Interreg Alpine Space

EUROPEAN UNION

AlpLinkBioEco

European Regional Development Fund

Linking BioBased Industry Value Chains in Alpine Region

AlpLinkBioEco – Joint Masterplan on circular bioeconomy

Sergi Costa (BIOPRO, PP7), Mateja Dermastia (Poly4Eml, PP4)

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1. Executive summary

An analysis of the economic performance, employment, and social equality of the Alpine macro-region reveals that this macro-region encompasses some of the best performing regions in Europe. The macro-region involves 7 countries (Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland) and 48 regions. In the Interreg Alpine Space project AlpLinkBioEco (2018-21) some of these regions have worked together to set up a methodology for creating novel value chains in circular bioeconomy. The initiated cross-regional cooperation needs to be mainstreamed through a common policy agenda and the Joint Masterplan in your hands aims to strongly contribute to this process.

The bioeconomy transition in the Alpine Space is facing challenges that are familiar: they replicate, in a major or minor degree, the situation of the bioeconomy at European level. Issues like the lack of common definition for bioeconomy, common indicators and proper cross-regional support schemes are among them. In the AlpLinkBioEco Whitepaper "Benefits and opportunities of bio-based economy value chains" sectors like wood, agriculture, bio-based packaging and chemistry were analyzed in the participating project regions. The report was completed in 2018 and showed good perspectives.

If we focus on the impact of the bioeconomy in the individual economies and the Alpine macro-region in general, there is not enough data for conclusive remarks. But the information collected through the project reveals indeed a booming sector with regional assets and high potential for cross-regional cooperation. The Alpine Space has sufficient biomass and relevant critical mass of stakeholders to gain pace towards the bioeconomy transition. In the process, the (effective) implementation of existing regional bioeconomy strategies and their better alignment with the EU Strategy for the Alpine Region (EUSALP) is needed.

The Masterplan on circular bioeconomy is driven by 3 ambitions:

- Unleashing potential, turning regional assets into macro-regional opportunities
- Strengthening the macro-regional identity
- Empowering digitalization for resilience

It builds on 4 actions to deliver on target: 1) developing regional/national strategies; 2) prioritization of thematic areas for macro-regional cooperation; 3) strengthening the transnational dialogue; 4) making bio-based value chains resilient through digitalization.

The execution levers of this Masterplan should be the regional/national/local authorities, regional development agencies, business support organizations, SMEs/enterprises, and the R&D community; last but not least, the Alpine citizens have to understand in layman's terms what bioeconomy is and how the transition works. The Alpine Policy Forum in February 2021 revealed a certain degree of maturity to trigger a coordinated policy response towards the bioeconomy transition and the related transformation processes. At the date of publication more coordinated dialogue among the Alpine regions is necessary to keep on framing this Masterplan with milestones and timelines. A short-term scenario till Autumn 2022 is envisaged and some of the recommendations collected in this document should be used for this purpose. The AlpLinkBioEco community, currently composed of 9 Alpine regions, 70 clusters, 400 SMEs and more than 50 decision makers, shall become larger and more robust if some of the recommendations and actions of this Masterplan are taken into practice.

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2. Bioeconomy assets in the Alpine macro-region: challenges and opportunities

Setting the scene

In what degree the Alpine Space is ready for a Joint Masterplan on circular bioeconomy at macro-regional policy level?

According to the EU definition, the bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes, among others, all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services[1].

This common definition of the bioeconomy at European level often collides with the regional specificities on the ground, particularly when regional/national bioeconomy strategies are already in course of implementation. In the framework of an (Alpine) macro-region, the lack of a common definition might jeopardize a common vision for an integrated policy framework.

Macro-regional strategies and specifically the EU Strategy for the Alpine Region (EUSALP) can help to find ways to better use existing resources, legislation and structures for the benefit of the whole region[2]. The EUSALP was set-up in 2015 after endorsement of the European Commission and involves 7 countries (Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland) and 48 regions. The intention of the EUSALP is to address common challenges i.e. enhancement of competitiveness in a more effective way.

Figure 1: Map showing Alpine regions supported by the Interreg Alpine Space Programme and Alpine regions represented by the EU Strategy for the Alpine Region (EUSALP)

Adapted from © Interreg Alpine Space Programme

[1] The EU definition excludes biomedicines and health biotechnology. European Commission, 2018. A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment: Updated Bioeconomy Strategy.

[2] https://www.alpine-space.eu/about/eu-regional-policy/macroregional-strategies, last accessed 23/02/2021

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An analysis of the economic performance, employment, and social equality of the Alpine macro-region[3] delivers relevant information to conclude that this macro-region encompasses some of the best performing regions in Europe. The three macro-economic indicators chosen for the analysis, briefly explained on the paragraphs below, reflect the (socio) economic context of the individual economies as well as of the macro-region as a whole.

The **Economic performance indicator** in the Alpine macro-region shows a relatively homogeneous picture regarding economic development of its regions: for the years 2011 and 2014 the highest values for the most regions are to be found in Germany and Austria, as well as for three regions in Northern Italy, **South Tyrol**, **Lombardy**, and **Provincia Autonoma di Trento**. The rest of the regions in the macro-region exhibit values for this indicator which are above the EU-average. Switzerland accounts nearly exclusively, with the exception of the canton Ticino, for the better performing half of the benchmarking scoring. The lowest values for this indicator can be found in **Slovenia**.

All NUTS-2 (Nomenclature of Territorial Units for Statistics regions, level 2) in Switzerland, Germany, and Austria in 2011 and 2015 exhibit values above the EU average related to the **Employment indicator**, a position already shown in 2008. The good performance of the regions in these three countries is due to their successful labour market policies, especially the dual vocational training, which plays an important role in reducing youth unemployment. In 2011, there were three regions with values below the EU-median: two Italian (Liguria and Piemonte) and one French (Provence-Alpes-Côte d'Azur) region. By 2015, however, the number of regions below the EU average increased to nine and belong to France, Italy and **Slovenia**.

The analysis shows a correlation between the level of economic development and social progress. The overall picture of the **Social Progress Index indicator**[4] demonstrates that in terms of social progress, the Alpine regions are fairly cohesive and perform mostly above the EU-median. Only about 23% of the regions are below the EU-median.

Towards a Join Masterplan for the Alpine Space

The overall objective of the Interreg Alpine Space project **AlpLinkBioEco** (2018-21) is to develop a macro-regional circular bioeconomy strategy by providing a roadmap and methodology for creating novel value chains. The AlpLinkBioEco community is composed of 9 Alpine regions, around 70 clusters, 400 SMEs and more than 50 decision makers. One of the main outputs of AlpLinkBioEco is the Value Chain Generator (VCG), a software based on natural language algorithms allowing to match actors from the database to create bio-based value chains. In the backbone lies the will to increase cross-regional cooperation and facilitate synergies among the multiple actors of the bio-based value chains.

This Joint Master Plan has been drafted as an output of the **AlpLinkBioEco** project, but it is intended to capitalize also the efforts undertaken through recent and ongoing Interreg Programme and ARPAF[5] projects. Following is a non-extensive list of projects that have been co-funded since 2016 looking for

[3] European Commission, 2017. Study on macroregional strategies and their links with cohesion policy.
[4] The indicator measures the extent to which countries provide for the social and environmental needs of their citizens.
[5] Alpine Region Preparatory Action Fund; https://www.alpine-region.eu/publications/alpine-region-preparatory-action-fund-arpaf

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cross-regional cooperation in the circular bioeconomy domain; their budget allocations[6] are also included:

- S3-4AlpClusters (€2.5 million)
- AlpBioEco (€2.1 million)
- AlpLinkBioEco (€2.3 million)
- ARDIA-Net (€1.6 million)
- A-Ring (€1.3 million)
- Circular 4.0 (€2.5 million)
- AlpGov 2 (€3 million)

Due to the general lack of regional-driven cross-border initiatives, the Interreg Programme and, at much lesser extent, ARPAF remain till date the main funding sources for cross-regional cooperation in the Alpine Space. In this regard, the scenario from 2021 onwards is promising: the programmes for cooperation are strengthened in the new regulatory framework post-2020 through European Structural and Investment Funds (ESIF) and specially the Investment for Jobs and Growth (IJG) Goal[7].

Challenges

A closer look to some deliverables of AlpLinkBioEco (i.e. Whitepaper, Policy synthesis report, Roadmap, Policy memos[8]) reveals the **main current challenges** for the full deployment of the bioeconomy in the Alpine macro-region. Some of them are not new and replicate, in a major or minor degree, the situation of the bioeconomy at European level:

- Lack of common definition for bioeconomy
- Lack of common indicators for harmonized data
- Lack of proper cross-regional support schemes that allow interested actors to cooperate across borders
- Lack of commitment of most regions to align their regional strategies with the EUSALP

Opportunities

In the Whitepaper "Benefits and opportunities of bio-based economy value chains"[9], the market and social opportunities of four bioeconomy-related sectors were analyzed: wood, agriculture, packaging and chemistry. The study, focused in the participating project regions, underlines the difficulty to find complete datasets related to these sectors. It confirms that wood is one of the most abundant resources in the regions, with more than 35 million m^3 of harvested wood per year. Agriculture also covers an important role with roughly 1,400,000 employees and a revenue of about €140 billion

[6] Total eligible costs, including 85% contribution from the European Regional Development Fund (ERDF) and 15% own contribution from the participating partners. In the case of the Swiss cantons, the own contribution amounts to 100%.
[7] Interact Programme, 2020. Guideline on cooperation under IJG goal 2020+.
[8] https://www.alpine-space.eu/projects/alplinkbioeco/en/project-results, last accessed 22/02/2021
[9] https://www.alpine-space.eu/projects/alplinkbioeco/white-paper/benefits-and-opportunities-of-bio-based-economy-value-chains_-final.pdf

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annually. The packaging industry employs more than 230,000 people (due to difficulties to find data for packaging for food and pharma, data about packaging as total are mostly reported). Chemistry is a well-developed sector with more than 3,000 companies (due to difficulties to find data for the bio-based chemistry, data about chemistry are mostly reported). In the same study a list of **indicators** classified as economic[10], process[11], environmental and societal are listed, although it is stated that these indicators need some refining in definition due to the fact that there is no common definition of bioeconomy in the Alpine Space.

Indeed, if we focus on the impact of the bioeconomy in the individual economies and the macro-region in general, there is currently not enough data for conclusive remarks; nonetheless **the Alpine macro-region has already the following assets that can be turned in opportunities**:

- sufficient biomass, coming from agriculture, forestry and residues
- substantial critical mass of stakeholders, including well-matured clusters
- regional strategies in place, though at different maturity level
- a post-pandemic call to become more resilient: prioritizing local versus global supply chains
- the new batch of Smart Specialisation Strategies (S3) and Operational Programmes 2021-27 acting as institutional instruments for a better alignment with the EUSALP

In this regard, the Alpine Policy Forum[12], held on 16/02/2021 with around 125 stakeholders representing most corners of the Alpine macro-region, pointed out the importance to work in a more cohesive way, exploit synergies and try to capitalize these assets. Taking this message into paper, **this Joint Masterplan is driven by three ambitions**:

- **Unleashing potential**: turning regional assets into opportunities at macro-regional level
- **Strengthening the macro-regional identity**: a renewed mindset that open the new batch of Smart Specialisation Strategies (S3) and existing regional frameworks to cross-regional cooperation
- **Empowering digitalization**: making broken bio-based value chains more robust and resilient against unforeseen circumstances i.e. pandemics

Main actors of the bioeconomy transition

The full deployment of a circular bioeconomy at regional and local level will be possible if all **stakeholders** of the innovation ecosystem are addressed, in short, if they are driven by the same mission. As stated before, the critical mass of stakeholders is sufficient and some of them (i.e. clusters) feel an urgent need to play a bigger role in this transition.

[10] Referred to business and competitiveness.
[11] Referred to technologies and innovativeness.
[12] Joint event organised by AlpLinkBioEco (Interreg Alpine Space) and Smart SME's (ARPAF) projects.

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Firstly, the **regional/national authorities** should be major drivers for a common definition of the bioeconomy and the set-up of cross-regional support schemes; they should also work towards the alignment with the EUSALP portfolio.
On a second level, **regional development agencies** and **business support organizations** (i.e. clusters and networks) can play the role of putting strategies and roadmaps into action. In the complex ecosystem of the bioeconomy, they should act as catalysts or "ambassadors" (as put on during the Alpine Policy Forum 2021) for the bioeconomisation[13] of the sectors that are representing.
The collaboration of the productive sector (mainly **SMEs**) with the academia (**R&D organizations** and **universities**) should contribute to make this transition attractive and more consistent: bioeconomy-related sectors still need R&D for scaling-up and triggering interest from private/public investors on the one hand. On the other, the harmonization of data through common indicators as output of these R&D activities should facilitate effective benchmarking and business intelligence in the field of bioeconomy.

Finally, the role of **society** as end-user of some of the bio-based products/services should not be overlooked in the transition. In times of EU Green Deal[14] and acceleration towards a circular and low-carbon economy, it might seem easier to advocate for sustainability and digital transformation, but communication and awareness raising on the positive aspects of the bioeconomy and the bio-based value chains should be steady in time; in this regard, the implementation of regional/national bioeconomy strategies should play also a definitive role at local level.

[13] The full deployment of the bioeconomy potential lies on the engagement and participation of all related-industries and stakeholders through the bio-based value chain. Missing gaps should be identified and integrated.
[14] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en; last accessed 08/03/2021

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3. Fields of action for the bioeconomy transition in the Alpine macro-region

This section focuses into four fields of action that, on the one hand, should facilitate an integrated policy framework and, on the other, should untap existing opportunities described above.

Field of action A gives a picture of the current state of regional/national bioeconomies strategies, how they are related to the new batch of Smart Specialisation Strategies (S3) in each region, which existing funding programmes allow cross-border cooperation and which regional assets are common. **Field of action B** shows which thematic areas can be matchmaked for cross-border cooperation while **Field of Action C** brings potential into practice with a list of dedicated actions to prioritize. Finally, **Field of Action D** highlights the importance of digitalization as a transformation agent to improve the performance of the bio-based value chains, specially in times of pandemic.

3.1 Field of action A - Developing regional/national bioeconomy strategies

The Alpine macro-region currently does not have a common bioeconomy strategy; the regions use different definitions of bioeconomy and the maturity of their regional bioeconomy strategies, if existing, is diverse. The inconsistency in understanding and prioritizing the bioeconomy among regions is also reflected in the policy supporting frameworks of each region.

Policy supporting framework in the participating Alpine regions

The research on strategic frameworks in each region reveals that most of the regions do not follow a systematic approach when it comes to a framework related to the bioeconomy. The diversity is summarized in Table 1, which shows different strategies developed in each region: either on wider (related to climate change, sustainability, the circular economy and resource efficiency) or narrower (sectoral, related to agriculture, forestry, energy and/or waste) scope. In some cases, they are embedded in the Smart Specialisation Strategies (S3).

Out of nine regions, four regions have national bioeconomy strategies (**Auvergne-Rhône-Alpes, Baden-Württemberg**, **Bavaria** and **Upper Austria**); moreover, **Baden-Württemberg** and **Bavaria** have a regional bioeconomy strategy in place. In May 2020, **Lombardy** region drafted a Roadmap for Research and Innovation on Circular Economy[15], that has contributed to the definition of the Smart Specialisation Strategy of Lombardy (2021-2027) and maintains strong links with the deployment of the bioeconomy in that region; a regional bioeconomy strategy is also under preparation.
Most of the regions have the bioeconomy principles incorporated in wider (regional and/or national) strategies or they are embedded in their Smart Specialisation Strategies (**Baden-Württemberg**, **Lombardy**, **Provincia autonoma di Trento**, **Slovenia**, **South Tyrol** and **Upper Austria**); **Fribourg** considers the bioeconomy as one of the priorities of its new regional policy.

[15] https://www.openinnovation.regione.lombardia.it/it/what's-going-on/lombardy-roadmap-for-research-and-innovation-on-circular-economy; last accessed 01/03/2021

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Table 2: Overview of strategies directly or indirectly related to the bioeconomy per participating Alpine region (2021)

Region	Wider scope	Bioeconomy	Sectoral	Smart Specialisation Strategy (S3)
Auvergne- Rhône-Alpes	3 national (low-carbon, circular economy, biomass mobilization with regional scheme in preparation)	1 national from the National Ministry of Ecological transition that ended in 2020 but is still implemen-ted through actions like regional and national competition for bioeconomy trophies (3rd edition 2020-2021); 1 national from the National Agency of Ecological transition16 valid until 2022	1 national (energy for green growth), 5 regional (reg. development/sustainable development/territorial balance, waste, circular economy, forests and wood, economic development/innovation and internationalization)	A new S3 is in the process of being adopted for the Auvergne-Rhône-Alps Region In the former S3, priorities related to the bioeconomy included eco-efficient factory; grids and energy storage; smart building with high energy-efficiency; mobility systems of the future; personalized healthcare
Baden-Württemberg	1 regional (sustainability); 1 regional (resource efficiency)	1 national; 1 regional		The S3 (2021-27) sets up bioeconomy as one of the priority fields. Other related priority fields addressed are resource efficiency, energy transition, sustainable mobility, digitalization and artificial intelligence
Bavaria		1 national; 1 regional		The Bavarian S3 has a broad scope. Bioeconomy is not an individual topic. Aspects of bioeconomy are covered by CleanTech, which has highest priority in the S3.

[16] https://www.ademe.fr/strategie-lademe-bioeconomie-durable-2017-2022

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Fribourg	New Regional Policy (3 priorities: agri-food, digital transformation, smart territory)	Bioeconomy included in the priorities of the New Regional Policy		
Lombardy	1 regional (S3 2021-2027); 1 regional Work Program (Research and Innovation); 1 Roadmap for Research and Innovation on Circular Economy; 1 Agreement for Sustainable Development in Lombardy; 1 Regional Law n.29 of 23 Nov 2016: "*Lombardia è ricerca e innovazione"*	1 national (Bioeconomy Strategy - BIT II); 1 regional Bioeconomy Strategy (in preparation)		Priorities related to bioeconomy include circular economy, eco- industry, agri-food, advanced manufacturing, sustainable mobility, and developing eco-friendly materials.
Provincia Autonoma di Trento	4 regional (sustainable development, climate change, regional development, rural development)		4 regional (energy, waste, health, forest/mountain resources exploitation)	Priorities related to the bioeconomy include quality of life, energy & environment, agri-food
Slovenia	2 national (development, climate & energy)			Priorities related to bioeconomy: circular economy, technologies for sustainable biomass transformation and new bio-based materials, technologies for use of secondary and raw-materials and reuse of waste, and production of energy based on alternative sources

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South Tyrol	3 regional (ERDF) related to S3 (energy and environment, food technology, medical technology end medical treatment); Research Südtirol/AltoAdige; Joint research projects; Seal of Excellence	1 national		Priorities related to the bioeconomy include energy & environment, food technology and medical technology end medical treatment
Upper Austria	3 national (sustainability, climate change, resource efficiency, with 1 action plan Action Plan for the Use of Renewable Resources)	1 national		Priorities related to the Bioeconomy include renewable energy, residual flows, biogenic processes, economic policy in the field of energy and environmental technologies, industrial production processes

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Funding opportunities in the participating Alpine regions

In order to implement the strategies and achieve expected impact, regions have to set up a favorable legal and administrative framework to support the development of the circular bioeconomy. One of the enabling factors are certainly the funding programmes that provide different instruments, such as grants, loans, consultancy or networking services.

According to the AlpLinkBioEco project partner reports there are different funding programmes available on regional, national or transnational level. Surprisingly, only two regions (**Baden-Württemberg** and **Slovenia**) are involved in transnational programmes (such as EUREKA or EUROSTARS), which also shows that there exists the untapped potential for transnational partnerships, internationalization and new value chains that could be built within joint R&D projects funded by transnational programmes.

Due to the differences in strategic frameworks among the participating Alpine regions, differences in the funding opportunities are noticeable (Table 2). AlpLinkBioEco project partners identified the funding programmes with focus on bioeconomy, circular economy or sustainability in their regions, which were grouped in the following categories:

- Research and development (R&D)
- Development of technological or non-technological innovation
- Access to finance for SMEs
- Creation of new innovative companies
- Knowledge and technology transfer
- SME capacity building
- Educating workforce to increase knowledge/experience in R&D context
- Cluster initiatives, platforms focused on circular bioeconomy
- Joint infrastructure (technology centers and joint research centers for a circular bioeconomy)
- Other relevant programmes and schemes

The closer look at the funding opportunities reveals that most of the funding programmes in the participating regions are available for **R&D** (53), followed by **development of technological or non-technological innovation** (18) and **creation of new innovative companies** (17). Furthermore, the Policy synthesis report[17] shows the differences in accessibility for funding among the participating regions, especially considering the focus on bioeconomy, circular economy or sustainability. The information provided by regions show that **Slovenia** has the highest number of funding programmes (30), followed by **Auvergne-Rhône-Alpes** (25) and **Provincia autonoma di Trento** (23), while **Fribourg** (5) and **South Tyrol** (4) have the least funding programmes with focus on bioeconomy.
It is worth mentioning that most of the funding programmes are intended for actors from a wide range of sectors, which means that the actors in bioeconomy have to compete with other actors from sectors like digitalization or e-mobility, that might be higher on the agenda of the programme owners. Additionally, the EUSALP study on this topic[18] found gaps in funding opportunities for the investment phase: particularly for up-scaling of processes, ramping-up of manufacturing processes and also for the market entry phase.

[17] https://www.alpine-space.eu/projects/alplinkbioeco/policy-synthesis-report/d.t4.1.1-alplinkbioeco--synthesis-of-regional-reports-on-policy-instruments..pdf
[18] https://www.alpine-region.eu/results/study-available-funding-opportunities-bioeconomy-alpine-region

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Table 3: Funding programmes (incl. number) with regional / national focus on bioeconomy, circular economy or sustainability per participating Alpine region (2020)

	Categories of funding programmes	Bavaria	Baden-Württemberg	Lombardy	Auvergne-Rhône-Alpes	Upper Austria	Slovenia	Prov. Trento	Fribourg	South Tyrol	Total no.
1	**Support for R&D projects**	x (6 regional)	x (5 national)	x (12 regional, 2 national)	x (3 regional, 3 national)	x (3 regional, 9 national)	x (3)	x (3 regional, 3 national)	x		**53**
2	**Development of technological or non-technological innovation**	x (2)	x		x	x (6)	x (3)	x (2 regional, 1 national)		x	**17**
3	**Generic access to finance**	x (2)	x		x (1 regional, 1 national)		x (2)	x (1 regional, 1 national)			**9**
4	**Creation of innovative companies**	x (3)	x		x (2 regional, 4 national)		x (5)	x (2 regional, 1 national)			**18**
5	**Knowledge and technology transfer**	x (4)	x		x	x	x (2)	x (3)		x	**13**
6	**Support for improving capacities**	x	x		x (1 regional, 2 national)	x (2)	x (2)	x	x (2)		**12**
7	**Education and workforce development**	x	x		x	x	x (4)	x			**9**
8	**Support to cluster initiatives and similar focused on circular bioeconomy**	x	x		x		x	x	x	x	**7**
9	**Support to joint infrastructure – available for SMEs/enterprises active in circular bioeconomy**	x	x (2)		x (1 regional, 1 national)		x (3)	x	x	x	**11**
10	**Support to digitalization of bio-based value chains (or value chains in general)**	x	x		x		x (4)	x (1 regional, 1 national)			**9**
11	**Other relevant programmes, initiatives**				x		x				**2**
	Total no.	**22**	**15**	**14**	**25**	**22**	**30**	**23**	**5**	**4**	**160**

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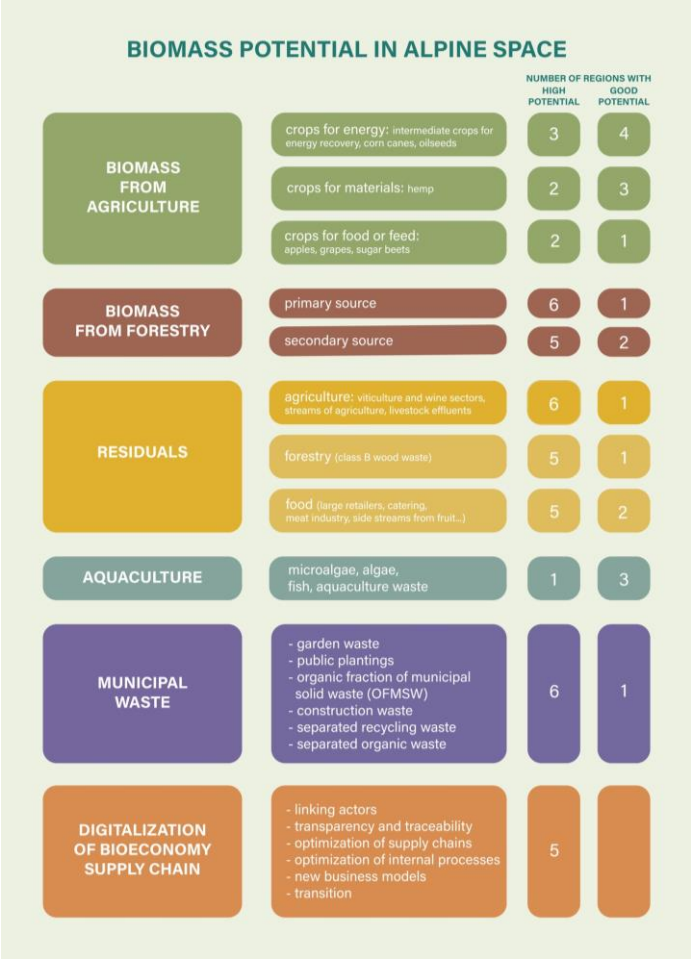
Potential of the regional biomass resources in the participating Alpine regions

Biomass resources coming from forestry, residuals from agriculture and municipal waste are among the sources with highest potential in the participating project regions. In their regional reports[19], regions described the bioeconomisation potential of their industries according to the biomass resource availability and use. Figure 2 summarizes the biomass potential for the participating project regions and identifies the following **priority biomass resources for the Alpine macro-region based on common assets:**

- crops for energy
- biomass from forestry as a primary resource
- wood as a secondary source (from wood processing, sawmill industry)
- residuals from agriculture, forestry and food industry
- municipal waste
- digitalization of the bioeconomy supply chain

Figure 2 shows that most of the participating project regions identified wood biomass as highly relevant for the development of bioeconomy (6 for wood biomass from primary source and 5 from secondary source); 6 regions considered respectively that residuals from agriculture and municipal waste have a high potential in their region.

Figure 2: Biomass potential in the participating regions including common assets to prioritize



[19] https://www.alpine-space.eu/projects/alplinkbioeco/en/project-results/regional-policy-inventory

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Furthermore, Table 3 offers a more detailed overview of the regional biomass potential per participating project region, from which the following conclusions can be drawn:

- Agricultural biomass is a strong resource in **Bavaria** and **Fribourg**, and a significant resource in **Provincia autonoma di Trento**, **Auvergne-Rhône Alpes**, **South Tyrol**, **Baden-Württemberg** and **Upper Austria**
- Forestry biomass is a strong resource in **Fribourg** and **South Tyrol**, with high potential in **Upper Austria**, **Auvergne-Rhône Alpes** and **Bavaria**. Interesting cases are **Lombardy** with a lack of the resource but with high demand (due to its highly developed furniture industry) and **Baden-Württemberg**, which harvests a large amount of wood for bioenergy and acknowledges the small contribution of the resource to the Gross Domestic Product (GDP)
- Biowaste and residuals are identified as an important resource to different extents in all regions
- Biomass from fisheries is relevant in **Lombardy** and from algae in **Slovenia**; **Provincia autonoma di Trento** shows some potential.

Table 3: Comparison of participating regions based on state of biomass availability and potential degree (2018)

BIOMASS RESOURCES IN ALPINE REGIONS

	AGRICULTURE	FORESTRY	BIOWASTE & RESIDUALS	FISHERIES & OTHER WATER ORGANISMS
BAVARIA	**HIGH POTENTIAL** cereals, corn, winter rapeseed, hops livestock (pigs, cows)	**HIGH POTENTIAL** not meeting annual cutting rate 36 % of surface covered in forests annual harvest: 4.79 million m³	biowaste & residuals from: - food industry - cattle raising - agriculture - forestry and wood processing industry	low relevance
BADEN-WÜRTTEMBERG	**MEDIUM POTENTIAL** agricultural land & certain livestock breeding in decline increase in poultry, goat breeding and organic farming	annual harvest: 11 million m³	biowaste & residuals from: - household organic waste - green cuttings, agriculture, aquaculture and forestry side streams	low relevance
LOMBARDY	strong sector with € 8.3 billion and more than 124.000 employees	Insufficient resources due to high divergence between natural resources and industrial sector use. annual harvest 0.53 million m³	**HIGH POTENTIAL** but focus on reduction and production of bioenergy	aquaculture is one of the most important freshwater markets
AUVERGNE-RHÔNE ALPES	**GOOD POTENTIAL** livestock plant sector	**HIGH POTENTIAL** but only 5.2 million m³ annual harvest	**GOOD POTENTIAL** - animal dung - sludge treatment - intermediate crops - end-of-life wood - waste from agri-food industry - biowaste	low relevance
UPPER AUSTRIA	**MEDIUM POTENTIAL** cereals, root crops, oil plants	**VERY HIGH POTENTIAL** annual harvest: 17.65 million m³	**GOOD POTENTIAL** organic residues: biowaste, unused plant or animal by-products, household, industry, trade waste, sewage sludge, manure, slurry ...	low relevance
SLOVENIA		**GOOD POTENTIAL** 58 % of surface covered in forests annual harvest: 6 million m³	**GOOD POTENTIAL** - agriculture - waste from public utilities - organic landfill waste - organic kitchen waste - biodegradable waste from food processing industry	**GOOD POTENTIAL** due to algae production
PROV. TRENTO	**GOOD POTENTIAL** 13.1 % cultivable area 62 % pastures and grasslands	**LOW POTENTIAL** 63 % of surface covered in forests, but only 0.34 million m³ annual harvest	**GOOD POTENTIAL** - 26 % waste residual biomass from sawmill processing - woody residuals from vineyards and apple cultivation - agri-food waste, wastewater sludge, food waste	**SOME POTENTIAL** due to aquaculture
FRIBOURG	strong sector poultry cattle farming fruits & vegetables	important sector for biomass supply	by-products of poultry and cattle farming (feathers, manure)	
SOUTH TYROL	strong sector 89 % pastures, grassland, meadows 10% apples and vineyards dairy farming 37% of Province revenue	strong sector 42 % of surface covered in forests 60 million m³ of wood 23 % energy use	**GOOD POTENTIAL** - animal waste - agri-food waste - urban organic waste - wood waste from wood processing - woody agricultural residuals from vineyards and apples	low relevance

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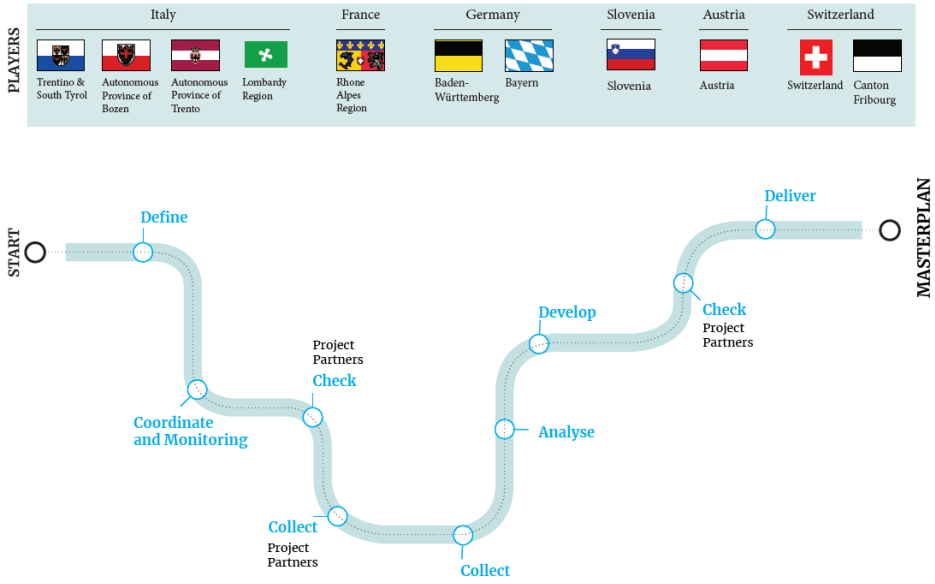
3.2 Field of action B - Prioritization of thematic areas for macro-regional cooperation

The input of the regional policy/industrial dialogues[20] conducted in summer/autumn 2020 in all participating project regions has been used to draft the Roadmap for a common Alpine Space policy circular bio-based economy[21]. The Roadmap, along with other policy-related deliverables and events, has been the basis for the Joint Masterplan.

Figure 3: Roadmap developing method towards the Joint Masterplan



In the policy/industrial dialogues two questions were specifically referred to field of action B[22]:

1. What are in your opinion the main challenges to overcome in order to foster a common macro-regional approach to the circular bioeconomy in these specific thematic fields?
2. Do you know best-practice examples of approaches at any administrative level which should be considered in the set-up of a macro-regional approach for the circular bioeconomy in the Alpine Space?

The first question investigates the main challenges that should be overcome in order to foster a common macro-regional approach to the circular bioeconomy in the specific thematic fields that were pointed out by the interviewees. According to many **national policy stakeholders**, a first big obstacle is the lack of common standards among the different regions. There is no common multi-level governance in place, alongside with robust cross-departmental political structures, which might serve to strengthen the position of the circular bioeconomy domain. It is important to bridge over the main administrative barriers linked to the fragmentation of policies in the entire Alpine macro-region, along with the social and cultural barriers that characterize the different regions. The absence of a common R&D policy represents a major shortcoming which could be overcome by supporting tools for sharing

[20] A general overview of the interviews can be found in Table 2 in https://www.alpine-space.eu/projects/alplinkbioeco/d.t4.2.1-roadmap-for-a-common-alpine-space-policy-on-circular-bio-based-economy/alplinkbioeco--wpt4--roadmap.pdf

[21] See previous link.

[22] More information in Chapter 9.2 (Prioritizing Thematic Areas for a Macro-Regional Cooperation) in https://www.alpine-space.eu/projects/alplinkbioeco/d.t4.2.1-roadmap-for-a-common-alpine-space-policy-on-circular-bio-based-economy/alplinkbioeco--wpt4--roadmap.pdf

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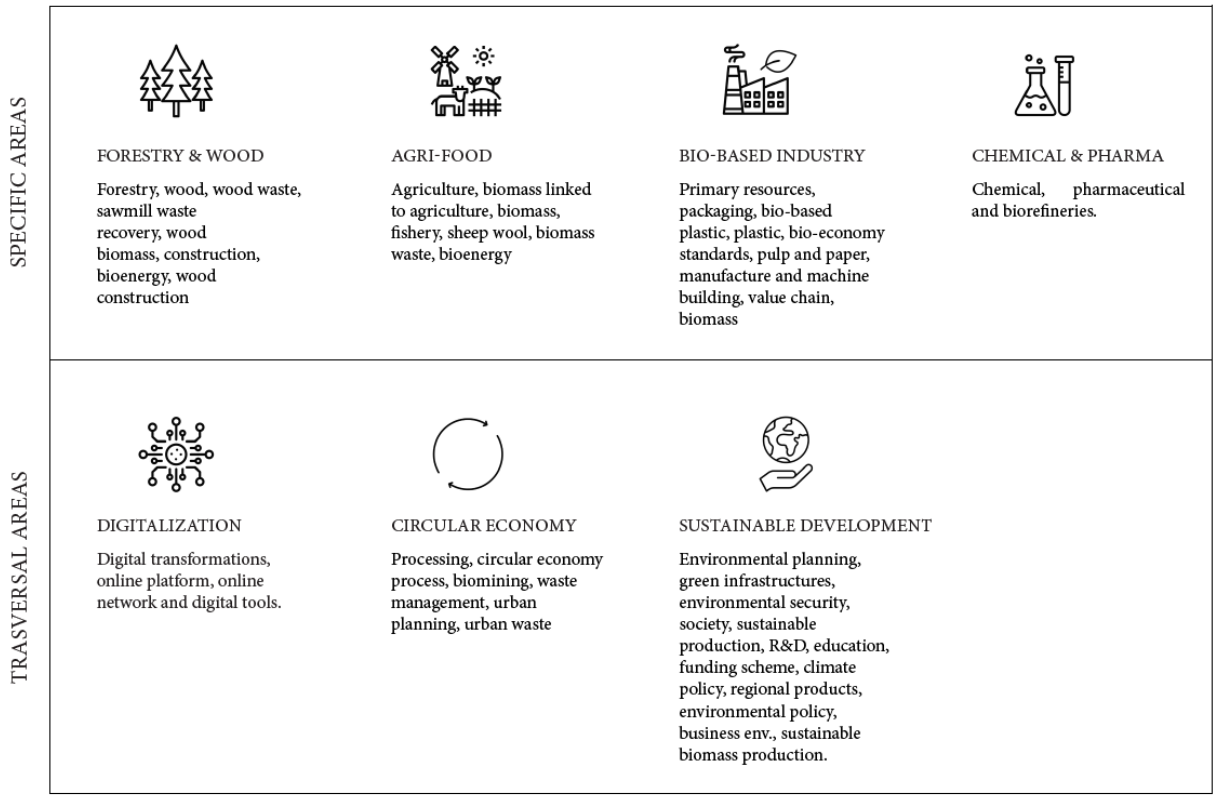
good practices in innovation governance. In this respect, the access to funds should be facilitated by simplifying procedures, involving banks and other credit institutions, and by harmonizing existing financial instruments. To achieve a common macro-regional approach to the circular bioeconomy, it is also necessary to create a network of regional actors, where intellectual property is protected to ensure mutual trust.

Knowing the major challenges that may arise when undertaking such a macro-regional approach, it is now interesting to present the best practices suggested by the interviewed stakeholders. Looking at the answers of the second question, it is reasoned that most of the best practices mentioned are related to the industrial sector, regional networks and strategies, and European projects. Following, the different best practices collected during the survey were divided into four specific areas (Forestry and wood, Agri-food, Bio-based industry, Chemical & pharma; Figure 4) and three transversal areas (Digitalization, Circular economy and Sustainable development).

Figure 4: Definition of areas for cross-regional cooperation, specific and transversal



The interviewees were asked to inform about existing regional, national and European best practices that could facilitate macro-regional cooperation. The four best ranked areas[23] with a short description of best practices are described below. Some practices related to non-participating project regions have not been included in the description for the purpose of this Masterplan and can be found in the Roadmap deliverable. Nonetheless, they are included in Table 4.

[23] Sustainable development (8), Forestry and wood (6), Circular economy (6) and Bio-based industry (5).

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Sustainable development

In Italy, there are several laboratories at the Noi TechPark that support the sustainable development of **South Tyrol**. In **Baden-Württemberg**, stands out the InnoCamp Sigmaringen, which wants to improve regional innovation at local level. The Energy Environment Agency (former RAEE) in **Auvergne-Rhône-Alpes** supports the regional sustainability development.

In the European context, several best practices can be mentioned, such as: the EIT Climate-KIC, a Knowledge and Innovation Community[24]. In addition, the Cassis de Dijon principle is considered one of the pillars of the European internal market, which establishes the mutual recognition of the respective national regulations by the Member States. This recognition should respect the socio-environmental regulatory standards of the receptor region.

Looking at company level, it is possible to highlight the B2B platform for enabling transparent and fair trading of animal by-products and plant-based materials. The platform has been launched by **Bavarian** Start-up Byprotex.

Forestry & wood

The needs of the forestry and wood sector have led to the creation of several partnerships in the Alpine macro-region. Among them, it is possible to find different best practices that produce reasonable estimates of bio-resources such as the following Italian partnerships: the Segherie Valle Sacra in Piedmont, LegnoTrentino in **Provincia autonoma di Trento** and Wood Cluster in Friuli Venezia Giulia. Further, in **Slovenia**, the Wood Chain Manager supports the organization and optimization of forestry works.

In the Italian National Forest Strategy, principles related to bioeconomy and circular economy are often mentioned. Looking towards European initiatives, the Wood K Plus with headquarter in **Upper Austria** is a leading European research institute which support wood and renewable raw materials.

Circular economy

Since the publication of the updated European Bioeconomy Strategy in 2018 the connection between circular economy and bioeconomy is even closer. That is already mainstreamed in most of the ongoing regional policy initiatives. **Baden-Württemberg** and **Bavaria** have a regional bioeconomy strategy in place. Most of the regions have the bioeconomy principles incorporated in wider (regional and/or national) strategies or they are embedded in their Smart Specialisation Strategies (**Baden-Württemberg, Lombardy, Provincia autonoma di Trento**, **Slovenia, South Tyrol** and **Upper Austria**), while **Fribourg** considers the bioeconomy as one of the priorities of its new regional policy. The Vanguard initiative can be seen as a best practice for cross-regional collaboration, including pilots on bioeconomy (co-led by **Lombardy** region) and artificial intelligence.

Bio-based industry

Several platforms for bio-based industries can be mentioned: the online marketplace Rohstoffboerse[25] in Germany for sustainable raw materials is considered an excellent example. Important considerations must be made about packaging, where several companies offer a sustainable product using biodegradable and environmentally friendly solutions: Landpack in **Bavaria** and EveGreen in **Slovenia**. There are also several initiatives in this field, including the **Bavarian** PlanB competition for start-ups and the Horizon 2020 project POWER4BIO[26], where **Bavaria**, **Lombardy** and **Provincia autonoma di Trento** are represented.

[24] This initiative is represented in some participating countries: Austria, France, Germany, Italy and Switzerland.
[25] https://www.digitale-rohstoffboerse.de/
[26] https://power4bio.eu/

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Table 4 shows how transversal areas are very often related to the different best practices, in particular, the area of sustainable development (29 matches). Furthermore, the governance is highlighted as a new transversal area in this table with 23 matches; indeed, it was cited many times during the interviews as a challenge to overcome in the future. Digitalization is relevant in many of the best practices listed (19 matches).

Table 4 Matchmaking of best practices for cross-regional cooperation with specific and transversal areas (2020)

	SPECIFIC AREAS				TRASVERSAL AREAS			
BEST PRACTICES	FOREST & W.	AGRI-FOOD	CHEM/PHAR	BIO-BASED	CIRCULAR	SUSTAIN. DEV.	DIGITAL.	GOVERNANCE
EVENGREEN, SLOVENIA				●	●	●		
LANDPACK, GERMANY				●	●	●		
CASSIS DE DIJON						●		●
SEGHERIE VALLE SACRA PIEMONTE, ITALY	●				●	●	●	●
LEGNO TRENTINO, ITALY	●				●	●	●	●
CLUSTER WOOD FRIULI, ITALY	●				●	●	●	●
CIRCULAR ECONOMY GLASGOW, ENGLAND	●	●		●	●	●	●	●
SUSTAIN. BIOECO. BADEN-WURTTEMBERG	●	●			●	●	●	●
INNOCAMP SIGMARINGEN, GERMANY						●	●	
FORUM STARTUP CHEMIE, GERMANY			●	●		●		
PLAN B, GERMANY	●	●		●		●	●	●
NORDIC CLUSTER	●	●	●	●	●	●	●	●
ENERGY ENVIRONMENT AGENCY FRANCE	●					●	●	●
INTERREG EUROPE COLOR CIRCLE	●	●		●	●	●		●
BIOECONOMY PILOT VANGUARD					●	●		●
POWER4BIO HORIZON				●	●	●		●
BIOECONOMY BALTIC SEA REGION	●			●	●	●		●
ENRD EUROPEAN NETWORK RURAL DEV.	●					●	●	●
ITALIAN NATIONAL FOREST STRATEGY, ITALY	●				●	●	●	●
BYPROTEX DIGITAL PLATFORM, GERMANY						●	●	
DIGITALE ROHSTOFFBOERSE, GERMANY				●		●	●	●
OPEN INNOVATION PLATFORM, ITALY						●	●	●
WOOD CHAIN MANAGER, SLOVENIA	●				●	●	●	●
CELFIC, BELGIUM			●			●		
SMART PILOT EU PROJECT				●		●	●	●
EIT CLIMATE KIC	●	●		●	●	●	●	●
WOOD K PLUS, AUSTRIA	●				●	●	●	●
BIOÖKONOMIE ÖSTERREICH, GERMANY		●		●	●	●		●
NOI TECH PARCK, SOUTH TIROL, ITALY	●	●				●	●	●
TOTAL	FORESTRY & WOOD	AGRI-FOOD	CHEM. & PHARM.	BIO-BASED IN.	CIRCULAR ECON.	SUSTAIN. DEV.	DIGITALIZATION	GOVERNANCE
	16	8	3	13	17	29	19	23

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3.3 Field of action C – Transnational dialogue with prioritization of dedicated actions

Analysis of related-questions from the policy/industrial dialogues

The potential areas and best practices for a cross-regional cooperation on bioeconomy are described in Section 3.2; now it is needed to envisage to what extent the circular bioeconomy in each region could benefit from a macro-regional approach.
The broad idea that resulted from one of the questions[27] taken from the dialogues is that each region could benefit from one another knowledge, resources and network of contacts. In this sense, **Italian/Austrian regional policy** and **Slovenian industrial stakeholders** point out the access to knowledge and exchange on best practices as levelers of cross-regional cooperation.

A general advice towards the macro-regional approach is the creation of an online platform for the Alpine macro-region to enable the flow of knowledge and information. This platform should act as a catalyst to attract investors, connect actors and create "new partnerships", as stressed by the **French regional policy stakeholders**. Another critical issue is the resource flow: ensuring sufficient supply of raw materials from region to region is pointed out as critical by the **French industrial stakeholders** to lever synergies among actors. In the same direction, the role of the rural areas and agriculture is stated by some **Slovenian industrial stakeholders** as critical for the sufficient supply

Most regional/national policy and industrial stakeholders agree that a macro-regional approach could bring economic and social benefits for the local industry. **Austrian industrial stakeholders** stress that a macro-regional approach could trigger harmonized rules and frameworks, and strengthen the position of the bio-based value chains in the Alpine macro-region. A cohesive financial support that addresses the regional and cross-regional bio-based value chains should become an asset for consolidating the circular bioeconomy as a booming sector in the Alpine Space.

Resilient and sustainable bio-based value chains are more feasible if there is a common policy agenda and an overall R&D strategy behind. The conducted policy/industrial dialogues show that the current level of macro-regional dialogue on the circular bioeconomy in each participating project region is medium-low[28]; according to the interviews, it is expected to reach the medium-high level till beginning of Autumn 2022 (2 years after the conduction of the dialogues). This achievement should involve several common actions for the whole Alpine macro-region: general and sector-specific development strategies, policies and agendas, funding schemes and public involvement.

Tools such as the Value Chain Generator (VCG) -highly valued by regional policy and industrial stakeholders- can act as data-based repository to work in this direction. During the policy/industrial dialogues, the tool was rated with a high potential for the development of a common agenda for the Alpine macro-region. The possibility to identify and focus on emerging biolinks[29] via the VCG can help to support the development of new value chains and contribute to develop common strategies for specific sectors. In this sense, **the area of Forestry & wood** (Chapter 3.2) **is seen as a flagship for the establishment of a sector-specific macro-regional agenda**, and increase knowledge and R&D in the first steps of the forest/wood value chain (i.e. owners, sawmills).

[27] To what extent could the circular biobased economy of your region benefit from a macro-regional approach?
[28] Chapter 6.3 in https://www.alpine-space.eu/projects/alplinkbioeco/d.t4.2.1-roadmap-for-a-common-alpine-space-policy-on-circular-bio-based-economy/alplinkbioeco--wpt4--roadmap.pdf
[29] Bilateral interactions between actors based on shared business opportunities; typically based on the output of an actor that can be used as an input for another.

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Through two questions[30] of the policy/industrial dialogues, six topics related to a common agenda have been considered to get an overview of their current state and expectations for progress in a near future (2 years):

- Common funding programmes for R&D
- Common overall strategy for development
- Common sector-specific strategy for development
- Common policy
- Overall macro-regional dialogue and exchange of experiences to set a common agenda for the Alpine Space
- Public awareness and understanding of the potential of the circular bioeconomy

Common funding programmes for R&D are currently rated[31] as low in macro-regional cooperation (42% of the interviewees; 15% did not answer). On the contrary, 33% and 36% of the interviewees assign a rate of 4 and 5, respectively, as regards to the need to increase this dialogue in the future (12% did not answer).

Common overall strategy for development show different results: in fact, 27% of the interviewees claim that the current dialogue for this aspect is quite high, and 30% that is rather low (6% did not answer). The potential for dialogue in the future must not be overlooked: almost half of the interviewees point out this option (15% did not answer). Most of the stakeholders show great expectations for the future. In particular, there is a lot of interest in **Switzerland** and **Italy** at industrial, national and even regional levels.

Common sector-specific strategy for development; the expectation for this topic is rather low since 24% assigned a rate of 2 and 15% a rate of 1. Nonetheless, 39% of the interviewees suggest strongly to increase this dialogue in the future and none of them is completely contrary. For both questions, the non-response rate amounted to 15%. The national stakeholders in **Italy** and the regional ones in **Austria** are already aware of this topic. Future interest is expressed by **Swiss** and **Slovenian** industrial stakeholders, by **Italy** at all levels, and by **French** regional stakeholders.

Common policy; the current level of transnational dialogue on this topic is rather low (30% and 21% of the interviewees assign a rate of 2 and 3, respectively). From the data it can be deduced that this topic is already pretty much discussed in some regions, whereas in others it is not. The potential for the near future is very relevant, since most of the interviewees assigned a rate of 4 and 5, respectively amounting to 24% and 39% (15% did not answer). **Austrian** stakeholders at national level are already aware of this topic; as far as the rest are concerned, future interest is expressed by **Italy** at all stakeholder levels, and from **German** and **Slovenian** industrial stakeholders.

A significant portion of the interviewees stated that the current level of transnational dialogue concerning setting-up a **Common agenda for the Alpine Space** is quite present, assigning a rate of 3 (21% did not answer). Additionally, more than the half of the interviewees, i.e. 52% see an urgent need to increase the dialogue in the future, assigning a rate of 5 (15% did not answer). The national policy stakeholders in **Italy** and the regional policy stakeholders in **Austria** are already aware of this

[30] How do you rate the current level of macro-regional dialogue on the circular bio-based economy in which your region is involved with respect to different aspects?; In which specific fields the future (next 2 years) level of macro-regional dialogue on the circular bio-based economy should be increased?

[31] Potential ranking from 1 (lowest) to 5 (highest).

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topic. As far as the rest of the stakeholder types are concerned, future interest is expressed from all levels in most regions.

About the **Public awareness and understanding of the potential of circular bioeconomy**, the majority of the interviewees assigned a rate ranging from 1 to 3, indicating that the current dialogue level in this regard is quite low. On the contrary, most of the stakeholders see a strong need to increase this dialogue in the future (24% and 39% assigned a rate of 4 and 5, respectively; 9% did not answer). **Austria** has awareness on almost all levels and future interest is expressed especially by **Germany**, **Austria** and **Italy**. But also, at regional policy level in **France** and **Switzerland**.

Dedicated actions for a macro-regional cooperation

The Policy synthesis report[32] highlighted **following topics as potential for cross-regional cooperation** in the Alpine macro-region:

- Bioenergy and biofuels
- Biobased plastics (based on wood, starchy crops and algae) and plastics composites (based on wood, cork and hemp)
- Pulp and paper products as high-tech products (i.e. printed conductors, fiber products with electronic application)
- Biorefineries
- Food and feed including food processing
- Biopharmaceuticals
- Bioconstruction

Complementarily to the specific results of the policy/industrial dialogues reviewed in the previous section, a majority of the attendees in the afternoon session of the Alpine Policy Forum 2021 stressed the need to address the bioeconomy in the new batch of Smart Specialisation Strategies[33]; 55 over 61 attendees (90%) agreed anonymously with this approach; 25 participants did not respond for undefined reasons.

In the same session, there was a multi-choice pool to rank the activities with higher potential for cross-regional cooperation in bioeconomy-related sectors, with the following results:

1) Set up of a network/platform for the identification and collaboration between relevant stakeholders (i.e. knowledge transfer, marketplace); 49 over 62 attendees (79%)
2) Creation of joint facilities (i.e. testing, prototyping, piloting) supporting innovation for SMEs; 39 over 62 attendees (63%)
3) Specific Alpine Space funding schemes supporting cross-regional collaboration; 35 over 62 attendees (56%);
4) Other options (not specified); 5 over 62 attendees (8%)
   In the pool 24 participants did not respond for undefined reasons.

[32] https://www.alpine-space.eu/projects/alplinkbioeco/policy-synthesis-report/d.t4.1.1-alplinkbioeco--synthesis-of-regional-reports-on-policy-instruments..pdf

[33] At the date of publication (March 2021) the regional Smart Specialisation Strategies are already published in some of the participating project regions, whereas in final draft status in others.

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As conclusive remarks taken from the Policy synthesis report, the related-output of the Roadmap, and the pools and panel discussions conducted during the Alpine Policy Forum 2021, some **dedicated actions to be prioritized for transnational cooperation** are highlighted below:

Work politically towards a common vision
There is an emerging interest for a transnational dialogue on circular bioeconomy by Alpine policy and industrial stakeholders; this dialogue should be activated soon and be in progress by end of 2022.

Make it easy: Use a single message
A common definition among regions is lacking; a first step of the transnational dialogue should aim to find a single definition by consensus. Moreover, a common branding of the circular bioeconomy will increase its understanding among Alpine citizens.

Embed the regional Smart Specialisation Strategies (S3) / Operational Programmes 2021-27
The new batch of S3 should be considered as a real opportunity to facilitate cross-regional matchmaking within the Alpine macro-region and beyond. Circular bioeconomy can be used as pilot field for this embedding and funds from the new Cohesion Policy[34] can support this transition.

Synergize: Use the existing EUSALP framework as lever for institutional collaboration
I.e. the set-up of synchronized models for support schemes should be aligned with the objectives of the EUSALP and streamlined through the work of its Action Groups (AG).

Empower the role of clusters
Clusters (or other business support organizations) should act as catalyst for the bioeconomy transition, acting in the interface between policy and industry. Setting-up platforms (i.e. for mutual exchange) or transnational joint facilities for SMEs need from public support schemes, but also from *brokers* that know regional assets and are aware of the cross-border opportunities.

[34] I.e. Investment for jobs and growth - IJG goal.

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3.4 Field of action D - Digitalization potential for resilient bio-based value chains

Findings during COVID-19 pandemic

Digital technologies change the way the industry and society exchange information, innovate, produce and consume. They lead to higher productivity and more innovation, and create new channels to market. Prior to the COVID-19 pandemic, a shift towards digitalization was already underway, however, current events have accelerated the transition.

In order to identify the trends in value chains after COVID-19 breakout and to find out how digitalization can play part in making value chains more resilient in unforeseen circumstances, Anteja ECG conducted a **survey among SMEs on value chain resilience** and sustainability at the Alpine macro-regional level **in February 2021**. The preliminary **findings** of the survey presented at the Alpine Policy Forum 2021 revealed the following:

1. In order to reduce the negative effect of their broken value chains, SMEs in the supply chain try to **multi-source, shorten their value chains and find suppliers locally/regionally**. However, the challenges they face are:
   - Difficulty to find suitable suppliers
   - It is a time-consuming process
   - It is difficult to find solutions for more robust value chains and new supply chain strategies

2. **Broken market structures** are affecting retail, distribution channels, product portfolio optimization and are increasing online sales. It was revealed that the main issues do not come from the Business to costumers (B2C) market but from Business to business (B2B) segment, as SMEs lack the experience and capabilities to use digital support/tools.

3. **COVID-19 accelerated the digitalization of internal and external processes of SMEs**. The two most important areas where SMEs intensified their digitalization are:
   - Communication with customers
   - Communication and documentation with suppliers

4. **Challenges faced by SMEs** in the fast transformation process are:
   - High cost of digitalization
   - Lack of digital skills/access to talents
   - Not appropriate digital readiness
   - Lack of appropriate tools on the market to address their needs

These findings clearly show that COVID-19 accelerated the scaling of digitalization of bio-based value chains in the Alpine Space; digital tools can help to transform the value chains to become well functional, organized and well-developed, addressing the needs and establishing linkages among each actor. Moreover, the implementation of new digital solutions can have the following impacts:

- Enhance traceability by integrating technologies in systems (Internet of Things-IoT, Big Data, Artificial Intelligence-AI)
- Reduce risks in agricultural production i.e. detecting crop diseases early on in production, or risks related to emissions and climate change

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- Allows better cooperation across value chains i.e. digital applications can help farmers share machinery
- Improve efficiency in production i.e. the use of water and energy with smart farming technologies
- Enable data sharing
- Engage smallholders in online platforms for marketing, distribution and exchange of knowledge with others
- Improve storage systems and efficiency of the transportation systems to connect production and supply

Digitalization tools as a solution in unforeseen situations[35]

Considering the findings in the previous section, the tools accelerating digitalization were grouped into three categories following the structure set in the project Smart SME's[36]:

a) **Public funding schemes**: encompass different government initiatives and are aimed at enabling digitalization in SMEs. These schemes include public funding, subsidies or regulations, that assist beneficiaries in implementing projects.

b) **Innovation or research hubs, centres or networks**: consist of solutions that are provided by publicly funded or non-profit organizations, such as innovation hubs or research centres. These organizations assist SMEs in several ways, such as providing assessments, guidance in applying for funding opportunities and networking.

c) **Private sector solutions**: consist of solutions that are provided by private enterprises or privately funded organizations, and usually provide precise and targeted solutions (software, Business intelligence-BI tools, applications, etc.).

Public funding schemes

Government initiatives work as incentive for the SMEs and enterprises to implement digital tools and improve their digital competencies within their organizations. Governments have already provided public support to increase the level of digitalization before COVID-19, but they started to prioritize it through the pandemic. These incentives mainly include free or subsidized access to broadband or software, grants and voucher schemes for software and equipment, access to educational tools, and training and specialist support. Since most of the times the adoption of digital tools requires allocating specific financial funds, companies need incentives and public support to embrace new technologies. I.e. the survey conducted by Deloitte[37] showed that in Germany the shortage of IT skills among employees is the major obstacle to digital technology for 67% of SMEs, while for 32% the lack of adequate financing sources is the most evident factor.

Innovation or research hubs, centres or networks

Digitalization is not just about adopting a new technology solution, but it is also about improving the digital capabilities of the company and creating new ways of working. Increased access to

[35] As unforeseen situation is considered i.e. pandemics, climate change, market instability or economic crisis.
[36] https://www.alpine-region.eu/publications/smart-sme%E2%80%99s-collection-good-practices-and-existing-tools
[37] https://www.vodafone.com/content/dam/vodcom/files/vdf_files_2020/pdfs/sme-digitalisation.pdf

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information and more productive and integrated digital processes also help to foster innovation. According to the findings of the project Smart SME's, companies lack information on the relevant digitalization opportunities. Here initiatives and programmes offered by research-oriented organizations, associations and hubs play an important role. Besides encouraging the knowledge transfer and improving the collaboration between academia and industry they also offer up to date information on new technologies, share knowledge, help implementing new solutions and provide matchmaking services; all these services make companies more resilient to unforeseen situations.

Private sector solutions

Implementing new technology and digital tools (i.e. application, online platforms or BI tools) improves efficiency and effectiveness, helps scale operations and drive growth, while helping organizations stay resilient in rapidly changing environments. It also enables companies, business units and teams to communicate efficiently and work together. Besides, since traditional operational processes and forecasts will not be effective, companies will have to develop data-driven approaches to tackle the volatility and learn to adjust rapidly to fast-changing environment.

Examples of best practices in the three categories are listed in Annex I.

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4. Conclusions and recommendations

AlpLinkBioEco project has developed a macro-regional circular bioeconomy strategy by providing a roadmap and the corresponding methodology for novel bio-based value chains. Through the process different stakeholders have been connected: i.e. bio-feed-stock producers with intermediate product developers, and the latter with end users of high value applications. Novel cross-regional value chains have been identified and some outputs i.e. the Value Chain Generator, can facilitate the creation of new enterprises in the Alpine macro-region.
The huge potential and related assets of the bioeconomy in the Alpine Space has been shown in Chapter 2 and further detailed in Chapter 3. The starting conditions to bioeconomise the Alpine Space industry are promising. Thus, the debate has to move from "**why** we should support bioeconomy and bioeconomisation of the industry" towards "**how** it can be done in the most efficient ways".

The Alpine macro-region has:

an enormous potential, since there are plenty of biomass assets in the participating project regions (Figure 2). The Value Chain Generator has proofed the availability of critical mass of stakeholders/actors in the field of bioeconomy in the Alpine Space that can be used to create such novel cross-regional value chains. The increasing industrial transformation will urge SMEs/ enterprises to transform and diversify, whereas there will be an even higher likeliness and openness of them to become part of new value chains. There is an excellent R&D and cluster landscape in the Alpine macro-region to further support potentialities into industrial practice.

an increasing **macro-regional identify** since most of the regions have the bioeconomy principles incorporated in wider (regional and/or national) strategies, or they are embedded in their Smart Specialisation Strategies and/or in their new regional policies. The COVID-19 pandemic and the discussion surrounding the EU Green Deal put further pressure on policy-makers to turn bioeconomy related policies into action. I.e. Baden-Württemberg increased the current budget for implementing the first set of funding programmes as part of the regional bioeconomy strategy from €8 million to €42 million. It can be expected that other regions will follow soon.

proven to be a frontrunner in **digitalization matters**. Although digital solutions, so far, primarily focused on providing solutions for traditional industries, like automotive, manufacturing technologies or health applications, the Alpine macro-region has all the technological capabilities to provide digital solutions of the bioeconomy-related industry (chapter 3.4).

Thus, the question is, **why we still do not have a Masterplan for the circular bioeconomy in the Alpine Space in place**? As mentioned in chapter 2 previous attempts have been made for cross-regional cooperation in the bioeconomy domain. In addition, the Sub-group "Bioeconomy and Cluster development"[38] under Action Group 2 and as part of AlpGov projects[39] provided valuable insights in the current funding schemes of the Alpine Space and initiated many of the cross-regional projects[40,41].

Despite all the opportunities, there are still significant challenges on the way to a common Masterplan. Bioeconomisation of the industry within the Alpine Space will not be easy. It is unsure, expensive and

[38] https://www.alpine-region.eu/action-group-2
[39] https://www.alpine-space.eu/projects/alpgov/en/home
[40] Dermastia, M., Meier zu Koecker, G., 2019. Study on available funding opportunities for bioeconomy in the Alpine Region, DOI:10.13140/RG.2.2.21884.90248
[41] Dermastia, M., 2020. Study on Available Funding opportunities for digitalization of the bioeconomy in the Alpine Region, published under AlpGov

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cultural borders have to be bridged over. The COVID-19 pandemic, on one side pushed the debate about sustainability and climate change further.

To really move forward, it is crucial to specifically address the **four key challenges** identified within the frame of the project:

- Lack of common definition for bioeconomy
- Lack of common indicators for harmonized data
- Lack of proper cross-regional support schemes that allow interested actors to cooperate across borders
- Lack of commitment of most regions to align their regional strategies with the EUSALP

Recommendations

In the following pharagraphs recommendations are given, how to best address these four challenges:

Challenge I: Lack of common definition for bioeconomy

This challenge should not be underestimated since a common definition is always a mandatory precondition for different actors/regions who intend to work together. However, in this regard, the Alpine macro-region can learn from others. A good example comes from the European Bioeconomy Strategy[42], which is based on a broad, but common understanding.

Sustainable & Circular: Bioeconomy, the European way

The bioeconomy covers all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services.[43] To be successful, the European bioeconomy needs to build around sustainability and circularity. This will drive the renewal of our industries, the modernization of our primary production systems, the protection of the environment and will enhance biodiversity.

Recommendation I: Initiation of an Alpine Space Dialogue related to a common understanding/ definition of Bioeconomy

Justification: Having agreed in a common understanding or/and definition of bioeconomy for the Alpine Space is an important prerequisite to move further. Practice has shown, that even the discussion process results in trust building and networking that enhances mutual understanding among regions involved. In order to succeed and turn the idea of an Alpine Space Dialogue (ASD) into practice some dedicated steps are proposed.

[42] European Commission, 2018. A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment: Updated Bioeconomy Strategy.
[43] Biomedicines and health biotechnology are excluded.

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Proposed actions

The following steps are proposed to turn this recommendation into practice:

- Identify a small group of frontrunner Alpine regions in the field of bioeconomy
- Gather responsible persons from these frontrunner regions that have a mandate to start a debate about a common understanding/definition of bioeconomy. So far, in most Interreg or ARPAF projects the partners did not really had any mandate to act accordingly
- Use established platforms, like the AG2 Sub-Group "Bioeconomy & Cluster development", to gather such experts/regional representatives to kick-off the discussion accordingly

Recommendation II: Identifying Alpine Space ambassadors to push the idea of a common Alpine Joint Masterplan forward

Justification: A missing ambassador has been one important reason why slow progress towards a harmonized understanding of bioeconomy in the Alpine macro-region has been made in the past. Until now, regions mainly focused on themselves and considered cross-regional thinking as a niche. In case bioeconomy strategies were developed on a national level, ambassadors came from exactly there. The fact that there is a common European bioeconomy strategy in place is also the result of some countries, like Germany, the Netherlands and Italy, that acted as instigator in this regard. Thus, it is the time to identify one or several ambassadors from Alpine Space level that have an important saying in the industrial and political debates surrounding bioeconomy and are interested to lobby for a common vision in the Alpine macro-region and a widespread Masterplan.

Proposed actions

The following steps are proposed to turn this recommendation into practice:

- AlpLinkBioEco community, the AG2 Sub-Group "Bioeconomy & Cluster development" or any well-established platform starts a process to identify such ambassador(s) that helps to bring the idea of this Alpine Joint Masterplan on circular bioeconomy further
- This action has to be well aligned with activities resulting from recommendation I

Challenge II: Lack of common indicators for harmonized data

This challenge is clearly connected to the first challenge. If there is no common understanding of what is bioeconomy all about, it is hard to work with common indicators or harmonized data.

Recommendation III: Expert workshop "Status quo" of the bioeconomy-related data for the Alpine macro-region

Justification: There is no doubt that requested data is not (easily) available. However, it is important to involve dedicated international expertise on what data is available (status-quo) and what data are needed (demand). This gap can then be addressed by follow-up measures. Such an expert workshop with international experts from science, microeconomics and other sectors related to bioeconomy can shed light on what data is available. Different competences are needed since there are very different approaches how such data can be collected at regional level.

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Proposed actions:
The following steps are proposed to turn this recommendation into practice:

- AlpLinkBioEco community, the AG2 Sub-Group "Bioeconomy & Cluster development" or any well-established platform helps to identify a group of experts with those competences mentioned above, who are willing to participate in such an event
- Organize the expert event with a limited number of participants to properly discuss this issue on availability of bioeconomy related data. It is important to also invite experts from outside the Alpine macro-region (i.e. Join Research Centre, Seville) to learn how peer (macro) regions might have dealt with the data/indicator issues
- Synthesis report of this workshop with dedicated follow-up actions needed to improve data availability on bioeconomy in the Alpine macro-region
- Initiation of an ARPAF project with selected partners and experts to follow-up the key findings identified in the workshop and try to close the gap of missing data

Challenge III: Lack of proper cross-regional support schemes that allow interested actors to cooperate across borders

This challenge is known for many years and is not just specific to the bioeconomy. So far, there are no dedicated funding schemes and multilevel governance in place that facilitate cross-regional cooperation within the Alpine Space. Existing EU-funding schemes are important, but not appropriate to allow cross-regional cooperation according to regional specificities. However, over the last years the knowledge how to develop such governance schemes that allow cross-regional cooperation has been improved.[44]. Thus, it is time to re-start actions and to implement related schemes.

Recommendation IV: Initiate a common pilot funding scheme with selected frontrunner Alpine regions that demonstrates the feasibility and impact of cross-regional cooperation

Justification: There is a common sense that cross-regional funding schemes are missing. Since related value chains in the field of bioeconomy within the Alpine macro-region are stretched across regions and borders, there is an even stronger need to eliminate such barriers. The ARDIA-Net project[45] is developing multi-level governance schemes that facilitate cross-regional cooperation. Furthermore, there is an initiative ongoing, led by the EU Strategy for the Baltic Sea Region (EUSBSR) and EU Strategy for the Danube Region (EUSDR), in which interested Alpine regions are about to synchronise existing funding schemes (Innovation Express 2021) to enable cross-regional cooperation. Such platforms and pilot governance schemes can easily be used to develop and implement pilot calls to promote innovation and value chain development in the field of circular bioeconomy across regions.

Proposed actions:
The following steps are proposed to turn this recommendation into practice:

- Follow closely the activities related to the Innovation Express 2021 as well as by ARDIA-Net to understand how synchronization to facilitate cross-border cooperation can effectively work in practice

[44] Keller, M., Dermastia, M., Meier zu Köcker, G., Pfaller, Ph., Bersier, J., 2020. New Power for the Macro-regional Innovation Motors – A Call for a Wave of New Cross-regional Funding Schemes in Europe, DOI: 10.13140/RG.2.2.34535.88488
[45] https://www.alpine-space.eu/projects/ardia-net/en/home

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- Select 3-4 Alpine regions that are interested to do a pilot call similar to the Innovation Express 2021. This action can be coordinated by the ARDIA-Net network or the AG2 Sub-group “Bioeconomy & Cluster development”
- Promote the idea of setting up multi-level governance structures that enable cross-regional funding schemes at policy and programme implementation level; thus, increasing awareness and interest in these kind of new support schemes

Challenge IV: Lack of commitment of most regions to align their regional strategies with the EUSALP

The findings of the AlplinkBioEco have indicated that most regional strategies are not well aligned with the macro-regional approach driven by the EUSALP. The rationale is that both, S3 as well as macro-regional strategies like EUSALP, are comparably new approaches. There is hope that this will change during the current programming period (2021-27), with a new batch of S3 and further progress of the Alpine macro-regional strategy.

Recommendation V: Increase awareness of the interplay between both strategic approaches

Justification: As mentioned, both strategy approaches, regional as well as macro-regional, are still comparably new. Very often there is a lack of understanding from regional level of what is the added value of being part of a macro-regional strategy. The macro-regional approach is often understood as the opportunity to have access to Interreg or ARPAF funding schemes. Thus, awareness has to be increased on the fact that macro-regional strategies are more than an additional funding scheme.

Proposed actions:
The following steps are proposed to turn this recommendation into practice:

- Development and implementation of a communication approach that demonstrates on all three levels (policy, intermediary and private sector) what are the benefits of having a macro-regional strategy in place. Best practices are good tools to provide concrete information on this.

Recommendation VI: Provide incentives for regions that are interested to align or coordinate their strategies with EUSALP

Justification: So far, there is not much motivation for Alpine regions to align their strategies or programmes with EUSALP. As long as there are no incentives/reasons to do so and cross-regional cooperation is still considered as a difficult topic, regions are reluctant to align accordingly. Thus, there is a need for targeted discussion, how both approaches (regional as well as macro-regional) can better benefit from each other. One option is that funds from macro-regional funding schemes are used to top-up cross-regional funding schemes initiated by the region. Such approach worked well at Member State level in connection with the ERA-Net scheme. The European Commission provided additional funds for Member States that became engaged in joint transnational funding projects.

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The current ERA-Net Cofund scheme is a good example[46]. However, there might be other approaches that motivate regions accordingly.

Proposed actions:

The following steps are proposed to turn this recommendation into practice:

- Use established networks, like ARDIA-Net or AlpGov, to start a dialogue between open minded regions that are interested to align their bioeconomy strategies or related programmes with the EUSALP strategy
- Develop ideas how to incentivize regional strategy alignments or cross-regional cooperation initiatives with EUSALP
- Use good practices from outside the Alpine macro-region, like the Baltic Sea macro-region, to learn how other regions succeeded in aligning with to their macro-regional strategies
- Organize a policy forum under AlpGov or similar to present and discuss ideas/results from the resulting dialogue

[46] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/era-net

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5. Glossary of acronymes and terms

Acronym / Term	Definition
AG	Action Group of the EU Strategy of the Alpine Region
AG2	Action Group 2 of the EU Strategy of the Alpine Region; its mission is to increase the economic potential of strategic sectors
AI	Artificial Intelligence
Alpine Space	It involves 7 countries (Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland) and 48 regions. For the purpose of the document, it is generally used as synonym of the Alpine macro-region
ARPAF	Alpine Region Preparatory Action Fund
B2B	Business to Business
B2C	Business to Costumers
BI	Business Intelligence
Biomass	According to the Renewal Energy Directive[47], it is defined as the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries, including fisheries and aquaculture; as well as the biodegradable fraction of waste, including industrial and municipal waste of biological origin.
Cluster	Generally described as groups of companies, mainly SMEs and other actors (i.e. research and academia) cooperating within a geographic area and on an specialized niche; they establish close linkages and working alliances to improve the competitiveness of the sector they represent.
EUSALP	EU Strategy for the Alpine Region
EUSBSR	EU Strategy for the Baltic Sea Region
EUSDR	EU Strategy for the Danube Region
Interreg	European Territorial Cooperation, as part of the EU's structural and investment policy
IoT	Internet of Things
i.e.	In example
NUTS-X	Nomenclature of Territorial Units for Statistics regions. It is a geocode standard for referencing the subdivisions of countries for statistical purposes; the X indicates the level of NUTS division.
Operational Programme	Detailed plan in which the Member States set out how money from the European Structural and Investment Funds (ESIF) will be spent during the programming period. It can be drawn up for a specific region or a country-wide thematic goal (e.g. Environment). For the European Territorial Cooperation goal, cross-border or interregional operational programmes are drawn up[48].
R&D	Research and Development
Region	Regions within the project and which are represented by the project partners (namely 9 regions of the Alpine Space: Auvergne-Rhône-Alpes, Baden-Württemberg, Bavaria, Fribourg, Lombardy, Provincia Autonoma die Trento, Slovenia, South Tyrol, and Upper Austria). It is worth to mention here that the analysis of the Whitepaper "Benefits and

[47] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN
[48] https://ec.europa.eu/regional_policy/en/policy/what/glossary/o/operational-programme

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	opportunities of bio-based economy value chains" included the whole Switzerland, as it includes 26 out of the 48 regions of the Alpine Space.
S3	Smart Specialisation Strategies (S3), referred as an strategic approach to economic development through targeted support for research and innovation. It involves a process of developing a vision, identifying the place-based areas of greatest strategic potential, developing multi-stakeholder governance mechanisms, setting strategic priorities and using smart policies to maximize the development potential of a region[49].
SME	Small & Medium Enterprise
Value chain	It is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product (i.e., good and/or service) for the market. The concept comes out of business management and was first described by Michael Porter in 1985[50].

[49] Foray, D., 2015. Smart Specialization, Opportunities and Challenges for Regional Innovation Policy, Routledge.
[50] Porter, Michael E., 1985. Competitive Advantage: Creating and Sustaining Superior Performance. New York.: Simon and Schuster. ISBN 9781416595847.

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Annex I: Best practices in digitalization of bio-based value chains

Detailed descriptions of some of these best practices can be found in the Synthesis report of good practices and existing tools[51] of the project SMART SME's funded by ARPAF.

Public funding schemes

Best practice 1: Digital vouchers[52]

Country: Slovenia

Digital vouchers are part of the public system for small-value incentives, which provides SMEs with access to co-financing schemes for their digitalization (i.e. vouchers for increasing the level of digital competencies, vouchers for elaborating digital strategies or vouchers for digital marketing).

Best practice 2: Innovation manager voucher

Country: Italy

Voucher for the introduction of an innovation manager in the company, who is able to implement key enabling technologies and modernize the management and operative assets of the enterprise through: consultation and analysis, introduction and implementation of key enabling technologies (i.e. AI, IoT, virtual reality, cloud, big data, etc.), improving and implementing innovative project ideas, and modernizing management and organizational assets, including access to new markets and funding.

Best practice 3: Funding programme "go-digital"[53]

Country: Germany

The programme supports SMEs and handicraft enterprises in advancing their own digitalization in three areas:

- online trade
- digitalization of everyday business life
- a growing need for security in digital networking

Funding is provided for consulting services in a selected main module with any necessary auxiliary modules at a funding rate of 50% up to a maximum daily consultant rate of 1,100 €.

[51] https://www.alpine-region.eu/publications/smart-sme%E2%80%99s-collection-good-practices-and-existing-tools
[52] https://podjetniskisklad.si/sl/produkti-sklada/sps-dvojcekdpora-pri-produktih/vavcerski-sistemi
[53] https://www.bmwi.de/Redaktion/DE/Artikel/Digitale-Welt/foerderprogramm-go-digital.html

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Innovation or research hubs, centres or networks

Best practice 4: InnoRenew CoE research institute[54]

Country: Slovenia

InnoRenew conducts research on renewable wood materials and sustainable buildings, and transfers obtained knowledge into the industry. The institute helps SMEs throughout the entire funding process and provides support through trainings, workshops and other consulting activities. It also organizes conferences and events for sharing knowledge between academia and industry, collaborates with other research and industry partners in R&D activities and projects, focusing on exploring innovative concepts, technologies and tools for sustainable usage of renewable materials.

Best practice 5: House of Digitalization – Lower Austria's ecosystem for digital transformation[55]

Country: Austria

House of Digitalization is an initiative supporting the digital update of Lower Austrian companies by offering as a one-stop-shop the following services:

- Information: lexicon for digital terms, good practice examples of already implemented digital solutions, all relevant training and education offers in the region, and relevant events
- Education: specific seminars for companies with the help of IT knowledge providers in the region
- Matchmaking: a short description of relevant competencies of companies and R&D institutions in the region and assistance in finding partners

Private sector solutions

Best practice 6: Carrefour - Use of Blockchain technology for the traceability of goods and animals

Country: France

Carrefour launched Europe's first food Blockchain for free-range in 2018. Company uses a secured database and guarantees a higher level of food safety, which increases consumer trust, loyalty and can also attract more customers.

With Blockchain technology, information is added to products in each phase of the value chain, which enables traceability. I.e. for chickens, consumers can find out where and how each animal was bred, the name of the farmer, what feed and treatments were used, where the meat was processed and on which shelf in the store it was stored.

[54] https://innorenew.eu/
[55] https://www.virtuelleshaus.at/

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Best practice 7: BioSCO (Bioresources Supply Chain Optimizer)[56]

Country: France

RonGO (collection plan optimization tool) delivers real-time logistics optimization, based on innovative applications of large-scale operational research and leads to cost savings. Moreover, RonGO substantially reduces the carbon footprint related to logistics by optimizing storage management.

The tool has positive impacts in terms of optimization: it improves the internal processes, reducing time required to define a non-optimized storage plan. Moreover, it also helps to create cost-efficient logistics and storage in agribusiness, reducing transportation requirements, costs, and improving the life cycle of goods.

Best practice 8: FarmBlick[57]

Country: Germany

The FarmBlick start-up company provides services to farmers in order to support them in precision farming and transition to digitalization. The company contributes to staff skills with services such as consulting and workshops i.e. how to satellite maps or take soil samples. The company also developed an online-platform with the same name, which provides practical digital tools and is also used to exchange ideas between members.

[56] https://biosco.fr/en/company
[57] https://farmblick.de/

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AlpLinkBioEco develops

1. Database to map existing resources, actors and relevant policies in the Alpine Space
2. Methodology to match actors for new value chains
3. New (cross)-regional value chains
4. Policy recommendations for the development of bioeconomy in the Alpine Space

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