reduce impact. There are many side streams in bioeconomy that are still not used or with a very low value added. A focus will be given to new (value chain mapping), innovative initiatives that build on traditional use of natural resources while seeking innovation in side streams. The measure foresees the value chain mapping approach identified in (**GP2**) and already successfully tested in dairy and aquaculture sectors as the initial step towards product development and higher value added.

Impact process (institutions to be involved, evidence they require, stakeholders to be involved, anticipated timetable)

The following steps have been / are being followed:

1. Mapping of stakeholder needs (online survey – July 22)
2. Mapping of stakeholder needs (interviews – autumn 22).
3. Introduction of Bridges outcomes (September 22)
4. Drafting of the strategy of the Soča valley LAG (autumn 22)
5. RSG meetings (LAG board – regular)
6. Amendments and final approval (2023)

Timetable: 1.1.2022 – 2023

