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REPORTS ON GOVERNANCE AND POLICY REGIME FOR THE BIOECONOMY AND BIOECONOMY POTENTIAL IN THE PILOT REGIONS

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Table of Contents

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101060476

List of Figures

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101060476

List of Tables

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101060476

SUMMARY

This report presents an analysis of bioeconomy governance in six European pilot regions: the North Swedish Region, Sweden; Nitra, Slovakia; the Delta Region, Netherlands, Normandy, France; Tuscany, Italy; and Western Macedonia, Greece. For each region, it provides insights into the effectiveness of current policies and initiatives, and identifies opportunities for improvement, by applying a standardized quantitative assessment framework for bioeconomy-related governance across three key areas: implementation and financing, rule-setting, and information sharing. These findings of were validated through interviews with local experts and stakeholders, which informed the development of tailored recommendations for regional bioeconomy governance. This report was developed as part of the BIOMODEL4REGIONS project.

Figure 1 illustrates the performance of the six pilot regions across three basic governance functions: information-sharing, rule-setting, and finance & implementation. Across all regions, information-sharing seemed to be an area for improvement. In five out of the six regions, it was the governance area with the lowest score and/or scored at or below 1. The Delta Region in the Netherlands was the exception, where information-sharing scored the highest out of any region and exceeded the Delta region's scores in other governance areas. This may reflect the challenges of coordination and collaboration among groups of stakeholders from different sectors and levels of government who, given the relatively recent emergence of the concept of the bioeconomy, may not previously have worked together or seem themselves as part of the same stakeholder group. New structures for sharing information, promoting cooperation and planning convenings could help improve governance in the area of information-sharing.

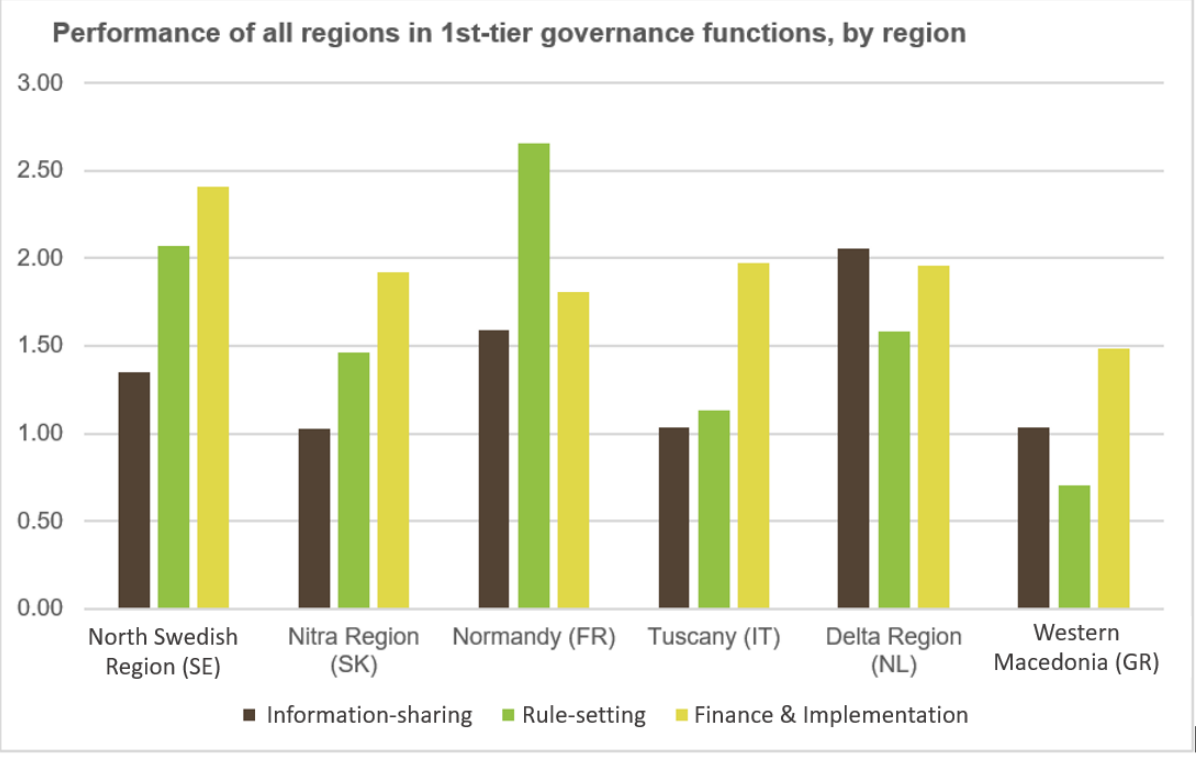

Figure 1. Performance of all six regions in 1st-tier governance functions
Source: BERST Dashboard

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At the other end of the spectrum, Figure 1 shows that finance and implementation was a main area of strength in most regions. It was the highest-scoring governance area in four regions (the North Swedish Region in Sweden, Nitra, Tuscany and Western Macedonia), nearly tied for top in the Delta region, and still received a strong score in Normandy. This likely reflects the fact that most of these regions have a strong history and presence of bioeconomy-related activities (such as agriculture, aquaculture or forestry), so there was already, for example, significant biomass production and some available financing. These region's goals in this pilot were not to catalyse the bioeconomy from scratch, but rather to build on these pre-existing activities by strengthening and aligning their governance of these improve synergies, sustainability and future growth.

The governance function of rule-setting - which covers policy, regulation, incentives, strategy, and the linkages among them - saw the most variation in scores (see Figure 1). For instance, Normandy's score in rule-setting was the highest of any governance function in any region, while in Western Macedonia it was similarly the lowest. This variation may derive from the country's overall strength and alignment in policymaking and regulation, which for example seems to be more of a challenge in Greece and Italy than Sweden and France. The heterogeneity may also reflect how established the region's bioeconomy activities are, or the extent to which they fall in to a "traditional" category of policymaking – for example, governance of forestry in Sweden is long-standing, well-studied and aligns with typical departmental structures, whereas other regions may be focused on newer industries or more innovative or circular value chains.

Figure 2 visualizes all regions' scores in the 2nd-tier governance functions, grouped by function rather than region. A key trend is how some governance functions saw high alignment in scores across regions (particularly related to biomass, land use, innovation, employment, and financing), whereas others varied widely among regions (especially policy incentives, strategy linkages, accountability and transparency). This highlights again that a key challenge in the development of the bioeconomy seems to be the governance itself, rather than the creation of enterprises, economic activity and biomass output in bioeconomy-related sectors. It also emphasis the diversity in the types of challenges that regions are facing, and therefore the need for context-specific strategies and interventions.

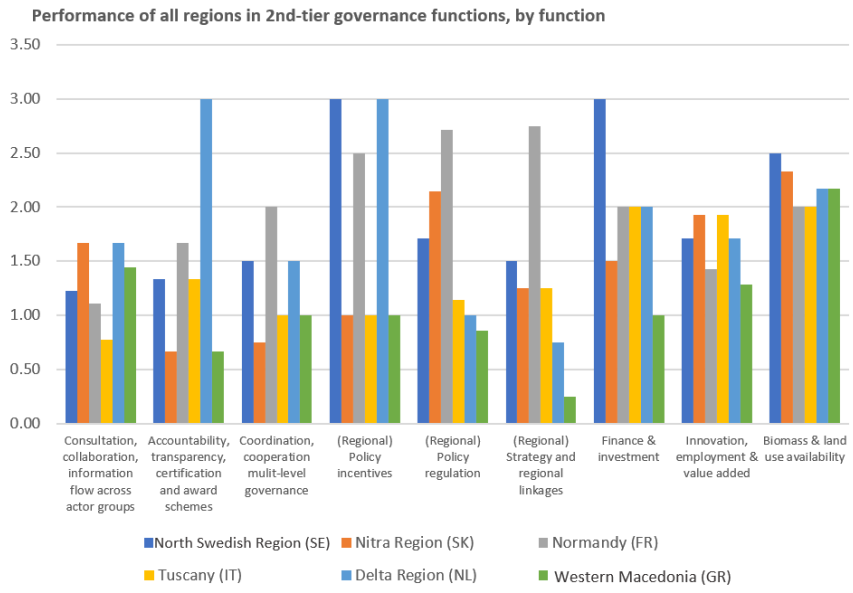

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Figure 2. Performance of all regions in 2nd-tier governance functions
Source: BERST Dashboard

The following section provides a short summary of the context, findings and recommendations for each of the six pilot regions.

The North Swedish Region, Sweden

- **Regional Profile**: The North Swedish Region is largely dominated by forestry, which accounts for 97% of biomass availability. The area is rural, with a strong emphasis on bio-based industries.
- **Assessment Results**: The region excels in *Implementation & Financing*, showcasing robust bio-based market structures and a high SME birth rate. However, *Information-Sharing* is less developed, particularly in horizontal and vertical collaboration. Challenges include difficulties with EU waste regulations and limited innovation potential.
- **Recommendations**: Sweden should enhance its *Information-Sharing* mechanisms, particularly across governance levels. Strengthening collaboration between stakeholders and improving innovation potential are key to advancing its bioeconomy.

Nitra Region, Slovakia

- **Regional Profile**: The Nitra region is agricultural, with 61.5% of its land used for cropping and livestock. Forestry is secondary but still contributes significantly to biomass production.
- **Assessment Results:** *Implementation & Financing* scored the highest, showing good local biomass availability and an emerging bioeconomy. However, *Information-Sharing* was identified as area needing improvement, particularly in interregional collaboration and market accessibility.
- **Recommendations**: Strengthening innovation through research partnerships and boosting collaboration within the region and at the national level are crucial. It is also recommended to simplify the bureaucratic processes around financing.

Delta Region, The Netherlands

- **Regional Profile**: This densely populated region is a hub for bio-based industries, supported by a strong logistics infrastructure and proximity to biomass resources.
- **Assessment Results**: The region excels in *Information-Sharing*, with strong collaboration across stakeholders. However, challenges exist in *Rule-Setting*, especially around EU regulations, which hinder market integration of bio-based products.
- **Recommendations**: The Delta Region should develop a dedicated bioeconomy strategy, particularly focused on harmonizing regional regulations with EU laws. Strengthening innovation potential and improving public support mechanisms will also help accelerate the bioeconomy transition.

Normandy Region, France

- **Regional Profile**: Normandy is a region with an established agricultural and forestry base, making it a leader in bioeconomy-related activities.

- **Assessment Results**: The region scored well in *Rule-Setting* and *Implementation & Financing*, with a strong SME landscape and policy commitment. However, *Information-Sharing***,** especially public consultation and collaboration, was weaker. There are regulatory barriers, particularly concerning EU laws, which slow innovation.
- **Recommendations**: Normandy should focus on improving *Information-Sharing* by fostering better collaboration across public and private sectors. Simplifying regulatory frameworks and aligning local policies with EU laws are essential to unlocking its bioeconomy potential.

Tuscany Region, Italy

- **Regional Profile**: Tuscany has a diverse bioeconomy, supported by strong agricultural and forestry sectors. Its bioeconomy is linked with broader sustainability and circular economy strategies.
- **Assessment Results**: Tuscany performed well in *Implementation & Financing*, particularly in supporting SMEs and reducing GHG emissions. However, *Rule-Setting* and Information Sharing lagged, with challenges in policy alignment and collaboration.
- **Recommendations**: Tuscany should streamline regulatory frameworks to reduce administrative burdens and strengthen cross-sectoral stakeholder collaboration. Investments in education and skills development for the bioeconomy workforce are also essential.

Western Macedonia, Greece

- **Regional Profile**: Western Macedonia is a rural and mountainous region with a low population density. Its bioeconomy potential lies in its significant biomass resources, mainly from crop and grassland.
- **Assessment Results**: *Implementation & Financing* was strong, especially in terms of biomass availability and sustainable management practices. However, the region faced significant challenges with *Rule-Setting*, particularly with the transposition of EU laws and regulations.
- **Recommendations**: The region should develop a clear bioeconomy strategy, align local policies with EU frameworks, and improve consultation between stakeholders. Simplifying regulatory processes and providing financial support mechanisms would foster bio-based innovation.

Introduction

This report presents an analysis of bioeconomy governance in six European pilot regions: the North Swedish Region, Sweden; Nitra, Slovakia; the Delta Region, Netherlands, Normandy, France; Tuscany, Italy; and Western Macedonia, Greece. It provides insights into the effectiveness of current bioeconomy governance and identifies opportunities and strategies for improvement. In each region's section, we examine the region's socioeconomic profile, bioeconomy-related policies and initiatives, and performance across three key governance areas: implementation and financing, rule-setting, and information sharing. Using a standardized assessment framework, the report evaluates governance indicators and highlights regional strengths and challenges in developing and enhancing their bioeconomy. The findings of these quantitative assessments were validated through qualitative interviews with local experts and stakeholders of each region. Finally, for each region, we provide tailored recommendations to enhance collaboration, innovation, and regulatory alignment.

This report was developed as part of the BIOMODEL4REGIONS project, which aims to develop innovative governance models that will support the development of bio-based economy strategies. It supports the establishment of the innovative governance models at local/regional level to achieve better informed decision-making processes, social engagement and innovation to support and strengthen EU and international science-policy interfaces to achieve the Sustainable Development Goals and contribute to the Circular Cities and Regions Initiative (CCRI). The project received funding from the European Union's Horizon Europe research and innovation programme under grant agreement N° 101060476.

Key collaborators in the development of this report were the bioeconomy clusters in each region (partners in the BIOMODELS4REGIONS project), which are cross-sector consortiums with members including regional and local authorities, primary producers, SMEs, civil society organisations including NGOs, knowledge providers and consumers. They provided some input data for the quantitative governance assessment via indicators, conducted the expert interviews, and provided feedback on the draft analysis and recommendations. Wageningen Research, also a partner in the project, wrote the regional profile chapter for each pilot region, based on their prior collection and analysis of socio-economic data per region.

Both the profile data collected by Wageningen Research and the governance indicator data collected from Cluster Regions by ICLEI Europe, are presented, and visualized on the BERST Monitoring Dashboard.

METHOD

The analysis of bioeconomy governance models in the six pilot regions is based the bioeconomy governance framework developed by Jacobi, Connolly and Hayder (2023) – also developed in the BIOMODELS4REGIONS project. This framework categorizes governance functions into three tiers of increasing specificity: basic governance functions (1st-tier), specific bioeconomy governance functions (2nd tier) and assessment criteria (3rd-tier) – which were assessed using an indicator set of 50 indicators. For each governance function in each tier the region was scored on a five-part Likert-type (ordinal) scale, which consisted of:

- Further from target
- Below target
- On track for target
- Just below target
- On target

The target varies by assessment criteria but indicates the benchmarks found in European best practice strategies (Haarich et al, 2022) and in scientific literature. To gather data for this analysis, the six Biomodel4Regions pilot regions and their cluster organizations conducted data collection between January and November 2023. B4R pilot cluster partner provided input data for many of the assessment criteria based on their local knowledge. The data was then processed by ICLEI Europe, including cleaning up errors and filling gaps with reasonable assumptions, and a score was assigned to each indicator value, based on benchmarks from best practice studies (cf. Haarich et al., 2022), scientific literature and authors judgement (e.g. in case of qualitative indicators).

Table 1. Sources for target benchmarking

Indicator	**Benchmark** *calculated value	**Source**
Collaboration in H2020, CBI-JU, HORIZON projects	11	Bioeconomy Strategy Catalunia; Link: https://ruralcat.gencat.cat/documents/20181/9479472/EBC2030_EN.pdf/51d819d9-b139-4fb9-b297-278344bf72ea
Collaboration in macro-regional projects	12	Stöber, L.F.; Boesino, M.; Pyka, A.; Schuenemann, F. Bioeconomy Innovation Networks in Urban Regions: The Case of Stuttgart. Land 2023, 12, 935. https://doi.org/10.3390/land12040935
Companies in bioeconomy cluster	0,2	Stöber, L.F.; Boesino, M.; Pyka, A.; Schuenemann, F. Bioeconomy Innovation Networks in Urban Regions: The Case of Stuttgart. Land 2023, 12, 935. https://doi.org/10.3390/land12040935; https://www.region-stuttgart.de/en/economy/
Campaigns/events to raise awareness on bio-based economy	50	Own judgement
Share of companies with sustainability credentials	0,1 *	Stefan Gorgels and Maximilian Priem from DIW Econ and Tsvetelina Blagoeva, Agnès Martinelle and Giulio Milanesi. Annual Report on European SMEs 2021/22.
Number of interregional forums	10	Own judgement
Tenders with bio-based	1	Own judgement

requirements in procurement		
Regional strategies with links to bioeconomy and bio-based economy	12,6	Haarich, S., Kirchmayr-Novak, S., Bioeconomy strategy development in EU regions, Sanchez Lopez, J., Borzacchiello, M.T. and Avraamides, M. editors, Publications Office of the European Union, Luxembourg, 2022, ISBN 978-92-76-49341-9, doi:10.2760/065902, JRC128740.
Number of government departments and agencies involved in bioeconomy strategy roll-out/implementation	11	Bioeconomy Strategy Catalunia; Link: https://ruralcat.gencat.cat/documents/20181/9479472/EBC2030_EN.pdf/51d819d9-b139-4fb9-b297-278344bf72ea
Bio-based SME birth rate	0,094	Catalunia, BERST tool Link: https://berst.databank.nl/dashboard/en-gb/dashboard/dynamic-factsheet--select-region-
R&D expenditure	0,0289	Flanders Bioeconomy Strategy, 2020: Link: https://publicaties.vlaanderen.be/view-file/38652
Pilot and Demonstration facilities	yes	Flanders Bioeconomy Strategy, 2020: Link: https://publicaties.vlaanderen.be/view-file/38652
Intellectual property rights	0,0000058	Main Science and Technology Indicators, Volume 2015 Issue 2; https://doi.org/10.1787/msti-v2015-2-en; Link: https://read.oecd-ilibrary.org/science-and-technology/main-science-and-technology-indicators/volume-2015/issue-2_msti-v2015-2-en#page87
Share of cooperatives	0,61	COOPID Project; Link: https://coopid.eu/wp-content/uploads/2022/03/COOPID-Cooperatives-in-the-bioeconomy-FINAL.pdf
Share of female led business of total businesses in biobased-economy in the region	0,08	Support for female entrepreneurs: Survey evidence for why it makes sen. European Investment Bank, 2022. Link: https://www.eib.org/attachments/lucalli/support_for_female_entrepreneurs_en.pdf
Tertiary education programs	20	EC, 2022: Promoting education, training and skills across the bioeconomy - Final Report
Number of vocational programmes on bio-based economy	32	IFO Institut, 2019
Agricultural biomass production	0,0013 *	EC Bioeconomy Monitor; Link: https://knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en
Blue biomass production	0,00000279 *	EC Bioeconomy Monitor; Link: https://knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en
Forestry biomass production	0,00048 *	EC Bioeconomy Monitor; Link: https://knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en
Waste production	0,2 *	EC Bioeconomy Monitor; Link: https://knowledge4policy.ec.europa.eu/bioeconomy/monitoring_en
Emission intensity of bio-based industry	0,000169002 *	Crippa, M., Guizzardi, D., Pagani, F., Banja, M., Muntean, M., Schaaf E., Becker, W., Monforti-Ferrario, F., Quadrelli, R., Risquez Martin, A., Taghavi-Moharamli, P., Koykka, J., Grassi, G., Rossi, S., Brandao De Melo, J., Oom, D., Branco, A., San-Miguel, J., Vignati, E., GHG emissions of all world countries, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/953322, JRC134504

These results were then visualized in the BERST Dashboard, developed by Wageningen Research.

To validate and nuance the results of the assessment results, interviews with policy experts were conducted in each pilot region carried out by the pilot cluster partners based on the questionnaire developed by ICLEI Europe. Interviews were carried out in most cases between March and May 2024. Summaries of the interviews were sent to ICLEI Europe by Pilot Cluster Partners, and then elaborated on and coded by ICLEI Europe.

Taken together, these results show the quality of bioeconomy governance in the six pilot regions, the areas of strength, and the areas that could be most improved. This can help national and regional policymakers and other stakeholders understand where best to focus their efforts when developing policies, regulations, support mechanisms, and other initiatives related to bioeconomy governance.

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THE NORTH SWEDISH REGION, SWEDEN

1 REGIONAL PROFILE

The geographic scope of the North Swedish Region consists of the NUTS2 regions Mellersta Norrland (SE32) and Ovre Norrland (SE33), located in respectively the mid and the North of Sweden (Figure 3). With 897 thousand inhabitants, the North Swedish region is not a densely populated area: nearly 4 persons per km2 versus 23 persons per km2 in the average Swedish NUTS2 region.

The indicators expressed in Table 2 give insight in the socio-economic profile of the North Swedish region in terms of land area coverage, population, sectoral employment, sectoral value added and biomass availability (column 1). The structure of the pilot region is more or less similar as for Sweden as a whole (column 2).

When compared to the average EU-27 (column 3), the role of forestry biomass in total biomass availability is dominant (97% versus 27%), which aligns with the high share of wood land in total land area in the country. On the other hand, the potential active labour force (15-65 years class) in total population is relatively small compared to both Sweden and EU-27 as a whole.

Table 2. Profile indicators for the North Swedish region, compared with Sweden and EU-27
Sources: Eurostat, EC-JRC

	North Swedish region	**Sweden**	**EU-27**
Regions included	SE31, SE32 (Nuts2)	SE (Nuts0)	
Total land area covered (km2)	240.794	447.424	4.125.104
- *Of which wood land*	*62.4%*	*62.4%*	*41.1%*
Total population covered (persons)	897.986	10.327.589	447.319.916
- *Of which 15-65 years*	*60%*	*62%*	*64%*
Employment in NACE B-N (persons)	245.699	3,230.140	126.003.564
Employment in potential biobased sectors (NACE C10-C22; C31, D, E38, F41-F43	66.590	673.564	24.694.206

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- Of which in bio-based industry	*21.887 (32.7%)*	204.754 (30.1%)	8.524.971 (34.5%)
Value added in NACE B-N (mil euros)	59.703	243.493	6.488.393
Value added in potential biobased sectors (NACE C10-C22; C31, D, E38, F41-F43	5.508	57.773	1.454.603
- Of which in bio-based industry	1.882 (34.2%)	19.563 (33.9%)	484.293 (33.3%)
Biomass availability (kton dm)	21.469	48.469	917.751
- Of which forestry biomass	*97%*	*80%*	*27%*
National bioeconomy strategy		In development	

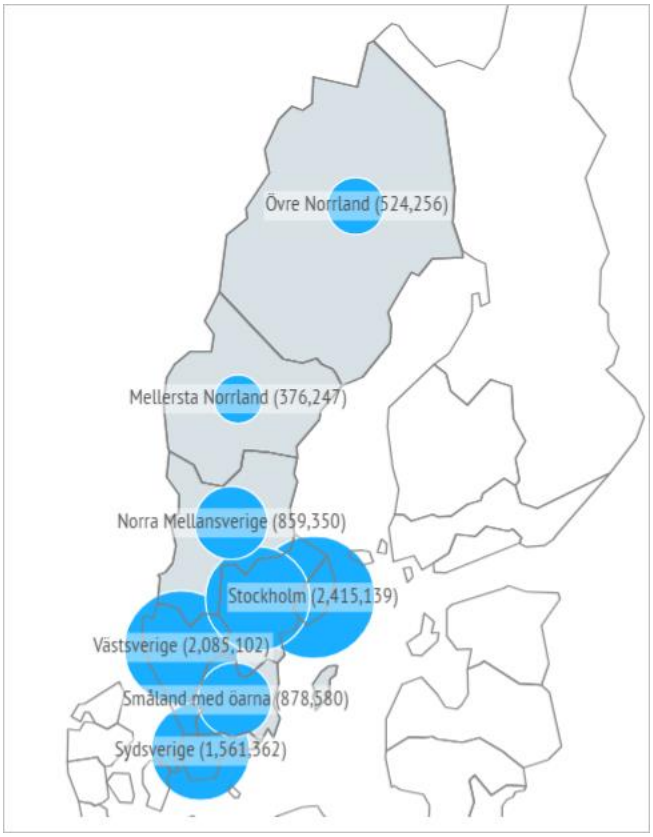

Figure 3. Population in the North Swedish Region, in the north of Sweden (Mellersta Norrland and Ovre Norrland)

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2 POLICY CONTEXT

2.1 STRATEGIC FRAMEWORK AND GOVERNANCE MODEL ON THE BIOECONOMY

Sweden is among those six EU member states with intensive regional strategic action on the bioeconomy (Haarich et al., 2022), alongside Spain, Finland, France, Italy, and Poland. A national bioeconomy strategy is underway of development in 2022-2023, pending results of a referral process summer of 2024. 20 regions have strategies (all NUTS 3) related to the bioeconomy, of those 19 regions with published frameworks, and a framework under development in one region. Two of those regions have a 'fully dedicated' bioeconomy strategic framework, according to Haarich et al. (2022), while another 12 have a 'strong bioeconomy focus' and six exhibiting a 'minimum of bioeconomy content'. Furthermore, there are 15 strategies with a strong sectoral focus on forestry. At the NUTS 2 level, currently one out of 16 regions have a dedicated bioeconomy strategy.

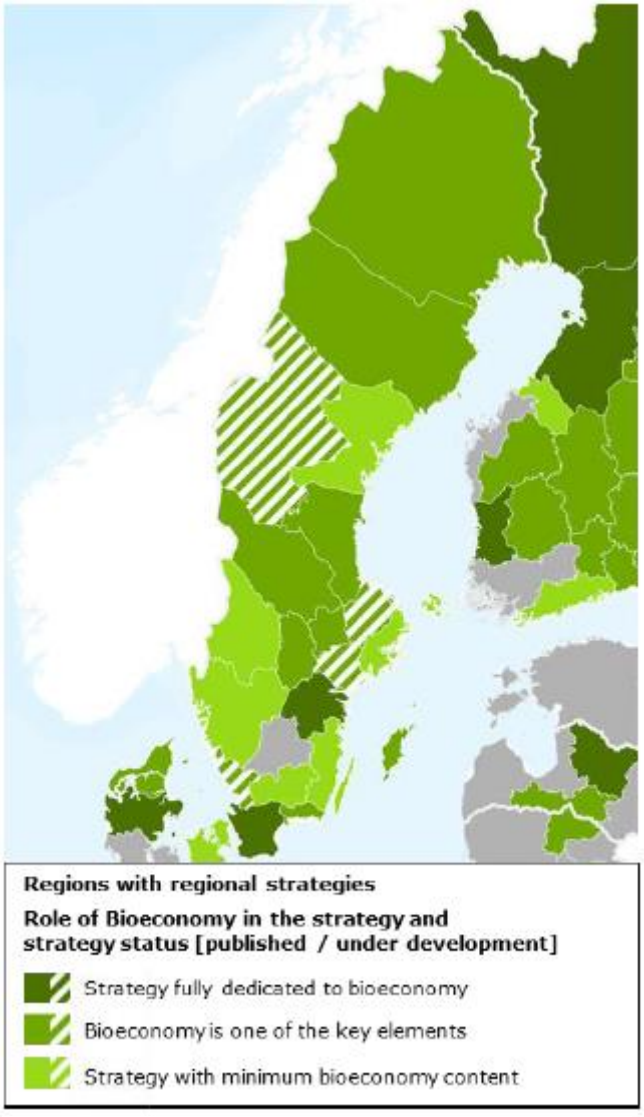

Figure 4. Overview on regional bioeconomy strategies in Swedish regions
Source: Haarich et al, 2022

Thirteen regions have a formal mandate related to the bioeconomy, while one region does not. The remaining two regions refer to the 'forestry program', as their bioeconomy agenda. The forest programme is a platform for dialogue between forest stakeholders, authorities and the government. The Strategy for the Forest Programme was adopted in 2018. It contains objectives for five focus areas that will contribute to achieving the programme's vision, work and organisation. The vision for the forest program is that "The forest, the green gold, will contribute to jobs and sustainable growth throughout the country and to the development of a growing bioeconomy". To achieve the vision, which aims to make better use of the forest's opportunities, the Government has, in broad dialogue with many committed parties, developed this strategy for Sweden's National Forest Programme. The strategy contains goals for five focus areas and the forest programme's plans for continued dialogue.

Commitment and efforts from companies, organisations and stakeholders throughout the forest value chain, together with authorities, higher education institutions and the government, are basic prerequisites for the successful implementation of the forest programme. Both

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national and regional dialogue are included in the forest programme. International forest issues are also included as a natural part of the forest programme.

The Government will also decide on concrete measures based on the vision and objectives of the Forest Programme, in support of the Forest Programme's strategy. These measures will then be brought together in a future action plan. The first version of the action plan will mainly include measures where the state has a primary responsibility. The action plan will be updated in dialogue with various stakeholders, where strategic advice from the Forest Programme's programme council will play a central role. The Government hopes that the forest sector and society at large will contribute with measures to the realisation of the vision and goals.

In response to five fixed alternatives, the results indicate that bioeconomy is integrated into the following strategies: Regional Development Strategy (15), Smart Specialization (15), Forestry Strategy (13), Food Strategy (13), and Circular Strategy (2). The field of bioeconomy is included in various strategies. Additional regional policy areas where bioeconomy is a part of include food and forestry; sustainable growth; sustainable cities; sustainable materials (including for construction); biomarine industries; bio-based green industries; circular biobased economy.

Bioeconomy has thus been integrated into a variety of regional strategies in Sweden in recent years. It has been the focus in all regional forestry strategies, focusing primarily on wood, wood-based products and forestry biomass. The main focus lies on natural resource management and on increasing sustainable growth and employment. Furthermore, in addition to the forestry sector, biofuels are of high importance in the Swedish regional development strategies. Moreover, depending on the regional economic profile, other sectors of the bioeconomy are also addressed, e.g. construction, biomaterials, bioeconomy-related research and innovation, etc. (Haarich et al., 2022).

Responsibility and mandate for the bioeconomy at county or municipal level in Sweden varies. Some regions report sub-regional authority on topics such as food strategy, the forestry programme, which in many cases is close to synonymous to the bioeconomy, and the energy and climate strategy. Likewise, the degree of collaborative governance on the bioeconomy between regions, counties and municipalities, varies substantially. 11 out of 16 regions report to work closely with their municipalities on different issues related to the bioeconomy, while almost all regions collaborate with industry- and other bioeconomy cluster organization. Collaborative governance with municipalities includes topics such as: circular economy, industrial symbiosis, business offices, biosphere reserves, water issues, water and wastewater management (VA), climate adaptation, green investments, business development (including food), rural development, land-use issues, testbeds, forestry clusters, and supporting new innovations from companies and establishments. The regional collaboration with the Association of Local Authorities and Regions is reported to be very limited, with only two regions entertaining sporadic exchanges on the issues.

In all four regions within the pilot region report there is a collaboration with the municipality, these range from establishment of new companies, strategic planning, environmental questions, and water and wastewater management. In addition, the four regions all work with their County Administrative Boards'. Three out of the four regions also report to work closely with cluster organizations and two of them also report working with the Swedish Forest Agency.

Moreover, a strong collaboration of the north Swedish pilot region, is the North Sweden European Office, that is managed and owned by a broad group of regional actors in Norrbotten, Västerbotten, Jämtland Härjedalen and Västernorrland. North Sweden European Office is the Brussels representation of Norrbotten, Västerbotten, Jämtland Härjedalen and Västernorrland, the four northernmost counties of Sweden. The aim of the office is to create good conditions for the region's companies, academia and public authorities to act successfully in the EU arena. That is done by monitoring and influence the EU-policy in areas of interest for the regional actors, our owners.

2.2 POLICY CONTEXT

The 'Swedish Research and Innovation Strategy for a Bio-based Economy' (2012) can be understood as a starting point to the national bioeconomy strategy. The Swedish bio-based economy strategy is under development. The 'Nordic Bio-based Economy' and 'Baltic Bio-based Economy' is already in place, which represents a macro-regional initiative on bioeconomy between all Nordic and Baltic countries. Those strategies have a great impact on rural development in these countries. The Nordic strategy is supported by a 15-point action plan. To date, a national forest programme exists that is for now the main focal point in Sweden's bioeconomy. National ministries in charge are the Ministry of Enterprise and Innovation, the Ministry of Environment and the Ministry of Rural Affairs. Other ministries that have overlapping or topically relevant mandates, are the Ministry of Finance, the Ministry of Education and the Ministry of Infrastructure. The defining sector for the Swedish bioeconomy is the forestry sector due to its identification capacity and ownership structure.

The regions catered to by the Biofuel Cluster are in the northern part of Sweden and constitute in the vast majority rural areas with sparse populations. The regions take part in the S3 programme and Västernorrland's, one of the pilot regions, identified the 'forest-based bio-based economy' as its new bioeconomy priority for the period 2021-2027. The regions are characterised by forestry, agriculture and mining. Living in rural areas results in a diversity of income sources, some having two to three businesses to afford living. Due to these constraints, there are substantial migration tendencies into cities.

Inter-regional but especially inter-municipal corporations are important. The former is enshrined in a common policy initiative, the 'Swedish Region for Bio-based Economy', while at the same time, all regions have their own regional forest strategies. These strategies have a combined focus on regional development and smart technologies on the one hand, and wood construction on the other. Steering groups are linked and work cross-region in some cases. In the future, the inter-regional collaboration will require increased consideration since forests are not isolated "green islands".

Relevant policies at European level were also discussed during B4R the focus groups in 2022/23, for example the EU law on 'Deforestation-free Supply Chain'. On a national level relevant policies include the Carbon Tax (1992), national climate plans and the Circular Economy Strategy (2020). The latter references the upcoming bioeconomy strategy. Based on desk research the revised national forestry accounting plan for Sweden 2012-2025 could play a role. This links to the reporting of forestry under the EU ETS. While on the national level an inter-ministerial group will be developing the bioeconomy strategy the regional bioeconomy strategies are on their way. Some advocates argue that the regional strategies should go

beyond forestry including hunting, foraging of products and tourism. Thus, affecting a diverse set of industries and business models. Considerations of minority groups and their traditions should be considered in the bioeconomy strategy. Furthermore, increasing focus is given to the added value of the by-products in the bioeconomy (sawdust, bark etc.) that will be valorised. Participants mention the difficulty in moving from demonstration to operation. Waste legislation plays a role in this, creating challenges for concerned actors in the industries.

Ownership in forestry is highly fragmented consisting of a few big companies but with a main share of small family businesses. The ownership of these family businesses is often in the hands of women. The paper industry invests in increasing production over the last decade sponsoring energy power plants and industrial symbioses.

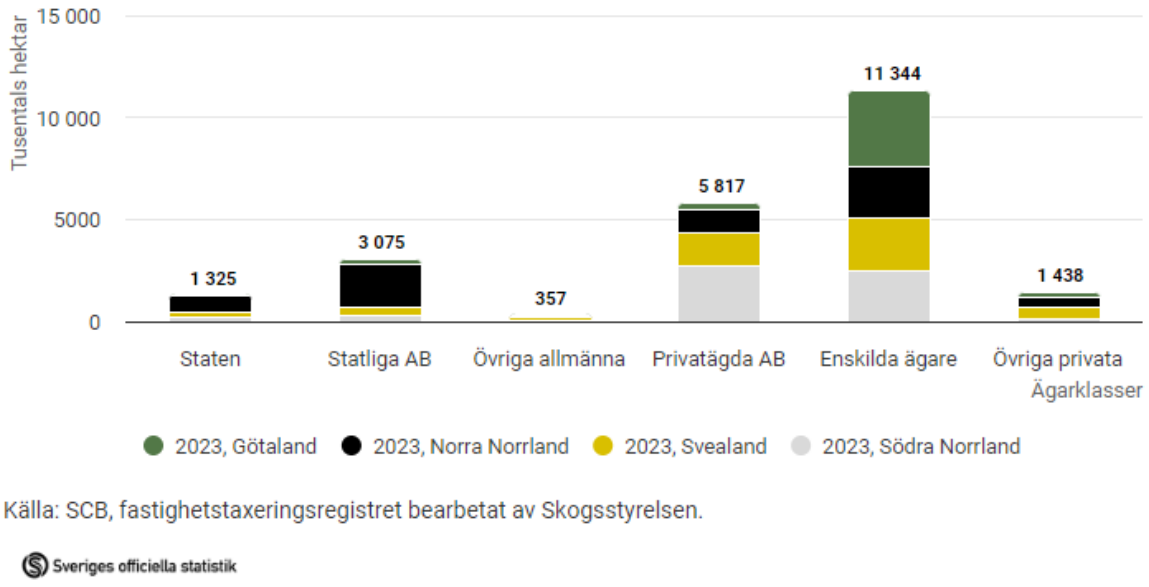

Figure 5. Forest ownership structure, North Swedish Region
Source: Swedish Statistical Office

According to Figure 5, the State ownership classes have 1.3 million hectares and State limited companies 3 million hectares. These ownership classes have large parts of their holdings in the Northern Norrland district with 59 percent and 67 percent respectively. The holdings of private limited companies (5.8 million hectares) are mainly located in Södra Norrland with 47 percent. Individual owners (11.3 million hectares), Other private owners (1.4 million hectares) and Other public owners (0.4 million hectares) have a relatively even distribution of their holdings across the parts of the country.

According to Figure 5, the largest area of declared productive forest land is in Norra Norrland (7.1 million hectares) and the largest owner class is Individual owners, who own approximately 36 percent. The second largest is Södra Norrland (5.9 million hectares) and here the largest ownership class is Privatägda AB, which owns approx. 46 percent. In Svealand, 5.5 million hectares are declared and here, too, the largest ownership class is Individual owners who own approximately 46 percent. In Götaland there are 4.8 million hectares and the dominant ownership class is Individual owners with 77 percent.

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Men own more forests than women do. In Sweden, approximately 52 percent of the declared productive forest land area is owned by legal entities, for example limited liability companies or associations. The remaining 48 percent is owned by individuals. The land can be owned by women alone, men or shared ownership between the sexes. Women own the least forest land of these three groups. There is more forest land that is jointly owned than solely owned by women. Examples of joint ownership could be siblings or spouses who own forest land together. The difference has been permanent over time, both men's and women's ownership has increased since 1999, while joint ownership has decreased during the period.

In total, there were nearly 303,000 forest owners living in Sweden in 2023, of which 61 percent were men and 39 percent were women. The distribution has remained relatively unchanged since 1999. At that time approximately 38 percent of the forest owners were women. In total, there were nearly 303,000 forest owners living in Sweden in 2023, of which 61 percent were men and 39 percent were women. The distribution has remained relatively unchanged since 1999. At that time approximately 38 percent of the forest owners were women.

Education in the bioeconomy is mainly directed toward higher education. Education in forestry specifically, has a long tradition Sweden and several programs are available. Innovation must overcome old mindsets.

Overall, the ambitious goals outlined by the different policy initiatives and strategies do not align with limited and shrinking public investment. Although in principle, public, private and blended funding is available. Västernorrland describes in the RIS3 2021-2017 application as a detailed funding strategy which targets external financing. European funds and programmes (Interreg, COSME, Horizon Europe, Baltic Sea Programmes), structural fund programmes (ERDF, ESF+, JTS) and national funding authorities such as the Swedish Energy Agency, KK Foundation, Tillväxtverket, Vinnova and various foundations are targeted in RIS3 2021-2017.

Furthermore, insurance policies and practices play an important role in financing Sweden's bioeconomy, alongside banks, funds and European programmes. Especially under changing climate conditions risks increase, particularly the risk of storms is an issue for small scale farmers. Adaptation measures and sustainable practices come into play to mitigate the effects and increase resilience. At this time the number of insurers ensuring forests is limited. The increasing variety and intensity of climate-change induced extreme weather occurrences make increase the investment risks for investors, making it more difficult to implement related bio-based programmes. In addition to risks from climate change, the climatic/ecological changes predicted in northern Sweden mean that there might be opportunities to bring new bio-based economic activities to the region (and perhaps other economic activities in general) - but these might also put development pressure on forests and other natural areas. An aspect that should be considered in medium-/long-term strategies are taking that into account.

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3 BIOECONOMY GOVERNANCE

3.1 ASSESSMENT RESULTS

The following chapter presents the results of analysis according to the governance framework developed by Jacobi, Connolly and Hayder (2023), outlining a three-tiered framework consisting of basic governance functions (1st-tier), specific bio-based governance functions (2nd tier) and assessment criteria (3rd-tier) – see method chapter in this report for more information.

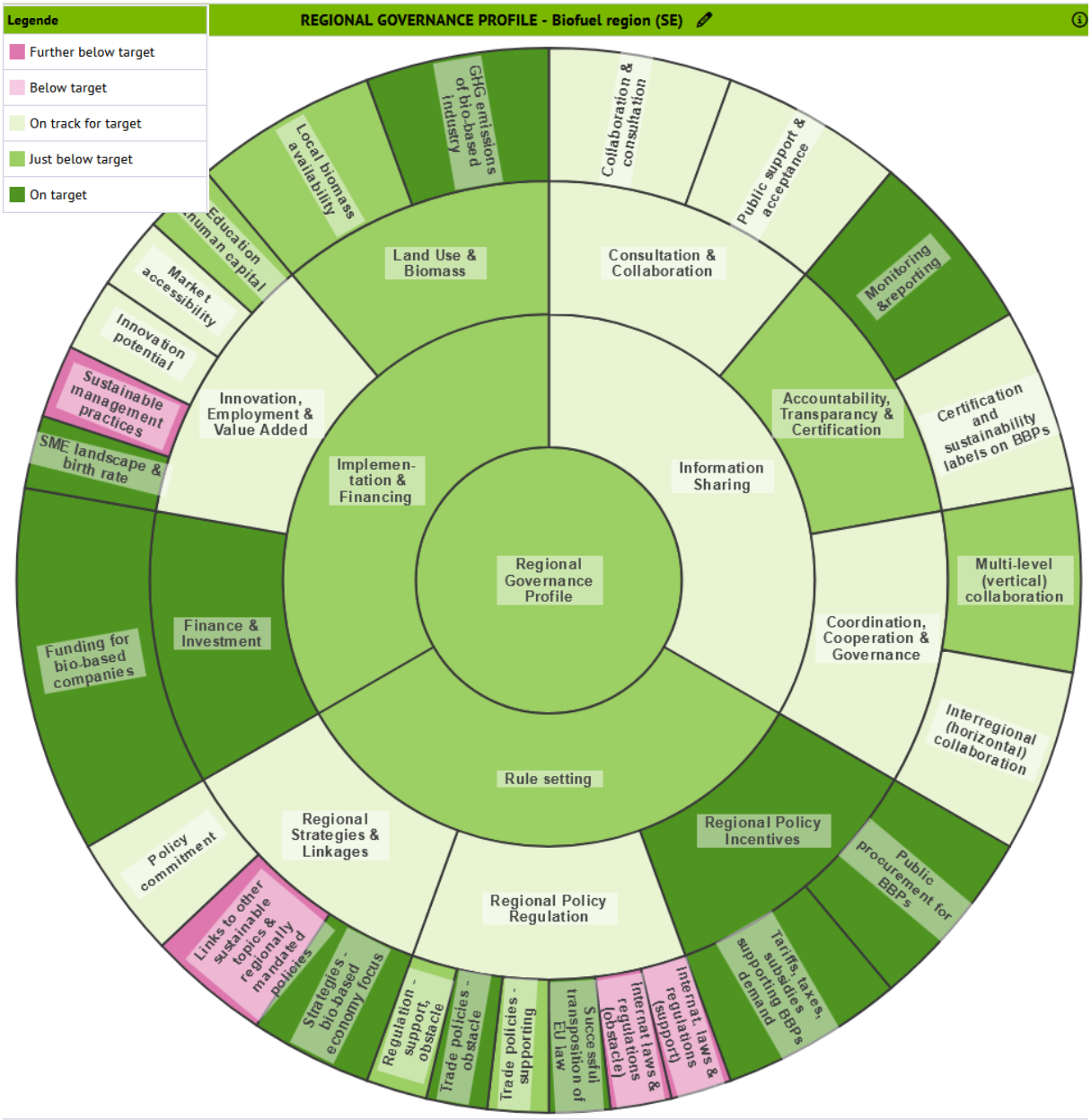

Figure 6. All-tier overview of assessment results for the North Swedish Region
Source: BERST Dashboard

At an aggregate, 1st-tier level, the results reveal the strongest performance on *implementation & finance* followed by *rule-setting*. A lower performance can be observed in the area of *information-sharing*, where also the biggest challenges for the bio-based governance in the

Swedish pilot regions appear to be grounded. In terms of *implementation & finance*, the results suggest that the regional bioeconomy is characterised by very robust value chains and very strongly developed and partly diversified bio-based market structures as well as high-value added, and a workforce employed in well-paid jobs. Although innovation potential and market accessibility (level playing field for involved market actors) as well as sustainability practices (i.e. share of companies with sustainability credentials) have been evaluated the lowest within this tier, the SME landscape and birthrate appears to be promising compared to the threshold. There are prospective and sustainably managed land and water ecosystems in place to derive feedstock for the bioeconomy and land-use and sector conflicts are minimised. Additionally, there is dedicated public funding available for strategic bioeconomy development and the framework conditions and bio-based technology readiness levels are favourable for private investments. The assessments results reveal that the criteria of sustainable management practices scored lowest, while in fact the North Swedish Region has practised sustainable forest management and regrowth for over 100 years in Sweden, including requirements in law to replant harvested areas. This will be reflected in the final version of BERST tool and the results displayed need to be **disregarded**.

For the area of *rule-setting*, results suggest that based on its dedicated and fairly integrated bioeconomy policy framework, the bioeconomy in the four Swedish pilot regions uses or advocates for using all incentivising mechanisms possible to stimulate production and consumption of BBPs. The region has a fully established regional regulatory framework in place that favours the uptake of bio-based products, and it fully understands how national or EU regulations impact regionally and advocates to the extent possible for favourable change. The biggest challenges in this governance area appear to be on the degree of integration of bioeconomy policies, regulations and strategies with other policy priorities, or regional mandates. Furthermore, EU laws, e.g. on waste, seem to be hindering the development of the bioeconomy rather than promoting it (see Figure 6).

Information-sharing appears to be most challenging area in terms of bio-based governance in the Swedish pilot regions. Here, assessment results suggest that structures for information sharing both vertically (between governance fields/government levels) and horizontally (between actor groups at regional level), including with the public, are semi-established and leave room for improvement. There appears to be a medium degree of bio-based industry collaboration. Transparency and accountability measures such as labels for BBPs appear to be semi-effectively used and certification mechanisms to stimulate and regulate BIO-BASED markets scarcely applied. However, regional governments (and its institutions and agencies) have reporting schemes in place to verify progress along a circular bioeconomy transition (see Figure 6).

Another, more detailed view on the assessment criteria of the evaluation (represented by tier 3) is provided by Figure 7 below.

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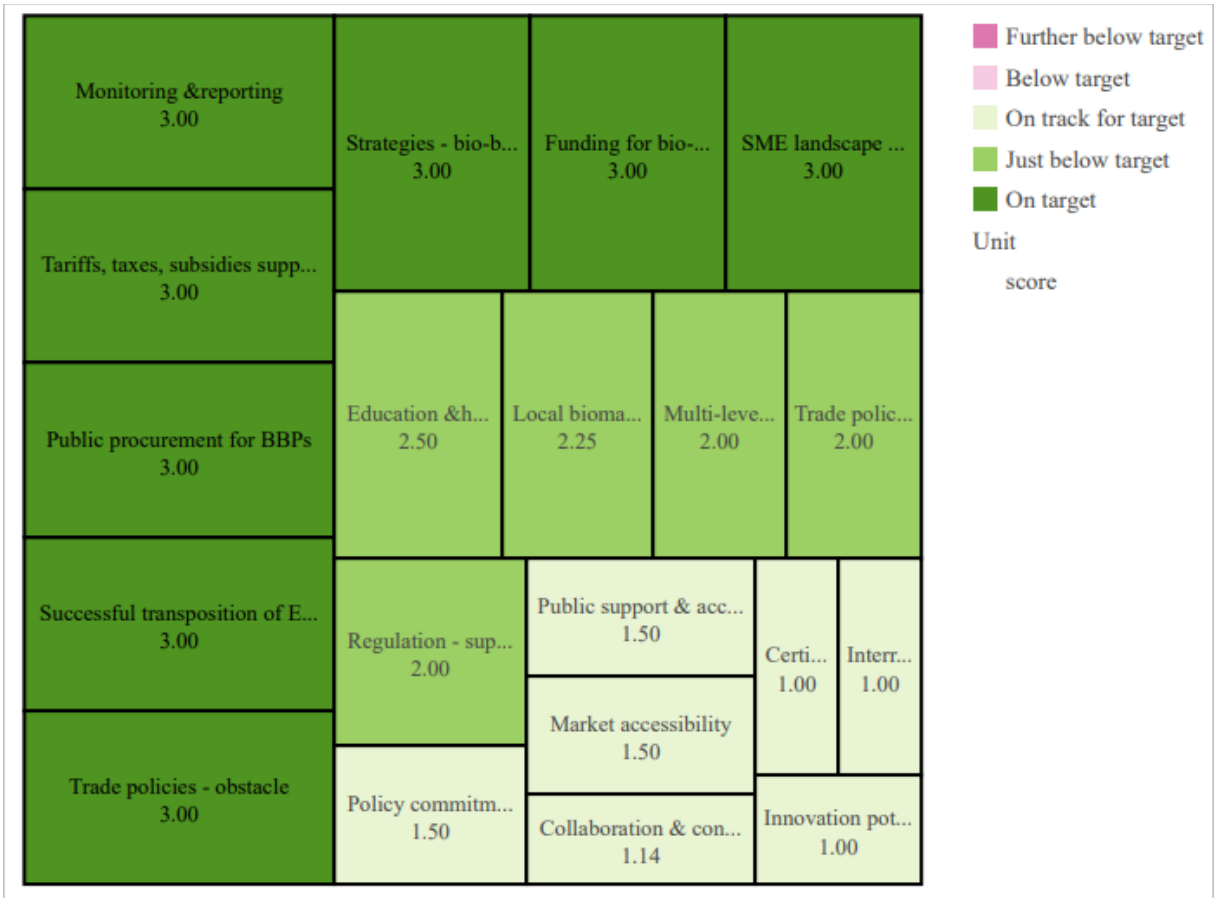

Figure 7. Overview of assessment criteria (tier 3) structured by scores for the Swedish pilots
Source: BERST Dashboard

According to Figure 7, the highest scoring criteria include:

- Monitoring & reporting (information-sharing)
- Tariffs, taxes and subsidies (rule-setting)
- Public procurement for BBPs (rule-setting)
- Successful transposition of EU law (rule-setting)
- Coping with trade policies as obstacle (rule-setting)
- Strategies/policies with bioeconomy focus (rule-setting)
- Funding for bio-based companies (implementation & finance)
- SME landscape & birthrate (implementation & finance)

Assessment criteria, scored just below benchmark include:

- Multi-level collaboration (information-sharing)
- Using trade policies for the bioeconomy (rule-setting)
- Regulation for the bioeconomy (rule-setting)
- Education & human capital (implementation & finance)
- Local biomass availability (implementation & finance)

Criteria scoring low, but with view towards benchmark include:

- Public support and acceptance (information-sharing)

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- Certification and sustainability labels (information-sharing)
- Collaboration & consultation (information-sharing)
- Interregional (horizontal) collaboration (information-sharing)
- Policy commitment (rule-setting)
- Market accessibility (implementation & finance)
- Innovation potential (implementation & finance)

Least scoring areas and therefore biggest challenges according to the evaluation done, include (not displayed in figure):

- Dealing with international/EU laws – both in support and as obstacle/challenge (rule-setting)
- Links to other regional (sustainability strategies) (rule-setting)

3.2 LOCAL POLICY EXPERT VALIDATION

3.2.1 Background and Method

The Bioeconomy Network - Regions in Collaboration received a request from the Government Offices during the spring of 2023 to assist in gathering feedback from Sweden's regions for the investigation that will serve as the basis for the bioeconomy strategy. Part 1 was delivered in June 2023, and in response to the Government Offices' request, the work was supplemented with a digital interview during the fall of 2023, and Part 2 was compiled in October 2023. North Swedish Region has been responsible for collecting and summarizing the feedback.

As many regions as possible were contacted via email and asked to participate in interviews before midsummer. The initial contact list primarily utilized the Bioeconomy Regions in Collaboration network's distribution list. This list was supplemented with contact information obtained from the Government Offices. In the end, 20 out of 21 regions received the email outreach. Apart from the 13 regions that were interviewed, an additional two regions responded that they were unable to participate.

The interviews, which lasted for 0.5 to 1 hour, were conducted digitally (via Teams) between June 9 and June 21, 2023, by Lena Jonsson from North Swedish Region. The questions asked were those developed by the Government Offices, supplemented with two additional questions (see Appendix 1 for the current questionnaire). The first question in the form, added by North Swedish Region and unnumbered, is not reported in the results section as it was a question asked to understand the interviewed region's starting point.

Each interview was documented in writing. The notes were shared with the interviewed regions, who were also given the opportunity to review and supplement the notes by July 4, which some regions did. Not all interviewed regions provided feedback on the notes.

An additional set of interviews was conducted via virtual calls with policy experts, specifically for validation of B4R analysis results. The interviews were conducted between June 2023 and May 2024 with Carina Christiansen, Senior Adviser in European Affairs, North Sweden European Office; Ylva Sardén, Region Norrbotten; Lena Friborg; Kim Strömmer, Region Jämtland/Härjedalen; and Malin Vedin, Bioeconomy Stategist, Region Västernorrland.

Results from both sets of interviews have been analysed and interpreted in conjunction and are summarized below.

3.2.2 Barriers to strengthening the Swedish bioeconomy for companies in the region

Human resources in terms of capacity and competence are a hindrance that virtually all regions point out. It pertains to workforce supply, obtaining the right skills and capabilities for the needs companies see today, as well as new skills and capabilities for transitioning to circularity and fossil-free practices. Some regions are developing these ideas further and describe that this issue is also linked to workplace attractiveness and gender equality. Prevailing culture and norms, described by one region as "gender segregation and a low tradition of education," create lock-in effects and do not provide a solid foundation for the rapid transformation that must occur. Culture and norms need to be addressed and constructively changed. Two regions also note that some of the jobs in the bioeconomy are seasonal, which is a challenge in itself, and that there is a risk of labor shortages when national regulations make it more difficult to hire foreign labor.

Policy and regulations, primarily at the EU level, are obstacles that many regions highlight because they create uncertainty about the availability of raw materials, which discourages companies from making investments. This primarily concerns conditions for forestry, processing of forest resources, and bioenergy issues. Examples of obstructive regulations mentioned include species directives, deforestation regulation, sustainability criteria in RED LULUCF, taxonomy regulations, and most recently, the upcoming EU regulations on nature conservation restorations. For example, the geolocation and digitalization requirements connected to the deforestation regulation poses a huge challenge for small scale forestry companies.

Lack of long-term political commitment is partly related to the previously mentioned obstacle of policy and regulations, but there are also many national examples, such as the North Swedish issue. Long-term planning is needed for companies to dare to invest and try out new business ideas.

Conflicts over land use and resources, as well as goal conflicts, are highlighted by several regions. For example, one region emphasizes that the biggest hindrance to companies' development in the bioeconomy is conflicts over land use and resources, such as reindeer grazing. However, this is problem specifically related to this northern region and it is a two-sided coin, that the reindeer herding is also part of the regional bioeconomy. Several regions also mention specific land use conflicts related to forestry and tourism, small-scale coastal fishing and large-scale industrial fishing, as well as agricultural land and construction of housing, roads, etc. Goal conflicts, such as forestry vs. carbon sequestration and biodiversity, are cited as an obstacle by even more regions. In this context, conflicts not only contribute to concrete land use conflicts but also hinder regional collaboration and create uncertainty about which activities should be supported. Regions call for a holistic perspective that will serve the many landowners in Sweden that that have both land and forest in the same company.

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Lengthy and complex permitting processes are the obstacle mentioned by the most regions after competency supply, regulations, and policy. In addition to the time-consuming permitting processes, several regions state that the regulations are somewhat outdated and need to be reviewed to enable and facilitate circularity. For example, it is often challenging to obtain permits for utilizing a waste stream if it is classified as waste as well as to receive a permit for aquaculture activities. Another example is that fish waste is currently not allowed to be used as fertilizer on agricultural land.

The competitiveness of businesses is an obstacle mentioned by five regions, primarily referring to the poor competitiveness of agricultural enterprises. Meat and milk are currently essential products, but what will happen in the future as society increasingly transitions to plant-based protein? The competitiveness of agriculture in the counties is low. Perhaps an investigation is needed that includes gathering knowledge on how neighbouring countries (e.g. Norway) manage to have a more viable agriculture. Business models that include ecosystem services will become important in the future. There must be conditions for sustainable agriculture to thrive.

Development and innovation are obstacles mentioned by three regions from slightly different perspectives. One aspect is the lack of collaboration between academia and industry, among others. Another aspect is that companies in the bioeconomy must transition to a circular economy, as must other companies. Obstacles to the forestry sector's transition to a circular economy include general obstacles such as the lack of digitization and traceability. Two regions also suggest that economic incentives would be beneficial, making recycled materials cheaper or, alternatively, making virgin materials more expensive.

3.2.3 Barriers to strengthening the Swedish bioeconomy for regional governments to effectively support bio-based development

Different silos for agricultural policy and growth policy, along with associated business and project support, are obstacles. Regional development funds, such as “1:1 funds” and ERDF funds, cannot be used to support primary production but only for processing development. To develop new products, it is necessary for bio-based entrepreneurs to be able to include the entire raw material chain in the development work, which is hindered by the current support systems. Additionally, the fact that responsibility for agricultural policy lies with the County Administrative Board and growth policy with the regions does not facilitate a holistic perspective.

The regulations for business support and project support also largely determine the type of activities that can receive support, even though some regions have funds that they can largely decide on themselves. Several regions report that bio-based companies are very small, making it sometimes difficult to find an organization on the bioeconomy side with the capacity to receive support.

The interpretation of regulations by authorities can also be an obstacle. For a company to receive public funds, there must be a societal benefit in what is being supported, but of course, there also needs to be a benefit for the companies themselves to be interested. There are examples where the region's strategists assess that a project has a societal benefit, but project

support makes a different assessment, making the project incompatible with project support regulations. This is further exacerbated by the new interpretation of state aid rules that the Swedish Agency for Economic and Regional Growth (Tillväxtverket) has begun to apply in certain regions and plans to implement nationwide, which may pose problems for regions in supporting businesses in the long term. Furthermore, regulations need to be reviewed to enable circular flows; for example, fish waste is currently not allowed to be used as fertilizer on agricultural land.

Several regions cite limited resources as an obstacle, both in terms of financing and personnel resources for working on the development of bioeconomy issues in the regions. Short-term national policies that have previously incentivized North Swedish development, have shifted focus to the electric vehicle industry. This shift may cause concern and hinder investment in the bioeconomy.

3.2.4 The regions' opportunities to contribute to increased climate mitigation efforts

The regions primarily see significant opportunities through the development of the bioeconomy to **substitute carbon-intensive materials and energy sources,** thereby reducing greenhouse gas emissions. A couple of regions mentioned carbon storage through pasture farming, climate- and site-adapted and less intensive forestry as contributions from the bioeconomy to climate benefit, while one region specifically stated that forests should not compensate for our fossil emissions. Digital technology can help facilitate smaller artisans/producers in accessing raw materials with specific characteristics. Furthermore, Northern Sweden has large areas of marginal farmland that could, be used for food production and contribute to our security of supply, as well as contribute to sequestration activities. Carbon credits and the Renewable Directive can be used as driver for climate-sensitive investment in this direction.

3.2.5 The regions' opportunities to contribute to reduced societal vulnerability and increased resilience

Almost all regions agreed that the bioeconomy can contribute to reducing societal vulnerability through **increased regional/local food and energy supply. Locally/regionally/nationally produced North Swedishs can reduce vulnerability in the transportation sector.** Resilience in society increases when we can produce more ourselves and have the ability to adapt quickly. One region specifically pointed out that there is great potential in finding synergy between the bioeconomy and crisis preparedness and that businesses should be included in it for effective crisis preparedness. In this context, small businesses with more diversified operations are desirable. However, macroeconomics tends to favor largescale and specialization. Diversification within the green sectors means that businesses have more legs to stand on, creating more robust companies that, in turn, enhance societal resilience. The region can also participate in/contribute to platforms where dialogue with various stakeholders occurs, thereby contributing to a shared understanding of the different conditions for utilizing various resources.

Concerning **bioenergy**, regions believe that since the demand for electricity is so significant, there is a need to ensure alternative energy sources for needs where electricity is not

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necessarily required, such as heating buildings. There needs to continue to be the possibility of using biomass for our power and district heating plants.

Increased food production contributes to a higher degree of self-sufficiency and reduced vulnerability. In some regions, there is a lot of unused agricultural land that could be used for production or grazing animals. Utilizing this unused land can help the regions become more resilient and meet the needs of a growing population, thereby also increasing the understanding of multi-use forestry and reducing land use conflicts.

3.2.6 The regions' opportunities to contribute to increased regional growth

The regions primarily see **increased processing** as an opportunity for increased regional growth, including increased employment, rural development, and enhanced competitiveness. It is important to move up the value chain, increase value-added, and value preservation, from single-use to multiple-use and, ideally, to perpetual use. Several regions also mention the opportunities of better utilizing waste streams and fostering increased symbiosis between different companies and industries in so-called industrial symbiosis centers.

It is important to **get SMEs to grow**. For the forest, small-scale wood industry contributes most to regional growth. For regional growth, it's important to increase the processing of more long-lived products and the same on the food side to increase processing. By leveraging knowledge and skills across industries, innovation and sustainable practices (multidisciplinary skills) may be fostered. For example, forestry that considers/promotes multi-use with biodiversity, tourism, reindeer husbandry, and hunting can create regional growth through the emergence of small businesses.

3.2.7 Measures to be tackled by regional bioeconomy strategies

Policy issues and balancing goal conflicts are the most important measures mentioned by most regions for the national strategy. The regions believe that this is crucial to create robust conditions for agriculture and forestry while safeguarding ecological goals. One of the regions expresses the need to "forge a clear path."

The EU level needs to be involved, and the national strategy must relate to it. The regions express the importance of Sweden taking a stance in the national strategy, as it can serve as a reference point for regions in negotiations with the EU regarding, for example, the design of ERDF programs and in regional development work. It is crucial, according to the regions, to resolve goal conflicts, as illustrated by dissatisfaction with the fact that the forestry strategy could not resolve property rights issues.

The second most important measure mentioned by the regions is a **vision for how Sweden can become/remain a leader in green transformation.** The national strategy needs to have a clear vision, clear target values, and a clear path forward, preferably with an international perspective and export opportunities for the industries. The green transformation of society and businesses should not only meet climate goals but also provide a competitive economy.

A proposal from a few regions is to assign regions the task of giving the bioeconomy a more prominent role in regional development strategies. One region specifically expressed the desire for the bioeconomy strategy to result in regional and national efforts to develop the bioeconomy, making Sweden a clear bioeconomy nation. The goals should be long-term and well-grounded.

One region suggests that the objectives should be linked to the generational goal, and the public sector should lead the way and take responsibility for essential societal needs: food, water, heating, and sanitation. We need to close loops, such as those related to water and sewage.

Financing the strategy is also important. The national strategy should pave the way for regional work. A suggestion from some regions is that regions are tasked with giving the bioeconomy a more prominent role in regional development strategies, along with a budget allocation.

Increased requirements for biobased products in public procurement to promote the green transformation. Procurement is one of the strongest incentives for businesses. The development of relevant indicators measuring goal attainment at the national level is essential, as is thorough follow-up of the requirements.

Investments in education, research, and innovation in the bioeconomy in areas such as dematerialization, circularity, resource optimization, and value chains linked to business models. National-level venture capital is needed for larger pilot projects, and the strategy can identify several risky initiatives that need to be undertaken. Comparisons with the investments made in Hybrit for the bioeconomy are also important.

Measures to increase gender equality and inclusion in the sector to enhance attractiveness and opportunities for recruiting new talent.

The **regions can participate in European networks** and forums. The regions can work to increase the number of experts within EU institutions. That Sweden should make an implementation of the EU regulations that suit the regions, involving also the Swedish Association of Local Authorities and Regions.

3.2.8 Relationship between the national strategy and regional strategies

The concept of the bioeconomy needs clarification since several regions do not use it at all. One suggestion arising from the interviews is to develop communication materials that help everyone better understand how we use our resources and how important it is.

In the interviews, it was noted that the national **bioeconomy strategy needs to relate to other strategies,** primarily the circular strategy because it is system-building, as well as the food strategy and the forestry program. It is challenging to envision a functional bioeconomy strategy that does not encompass primary production, making it crucial to consider how it relates to the forestry program and the food strategy.

Unfortunately, the work on the national circular strategy has stalled, but work at the EU level is progressing, and most regions are actively engaged in the circular economy. Therefore, it is essential to consider how the bioeconomy strategy relates to the circular strategy.

The bioeconomy in the regions has different conditions**, so there must be space and flexibility for the regions to determine how regional work should be organized.** All regions are in complete agreement on this matter. The national guidelines should specify the coherent, balanced national perspective, while the regional level should allow for the regional perspective and room for regional adaptations in implementation.

Collaboration between the national and regional levels, as well as among regions, is needed. Therefore, it is beneficial to include in the national strategy that collaboration should occur through networks, such as Bioeconomy - Regions in Collaboration. Several regions mention that learning from the work on the circular strategy, which was fundamentally excellent but lost its networking opportunities, is essential. It is crucial to have clarity and long-term commitment in the work.

Another aspect of collaboration mentioned by the regions is the desire for **collaboration on innovation initiatives.** It is neither necessary nor feasible to have similar demonstration facilities and pilot projects in multiple counties. Companies in one county should have the opportunity to participate in innovation initiatives in another county.

4 RECOMMENDATIONS

Considering the aggregated analysis of 50 benchmarked governance indicators for the six pilot regions, according to the assessment framework developed (Jacobi et al., 2023), as well as the summary of interviews carried out with local policy experts, table 1 below provides an Overview of the robustness of results by mapping-out both quantitative and qualitative assessment results.

Table 3 shows specific bio-based governance areas (assessment criteria) in the first two columns. The three ‘local expert validation’ columns represent statements made by interviewees from all the Swedish regions and the policy experts interviewed, which confirm, contradict, or indirectly confirm or contextualize, the quantitative assessment results. Quantitative assessment results either confirmed or indirectly/contextually confirmed by experts are viewed as ‘highly robust’ or ‘medium robust’ results, while quantitative assessment results contradicted by experts’ statements, are considered as ‘weakly corelated’ or ‘non-robust’. Quantitative assessment results not at all mentioned by experts, may be viable but are missing further validation by practitioners and local experts. The robustness check both contributes to validating the assessment framework as well as helps to generate viable recommendations for the Swedish cluster partner and the regional governments it caters to. Results of this mapping are summarized below as recommendations for the region(s).

Table 3. Robustness check / alignment between quantitative and qualitative results

Quantitative assessment results		**Local expert validation** *No. of statements confirming/ contradicting assessment result*		
Basic governance function (1st tier)	**Assessment criteria / narrative statements**	**Confirmed by experts**	**Ind. / cont. confirmed by experts**	**Contradict. by experts**
Area of governance excellence				
information-sharing	Good bio-based monitoring & reporting mechanisms established			
rule-setting	Tariffs, taxes and subsidies are being used as instruments to support the development of the bioeconomy		**x**	
(rule-setting)	Public procurement for BBPs is leveraged as key support mechanism	**x**		
(rule-setting)	EU law on bioeconomy is successfully transposed into national law and applied in practice			**x**
(rule-setting)	There is a variety of strategies/policies with bioeconomy focus / strong bio-based policy framework in place	**x**		
(implementation & finance)	There are diverse and potent funding opportunities for bio-based companies		**x**	
(implementation & finance)	The bioeconomy exhibits a strong SME landscape & birthrate		**x**	
Opportunities to improve				
(information-sharing)	Multi-level collaboration, both horizontally and vertically, could be improved to overcome silos in governance structure		**x**	
(rule-setting)	Regulatory framework on the bioeconomy is established but could be improved to work in favour of regional bio-based development and effective implementation	**x**		

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(implementation & finance)	Education & human capital related programmes exist but could be enhanced to support bio-based development in the region		x	
(implementation & finance)	Local biomass is readily available, but could be diversified to exploit the full potential of the bioeconomy in the region		x	
	Challenges			
(information-sharing)	Public support and acceptance		x	
(information-sharing)	Certification and sustainability labels – certification and permitting are challenges, creating uncertainty among bio-based companies	x		
(information-sharing)	Collaboration & consultation between different governance levels as well as between regions and bio-based companies is lacking		x	
(information-sharing)	Interregional (horizontal) collaboration is lacking.			x
(rule-setting)	There is lack in long-term policy commitment hindering long term planning for the bioeconomy	x		
(implementation & finance)	Market accessibility is an issue in terms of ensuring level playing field and favouring framework conditions for sustainable and future-oriented bio-based branches to enter market	x		
(implementation & finance)	Innovation potential is lacking insufficient actor collaboration and limiting focus on low innovation primary industry sector	x		
(rule-setting)	International/EU laws are a challenge e.g. in terms of processing forestry resources and bioenergy issues	x x		
(rule-setting)	Links to other regional (sustainability strategies) are missing			x

(implementation & finance)	Sustainable management practices			

The following recommendations related to addressing **challenges** of the bio-based governance regime in the Swedish pilot regions can be made, building on the analysis conducted and presented above:

- **Certification and permits** – certification and permitting for bio-based production or for bio-based products should be improved and related processes speeded-up, creating more certainty and longer-term perspectives for companies and investors.
- **Collaboration & consultation** between different governance levels as well as between regions and bio-based companies should be improved, creating e.g. formal exchanges and partnerships between different quadruple-helix actors, especially between industry and academia (e.g. through cluster organization, professional associations, market dialogues etc.)
- **The policy commitment** should be improved by engaging a broad range of departments and agencies in the governance of the regional bioeconomy (e.g. via a widely owned strategy development process), by securing long-term commitment from leadership and through choosing policy instruments for bio-based policy and regulation which are not subject to government changes every four years (e.g. legislation, laws and directives rather than strategies, initiatives, programmes, or executive orders etc.). Engaging in EU-law making where possible can also help increase the commitment at home.
- **Market accessibility** should be improved by e.g. strengthening small and medium size forest owners, e.g. by solving land-use – and goal conflicts or by providing incentives for diversifying the bio-based product portfolio to allow for diversification in the bioeconomy, which will favour predominantly SMEs and increase market access and competition. Ensuring a level playing field and favouring framework conditions for sustainable and future-oriented bio-based branches to enter market is key in order to create a future-proof bioeconomy.
- **Innovation potential** is lacking and should be strengthened by e.g. increasing the information flow between relevant actors (academia, industry). The bioeconomy in Sweden is largely focused on primary biomass production, which is often exempted from receiving any kind of national or EU funding for innovation. Measures to diversify or shift away from primary production could help boost innovation.
- **EU laws are a big challenge** for the Swedish pilot regions, e.g. in terms of investments and also processing forestry resources and bioenergy issues. Increasing interregional collaboration among Swedish regions can help make the case for region-specific issues at EU level. Increasing presence and influence where sensible in order to help shape EU policies is important in order to ensure Swedish perspectives on the issues, e.g. with regard to the nature conversation law, the waste classification etc.

Recommendations on governance **areas with room to improve** include:

- **Multi-level collaboration**, both horizontally and vertically, should be improved to overcome any silos in governance structure. Vertical collaboration (i.e. between

municipalities, regions and the national level) is key in order to affect policy, to access funding or to shape topical programmes and initiatives. Cross-governmental dialogues can help achieve that. Also, the development of a national strategy such as in Sweden (ideally with targets) can help set the implementation and finance framework for lower government level, which then have to follow with their own plans, adhering to provided targets, frameworks and metrics. Horizontal governance, e.g. set-up of cross-departmental task forces, reporting structures which overcome silos, or related co-creation initiatives can help create co-ownership of the topic and increase political backing and leadership. Measures to increase multi-level collaboration should be sought wherever possible.

- **The regulatory framework** on the bioeconomy in the Swedish pilot regions appears to be well established but could be improved to work in favour of regional bio-based development and effective implementation. Areas affected by regulation include many. These should be mapped systemically, and improvement needs outlined vis-à-vis collective bioeconomy objectives, such as e.g. increasing innovation potential, market access, reducing bureaucracy for permitting and certification, reducing land -use and goal conflicts, streamlining funding opportunities, or reducing dependency on EU regulation. Regional implementation reports can be a great vehicle to raise these issues towards the national government, again, engaging in a form of multilevel governance on the bioeconomy.
- **Local biomass** is readily available but could be diversified to exploit the full potential of the bioeconomy in the region. This concerns mainly the improvement of permitting for different biomass or aquatic products but also to diversify and broaden the crops grown (e.g. *Brassica rapa*) in the north for increased self-sufficiency and resilience.
- **Governance areas of excellence**, according to the quantitative assessment results, have not been confirmed by the expert interviews, which might in part be because the interviews were conducted on barriers and opportunities and not on areas of good performance. However, governance functions in this category indirectly confirmed by experts may still serve as reflection stimulus, also in conjunction with the areas outlined above. These functions include:
  - **Tariffs, taxes and subsidies** are being used appropriately as instruments to support the development of the bioeconomy in the regions.
  - **Public procurement for BBPs** is leveraged as key support mechanism.
  - There is a variety of **strategies/policies with bioeconomy focus** / strong bio-based policy framework in place.
  - The bioeconomy in the Swedish pilot regions exhibits a **strong SME landscape & birthrate**.

Contradictions include '*EU law on bio-based economy is successfully transposed into national law and applied in practice*'. The discrepancy between the assessment results and the expert validation, appears to be either a mistake during the data collection, or in the interpretation (i.e. "act of transposing vs. impact of EU law"). In reality, EU law on bio-based economy seems to be a big issue as expressed by several experts throughout the interviews. There have been cases, there the EU policies have been ambitiously interpretated and therefore caused unnecessarily strict implementation that limits primary producers and bb-companies more than in other parts of Europe. Another example is the EU policy suggestion (RED II) relating to heavily limiting the collection of logging residues. The suggestion did in the

end not go through, but were very close to doing so, and would have affected over 15% of the Swedish electricity production (a similar, if not higher numbers for Finland, as both countries have bio-boilers for heat and power production, fuelled by forest residues).

Furthermore, the statement that funding is sufficient and diverse has also been contradicted by expert. This appears to be a gap between the oversimplification of the indicator in the assessment framework, which signals positively only if dedicated bio-based funding is available, and the nuanced reality about this issue expressed by the experts. The same, or similar explanation could be given for the statement of 'interregional (horizontal) collaboration is lacking', which also has not been confirmed by experts. Here, one could also see a definition issue – i.e. how is interregional collaboration defined? Lastly, 'links to other regional (sustainability strategies) are missing' was also contradicted by experts, pointing to the fact that the national strategy was just under development in 2022/23 and the indicator may not have been well enough understood – however, in reality the policy framework for the bioeconomy in Sweden, seems to be quite integrated, as described in chapter 1 and outlined by experts.

NITRA REGION, SLOVAKIA

1 REGIONAL PROFILE

The geographic scope of the Nitra consists of the NUTS2 region Západné Slovensko (SK02), located in the West of Slovakia (Figure 8). With 1,8 million inhabitants, the population density of Nitra is above the country average: 122 persons per km^2 compared to 111 persons per km^2 in Slovakia as a whole.

Table 4. Profile indicators for Nitra compared to Slovakia and EU-27
Sources: Eurostat, EC-JRC, own estimates

	Nitra region	Slovakia	EU-27
Regions included	SK02 (Nuts2)	SK (Nuts0)	
Total land area covered (km2)	15.003	49.035	4.125.104
- *Of which wood land*	*30.5%*	*45.8%*	*41.1%*
- *Of which crop and grass land*	*61.5%*	*45.1%*	*41.6%*
Total population covered (persons)	1.812.542	5.434.712	446.735.290
- *Of which 15-65 years*	*66.9%*	*66.6%*	*63.9%*
Employment in NACE B-N (persons)	513.068	1.592.642	126.003.564
Employment in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	131.066	350.718	24.694.206
- Of which in bio-based industry	*39.451 (30.1%)*	111.090 (31.6%)	8.524.971 (34.5%)
Value added in NACE B-N (mil euros)	14.254	41.144	6.488.393
Value added in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	3.618	8.090	1.454.603
- Of which in bio-based industry	909 (25.1%)	2.415 (27.8%)	484.293 (33.3%)
Biomass availability (kton dm)	5.200	12.945	917.751
- *Of which forestry biomass*	*19.2%*	*37.8%*	*27.0%*
- *Of which crop and grass biomass*	*80.8%*	*62.2%*	*72.9%*
National bioeconomy strategy		Not available	

The indicators reported in Table 4 give insight in the socio-economic profile of Nitra in terms of land area coverage, population, employment and value added of biobased sectors, and land coverage (column 1) compared to Slovakia as a whole (column 2) and the EU-27 (column 3). More than 60% of land area in Nitra is used for arable and livestock farming, whereas this amounts to only 45% at the country level. The share of the biobased industry in the total potential bioeconomy (excluding primary sectors) in Nitra is below those of the average region in Slovakia and the EU-27 in terms of both employment and value added. On the other hand, potential active labour force (15-65 years class) in total population of Nitra and Slovakia is relatively high compared to the EU-27 as a whole. When compared to the EU-27, the role of

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crop and grass biomass in total biomass availability is relatively strong in Nitra (81% versus 73%), which aligns with the dominant use of land for cropping and grazing in this region.

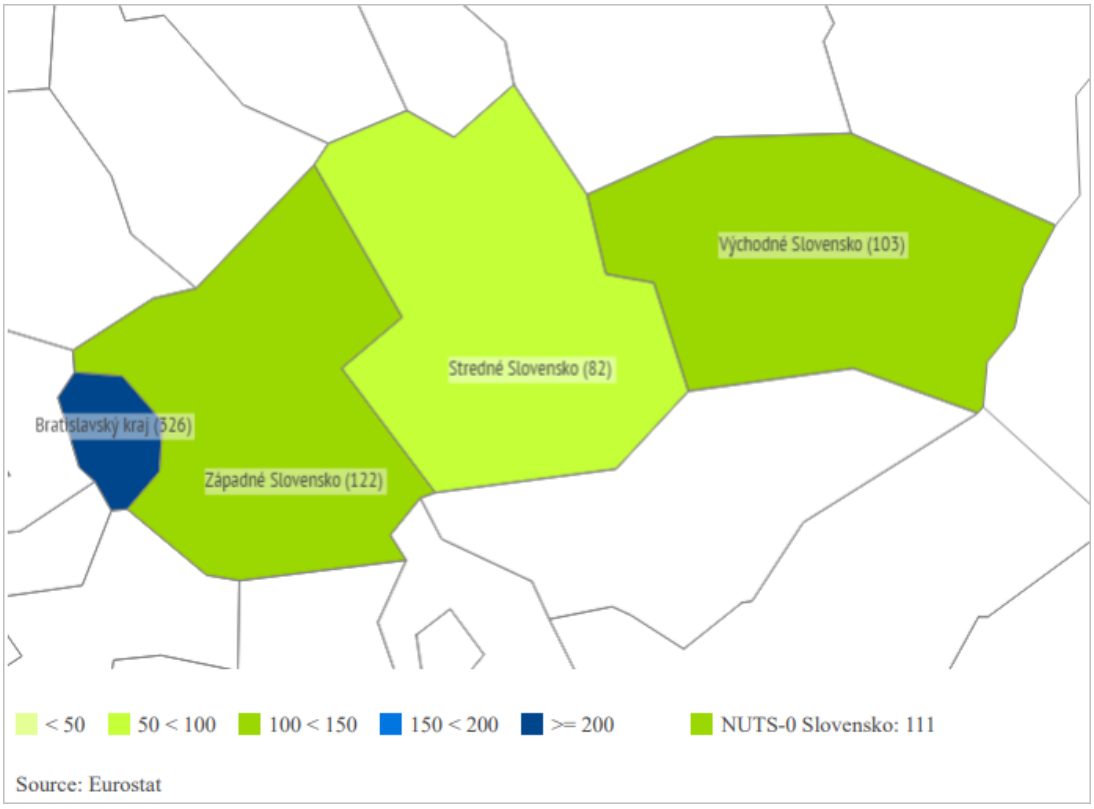

Figure 8. Population density in Nitra region (Západné Slovensko), in the West of Slovakia

2 POLICY CONTEXT

2.1 HISTORICAL AND ECONOMIC CONTEXT

In the Slovak Republic, the agricultural sector is seen as the largest potential contributor to the bioeconomy, followed by forestry. These sectors are both well-established in the country and are characterized by a fragmented ownership structure, challenges with modernisation and competitiveness, and strong influence from the EU. The Slovak Republic joined the EU in 2004, and since then, EU regulatory frameworks and policies have been a major determinant of national policy in bioeconomy-related sectors.

Domestically, the Slovak Republic's agricultural sector is primarily governed by the Ministry of Agriculture and Rural Development, which oversees agricultural policy, food safety, rural development, and environmental sustainability. The ministry is responsible for implementing national policies as well as EU agricultural regulations. Meanwhile, forestry is overseen by the Ministry of Land Management, Forest Section (Hrvol, n.d.)

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During Slovakia's transition away from socialism in the 1990s, land redistribution and restitution policies returned significant portions of the country's farmland and forests to small private owners. This fragmented ownership structure, which largely persists today, means that smaller landowners may lack the knowledge or resources to effectively manage their farmland or forests in line with the Slovak Republic's bioeconomy-related goals. It also presents challenges for coordinating action, modernization, and efficient land use.

Related to this fragmented ownership and small farm size, Slovak agricultural outputs sometimes struggle to complete in the EU market, with commonly cited issues including smaller farm sizes, outdated technology, and lower levels of investment compared to Western European countries. The war in Ukraine has disrupted supply chains and exacerbated economic challenges in the agricultural sector. This makes Slovakian agriculture heavily dependent on subsides. In particular, the EU Common Agricultural Policy (CAP) provides a large share of the country's agricultural subsidies and rural development funds. These funds are especially critical in less competitive regions, given that some rural areas face depopulation, aging populations, and a lack of infrastructure.

Against this backdrop, this report focuses specifically on the Nitra region. Nitra similarly struggles with agricultural competitiveness and rural development, but less than other regions: it is one of the Slovak Republic's most fertile areas and a leading agricultural producer. Its major products are cereals (especially wheat and maize), sugar beets, and sunflowers, as well as significant livestock and wine industries. It also benefits from the local presence of the are the Slovak University of Agriculture in Nitra. The regional government, Nitra Self-Governing Region (Nitra County), plays a key role in managing and supporting the agricultural sector, in coordination with the national Ministry of Agriculture and Rural Development.

The Slovak Republic's forestry sector is smaller than the agricultural sector in economic terms, making up less than 1% of GDP and employment 2% of the population (EEA, 2023). However, with 40% of the country under forest cover, management of forested lands will play an important role in achieving national goals related to climate and biodiversity. Woody biomass products are cited as a possible area of growth, indicating potential for conflict between economic and environmental forest management goals (Navrátilová et al., 2021). In terms of EU influence, certification schemes like FSC (Forest Stewardship Council) or PEFC (Programme for the Endorsement of Forest Certification) as well as the EU Timber Regulation have significantly influenced forestry practices.

In addition to agricultural and forestry products, an important stream of biomass is municipal waste, especially biological waste suitable for composting. Nitra's work in the Bioeconomy4Regions project and Blueprint will focus on municipal waste.

2.2 STRATEGY CONTEXT

2.2.1 National Strategy and Policy Context

The Slovak Republic does not have a dedicated national strategy for the bioeconomy, which several publications and interviewees emphasized as a primary obstacle to enhancing and

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coordinating the bioeconomy (Navrátilová et al., 2020). However, there is movement towards strategy development at both the national and regional level, as well as existing strategies that link to the bioeconomy. These include the Strategic Plan of the Common Agricultural Policy (2021-2027), the Slovak Waste Management Programme (SWMP) for 2021-2025, the National Energy and Climate Plan (as per (EU) 2018/1999), Greener Slovakia – Strategy of the Environmental Policy of the Slovak Republic until 2030, Strategy of economic policy of the Slovak Republic until 2030 and the Low-Carbon Development Strategy of the Slovak Republic until 2030 with a view to 2050. The following section describes the bio-economy-related content of the most relevant of these strategy documents.

One of the Slovakian national strategies that is most relevant to the bioeconomy is the current *Slovak Strategic Plan for the Common Agricultural Policy (CAP)* for the 2023-2027 period. It aims to increase the competitiveness and resilience of the agricultural sector while protecting natural resources. The bioeconomy is referenced in Strategic Objective No. 8, saying that the "LEADER program will be complemented by *support for bioeconomy* and support for the management of small-scale forests, which will contribute to the development of rural employment and the efficient and sustainable use of natural resources and biomass" (page 36, emphasis added) (Slovakia Ministry of Agriculture and Rural Development, 2022). "Investments in bioeconomy" also appear on a list of indicators related to the development of the rural economy and rural enterprises (page 94), with the number of investments rising from 0 in 2024 to 75 in 2029 (Slovakia Ministry of Agriculture and Rural Development, 2022). Page 119 offers detail on the focus of these investments in bioeconomy, which are "set to complement the support of farmers in the I. and II. pillar and will contribute to strengthening verticals with a focus on:

1. More effective cooperation between primary producers and processors
2. Better quality food
3. Foods produced by more ecological procedures, or with a lower carbon footprint
4. strengthening the supply of organic food and products from farms with good living conditions for animals
5. Short supply chains
6. Increasing the supply of local food

Technological and construction investments will be supported with an emphasis on digitization and robotization and reduction burden on the environment" (Slovakia Ministry of Agriculture and Rural Development, 2022).

Overall, the CAP incorporates bioeconomy in tangible ways, framed primarily as a way to promote rural development and sustainable agriculture.

The CAP's Strategic Objective No. 4 is also relevant to this pilot. It emphasises climate change mitigation and adaptation, with a focus on reducing greenhouse gas emissions, increasing carbon dioxide sequestration, and supporting sustainable energy. Among its numerous objectives, this strategic objective promotes the use of bio-waste for energy production. The Slovak Republic generates approximately 1.5 million tons of municipal waste annually, of

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which around 400 thousand tons are organic waste that can be used for biogas production (page 125) (Slovakia Ministry of Agriculture and Rural Development, 2022).

Another relevant strategic document is the *Slovak Waste Management Programme* (SWMP) for 2019-2025 prepared by the Ministry of Environment of the Slovak Republic. The SWMP specifically focuses on the management of bio-degradable waste with the goal of diverting it from landfills. The Slovak Republic has identified the circular bioeconomy (including biomass-based economy) as a priority topic in the Research and Innovation Strategy for Smart Specialisation of the Slovak Republic 2021-2027 (Ministry of Investments, Regional Development and Informatization of the Slovak Republic, 2021).

Within the programming period 2021-2027, the Just Transformation Fund (JTF) will create an individual priority axis of Operation Programme Slovakia. The fund tackles the impacts of transition to climate neutrality, supporting the most affected and at-risk areas to prevent the increase of regional discrepancies and facilitate a fair transition. Specifically, they will aid in ensuring a just transition for the metals and chemicals sectors in the Trenčín, Košice, and Banská Bystrica regions.

In 2022, the Ministry of Agriculture and Rural Development of the Slovak Republic initiated the development of a roadmap for the circular bioeconomy, launching the bioeconomy strategy formulation process (OECD, 2022). The roadmap comprises eight sections:

1. Carbon Farming
2. Renewable Energy Sources
3. Biogas And Biomethane
4. Organic Fertilizers
5. Municipal Wastewater Treatment For Small Towns And Operational Facilities
6. Circular Bioeconomy
7. Sustainable Insulation Systems Buildings
8. Packaging Materials

It also includes technological capture and recycling of CO_2 at source with subsequent energy and material utilization. Each section has a dedicated working group that oversees the creation of supporting documents. Four sections of the roadmap have been approved, and the rest are still being prepared. This roadmap will inform and catalyse the development a national strategy, paving the way for the success of the bioeconomy in the Slovak Republic.

2022 also saw the publication of *Closing the Loop in the Slovak Republic: A Roadmap Towards Circularity for Competitiveness, Eco-Innovation and Sustainability*, which was carried out by the OECD with extensive expert input from numerous government officials in the Slovak Republic government, with funding from the European Union via the Structural Reform Support Programme in co-operation with the European Commission's Structural Reform Support Service (OECD, 2022). It includes a dedication section on the role of the bio-economy in transitioning to a circular economy in the context of the Slovak Republic.

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Furthermore, a bioeconomy hub is under development in the Slovak Republic. This hub will function as a platform to connect, coordinate and align a diverse range of stakeholders within the country's bioeconomy sectors, including government agencies, research institutions, industries, and civil society. Its primary goal is to facilitate the creation of a national bioeconomy strategy that, once implemented, will enhance the bioeconomy in the Slovak Republic.

Several EU-funded projects contribute to the development of the national bioeconomy strategy (CEE2ACT), the regional strategy for the Nitra region with an emphasis on bioeconomy (Power4Region, BioRegion) and strengthen the implementation of bioeconomy in the Slovak Republic (BioEast, Boost4Bioeast). The CEE2ACT project will further contribute to providing national roadmaps for bioeconomy strategies developed through a bottom-up participatory approach. These roadmaps will align the commitment and ambitions of the bioeconomy sectors and will form the basis of a national policy that will be adopted by the relevant authorities as an official strategy. There are also several EU-funded projects aimed at accelerating the transition to the bioeconomy (Transition2BIO, BIOLOC).

The main drivers of innovation in the bioeconomy in the Slovak Republic are the Slovak University of Agriculture in Nitra, the National Agricultural and Food Center, the Bioeconomy Cluster (BEC), SMEs operating in the bioeconomy area and start-ups. BEC creates an innovation ecosystem for knowledge and technology transfer between research and the agri-food industry, including start-ups. BEC also supports start-ups and SMEs through innovation vouchers. However, in focus groups early on in the project, participants expressed the views that business-to-research and business-to-business cooperation were areas for improvement.

Education: Universities offer education linked to bioeconomy, with relevant topics including forestry, biotechnology, environmental science and ecology, agrobiology and food, and wood science and technology. Secondary vocational schools also provide relevant training, especially in agriculture and rural services.

Funding: BEC describes the funding for the bioeconomy as blended funding. Funding is available via the European Structural and Investment Fund (ESIF) and funding of innovation through innovation vouchers. The rural development funding mechanism in the pilot region is the LEADER NSK programme, representing a funding option for small-scale circular economy projects throughout the Nitra Region. A wide range of projects are being funded, in the future, it might put more emphasis on environmental aspects (forthcoming NSK Waste Management Programme).

Monitoring: No national monitoring is in place, however, the Bioeconomy Cluster (BEC) engages in voluntary monitoring on some aspects of the bioeconomy and bioeconomy through projects. There are also several EU-funded projects implemented by Slovak organizations which engage in mapping and monitoring of bioeconomy aspects (e.g. CELEBio). The Slovak University of Agriculture in Nitra, National Agriculture and Food Center and INCIEN (Institute of Circular Economy) are active in bioeconomy monitoring.

2.2.2 Regional Strategy Context

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Most regional activity related to the bioeconomy in Nitra orbits around the Bioeconomy Cluster (BEC). BEC has participated in nearly 20 projects related various aspects of the bioeconomy, most notably BIOEAST. Its members include numerous local small and medium enterprises, such as a vermicompost business, beer brewery, orchard and agriculture cooperative. It enjoys institutional support from the Slovak University of Agriculture in Nitra in a leading role, as well as the National Agricultural and Food Centre, the Institute of Knowledge Agriculture and Innovation, the Institute of Landscape Ecology of the Slovak Academy of Sciences and the Slovak Agriculture and Food Chamber (Bioeconomy Cluster, 2024).

The Nitra region has the Slovak Republic's only published regional strategy focused on the bioeconomy. In the context of the BIONET project, Nitra's Bioeconomy Cluster (BEC) published the *Bioeconomy Cluster Development Strategy to 2025*, which set three goals:

1. Strengthening the innovation potential of actors in the bioeconomy through cooperation in knowledge and technology transfer, research, development and innovation with high regional impact
2. Involvement of the regional research and innovation ecosystem in international cooperation, including projects and expert participation in national policy-making
3. Raising awareness and information about the bioeconomy at the regional and national level (Bioeconomy Cluster, 2024).

The *Action Plan Towards Circular Bioeconomy In The Nitra Self-Governing Region*, developed as part of the BIOREGIO project and published by 2018, additionally steers bioeconomy governance in Nitra. For a more efficient use of funds in the new programming period Nitra region created a strategic development document titled *Programme of the Economic and Social Development of the Nitra Self-governing Region until 2030 / Integrated Territorial Strategy of the Nitra Self-governing Region until 2030* (PESD 2030).

In summary, the governance structure for the bioeconomy in the Nitra region is characterized by triple helix participation, with limited involvement from civil society. It has a predominantly bottom-up approach with a strong focus on regional pilot cases and emerging good practices, often stemming from European projects and other European funds.

Looking beyond Nitra, there is regional action towards developing and implementing bioeconomy strategies in 5 out of the Slovak Republic's 8 NUTS level-3 regions. Nitra's efforts the most advanced and four regions (Bratislavský kraj, Trnavský kraj, Trenčiansky kraj and Košický kraj) have a strategy or programme where bioeconomy is embedded in wider strategic framework(CITE HAARICH). These consist of an economic and social development programme, a low carbon strategy, an environmental education concept, and a territorial development strategy. According to Haarich et al. (2022), this places the Slovak Republic in the category of "EU Member states with *some* regional strategic action to deploy bioeconomy," defined as between 1 and 15 regions with bioeconomy-relevant strategic frameworks, alongside 15 other EU countries (Haarich et al, 2022).

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Figure 9. Regions in the Slovak Republic with regional strategies
Source: Haarich et al., 2022

According to the Waste Act no. 460/2019 Coll., municipalities are required to introduce a system for the collection of bio-degradable and bio-kitchen waste (BDKW) starting from January 1, 2021 (EEA, 2023). However, implementation has floundered due to financing challenges, and the measure lacks rules on composting bio-waste including animal components. The pilot's overall goal is to find a way to process all the kitchen waste, what would reduce the amount of mixed waste at landfills and decrease the methane production resulting from degradation of bio-waste at landfills. To achieve this, the pilot region needs to assess various business models and technologies, and select the best solution based on economic efficiency, environmental impact and social sustainability. In respect of that, BEC, together with other interested entities, is establishing a working group with the objective to create a methodology for bio-based waste composting aiming for high-value and high-quality compost for the amelioration and restoration of the soil. However, taking in to account the complicated legislation process, the methodology may not be the most suitable solution. Other solutions (as introduction of the biogas station to the composting plant) are being discussed within the association.

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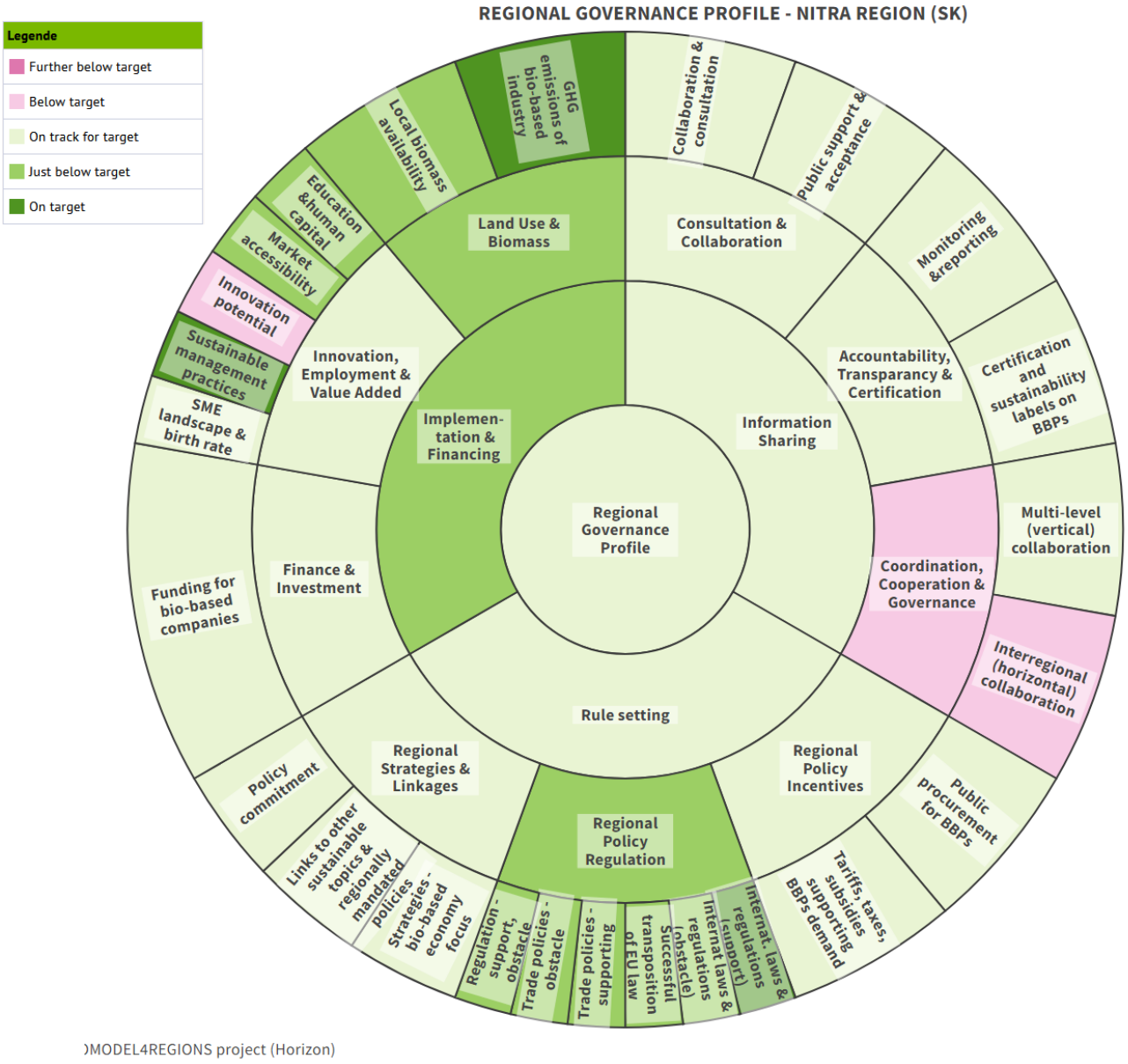
3 BIOECONOMY GOVERNANCE

3.1 RESULTS FROM GOVERNANCE INDICATOR ANALYSIS

The following chapter presents the results of analysis according to the governance framework developed by Jacobi, Connolly and Hayder (2023), outlining a three-tiered framework consisting of basic governance functions (1st-tier), specific bio-based governance functions (2nd tier) and assessment criteria (3rd-tier) – see method chapter in this report for more information. Figure 10 visualizes the results organized into the three tiers of governance functions, the Figure 11 shows the same assessment criteria grouped based on their scores.



)MODEL4REGIONS project (Horizon)

Figure 10. Regional Governance Profile: Nitra Region, the Slovak Republic (sunburst chart)

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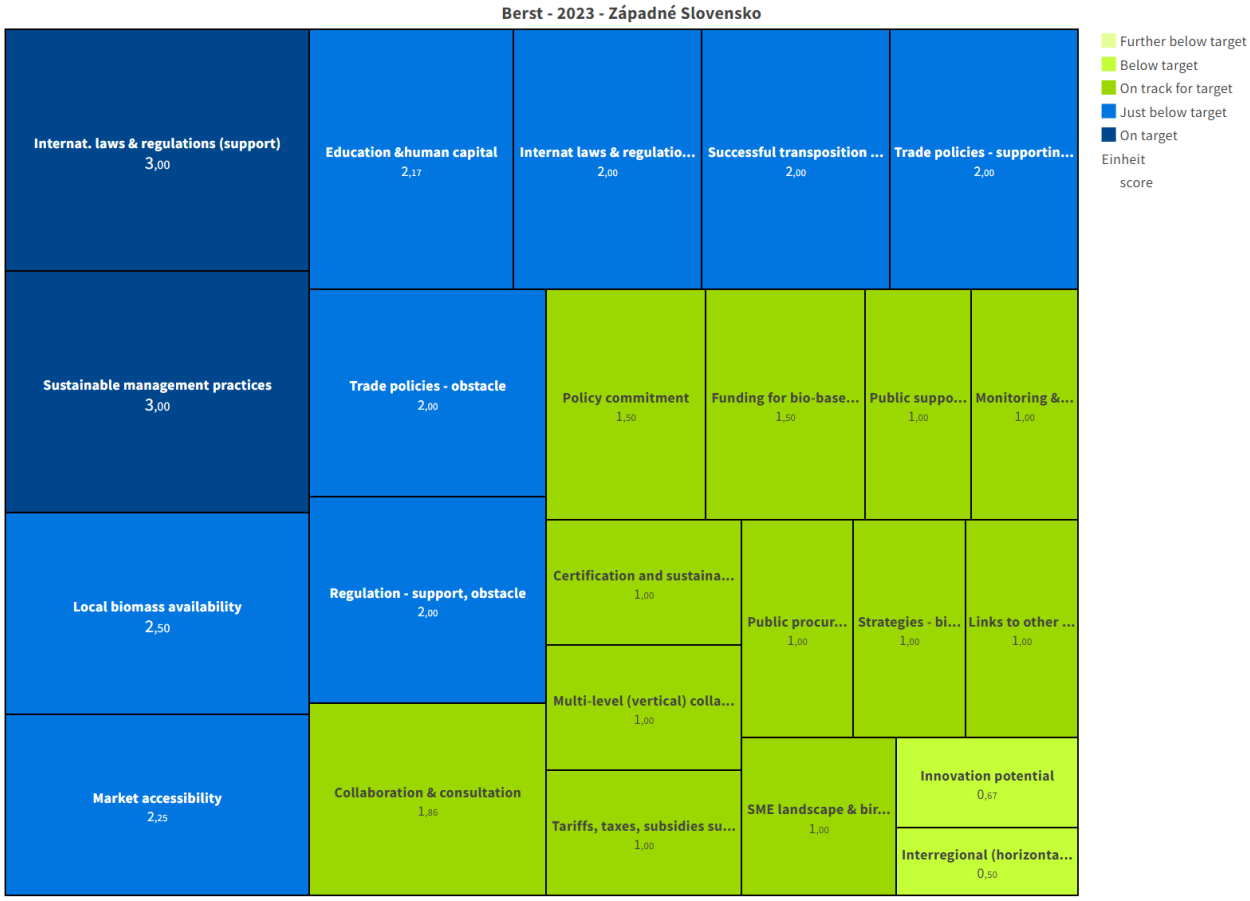
Of the three first-tier basic governance functions (Implementation & Financing, Rule Setting and Information Sharing), Nitra received the middle score of “On track” in Information-sharing and Rule-setting, and the higher score of “Just below target” in Finance and Implementation. This is within a similar range to other regions in the Biomodel4Regions project, most of which scored better in Finance and Implementation than the other categories.



Quelle: BIOMODEL4REGIONS project (Horizon)

Figure 11. Regional Governance Profile: Nitra Region, the Slovak Republic (treemap chart)

Drilling down to the second tier of nine bio-based governance functions, most indicators were determined to be “On track for target.” The highest scores were primarily found in *Regional Policy and Regulations, Land Use & Biomass,* and *Innovation, Employment & Value Added.* The following section lists and contextualizes the specific assessment criteria that received the best scores (*on target* and *just below target)* in these three categories of second-tier bio-based governance functions.

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Regional Policy and Regulation

- International laws and regulation (support)
- International laws and regulation (obstacle)
- Successful transposition of EU law
- Trade policies – supporting
- Trade policies – obstacle
- Regulations – support, obstacle

Most of the assessment criteria under *Regional Policy and Regulation* actually focus on the implementation of EU-level laws, policies and regulators, or the presence of corresponding national policies. Thus, the high scores in this category track with other sources' descriptions of the Slovak Republic's bioeconomy sectors (agriculture and forestry) as being highly influenced by EU policies, regulations and certification schemes. However, despite the name of this category, laws, regulations and policies related to bioeconomy at the *regional* level – namely, from the government of Nitra – do not appear extensive or well-developed. That said, given the relatively small size of Slovakian regions, most policy-making happens at the national level, so it is unclear how much regional-level policymaking, regulations or laws could be expected or desired.

Land Use & Biomass

- GHG emissions of bio-based industry
- Local biomass availability

Given the strong influence of EU policy in Slovakian bioeconomy sectors, the high scores in *Sustainable management practices* and *Greenhouse gas emissions* may be partially attributed by the increasing focus on sustainability within EU frameworks and concomitant support. *Local biomass availability* reflects the high level of forest cover and the well-established agricultural industry in Nitra.

Innovation, Employment & Value Added.

- Sustainable management practices
- Market accessibility
- Education and human capital

Education and human capital is exemplified by the presence of the Slovak University of Agriculture in Nitra. However, as elaborated below, the expert interviewees noted a lack of capacity and knowledge related to bioeconomy across stakeholder types. The high score in *market accessibility* raises additional questions, because other sources indicated that Slovak agricultural products can struggle to complete economically in EU markets, due in part to producers' relatively lower levels of modernization and efficiency, which may be connected the fragmented ownership structure and small plot sizes. In the context of this analysis, the *market accessibility* assessment criteria mainly reflects the relatively straightforward permitting

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practices for infrastructure that might enable bioeconomy businesses, such as a processing facility or biogas plant.

The area with the most challenges, described as "Further below target," are *Innovation potential* and *Interregional (horizontal) collaboration.* In this governance analysis, *Innovation potential* reflects the relatively low levels of R&D expenditures, but the expert interviews expand on these challenges to include complex bureaucratic processes and difficulties in small and medium enterprises (SMEs) accessing funding and private financing. The challenges with *Interregional (horizontal) collaboration* are borne out in the expert interviews as described below.

3.2 RESULTS FROM INTERVIEWS WITH REGIONAL POLICY EXPERTS AND STAKEHOLDERS

During working groups held with Slovakian cluster members early in the project, participants expressed the views that good governance on the bioeconomy means successful development of multi-stakeholder dialogue (including local and regional governments, industry, and research), and improved targeting of existing supporting schemes, funding and subsidies that promote the roll-out of technology in bio-based industries. Other key aspects of good governance include increasing public awareness of the social and environmental benefits of the bioeconomy, making sure regulations are supportive at the national and EU levels, allowing circularity in bio-waste processing in specific areas and bringing innovation to market.

To validate and nuance the results of the governance analysis, interviews were conducted with four experts or stakeholders from Nitra in March and May 2024. The following section summarizes the obstacles, challenges, strengths and opportunities that the interviewees identified

3.2.1 Obstacles and Challenges

A primary obstacle highlighted by interviewees was a **lack of capacity and knowledge** related to the bioeconomy. Interviewees said that the concept of bioeconomy was poorly understood and sometimes **conflated with circular economy**, with relevant expertise missing among most stakeholders including government officers and producers of bio-based products. (The exception to this seems to be the agricultural university, which was frequently referenced as an asset at the region's bioeconomy governance).

The other most widely cited obstacle was the **lack of bioeconomy strategies** at the national and regional level. Interviewees saw this to be linked to the **lack of prioritization** of bioeconomy at the national level and the lack of expertise, coordination and funding on bioeconomy-related areas. Interviewees described a lack of proper structures for communication and organizational collaboration. Particularly, despite numerous initiatives and projects related to bioeconomy at the national level and in Nitra, these efforts were fragmented and uncoordinated, meaning that the learnings or results of these initiatives were not effectively captured disseminated.

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Interviewees also addressed the **business environment** for bioeconomy companies in Nitra. From the perspective of companies, which in Nitra's case are mostly SMEs, a main challenge is **navigating bureaucratic administrative processes**. In terms of **finance**, interviewees said that SMEs had difficulty accesses private investment, were not aware of national funding opportunities and struggled with the lack of predictability in the funding landscape. Interviewees also reiterated a lack of awareness of bioeconomy – specifically, that many SMEs in Nitra's bioeconomy space were not aware that their business would fall within that category.

3.2.2 Strengths and Opportunities

Nitra already has **an established agricultural sector**, with a good **availability of biomass** and multiple **existing organizations** that are active in this space. There are opportunities to enhance and build on it by increasing the horizonal **networking, coordination and cooperation** between the many existing stakeholders and producers in the region. Interviewees emphasized the value of the presence of the Slovak University of Agriculture in Nitra, which can be leveraged for knowledge transfer and R&D.

Interviewees foresaw future business and economic opportunities from **new and diversified value-added bio-based product**s, especially ones that made use of current waste streams, which would build on the current output of both the agriculture and forestry sectors.

Support from the EU was described positively, with sufficient availability of funding, technical solutions and training.

3.2.3 Recommendations

Interviewees described the importance of **increasing the capacity of all stakeholders**, especially government officers at relevant national ministries including the Research and Innovation Agency. They also suggested **clarifying responsibility** for bioeconomy within the government. Interviewees supported the **national government leading the implementation** of bioeconomy-related efforts, given limited capacities at the level of the Slovak Republic's regional governments.

Recommendations related to funding and finance included creating **business incubators and accelerators** and pursuing initiatives to attract **private finance**, as well as establishing more funding opportunities and programs to support **cross-sectoral collaboration** related to bioeconomy.

Finally, interviewees made suggestions related to **data collection.** One suggested filling data gaps related to **biomass availability**, while another suggested that data collection and managements systems should be set up inform the **monitoring and evaluation** of bioeconomy activities and initiatives, to enable iterative improvement.

3.2.4 Alignment of expert interviews with governance analysis

The expert interviews largely confirmed the findings from the governance analysis. They agree on the need for improvement in coordination and cooperation, to better integrate the

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fragmentation among current bioeconomy-related initiatives and connect stakeholders to each other, and that the existing agricultural sector and current biomass availability are assets that ca be built on.

The main area of disagreement was the analysis' high scoring of "education and human capital" in Nitra, which differed from the experts' assessment of a lack of capacity and expertise related to bioeconomy. A possible explanation is the grouping of education and human capital into one category – educational opportunities may be a strength given the nearby agricultural university, but this doesn't necessarily mean that the average level of expertise among stakeholders is high.

Additionally, there was disagreement related to Innovation potential. The analysis rated Nitra as "below target" in this area, whereas interviewees saw opportunities for existing SMEs to benefit from new business opportunities by expanding into new, value-added bio-based products. This may be attributed to the presence of both high theoretical potential for innovation, and lack of current government structures or policies that would bolster that innovation.

The governance analysis also scored Nitra highly in the category of (Regional) Policy Regulation, which includes policies, regulations and laws at all levels of government, including the EU. The experts confirmed that EU support was available and relevant policies were being implemented, but did not speak directly to trade regulations.

Considering the aggregated analysis of 50 benchmarked governance indicators for the six pilot regions, according to the assessment framework developed[1] as well as the summary of interviews carried out with local policy experts, Table 5below provides an Overview of the robustness of results by mapping-out both quantitative and qualitative assessment results.

Table 5 shows specific bio-based governance areas (assessment criteria) in the first two columns. The three 'local expert validation' columns represent statements made by interviewees, which confirm, contradict, or indirectly confirm or contextualize the governance assessment results. The robustness check contributes to validating the assessment framework and informs the recommendations for the Nitra bioeconomy cluster.

Table 5. Robustness check / alignment between governance analysis and interview results

Quantitative assessment results		**Local expert validation** *No. of statements confirming or contradicting assessment result*			
Basic governance function (1st tier)	**Assessment criteria / narrative statements**	**Confirmed by experts**	**Ind. / cont. confirmed by experts**	**Contradict. by experts**	**Not mentioned**
Area of governance excellence					

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Implementation & Finance	Sustainable management practices are in place				XXXX
Implementation & Finance	Low greenhouse gas emissions from bio-based industry		XX		XX
Implementation & Finance	SMEs experience equal opportunities on the open market and are not burdened by permitting			XX	XX
Implementation & Finance	Local biomass is readily available	XX			XX
Implementation & Finance	Education & human capital supports bio-based industry development in the region	X		XXX	
Rule-setting	EU law on bio-based economy is successfully transposed into national law and applied in practice	X		X	XX
Rule-setting	Good coping with EU trade policies as obstacle			X	XXX
Rule-setting	Good use of trade policies to support the bio-based economy				XXXX
Rule-setting	Regulatory framework on the bio-based economy is established			XXX	X
Rule-setting	International/EU laws do not limit the growth of the bio-based economy	XX		X	X
Opportunities to improve					
Implementation & Finance	The SME landscape and birthrate could benefit from incubators to support the link between innovation to market		X		XXX
Implementation & Finance	Some access to funding opportunities for bio-based companies	X	X	XX	
Information-sharing	Multi-level collaboration, both horizontally and vertically, could be improved to overcome silos in governance structure	XXX		X	
Information-sharing	Good public acceptance and awareness but room to improve			XXXX	
Information-sharing	Some existence of bio-based monitoring & reporting mechanisms			XX	XX
Information-sharing	Certification and sustainability labels				XXXX
Information-sharing	Collaboration and consultation between different governance levels as well as between regions and bio-based companies is lacking	XXXX			
Rule-setting	Public procurement policy for green products could indirectly support procurement of bio-based products				XXXX
Rule-setting	Tariffs, taxes and subsidies are being used as instruments to support the development of the bio-based economy			X	XXX
Rule-setting	There is lack of long-term policy commitment hindering long term planning for the bio-based economy	XXX			X
Rule-setting	Links to other regional and sustainability strategies could be improved	XXX	X		

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Rule-setting	There are several strategies/policies with bioeconomy included		**X**	**XX**	**X**
Challenges					
Implementation & Finance	Innovation potential could be limited by low investment in R&D		**XX**	**X**	**X**
Information-sharing	Interregional (horizontal) collaboration is lacking	**XXXX**			

4. RECOMMENDATIONS

1. **Increase capacity and clarity at the national level.** Given Nitra's small size and the important role of the national government in Slovakian policymaking, a multi-level governance approach is warranted to develop the bioeconomy in Nitra. Clarify the responsibility for bioeconomy-related activities among national government agencies, then build capacity among those government officers to better manage and integrate bioeconomy-related initiatives, including the development of a national bioeconomy strategy.
2. **Create a more enabling business environment to smooth the path for bioeconomy SMEs**. Reduce administrative and bureaucratic burdens and make access to funding and financing easier and more predictable. Build the capacity of SMEs, such as through business incubators or accelerators, so they can better understand their role in the bioeconomy, the landscape of other bioeconomy stakeholders, and how to improve their competitiveness in the EU market, particularly in the context of disruptions created by the war in Ukraine.
3. **Create structures to promote cooperation and coordination** between national agencies, Nitra's regional government, the Slovak University of Agriculture in Nitra, and other stakeholders including SMEs and sectoral or NGO organizations. An inclusive process of developing of a national bioeconomy strategy could serve both to build relationships among stakeholders and to crystallize mechanisms to enhance cooperation and coordination moving forward.
4. **Build on current assets.** The positive environmental characterization of Nitra's bioeconomy-related sectors, as well as the high availability of biomass and agricultural products, are major strengths that should form the foundation of future bioeconomy initiatives and strategies. Similarly, the Slovak University of Agriculture in Nitra can be leveraged to continue playing a key role in capacity-building, education and R&D for Nitra's bioeconomy stakeholders.

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DELTA REGION, THE NETHERLANDS

1 REGIONAL PROFILE

The geographic area of Circular Biobased Delta (CBBD) consists of the NUTS2 regions Zuid-Holland (NL33), Zeeland (NL34) and Noord-Brabant (NL35) located in the South-West of the Netherlands (See Figure 12). With 6,7 million inhabitants, the population density of CBBD is far above the country average: 652 persons per km^2 compared to 466 persons per km^2 in the Netherlands as a whole. This is especially due to the province of Zuid-Holland which is by far the most populous province in the country.

Table 6. Profile indicators for Circular BioBased Delta region compared to the Netherlands and EU-27
Sources: Eurostat, EC-JRC, own estimates

	CBBD	The Netherlands	EU-27
Regions included	NL33, N34, NL35 (NUTS2)	NL (NUTS0)	
Total land area covered (km2)	10.265	37.377	4.125.104
- *Of which wood land*	*14.5%*	*15.1%*	*41.1%*
- *Of which crop and grass land*	*55.3%*	*57.6%*	*41.6%*
Total population covered (persons)	6.733.585	17.590.672	446.735.290
- *Of which 15-65 years*	*64.6%*	*64.5%*	*63.9%*
Employment in NACE B-N (persons)	2.280.313	5.953.219	126.003.564
Employment in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	325.805	874.987	24.694.206
- Of which in bio-based industry	*95.702 (29.4%)*	259.857 (29.7%)	8.524.971 (34.5%)
Value added in NACE B-N (mil euros)	153.850	399.752	6.488.393
Value added in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	30.831	76.528	1.454.603
- Of which in bio-based industry	9.099 (29.5%)	24.458 (32.0%)	484.293 (33.3%)
Biomass availability (kton dm)	3.431	11.236	917.751
- *Of which forestry biomass*	*12.8%*	*14.8%*	*27.0%*
- *Of which crop and grass biomass*	*86.5%*	*84.4%*	*72.9%*
National bioeconomy strategy		Available (2018)	

The indicators expressed in Table 6 give insight in the socio-economic profile of CBBD in terms of land area coverage, population, employment and value added of biobased sectors, and biomass availability (column 1) compared to the Netherlands as a whole (column 2) and the EU-27 (column 3). More than 55% of land area in CBBD is allocated to arable and livestock farming, which is somewhat below that of the average Dutch region. The development of CBBD's biobased industry follows the same speed as for the whole country in terms of employment (ca 29.5%). In terms of value added, however, the development of the biobased

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industry lags behind (29.5%) compared to the average Dutch and EU regions (32% and 33.3% respectively). Potential active labour force (15-65 years class) in total population of CBBD and the Netherlands is a bit above that of the EU-27. Contribution of crop and grass biomass in total biomass availability is relatively strong in CBBD and the Netherlands compared to the average EU-27 (87% versus 73%) which is conform the dominant use of land for cropping and grazing in the pilot region.

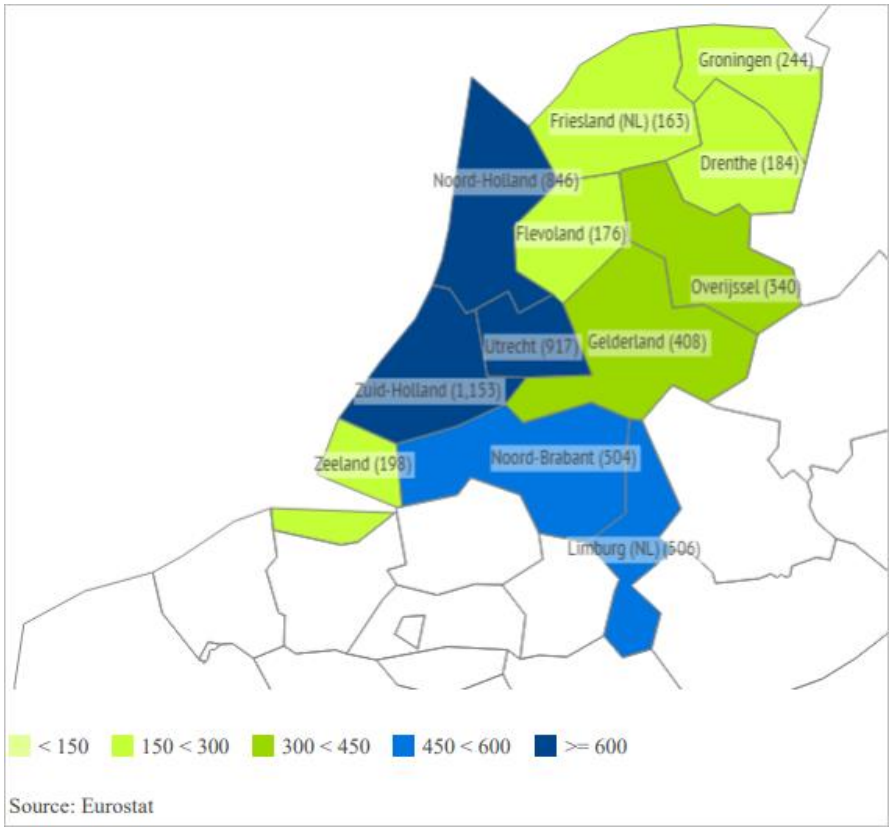

Figure 12. Population density in Circular BioBased Delta region (Zuid-Holland, Zeeland and Noord-Brabant), in the South-West of the Netherlands

2 POLICY CONTEXT

2.1 STRATEGIC FRAMEWORK

The Netherlands is one of a few countries that have implemented a bioeconomy strategy originally in 2007, with a follow-up in 2012.[2] A national agency (RVO) is the organism responsible for implementing its bioeconomy policies. A key objective that has been set up is sustainable biomass valorisation ("value pyramid") or production of biobased materials and

[2] *The Government Vision on the biobased economy in the energy transition (2007). Framework on the Biobased Economy (2012), a mid- and long-term vision and strategy for the biobased economy.*

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use residues for North Swedishs, electricity and heat ("co-production"). Realisation of the valorisation potential is done focussing mostly on biorefineries as key technologies.

Biobased policy development in the Netherlands has started relatively early compared to peer countries and is mostly driven by economic objectives, as strategic and environmental legislation mostly was already in place at the time. A considered extensive implementation is pursued, including installation of a national policy, an implementation agency, R&D programme **and regional and local implementation**

BIOECONOMY STRATEGIES AND ROADMAPS

- The Government Vision on the biobased economy in the energy transition (2007).
- Framework on the Biobased Economy (2012) is a mid- and long-term vision and strategy for the biobased economy).
- Green Growth: from biomass to business (2012) served as a 'business plan' for the transition to a Dutch Biobased Economy.
- Green Growth: for a strong, sustainable economy (2013).
- Monitoring Biobased Economy in Netherlands (2017) (from 2010-2016).
- Sustainable biomass and bioenergy in the Netherlands (2016) provides an overview of the biomass flows in the Dutch biobased economy over the year 2015.
- A Circular Economy in the Netherlands by 2050 has an interim target of reduction in the use of primary raw materials by 50% by 2030.
- "The Transition Agenda" is a program of five roadmaps on construction, plastics, the production industry, biomass and food, and consumer goods, leading them to become circular by 2050.

LEGISLATION

In 2013, the **Climate Agenda** set out Dutch commitments to reduce greenhouse gas emissions by 80-95% by 2050 (compared with 1990) and highlighted the need to reinforce action on climate mitigation and adaptation.

The Energy Agreement for Sustainable Growth (Energieakkoord) (2013) contains ten key pillars for sustainable growth including to increase the share of renewable energy.

Energy Reports are published every four years to set energy and climate policies. The most recent (2015) report focuses on the period beyond 2023 (after the Energy Agreement) on how to achieve a CO2 neutral energy supply system by 2050.

The Netherlands operates the government supported, market based, **SDE+ incentive scheme** (Encouraging Sustainable Energy Production) which is a feed-in tariff scheme where producers receive financial compensation for the renewable energy they generate.

Figure 13. Bioeconomy strategies and Roadmaps and Bioeconomy legislation.
Source: Interreg North-West Europe BioBase4SME, Bioeconomy Factsheet – The Netherlands, July 2018

National-level objectives and ambitions are translated into regional-level policies but not always with the publication of additional strategic policy documents (strategies, roadmaps, action plans etc.). All regional authorities (provinces) refer to bioeconomy on their webpages in one way or another, mostly in relation to their economic policy, circular economy, support to agri-food and chemical sectors as well as to energy transition.

All four 2021-27 Smart Specialisation Strategies in the Netherlands mention elements of the bioeconomy, although the relevance of the topic differs by strategy. Bioeconomy is most pronounced in the strategies for East, South and North Netherlands and less explicitly referred

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to in the strategy for West Netherlands. However, in general, bioeconomy in the S3 documents is only one priority among several others (cf. Haarich et al., 2022).

2.2 POLICY CONTEXT AND GOVERNANCE MODEL

The Netherlands has been at the forefront of circular economy efforts including the bioeconomy since the launch of its government-wide programme, "A Circular Economy in the Netherlands by 2050," in 2016, setting the 2050 ambition for a fully circular economy. This foundational plan evolving from the Memorandum on Bio-based Economy that had been published in 2012 was supported by the National Raw Materials Agreement in 2017. Another relevant document being the report on Sustainable biomass and bioenergy in the Netherlands for 2030 (2016). The next step, the "Transition Agenda" (2018) was established as program of five roadmaps on construction, plastics, the production industry, biomass and food, and consumer goods, leading them to become circular by 2050. The bioeconomy is featured within the Transition Agendas and is prominent in the Agendas for Biomass and Food, Construction, and Plastics. The first Circular Economy Implementation Programme (2020-2023) was launched, then followed by its second phase, the National Circular Economy Programme (2023-2030). Those build on the efforts to create a circular economy incorporating more compulsory measures to drive sustainable practices, including targeted actions in sectors such as bio-based construction and green chemicals.

Figure 14. Bioeconomy Governance
Source: Interreg North-West Europe BioBase4SME, Bioeconomy Factsheet – The Netherlands, July 2018

Governmental bodies of relevance for the bioeconomy are the Ministry of Infrastructure and Water Management, the Ministry of Economic Affairs and Climate Policy, the Ministry of Agriculture, Nature and Food Quality and the Netherlands Enterprise Agency (*Rijksdienst voor Ondernemend Nederland, RVO*).

On a national level, a new cluster organisation has also emerged (2022): 'Green Chemistry, New Economy' (Groen Chemie, Nieuwe Economy - GCNE). This national cluster entails a multiregional collaboration, connecting various regions, types of parties, and sectors. Its programme supports start-ups by removing barriers, "massaging" the market, and attracting

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the right investors. An example of success is the 'Paques Biomaterials' new demonstration plant.

Additionally, in support of Research, Development, and Innovation, the National Growth Fund (Nationaal Grooei Fond) has been established and it invests in projects that contribute to the sustainable earning capacity of the Netherlands. Among the themes focus of the National Growth Fund, is the 'Key Technologies and Valorisation, where The Biobased Circular growth fund (project) is ongoing. This is an initiative led by, among others, Green Chemistry, New Economy, to pave the way for the Netherlands to switch to the use of climate-neutral materials and is being implemented in 2024.

Focusing on the regional context, The Delta region within the Dutch border comprises the South-West of the Netherlands and includes the administrative provinces of Zeeland, North Brabant, and South Holland, as well as major cities and ports (e.g. Port of Rotterdam, North Sea Port). The three provinces are represented by economic development organisations: BOM (Brabant) + REWIN (West Brabant), Impuls Zeeland (Zeeland) and Innovation Quarter (South Holland), which have bioeconomy targets and focus. The spatial distance between provinces brings about substantial challenges in terms of coordination and collaboration. Collaboration occurs between the regional clusters and development agencies but not at all between municipalities. For strategic decision-making, they are supported by the Supervisory Board of Circular Bio-based Delta (CBBD), in which industry and representatives from the provinces are present. A 10-year plan was formulated and discussed at the supervisory board – again consisting of industry, science, and government representatives (triple helix). The cluster have been working closely with the European neighbours and collaborates e.g. with circular bio-based Europe or other European cluster organisations (e.g. SPRING). Furthermore, the cluster uses different national formats and events for networking and communication (e.g. the Dutch Design Week).

The Cluster Bio-based Delta (BBD) is a triple-helix cooperation formed in 2012. After aligning with the government policy for reaching 100% circularity by 2050 it became the Cluster Circular Bio-Based Delta (CBBD). The cluster promoted the development of green products and spear-headed the bioeconomy strategy for the Delta Region. Focus areas being bio-based feedstock, green chemistry, chemical recycling and waste valorisation. This accelerates bio-based routes and circular solutions by creating new values. One of the primary resources is the sugar beets (sugar delta).

Bio-based Delta's vision is to drive the transition towards a net-zero and circularity in the Delta region, more specifically, in CBBD's vision and ambition plan the target was set to achieve a 10 megaton CO2 reduction and 50% circularity in the Delta Region by 2030. These targets were inspired by the National Plan but were adjusted to reflect the regional needs and possibilities. The targets were decided and approved by the triple helix in the region, represented in the Board and the Supervisory Board of the CBBD.

Funding for the CBBD was concluded in December 2023, and from conversations with regional stakeholders during workshops and interviews, it is clear how crucial the CBBD's role was in advancing and accelerating bio-based industries locally. There is a recognized need for a similar structure to continue this work, focusing on bringing together public, private (especially

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SMEs), research, and civil society stakeholders to understand needs, discuss possibilities, and make joint commitments. The bioeconomy spans multiple sectors, including food, biomass, feed, fertilizers, chemistry, energy, construction, and consumer products, and requires breaking up traditional silos to foster innovation and collaboration. Stakeholders see the importance of identifying the next possible coordinating body to expand the CBBD's role, driving regional collaboration. Reflecting on this ten-year initiative, a key lesson learned is the importance of integrating closely with existing regional organizations and ensuring collaboration across the entire bio-based value chain. The CBBD has been an effective model, but moving the needle on the regional bioeconomy transition will require an even closer and more synergistic partnership among the quadruple helix players to create a truly sustainable and interconnected ecosystem.

HCH is taking over a few angles and roles from CBBD given its core business of connecting circular hubs, matchmaking, and dissemination on knowledge and best practice on the circular economy. HCH works at European and local level which ensures connecting opportunities, crossing silos, and bringing the most for local impact. Specific actions taken by HCH to support the Delta region in becoming an international leader in the Bioeconomy, HCH is a member of the Biobased Industries Consortium (BIC) a key space for the private sector (especially SMEs) to be represented in the European space in identifying EU projects, being at the forefront of policy development and finding strategic partners. Further, HCH is a co-chair of the European Stakeholder Platform and Member of the Leadership group "Circular Bioeconomy and Sustainable Food Chains", bringing the voice of the region to inform the European Bioeconomy plans, such as producing joint position papers. Several other activities developed by HCH, regionally, nationally, and internationally bring as focus the dissemination and development of the circular economy, which includes the bioeconomy in several angles (see website).

Investments in the bioeconomy are available mainly through public channels or R&D investments of companies and a few blended funding options. Besides European programmes (e.g. CBE, EFRO) and national programmes (Dutch National Growth Fund) some municipalities, e.g. Bergen op Zoom in the region of Brabant, issues vouchers to stimulate the bioeconomy. The 19.000 EUR vouchers are available to small bioeconomy businesses. The fund is made available through the provincial government, focusing on green chemistry. Other regions have similar voucher systems.

InvestNL funds bio-based projects e.g. in Public-Private Partnership (PPPs). In some cases, private investors also fund activities. There are PPPs in R&D programmes in place, e.g. between TNO, VITO and Circular Bio-based Delta. Subsidies and fiscal instruments are used (MIA/Vamil for market introduction (subsidy), not specific for bioeconomy and WBSO (fiscal), not specific for bioeconomy). The Just Transition Fund (JTF), designed to aid in economic diversification and the creation of sustainable jobs is especially relevant for sectors like green chemistry and bio-based industries, where there is potential to transform traditional industries into low-carbon, sustainable operations. Given their industrial heritage and the need to transition away from fossil-fuel-based industries, Zeeland and West-Brabant in the Netherlands are key beneficiaries.

Education programmes on the bioeconomy focus on tertiary education. Translating research into education tools for students in primary and secondary schools, is led by the Centre of

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Expertise Bio-based Economy (CoEBBE). The research at CoEBBE focuses on research with and for SMEs. Regarding life-long learning or re-skilling, there are different programmes for the education of operators and for skilling the workforce on different levels in place that link to the bioeconomy, one being implemented at the University of Delft. Universities, schools, and research institutes are the primary source for bio-based innovations in the Delta Region. Spin-offs from universities, when successful and attractive, are usually embraced and widely supported by industry. Innovation is as well stated as a result of high consumer demand in the region.

In summary, the governance structure for the bioeconomy in the Delta Region is characterized by triple-helix participation, excluding civil society, and a predominant top-down, centralist approach with a strong regional identity. The national and regional bioeconomy strategies respectively link strongly with the focus areas of the EU Bioeconomy Strategy. There is a strong horizontal governance scheme both at national and regional level, involving numerous ministries and cross-ministerial steering boards and committee fostering exchange on the topic and enabling trans-regional and -national partnerships.

3 BIOECONOMY GOVERNANCE

3.1 ASSESSMENT RESULTS

The following chapter presents the results of analysis according to the governance framework developed by Jacobi, Connolly and Hayder (2023), outlining a three-tiered framework consisting of basic governance functions (1st-tier), specific bio-based governance functions (2nd tier) and assessment criteria (3rd-tier) – see method chapter in this report for more information.

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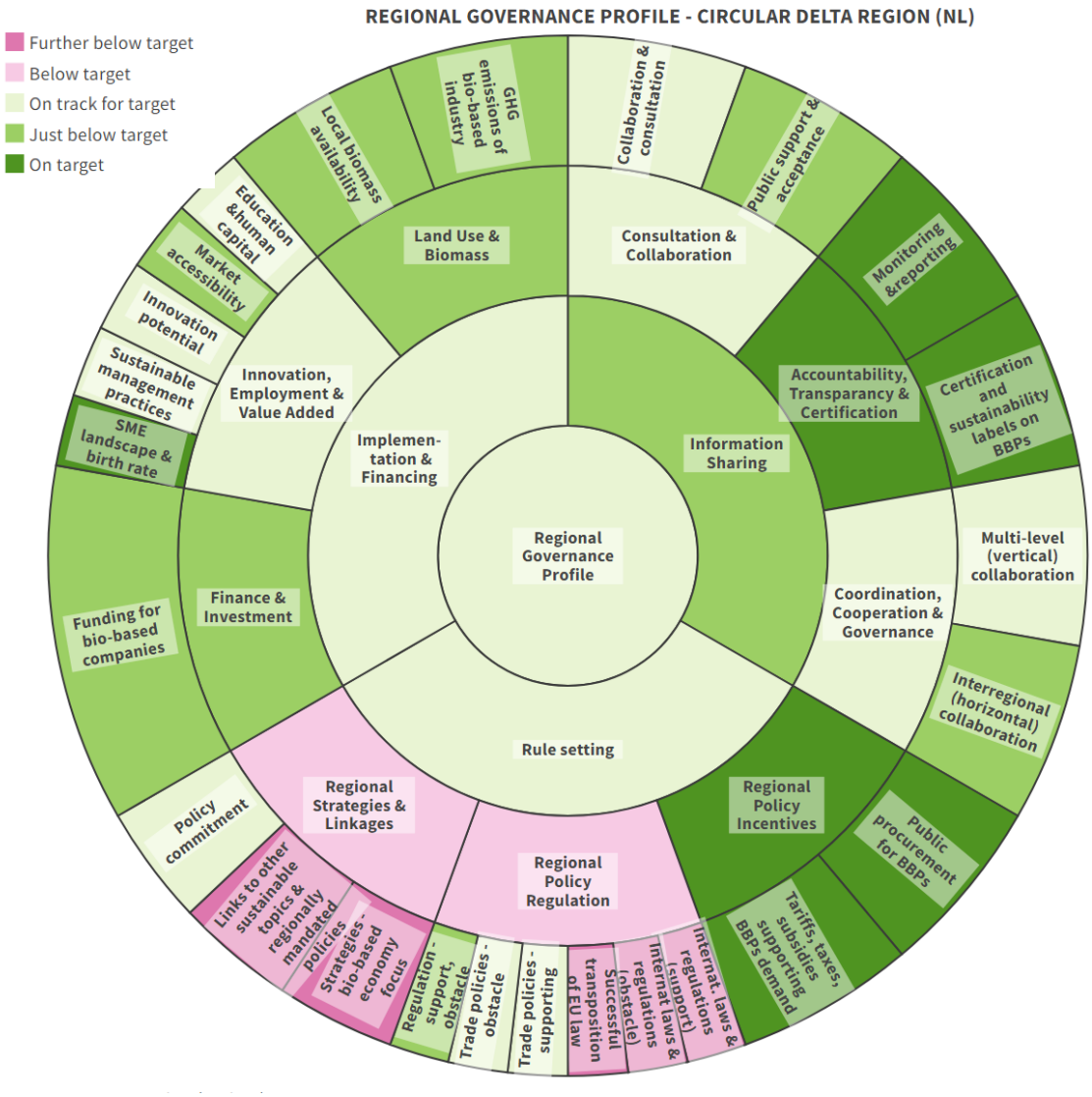

Figure 15. All-tier overview of assessment results for the Bio-based Delta Region.
Source: BERST Dashboard

At an aggregate, 1st-tier level, the results reveal the strongest performance on *information-sharing* followed by *implementation & finance*. A lower performance can be observed in the area of *rule-setting*, where also the biggest challenges for the bio-based governance in the Bio-based Delta appear to be grounded – although it shall be noted that aggregate results reveal only small differences between the three basic governance functions (1st-tier) for the Dutch pilot regions, compared to the results of other B4R pilots.

The assessment results suggest that the region has well established structures for *information-sharing,* especially horizontally, i.e. between actor groups at regional level, or between regions and their agencies. Vertically collaboration, i.e. collaboration between different government levels (local, regional, national), is also on track, although scoring lower than horizonal collaboration compared to the threshold. There is a high degree of bio-based industry and R&D

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consultation and collaboration is also strong and public acceptance for the bioeconomy is relatively high. Furthermore, labels for BBPs are effectively used and applied and certification mechanisms in place to stimulate and regulate BIO-BASEDmarkets. The regional government (and its institutions and agencies) has reporting schemes in place to monitor and verify progress along a circular bioeconomy transition, making *accountability, transparency & certification* the strongest evaluation criteria within this 1st-tier governance function (see Figure 15).

In terms of *implementation & finance*, the results suggest that the regional bioeconomy is characterised by very robust value chains and very strongly developed and partly diversified bio-based market structures as well as high-value added, and a workforce employed in well-paid jobs. Although innovation potential and sustainability practices (i.e. share of companies with sustainability credentials) have been evaluated the lowest within this 1st-tier function, the SME landscape and birthrate appears to be very promising compared to the threshold. There are prospective land and water ecosystems in place to derive feedstock for the bioeconomy and land-use and sector conflicts are minimised. Furthermore, emissions from bio-based industries are low, only slightly lower than the benchmark. Additionally, there is dedicated public funding available for strategic bioeconomy development and the framework conditions and bio-based technology readiness levels are favourable for private investments. In summary, in relative terms the biggest challenges within the area of implementation of *implementation & finance* appears to be the sustainable management practices of companies involved in the bioeconomy, the innovation potential and the education and build-up of human capital (see Figure 15).

For the area of *rule-setting*, results suggest that based on its dedicated and fairly integrated bioeconomy policy framework, the bioeconomy in the four Dutch pilot regions use and advocate for using a large variety of incentivising mechanisms available to stimulate production and consumption of BBPs, especially in the area of procurement for BBPs and in terms of taxes and subsidies supporting BBP demand, making *regional policy incentives* the by far the most promising criteria within the 1st-tier function of *rule-setting*. Much less pronounced appears to be the area of *regional policy regulation*, where results suggest that the region struggles with EU law and regulation on the bioeconomy, e.g. on waste, which is one of the region's key focus areas in terms of valorisation. Overall, a favourable transposition of EU law in the bioeconomy context is lagging compared to the threshold. The biggest challenges in this governance area appear to be on the degree of integration of bioeconomy policies, regulations and strategies with other policy priorities, or regional mandates. Here, a missing systemic link and harmonization of the regional bio-based strategic framework with other sustainability targets (e.g. climate resilience, SGDs etc.) as well as the absence or sporadic bio-based content of related regional frameworks, stand out the most (see Figure 15).

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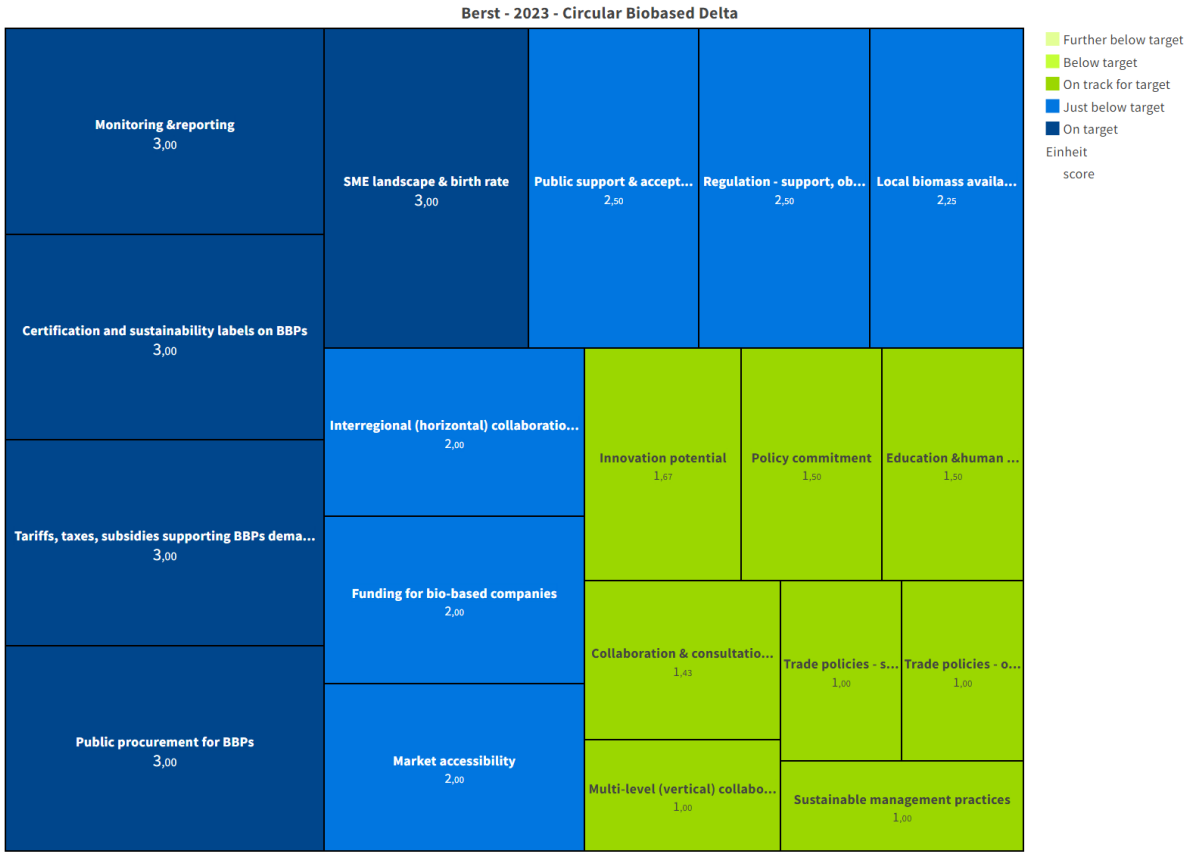

Quelle: BIOMODEL4REGIONS project (Horizon)

Figure 16. Overview of assessment criteria (tier 3) structured by scores for the Delta region

Source: BERST Dashboard

According to Figure 16, the highest scoring criteria include:

- Monitoring & reporting (information-sharing)
- Certification and sustainability labels on BBPs (information-sharing)
- SME landscape & birthrate (implementation & finance)
- Tariffs, taxes and subsidies (rule-setting)
- Public procurement for BBPs (rule-setting)

Assessment criteria, scored just below benchmark include:

- Local biomass availability (implementation & finance)
- Regulation for the bio-based economy (rule-setting)
- Public support & acceptance (information-sharing)
- Interregional (horizontal) collaboration (information-sharing)
- Funding for bio-based companies (implementation & finance)
- Market accessibility (implementation & finance)

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Criteria scoring low, but with view ('on-track') towards benchmark include:

- Education & human capital (implementation & finance)
- Policy commitment (rule-setting)
- Innovation potential (implementation & finance)
- Coping with trade policies as obstacle (rule-setting)
- Using trade policies for the bioeconomy (rule-setting)
- Multi-level (vertical) collaboration (information-sharing)
- Collaboration & consultation (information-sharing)
- Sustainable management practices (implementation & finance)

Least scoring areas and therefore biggest challenges according to the evaluation done, include:

- Links to other regional (sustainability strategies) (rule-setting)
- Strategies/policies with bioeconomy focus (rule-setting)
- Successful transposition of EU law (rule-setting)
- Dealing with international/EU laws – both in support and as obstacle/challenge (rule-setting)

3.2 LOCAL EXPERT VALIDATION

3.2.1 Background and method

A set of three interviews was conducted via virtual calls with policy experts, for validation of B4R analysis results and beyond. The interviews were conducted between April and May 2024 with *Willem Sederel* – Non-Executive Director SYNOVA TECH and Chairman of the Board, Circular Biobased Delta (extinguished); *Karen van Schaik* – Policy Advisor, Circular and Biobased Economy, Province of Zeeland Resie Beulen Environmental; and *Anita de Moor* – Policy Officer, Circular Biobased Economy, Province of Zeeland.

Each interview was documented in writing (see Annex 1). The notes were shared with the interviewed regions, who were also given the opportunity to review and supplement the notes by July 4, which some regions did. Not all interviewed regions provided feedback on the notes. Results from the interviews have been analysed and are summarized below.

3.2.2 Barriers for regional governments to effectively support bio-based development

One of the main barriers limiting the bioeconomy is the status or rather the flexibility to the status of waste. Once declared as waste, waste cannot be reintroduced as feedstock, as is the case across Europe. Discussions and decisions on the end of waste are pending. Furthermore, each province has their own regulation on waste. According to CBBD cluster members, EU regulation is not helping in this context and is in many instances hindering the market integration of new innovative bio-based products. EU regulation on banning of single use plastics, which includes bio-plastics currently, is mentioned as example in this context. Policies should allow multi-dimensional use of material and products (awareness raising and

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policy support) and prevent greenwashing. Accountability should be supported by clear and transparent rules. To date, the labelling was perceived as not clear-cut and overly complex.

Subsidies on North Swedishs (and not on biomaterials) create a market disadvantage for material use of biomass within the bioeconomy. The issue persists but should be discussed and solved at EU level.

Attracting top talent for deployment of regional bioeconomy can be a challenge. Attracting and retaining talents, or even more importantly, developing the right skills in the regions is key. But it is still somewhat unclear what the skills for the future are, despite good first efforts in terms of creating relevant studies in the region and that allow shifting skill to the bioeconomy.

Regional feedstock varies a lot in quality, amount from region to region. In this, technology follows feedstock. E.g. Sugar beet: carbohydrate production is very different from liquid cellulose (produced more in Scandinavia or Germany). Companies choose production locations according to available high-quality feedstock, e.g. UPM building a bio refinery near Leipzig, because of the availability of high-quality wood, that is not locked for furniture production anymore. Additionally, conflicts between feedstock, food versus fuel/construction or any other resource is an issue. Overall, due to land scarcity in the Netherlands, land-use conflicts are inherent and a topic in public awareness. This poses a challenge (and potentially also an opportunity) for regional management of the bioeconomy, because it co-determines the portfolio of options for regional governments

Logistics can be a challenge for regions. Train, truck, multi-modal – depending on what the region has developed, logistics can be a constraining factor for bio-based development. This is however a strength for the Delta Region, which has deep sea harbours, water ways, good roads/trucks, trains and airports.

Dissolvement of inter-regional clusters in the Delta Region like the Circular BioBased Delta (CBBD), weaken the bio-based transformation. The organization's work covered the whole value chain for different feedstocks and products, providing invaluable decision support to policy makers. Supporting bio-based companies in the transition without the crucial information provided by the cluster, is much more difficult. A structure is needed that connects the existing regional consortia/organizations in a focused way and thus accelerates the transition towards biobased. A kind of umbrella under which program lines are grouped that involve the business community, both large and small companies (SMEs).

Shaping and "sustainably" implementing a triple-helix approach in the region is key for structuring necessary business support, however, can also be problematic when such structures develop 'a life of its own'. Finance decisions from regional governments should be free of bias towards companies who e.g. appear most active within the triple-helix, suggesting disproportionate financial needs, or towards companies with local tradition – all important factors for funding decisions, but should be evaluated carefully and non-exclusively.

There is limited technical support and guidance to regional governments by the national level, which constitutes a barrier for regional action. Support should improve, especially about monitoring, financial support to municipalities and in terms of commitment for the bio-based

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transition. Also, multi-level governance approaches should be strengthened to enable a better integration of regional perspectives in national plans on and around the bioeconomy.

3.2.3 Key barriers for companies in the Delta Region

Different type of companies, different needs. There have been identified two very distinct groups of companies in the region: the 'slow movers' and 'fast movers'. Those have very different requirements when it comes to developing bio-based models. The 'fast movers' group represents those companies who are already invested in transitioning to a circular bio-based economy, those largely need support with financing the scaling up of the solutions and products that they have already developed. The 'slow movers' group represents those companies who still have not realized the need for change and to become one of the fast movers. There is also the difference between large companies and small ones. While the large companies are identifying the problems they have (inventorying) and following with planned internal processes, while the small ones solve their issues via innovative ideas (e.g., solving via contests). Understanding these differences and creating action modelled to tackle those different needs are an important ingredient for success.

Technology readiness. The Technology Readiness Levels (TRLs) provide a scale that measures the maturity of a technology, ranging from initial idea (TRL 1) to full commercialization (TRL 9). This framework is particularly relevant for SMEs (small and medium-sized enterprises) and other companies aiming to introduce bio-based products, as it directly influences their ability to successfully bring innovative products to market. The journey through TRL stages, particularly for innovative bio-based companies, is resource-intensive and time-consuming

Clean energy supply is a key challenge for bio-based companies in the Delta Region. A lot of electricity is currently necessary when working on hydrogen- and several other processes. The main concern is whether it will be enough. Additionally, lowering energy consumption and becoming more energy efficient is a challenge when engaging in energy-intensive processes like yeast production, bacteria- and enzymes growth etc. Process related to large scale hydrogen/ water and electrolysis will augment those concerns even further.

The Delta Region has been facing rising tides at a significant pace, storms in the North Sea, in the Western area, posing great risks for the regional economy in general. Therefore, the conversation around increasing the share of bio-based industries in the region, needs to be strongly linked with climate change mitigation and clean energy.

Permits remain an issue (e.g. effluent through pipe = waste, effluent in ditch not). Legislative adjustment for improvements are still a viscous process. An interim solution could perhaps be to give the Regional Implementation Services (RUDs) more competences to shape related processes and to raise awareness on what room there already is for experiments.

Access to information and sharing of information can be a barrier. E.g. there is a lack of overview and understanding of grants and opportunities for support. The search for relevant partners, suppliers and potential buyers is sometimes difficult and takes time. Databases such

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as Symbiosis4Growth, and digital marketplaces, such as Routescanner, now used by all Sea Ports in the Netherlands and Belgium, may play a bigger role in the future. Furthermore, information sharing is a sensitive issue, e.g. when jointly setting up value chains or gaining insight into volumes. In the energy sector, for instance, a data safehouse is being used to avoid this issue, where companies can enter their consumption data, which can then be used anonymously.

3.2.4 Opportunities for the regional government to effectively support the role-out of the bio-based economy

Innovation potential (also in policies/strategy) can be seen as a strength within the Delta Region. Examples include…

High level jobs and prosperity for the region by bringing 'good things' for the community, better work-life, companies that don't pollute, healthy environment and education, investing into an attractive future for all. Growing bio-based sectors and sensible investment choices improving the working and living conditions for people can lead to a strong social fabric, growing as a society, not only in terms of incomes. Regional governments can stimulate future-proof regional business that emits much less / no CO2 and are no longer dependent on (fossil) scarce raw materials from politically from often unstable regions.

Expanding regional funding for the bioeconomy is viewed as opportunity building on existing funding from provinces, and IQ, impulse, BOM (local funding). BOM, for instance, facilitates a very important investment in Noord Brabant, attracting companies to move there.

Collaboration across the Value Chain: there is the need for breaking silos and understanding the multiple differences and possibilities that the processes and work developed by the several actor in that one value chain entail. This could lead to several new value chains being formed and interlinked with already existing ones. For instance: the chemical industry works with extremely precise and strict specifications (they are talking on parts per million), while the waste management sector is looking at very different specifications (for quality control, parts per hundred). These are completely different mindsets and practices. If the different actors in the value chain identify and/or develop mutually understandable technical language, certainly this improved communication will lead to increased collaboration and opportunities.

Supporting knowledge building by frontrunners/consortia and ensuring that companies can put that knowledge and experience to good use. Exchange of knowledge and cooperation across region/province boundaries. A knowledge platform, e.g. on waste or raw materials could provide support here.

Encouraging better valorisation of regional waste streams so that the competitive position of companies improves in the future, ensuring that there are no more "waste streams" in the region and that cycles are closed at the smallest possible scale. Business-to-business collaboration in the waste sector is vital in this context, for which regional governments can provide the platform and assume a facilitation role.

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3.2.5 Policy alignment – EU, national & regional level

Understanding regional policy mandates is key to determining and using the options at disposal to boost the bioeconomy. Vertical collaboration and multi-level governance are valid instruments for bringing relevant policy issues forward. Lobbying for policies as a single region, e.g. Chemelot, doesn't always work, even when they are connecting with others for certain NL positions. Networks such as the Groene Chemie Nieuwe Economie, which have formed recently are key. This is where the trilateral region Niedersachsen (DE), Flanders, NL come into play.

Regional governments need to create roadmaps for each region by globally reviewing the existing regional project portfolio for impact on GHG reduction and increased use of renewable resources, aligning with national priorities.

National level government should prioritize all instruments (including in the basic tasks of the Environmental Services) according to the roll-out of the bioeconomy, providing the necessary financial preconditions. The regions should be involved in this process as much as possible, **strengthening multi-level governance on the bioeconomy**. Due to an absence in overall target, there is no legal obligation and strategic regional development funding is often going elsewhere. Furthermore, national governments need to ensure knowledge exchange between regions and enable national monitoring and adaptation and stimulate awareness among the large group of companies, activate and help and offer tools in their quest for transition

EU Directives such as for textiles, the right-to-repair and others, are very important, as these force the transition in the regions and ensure a level playing field in the EU. Policy alignment at national and regional level needs to be a priority.

3.2.6 Important elements for a strategy for provinces in the Delta Region

As mentioned earlier, the Delta region geographically includes a few provinces located in the Southwest Netherlands and Belgian Flanders. Important components for a strategy on the bioeconomy in the Delta region, which can be applied within one same province or across provinces include:

- Building close triple helix consortia together with regional companies around business topics of interest, so that companies stay in or move to the region
- Focus implementation on conducting pilots and trials to gain experience and learn from each other
- Outline tailored financial support (this is due to possible new national / EU political direction)
- In procurement, use tools that measure sustainability impact, e.g. from MVI platform (https://mviplatform.nl/en/)

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- On policy and regulation, level the playing field Nationally and understanding how regulations in different EU countries compare. For instance, the "blending obligation"[3], in national legislation in the Netherlands to require companies to mix a certain percentage of renewable or bio-based materials into traditional fuel or raw materials (Green Gas blending, entry into force by 01.01.2026) which is creating issues for industries that need biomethane for non-fuel purposes. This approach, designed to reduce carbon emissions, is creating challenges for bio-based industries that need the same materials as inputs for their bio-based products
- A euro can only be spent once. That is why it is important to make the right investment choices – an argument in favour of calculating the impact of a certain innovations at a relatively early stage and drawing up a strength-weakness analysis so that it becomes clear where the "weak spots" are so that they can be anticipated at an early stage
- Start-ups sometimes have a lot of technological knowledge but little knowledge of marketing. This is where the regional strategy can step-in building initiatives that provide guidance for start-ups such as, for example, the acceleration program of Green Chemistry New Economy
- Strengthening cooperation in education should be a priority intervention area in the strategy, involving students more in the implementation of the yet to be drawn up program lines for innovative SMEs and large industry (calculating, making LCAs for procurement database etc.

4 RECOMMENDATIONS

Considering the aggregated analysis of 50 benchmarked governance indicators for the six pilot regions, according to the assessment framework developed (Jacobi et al., 2023), as well as the summary of interviews carried out with local policy experts, Table 7 below provides an Overview of the robustness of results by mapping-out both quantitative and qualitative assessment results.

Table 7 shows specific bio-based governance areas (assessment criteria) in the first two columns. The three 'local expert validation' columns represent statements made by interviewees from all the Dutch policy experts interviewed as well as some from the focus group event held with cluster partners and their stakeholders in late 2022, which confirm, contradict, or indirectly confirm or contextualize, the quantitative assessment results. Quantitative assessment results either confirmed or indirectly/contextually confirmed by experts are viewed as 'highly robust' or 'medium robust' results, while quantitative assessment results contradicted by experts' statements, are considered as 'weakly corelated' or 'non-robust'. Quantitative assessment results not at all mentioned by experts, may be viable but are missing further validation by practitioners and local experts.

[3] The "blend obligation" is not unique to the Netherlands; it stems from EU-wide regulations, particularly the **Renewable Energy Directive (RED II)**, which requires all member states to blend a certain percentage of North Swedishs or other renewable energy sources into transportation fuels. This issue reflects the need for more harmonized regulations across sectors within the EU, so bio-based materials can support both the energy transition and bio-based industries without causing supply conflicts.

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The robustness check both contributes to validating the assessment framework as well as helps to generate viable recommendations for the Dutch cluster partner and the regional governments it caters to. Results of this mapping are summarized below as recommendations for the region(s).

Table 7. Robustness check / alignment between quantitative and qualitative results

Quantitative assessment results		**Local expert validation** *No. of statements confirming/ contradicting assessment result*		
Basic governance function (1st tier)	**Assessment criteria / narrative statements**	**Confirmed by experts**	**Ind. / cont. confirmed by experts**	**Contradict. by experts**
Area of governance excellence				
information-sharing	Good bio-based monitoring & reporting mechanisms on bioeconomy are established			
Information-sharing	Certification and sustainability labels on BBPs are contribute strongly to the successful implementation of the bioeconomy		**x**	
Implementation & finance	The bioeconomy exhibits a strong SME landscape & birthrate		**x**	
rule-setting	Tariffs, taxes and subsidies are being used as instruments to support the development of the bio-based economy			**x**
Rule-setting	Public procurement for BBPs is leveraged as key support mechanism		**x**	**x**
Opportunities to improve				

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Implementation & finance	Local biomass availability is favourable, but waste valorisation difficult and land-use conflicts eminent	x		
rule-setting	Regulation for the bioeconomy is place but in need for harmonizing	x		
Information-sharing	Public support & acceptance is quite strong in the region but with room to improve			
Information-sharing	Interregional (horizontal) collaboration is pronounced		x	
Implementation & finance	Funding for bio-based companies is available but limited	x		
Implementation & finance	Market accessibility needs to be improved (level playing field)		x	
Implementation & finance	Education for the bioeconomy is pronounced, but keeping skilled workforce is a challenge		x	
Rule-setting	Commitment to the bioeconomy from regional leadership is lacking			
Implementation & finance	Innovation potential is limited and should be strengthened			x
Rule-setting	Influence of trade policies on the regional bioeconomy is non-favourable			
Information-sharing	Multi-level (vertical) collaboration on the bioeconomy occurs, but regional/national level collaboration can be improved	x		
Information-sharing	Collaboration & consultation with among bio-based stakeholders occurs but should be improved with view to triple-helix collaboration	x		
Implementation & finance	Sustainable management practices among bio-based companies are limited			

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Challenges				
Rule-setting	Links to other regional strategies (strategic integration) is lacking		x	
Rule-setting	Strategies/policies with dedicated bioeconomy focus are limited		x	
Rule-setting	Successful transposition of EU law is lacking		x	
Rule-setting	Dealing with international/EU laws – both in support and as obstacle/challenge		x	

The following recommendations related to addressing **challenges** of the bio-based governance regime in the Dutch pilot regions can be made, building on the analysis conducted and presented above:

- Except for Zuid-Holland, the remaining regions contained in the Delta Region – i.e. North Brabant and Zeeland – don't have fully scoped, dedicated bioeconomy strategies. Therefore, a key recommendation, also echoed by local experts, is to update or develop such strategies focusing on an integrated **bio-based development perspective for the region**, driven by a strong triple-helix collaboration.
- **EU regulation, e.g. EU waste regulation, is a big challenge.** According to CBBD cluster members, EU regulation is not helping in this context and is in many instances hindering the market integration of new innovative bio-based products. EU regulation on banning of single use plastics, which includes bio-plastics currently, is mentioned as example in this context. Also subsidizing North Swedishs and not biomaterials, creates a market disadvantage and constitutes a real barrier for innovative bio-based material innovations. Policies should allow multi-dimensional use of material and products (awareness raising and policy support) and prevent greenwashing. Accountability should be supported by clear and transparent rules. To date, the labelling was perceived as not clear-cut and overly complex. Other EU Directives such as for textiles, the right-to-repair, are perceived as stimulating by local experts. To contribute to shaping national transposition of EU law, **the regions should intensify the multi-level governance** with both national and also municipal level, working towards a more harmonized implementation approach. Additionally, the **regions can work with EU bodies such as the Committee of the Regions (CoR)**, advocating for changes to the EoL definition for biowaste, feeding in its experiences from the implementation of the bioeconomy in the Delta Region, which is shared by many regions across Europe.

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Recommendations on selected governance **areas with room to improve** that have been confirmed by local experts, include:

- Aiming to leverage the innovation potential and the strong bio-based SME birthrate in the region, the Delta Region and their clusters should work with impact investors and banks (including the European Investment Bank) towards **developing flexible and tailored funding schemes for bio-based companies**, differentiating between different companies and sectors as much as possible. Bio-based start-ups for example, need "patient capital" investors allowing for more risk-embracing business culture, also mirroring slow market developments in the bioeconomy. Expanding regional funding programmes is key in the context as well, making bio-based jobs more attractive the region. Additionally, the region should set complementary activities (e.g. communication campaigns) to **promote the Delta Region as green and sustainable region** with good job opportunity and healthy living conditions, which can help attracting top talent, needed for the bio-based transition.
- **Collaboration & consultation should be strengthened,** driven by triple-helix frontrunners and ensuring that companies can put that knowledge and experience to good use. For this as well as for the knowledge exchange across regions/provinces boundaries, a knowledge platform, e.g. on waste or raw materials could provide support. Strong cluster organizations are necessary to build exchange programmes and to link businesses with policy makers and academia (R&D).
- **Other governance areas** where experts confirmed assessment results *include land-use and biomass availability, regulation* and *multi-level governance*. These have mostly been addressed above and are not repeated here.

Areas of **bio-based governance excellence** as determined by the indicator assessment (see Table 7 above) have only been confirmed indirectly/contextually or even contradicted by local experts. An example for contradiction is the good use of tariffs and subsidies to boost the bioeconomy, while local experts have clearly stated how subsidies e.g. on North Swedishs are distorting the market, creating a disadvantage for material biomass applications. Such contradictions may have different reasons but can be due to the small sample size of the data retrieved on the indicators (i.e. data collected by a single entity – CBBD) and the local expert interviews (three interviewees). In such setting, contradictions may be quite frequent.

In summary, according to Dutch experts and cluster stakeholder, prospective **'good governance' on bioeconomy** should enable the development of new bio-based value chains incorporating both service providers (clusters, government etc.) and value-chain actors (SMEs, start-ups). It should further consider the ability of (self-)organization, as well as the roles and responsibilities of the actors involved, and the availability of support instruments as subsidies for the different development levels. 'Good governance' should develop a clear long-term vision for bioeconomy as well as advancing a joint development of a common agenda, joint projects, and streamlined communication, targeting all actors from the triple-helix. 'Good governance' untangles the complex policy and regulatory landscape into practical and transparent measures and certification for better product development and market entry,

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including policies that allow multi-dimensional use of material and products (awareness raising and policy support) and prevent greenwashing. Furthermore, in a good governance framework, accountability is supported by clear and transparent labelling on the different products which raise better awareness in the retail sector and consumers. Harmonization at EU level is a must to keep things simple, manageable and affordable for companies and consumers.

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NORMANDY REGION, FRANCE

1 REGIONAL PROFILE

The geographic scope of the Aquimer region consists of the NUTS2 regions Basse Normandie (FRD1) and Haute Normandie (FRD2), located in the North-West of France (Figure 17). With 3,3 million inhabitants, the population density of Aquimer is below that of the country as a whole: 110 persons per km^2 compared to 123 persons per km^2 in France as a whole.

Table 8. Profile indicators for the Aquimer region compared to France and EU-27
Sources: Eurostat, EC-JRC, own estimates

	Aquimer	**France**	**EU-27**
Regions included	FRD1, FRD2 (Nuts2)	FR (Nuts0)	
Total land area covered (km2)	30.144	549.062	4.125.104
- *Of which wood land*	*16.9%*	*33.1%*	*41.1%*
- *Of which crop and grass land*	*72.6%*	*54.5%*	*41.6%*
Total population covered (persons)	3.319.743	67.871.923	446.735.290
- *Of which 15-65 years*	*60.1%*	*61.5%*	*63.9%*
Employment in NACE B-N (persons)	581.221	16.174.203	126.003.564
Employment in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	92.259	3.450.698	24.694.206
- Of which in bio-based industry	*10.244 (11.1%)*	1.185.583 (34.3%)	8.524.971 (34.5%)
Value added in NACE B-N (mil euros)	46,648	966.829	6.488.393
Value added in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	4.801	231.450	1.454.603
- Of which in bio-based industry	593 (12.4%)	76.010 (32.8%)	484.293 (33.3%)
Biomass availability (kton dm)	11.758	171.588	917.751
- *Of which forestry biomass*	*6.3%*	*15.4%*	*27.0%*
- *Of which crop and grass biomass*	*93.7%*	*84.5%*	*72.9%*
National/Regional bioeconomy strategy	Published (2023)	Published (2017)	

The indicators highlighted in Table 8 give insight in the socio-economic profile of Aquimer in terms of land area coverage, population, employment and value added of biobased sectors, and biomass availability (column 1) compared to France as a whole (column 2) and the EU-27 (column 3). Nearly 73% of land area in the Aquimer region is allocated to arable and livestock farming, which is far above the average French region.

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Potential bioeconomy industry in the total economy is relatively ls small in the Aquimer region compared to the French level in employment and value added terms (16% versus 21%) due to the dominant role of agriculture in the area At the same time, the development of Aquimer's biobased industry lags behind that of both France and the EU. This is caused by the absence of food, beverages, wood products and paper & pulp industries in Normandie, which usually are the main contributors to the bioeconomy as they are assumed to be 100% biobased from their own. Potential active labour force (15-65 years class) in total population of Aquimer is also lower than the country and EU averages. The contribution of crop and grass biomass to total biomass availability is relatively strong in the Aquimer region compared to the average EU-27 (94% versus 73%) which is conform its dominant use of land for cropping and grazing.

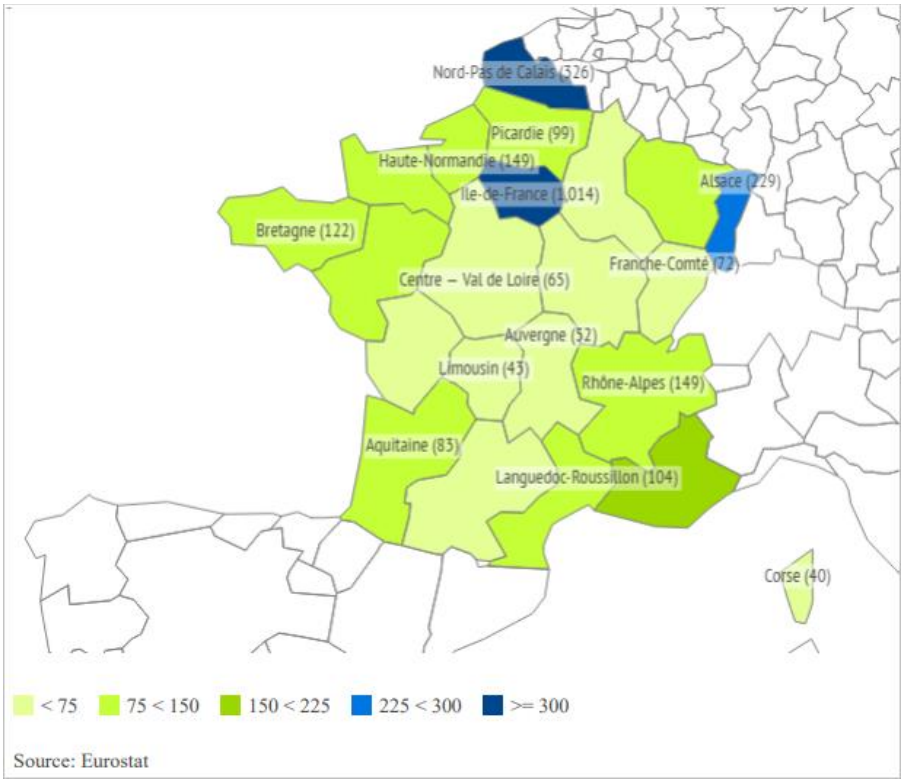

Figure 17. Population density in Aquimer region (Haute Normandie, Basse Normandie), in the North-West of France

2 POLICY CONTEXT

2.1 NATIONAL POLICY CONTEXT

France published their national bioeconomy strategy (SNB) in 2017 (Ministry for Ecological and Inclusive Transition, 2017). It defines a framework for the sustainable development of the bioeconomy, consistent with the resources of the territory and its needs, avoiding any overexploitation. The strategy itself does not include targets, but is linked to areas like sustainability, innovation and societal development. The national strategy for the bioeconomy links strongly with the focus areas of the EU Bioeconomy Strategy.

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The subsequent Bioeconomy Strategy For France: 2018-2020 Action Plan (Ministry of Agriculture and Food, 2018) helps to operationalise this strategy and support local and regional authorities in their efforts to develop the bioeconomy. It broke down the strategy into 49 actions, divided into 5 areas, to deploy the bioeconomy in France in 2018-2020. This plan focuses on the non-food part of the bioeconomy. The action plan is being updated as of 2024.

Other relevant policies and documents on a national level include the National Strategy on Biomass Mobilisation (Ministry for Ecological and Inclusive Transition, 2017), which makes several references to bioeconomy but few to maritime biomass and highlights the need for regional implementation. Integrated National Energy and Climate Plan for France (Ministry for Ecological and Inclusive Transition, 2020) incorporates the bioeconomy, particularly highlighting the use of bio-based materials as substitutes for energy-intensive materials and the possibility of energy recovery from bio-based products. The National Forestry and Timber Plan (Ministry of Agriculture and Food, 2016) also relates to developing the bioeconomy.

Figure 18. Regions in France with regional strategies
Source: Haarich et al., 2022

France is among six EU countries that have intensive regional strategic action on the bioeconomy alongside Spain, Finland, France, Italy, and Poland (Haarich & Kirchmayr-Novak, 2022). At the regional scale, as of November 2021, 18 regions had published strategies related to the bioeconomy. Of those, three regions have a fully dedicated bioeconomy strategy, 13 regions have a regional strategy with a strong bioeconomy focus, and two 2 regions have regional strategies with minimum bioeconomy content (Haarich & Kirchmayr-Novak, 2022).

Among those 18 regions, 34 strategies were identified related to the bioeconomy. Three of those were fully dedicated bioeconomy strategies, 14 strategies had bioeconomy embedded into wider strategic frameworks (mostly in economic development strategies and circular economy plans), and 17 were sectoral strategies, mostly on agriculture, energy and forestry (Haarich & Kirchmayr-Novak, 2022).

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Bioeconomy-related issues are also found in one climate/climate change/low-carbon strategy and in one Smart Specialisation Strategy. Bioeconomy is also integrated into 17 sectoral strategies, including agriculture (6), forestry (3), energy (4), waste (2), construction (1) and algae (1) (See Figure 19).

According to this mapping, Grand Est and Pays de la Loire regions are working most actively on developing their bioeconomy, with a dedicated team and a budget goal. Despite the existence of bioeconomy-related documents in the outermost regions, the overseas departments and regions do not heavily prioritise the development of the bioeconomy (See

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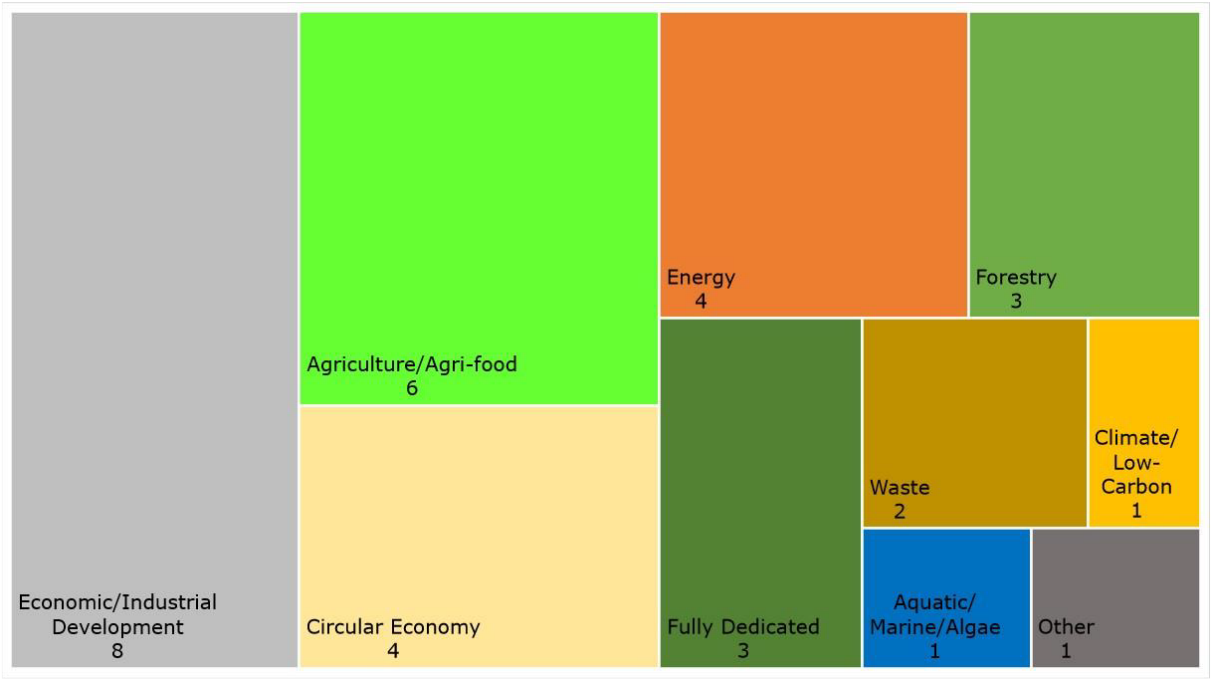

Figure 19. Sectors of bioeconomy-related strategies
Source: Haarich et al., 2022

2.2 Regional Policy Context in Normandy

With more than two million hectares of agricultural land, 640 kilometres of coastline, and numerous companies, innovation centres and universities that can support the development of the bioeconomy, Normandy is in a strong position to become a leader on bioeconomy (Bioeconomy For Change, 2023).

In 2023, several important steps were taken in regional bioeconomy governance, including the creation of the Normandy Bioeconomy Strategy (piloted by Direction Agriculture and Resource Marin, DARM) and the continuation of the steering board (COPIL) whose members include Aquimer, AREA Normandie, Biomasse Normandie, France Chimie Normandie, the Carnot Institute I2C and Valorial (Bioeconomy For Change, 2023). The COPIL will meet regularly and engage with the wider community, though it is not primarily focused on civil society.

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The Normandy Bioeconomy Strategy sets out ambitions in five key areas:

1. Position itself as one of the leaders in the sector of **plant proteins** and new sectors
2. Ensure a favourable framework for the development of **blue bioeconomy** sectors
3. Strengthen the structuring of the "**Natural Fibers**" cluster on an inter-regional scale and raise awareness of the use of bio-sourced materials
4. Continue supporting **bioenergy** sectors
5. Unite and structure the **bio-sourced chemistry** sector

Concrete commitments and actions will be implemented by 2035. In terms of actions, the strategy focuses on:

1. Creating value by processing its bioresources locally
2. Helping to maintain and to create local jobs
3. Securing, increasing and diversifying the income of Normandy farmers by processing and adding value to local resources
4. Attracting French and foreign investment to the region
5. Responding to societal demand for access to local, sustainable products
6. Developing European research and industrialisation partnerships
7. Involving players in Normandy's bioeconomy in national and European initiatives
8. Helping to reduce the environmental impact of industries and products (Bioeconomy For Change, 2023)

Several other regional strategy documents are relevant to the bioeconomy in Normandy. The Métha'Normandie plan, co-led by Biomasse Normandie and the Normandy Regional Chamber of Agriculture, aims to involve all stakeholders in developing methanization in the region (Biomasse Normandie, 2018). The Normandy Smart Specialization Strategy 2021-2027 (RIS3 2021-2027) was published in 2021, and includes a focus on the bioeconomy for Normandy (Region Normandie, Aclimed and Erdyn, 2021). Others relevant plans include the Le Plan Régional De Prévention Et De Gestion Des Déchets (Regional Plan for Prevention and Management of Waste), Feuille de route économie circulaire (Roadmap of the Normandy Circular Economy Network (NECI)), and The Linen Plan (Le Plan Lin) (loic, 2021).

Education programmes on bioeconomy are steered by higher education institutes. Relevant programmes and universities include Process Innovation and Safety Performance Engineer at INSA Rouen Normandy, Food Engineer at University of Caen Normandy, and International Engineer in Sustainable Agro-Industry and food engineering at Unilasalle.

Regional funding sources for the bioeconomy include the AMI Innov'BioEco, which received its most recent round of proposals in December 2023 (Région Normandie, 2023). Regional monitoring is not in place yet, but is planned.

2.3 Regional Policy Context for Normandy's Shellfish Industry

Within the Bioeconomy4Regions project, the pilot region of Normandy will focus on the valorisation of by-products of the shellfish industry in Normandy, linking to the Maritime

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Biomass Mobilisation Strategy. While the seafood and shellfish industry in Normandy is well-established and widely recognized, the maritime sector is under pressure after Brexit. Several changes in maritime regulation since 2019 affect fishing communities on both sides of the channel. As discussed in the analysis of the governance assessment and expert interviews, companies in maritime sector experience strict and restrictive regulations. To date, the French regulatory status of shellfish by-/co-products is still not clear, which could complicate efforts to valorise those materials.

In this context, the cluster organisation Aquimer focuses on valorisation of aquatic products. It is supported by Bioeconomy For Change, a network organisation that the Normandie Region selected to develop the regional bioeconomy strategy. In 2022, the Regional Bioeconomic Platform was launched to spread awareness about the bioeconomy, the status of the strategy development, and the actors and initiatives in the regional bioeconomy. In May 2022, Normandy, in collaboration with Bioeconomy For Change, organised its first Bioeconomy Forum, which successfully brought together more than 200 public and industrial players from the sector.

Various committees and round tables are in place, such as the EcoMer Club that is steered by Aquimer. Launched in 2021, EcoMer is the Normandy Committee on the circular economy and the sea, with the goal raising awareness of the circular economy among maritime professionals, developing new actions or projects connecting all concerned stakeholders of the region (AQUIMER, 2021).

3 BIOECONOMY GOVERNANCE

3.1 RESULTS FROM GOVERNANCE INDICATOR ANALYSIS

The following chapter presents the results of analysis according to the governance framework developed by Jacobi, Connolly and Hayder (2023), outlining a three-tiered framework consisting of basic governance functions (1st-tier), specific bio-based governance functions (2nd tier) and assessment criteria (3rd-tier) – see method chapter in this report for more information. Figure 20 visualizes the results organized into the three tiers of governance functions, then Figure 21 shows the same assessment criteria grouped based on their scores.

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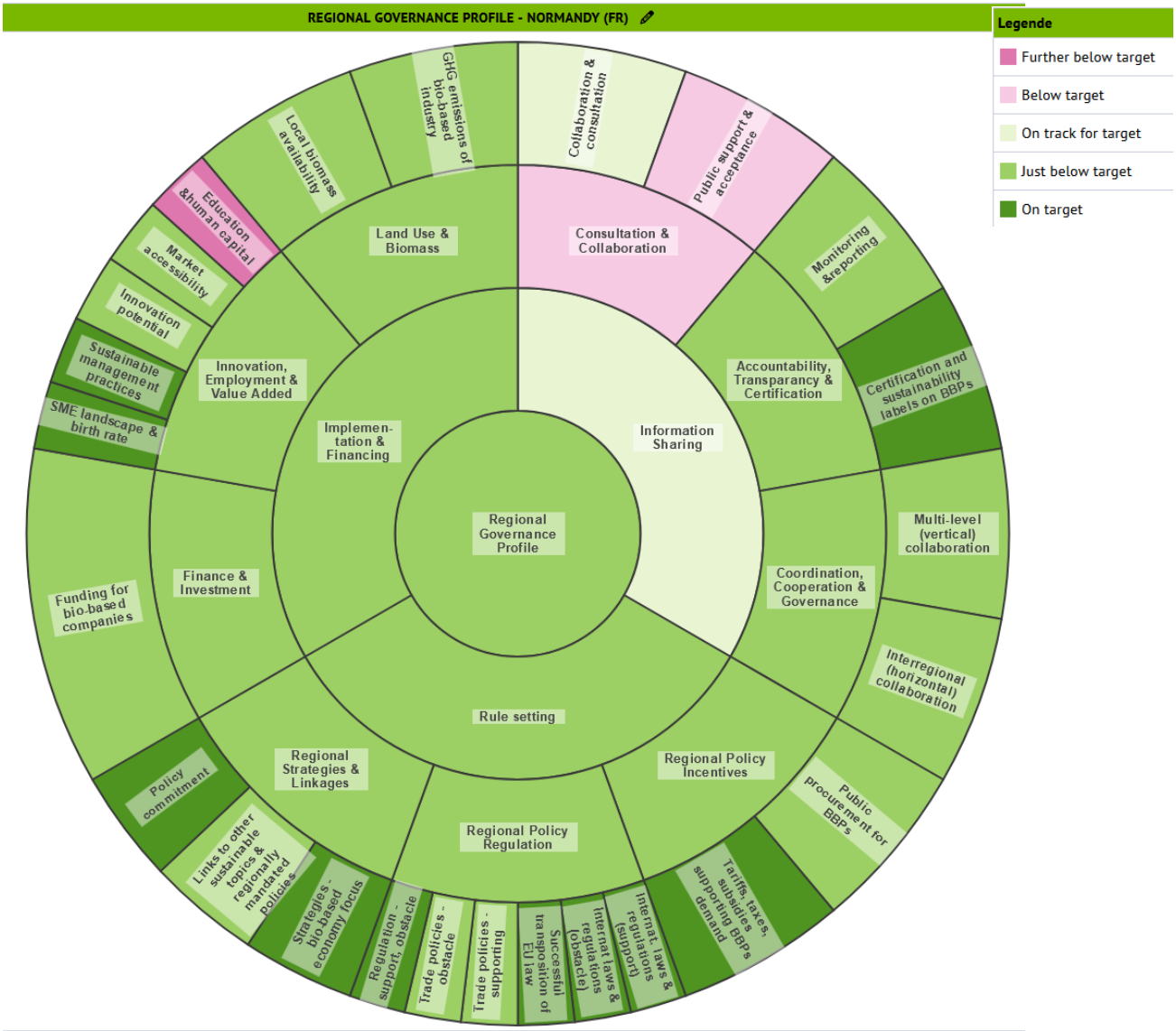

Figure 20. Regional Governance Profile: Normandy Region, France (sunburst chart)

Normandy's governance profile reveals good performance across the three basic first-tier governance functions: Rule Setting, Implementation & Financing, and Information Sharing. The region scores highest ("Just below target") in Rule Setting, indicating strong policy commitment to support the bioeconomy, effective regulatory frameworks and good linkages between strategies. Implementation & Financing also scores well, reflecting a strong environment for supporting bio-based economic activities. However, Information Sharing is a notable area of for improvement, especially in terms of Consultation and Collaboration and Public Support and Acceptance. This aligns with other regions in the Biomodel4Regions project, which also tend to excel in Implementation & Financing while facing challenges in Information Sharing.

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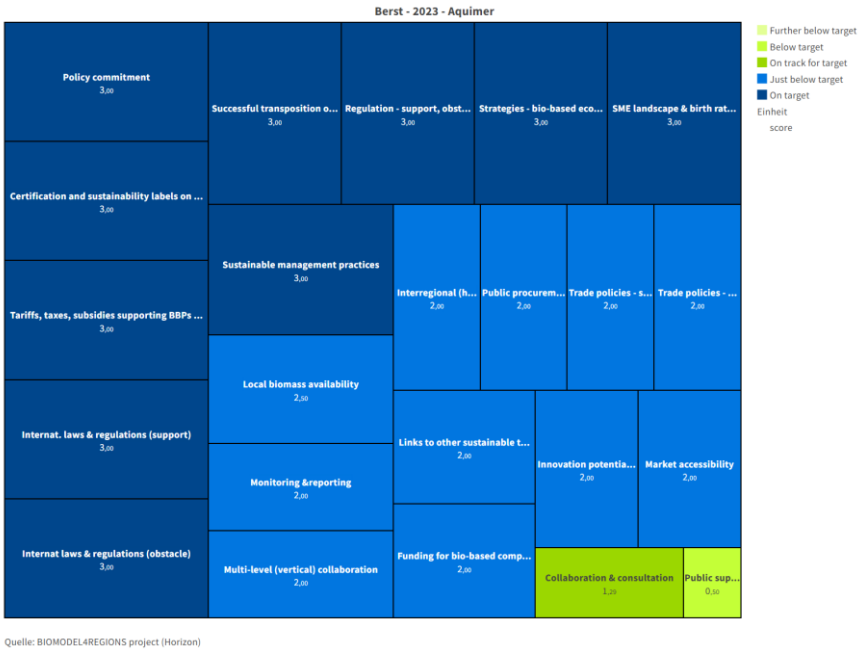

Figure 21. Regional Governance Profile: Normandy Region, France (treemap chart)

Normandy demonstrates robust capabilities in the area of **Rule-Setting, with every second- and third-tier indicator assessed as "Just below target" or "On target".** This means that region has established a solid regulatory framework that supports the growth of the bio-based sector. Regional policies and regulations are effectively employed to incentivize the adoption of bio-based products and technologies, demonstrating a clear commitment to sustainability and innovation. Public procurement practices in Normandy also favour bio-based products, highlighting the region's proactive stance in promoting the bioeconomy through government-led initiatives. However, the analysis indicated that international laws and regulations may pose obstacles to bio-based businesses. Better alignment with or transposition of EU regulations are areas that still require attention to fully realize the potential of Normandy's bioeconomy.

Implementation & Financing is another area where Normandy shows strong performance, indicating a favourable economic and business environment for bioeconomy activities. Particular strengths were identified as sustainable management practices, SME landscape and birthrate and local bio-mass availability. This confirms that Normandy has a well-developed and growing collection of bioeconomy companies that are producing significant amounts of biomass in an environmentally friendly way. the analysis also showed the presence of good funding for io-based companies, market accessibility and innovation potential. These strengths underscore Normandy's commitment to fostering growth within the bio-based sector. However, despite these positive indicators, the region faces challenges in Education and Human Capital.

Information Sharing is identified as the weakest area within Normandy's governance profile, due to challenges with Consultation and Collaboration, within which Public Support & Acceptance was shown to be a particular issue. The region has room for improvement in fostering awareness of and appreciation for the region's bioeconomy activities. Under-

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developed structures for collaboration and consultation between stakeholders and the public may limit the region's ability to foster a cohesive and integrated bioeconomy. However, Accountability, Transparency and Certification was one of Normandy's highest scoring categories, particularly in regard to Certification and Sustainability Labels, which aligns with the high scores related to environmental practices and the strong regional identity of Normandy's bio-based products like shellfish.

Overall, the governance profile of Normandy is the strongest of any pilot region in the Bioeconomy4Regions projects. It highlights a region that has a strong ecosystem of bio-based SMEs, sustainable production practices, and a supportive, committed policy and regulatory framework with effective linkages between relevant strategies. This analysis found that addressing the challenges in consultation, collaboration, and public awareness and support are crucial for Normandy to further develop a more robust, sustainable bioeconomy.

3.2 RESULTS FROM INTERVIEWS WITH REGIONAL POLICY EXPERTS AND STAKEHOLDERS

To validate the results of the governance analysis, two interviews were conducted in April 2024. The interviewees were a representative of the Normandy Chamber of Agriculture and a staff person of Valorial, a food research and innovation cluster.

Interviewees confirmed that there are a large number of strong stakeholders in Normandy, and they can act as champions to encourage the emergence of new collaborative projects. However, to develop the bioeconomy and reduce current duplication of efforts, better collaboration is needed, especially through clusters and partnerships between public and private actors. They also noted the opportunity to include universities and research centres in collaborations.

They also pointed out that local government representatives are not sufficiently familiar with bioeconomy strategies and stakeholders, and lack knowledge of the funding sources, aid mechanisms and technical solutions that could support bioeconomy companies in their territories. Similarly, bioeconomy companies are also unaware of these resources. Suggestions included initiatives to better train and inform bioeconomy companies about the players in the region, as well as funding mechanisms like start-up subsidies and/or tax incentives for companies, and investment in research and development to promote innovation in the bioeconomy.

Interviewees described complex and mis-aligned regulation as a significant obstacle to innovation and the growth of the bioeconomy in the regions. They suggested regulations should be simplified at the regional and national levels, and emphasized the need to align all levels of regulation with EU regulations. However, they saw new regulations like RE2020, the zero-carbon challenge and the regional COP as leverage points to shift the current situation.

In terms of specific sectors or material streams, interviewees mentioned opportunities in recovering household and industrial waste, carbon capture, local agriculture and food process, and carbon capture. Rising prices of raw materials and energy could pose an obstacle to some businesses, but could also create economic incentives to prioritize the

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bioeconomy because of its potential to utilize by-products and less energy-intensive natural processes.

A biomass observatory was suggested as a mechanism to better monitoring of the volumes and locations of bioeconomy products.

3.2.1 Alignment of expert interviews with governance analysis

The governance assessment and expert interviews align on the current challenges in collaboration among different stakeholder groups. Both identify a need to raise awareness among stakeholders including SMEs, government officials and the broader public about the existence and benefits of bio-based economic activities, and the resources that are available to support bioeconomy-related companies.

Another area of agreement is the current high level of bio-based economic activity in Normandy. Both the governance assessment and the expert interviews describe the existence of many bioeconomy-related SMEs engaged in sustainable practices, which attests to the strong tradition of fishing, aquaculture and agriculture in the region.

Regulation is the main area of difference between the governance assessment and expert interviews. The governance assessment scored Normandy in the highest or second-highest category (“On target” or “Just below target”) in every assessment criterion related to regulation and policy, including those related to tariffs, taxes and subsidies; international laws and regulations; trade policies; and successful transposition of EU laws. However, both interviewees emphasized regulation as a major obstacle, particularly in terms of limiting innovation. One interviewee described the need to simplify regulation at the regional and national level, and that regulations are current blocking companies’ innovation. The other stated a need for favourable and clear rules, regulations and policies, including in the environmental and tax domains, in order to encourage innovation and decrease costs.

4 RECOMMENDATIONS

1. **Review and rationalize regulations to promote innovation and alignment.** By ensuring that regulations are not overly complex, Normandy can ease the path for bioeconomy businesses to diversify and grow. Simplifying regional and national regulations, while aligning them more closely with EU standards, could reduce administrative burdens and increase the competitiveness of local bioeconomy enterprises. This will also foster a more innovation-friendly environment, encouraging the adoption of cutting-edge technologies and sustainable practices across sectors.
2. **Develop structures to promote collaboration among stakeholders**. Building on existing structures like the EcoMer and COPIL (the steering committee for Normandy’s bioeconomy) facilitating enhanced collaboration could strengthen existing initiatives, catalyse new ones, and help avoid duplication of efforts. Collaboration could benefit from including partners from the public and private sectors, universities, research centres, and civil society.

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3. **Raise awareness among the general public, government officials and SMEs.** The general public could be better informed about the existence and benefits of the bioeconomy in Normandy, government officials could improve their understanding of the landscape of bioeconomy stakeholders and tools, resources and levers that various levels of government have at their disposal to support the bioeconomy ecosystem. SMEs could benefit from a better understanding of the funding and resources available to them, and how their company fits in among the wider group of stakeholders and the bioeconomy strategies of Normandy, France and the EU.
4. **Increase SME's access to existing funding, and seek new funding sources for bioeconomy initiatives, such as EU funding for research and development.** Facilitating SME access to existing funding requires streamlining the application processes and providing tailored guidance to bio-based SMEs on how to navigate the complexities of available funding mechanisms. In addition to seeking EU funding for research and development, Normandy could explore private investment opportunities, such as green bonds and public-private partnerships, while advocating for new national and regional bioeconomy funding streams to address specific gaps in innovation and scaling efforts.
5. **Promote an inclusive transition to an equitable bioeconomy.** Ensure that processes that engage and consult stakeholders are accessible to people from all backgrounds. For example, translating content and providing different venues for sharing input can enable wider participation. Similarly, ensuring diverse representation on steering committees and other consultative groups can lead to more equitable, inclusive policies and strategies, which in turns brings more people into the process of

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1 REGIONAL PROFILE

The geographic scope of the Tuscany region consists of the NUTS2 region Tuscany (ITI1), located in mid-West Italy (See Figure 22). With 3,7 million inhabitants, the population density of Tuscany is clearly below the country average: 161 persons per km^2 compared to 197 persons per km^2 in Italy as a whole.

Table 9. Profile indicators for Tuscany compared to Italy and EU-27
Sources: Eurostat, EC-JRC, own estimates

	Tuscany region	**Italy**	**EU-27**
Regions included	ITI1 (Nuts2)	IT (Nuts0)	
Total land area covered (km2)	23.001	302.072	4.125.104
- *Of which wood land*	*49.3%*	*35.2%*	*41.1%*
- *Of which crop and grass land*	*38.7%*	*48.1%*	*41.6%*
Total population covered (persons)	3.664.191	59.301.132	446.735.290
- *Of which 15-65 years*	*62.1%*	*63.5%*	*63.9%*
Employment in NACE B-N (persons)	1.025.813	14.873.418	126.003.564
Employment in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	271.454	3.032.015	24.694.206
- Of which in bio-based industry	*109.576 (40.4%)*	1.092.733 (36.0%)	8.524.971 (34.5%)
Value added in NACE B-N (mil euros)	47.257	690.467	6.488.393
Value added in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	14.161	178.534	1.454.603
- Of which in bio-based industry	5.740 (40.5%)	64.298 (36.0%)	484.293 (33.3%)
Biomass availability (kton dm)	4.458	69.157	917.751
- *Of which forestry biomass*	*16.5%*	*9.9%*	*27.0%*
- *Of which crop and grass biomass*	*83.4%*	*89.9%*	*72.9%*

The indicators reported in Table 9 give insight in the socio-economic profile of Tuscany in terms of land area coverage, population, employment and value added of biobased sectors, and land coverage (column 1) compared to Italy as a whole (column 2) and the EU-27 (column 3). Around 39% of land area in Tuscany is used for arable and livestock farming, whereas this amounts to 48% at the country level. The share of the biobased industry in the total potential bioeconomy (excluding primary sectors) in Tuscany is above those of the average region in Italy and the EU-27 in terms of both employment and value added. On the other hand, potential active labour force (15-65 years class) in total population of Tuscany and Italy is relatively low compared to the EU-27 as a whole. When compared to the EU-27, the role of crop and grass biomass in total biomass availability is relatively strong in Tuscany (83% versus 73%), which aligns with the dominant use of land for cropping and grazing in this region.

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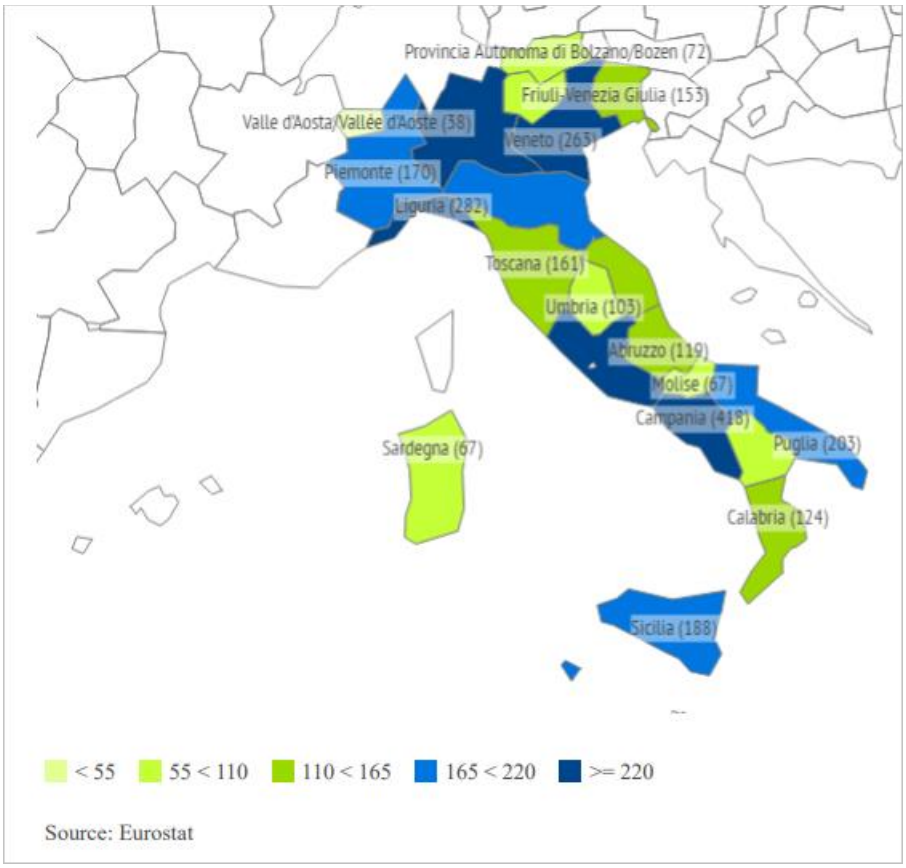

Figure 22. Population density in Tuscany region, in the mid-West of Italy

2 POLICY CONTEXT

2.1 NATIONAL POLICY CONTEXT

Italy's initial bioeconomy strategy was created in 2017, followed by the current Bioeconomy in Italy II (*BIT II - Bioeconomy in Italy: A New Bioeconomy Strategy for a Sustainable Italy*, 2019), which was published in 2019. The strategy provides a national assessment and strategic framework for the deployment and development of the bioeconomy. It describes how the Italian bioeconomy encompasses all major sectors of primary production (agriculture, forestry, fisheries and aquaculture); those processing biological resources, such as the food and drink, wood and pulp and paper industries along with biorefineries; and parts of the chemical, biotechnological, energy, marine and maritime industries. The strategy sets a target of increasing the Italian bioeconomy performance by 15% by 2030, which it aims to do by more investments in R&I, spin offs/start-ups, education, training, and communication; better coordination between regional, national and EU stakeholders/policies; better engagement with the public; as well as tailored market development actions. It plans to increase the current output of the Italian bioeconomy (approximately 250 billion euro/year) and the level of employment (around 1.7 million) by 20 per cent by 2030 (*BIT II - Bioeconomy in Italy: A New Bioeconomy Strategy for a Sustainable Italy*, 2019). The The BIT II is part of the implementation process of the National Smart Specialization Strategy (SNSI) and links strongly with the focus areas of the EU Bioeconomy Strategy.

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In 2021, the BIT II strategy was supplemented by the Implementation Action Plan (2020-2025) (Presidente del Consiglio dei Ministri, 2021). The actions in the Implementation Action Plan are clustered into 4 areas: policy and standards, pilot actions, regeneration of ecosystem services and stakeholder engagement. The plan outlines action at a local level (including for rural, coastal and urban areas) and prioritises the domains of agri-food, biorefinery, forestry, marine and maritime sectors, waste and waste waters. At the end of September 2024, the update Implementation Action Plan 2025-2027 of the Italian Bioeconomy Strategy BIT II will be presented.

A national monitoring system is in place, supported by the National Institute of Statistics. Additionally, a circularity index which examines parameters related to production, consumption, waste management, secondary raw materials market, investments and employment will be considered. Regions in Italy play a role in national governance of the bioeconomy, electing representatives to the National Bio-based Economy Coordination Board (CNBBSV). The Board consists of over 40 members from government ministries, public research institutions, technology clusters, regions commissions and industry/private sector, with areas of expertise including agriculture, forestry, biotechnology, environmental and industrial sustainability, circular economy, health and regional economic development. (*National Bioeconomy Coordination Board*, n.d.).

Looking across the country, Italy is among those six EU member states with intensive regional strategic action on the bioeconomy, alongside Finland, France, Poland, Spain and Sweden (Haarich et al., 2022).

At the regional level, as of November 2021, 21 regions in Italy have strategies related to the bioeconomy (including two strategies that are under development). Of those, there are six regions with fully dedicated bioeconomy strategies, nine regions with a regional strategy with a strong bioeconomy focus (7 of them published), and six regions with frameworks with minimal bioeconomy content (Haarich et al., 2022). Within those 21 regions, 37 strategies have been identified that are relevant to the bioeconomy. As of November 2021, twenty-seven of those strategies were published, and 10 were under development. They include six fully dedicated bioeconomy strategies, and 31 strategies where bioeconomy is embedded in wider strategic frameworks, mostly in sustainable development strategies and Smart Specialisation Strategies (Haarich et al., 2022).

Figure 23. Regions in Italy with regional strategies
Source: Haarich et al., 2022

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Looking at the project level across Italian regions, a total of nine projects in nine regions are found in the field of bioeconomy. Most are financed by European Structural and Investment Funds plus national, and sometimes regional resources. They mostly consist of regional clusters, cluster agencies and technology platforms for bioeconomy. In addition, results have shown that two Italian regions participate in transnational European projects (Interreg) concerning the bioeconomy.

2.2 Regional Policy Context in Tuscany

Tuscany does not currently have a regional bioeconomy strategy. However, laws on circular economy are in place (Regional Law no. 48/2018, Regional Law n.34/2020). The absence of a dedicated bioeconomy strategy is reflected in a lack of a regional-level institutionalised governance structure for the bioeconomy in Tuscany. The Regional Council, with Decision No. 30 of 25 June 2018, established the regional roundtable for the promotion of the circular economy. In the future, regional working groups may be re-established following a blueprint on the national level. At this point, there is no clear lead organisation or concrete timeline. In regard to climate mitigation, Tuscany has adopted a decarbonisation strategy, Toscana Carbon Neutral (Regione Toscana, 2020).

There is no dedicated Regional Council Directorate in charge of the bioeconomy, but it is included in the work of the Agriculture and Rural Development, Production Activities, Environment and Energy Directorate. The Agriculture and Rural Development Directorate oversees the strategic development, the link to the rural development programme, the other directories that support regional S3 and the European Rural Development Fund (FESR).

In Tuscany, efforts to increase capacity in the workforce of bioeconomy-related industries mostly depend on tertiary education programmes. Much of this takes place through broader sustainability programs, but there are also dedicated research departments on bioeconomy starting to emerge. A prime example is the Institute for Bio-based Economy at the CNR National Research Council near Florence.

In terms of funding, many opportunities stem from the European Rural Development Fund (FESR). In the agrifood and forest sector, the Rural Development Plan (RDP) financially supports the creation of Operational Groups (GOs) which aims to identify innovative solutions to specific problems or to promote opportunities for agricultural enterprises. Private capital does not have a strong presence in the region. A new funding instrument for technology districts is being established in Tuscany, which has links to the bioeconomy specifically related to the energy sector. There is also a lively start-up scene, mainly driven by universities.

3 BIOECONOMY GOVERNANCE

3.1 Results from governance indicator analysis

The following chapter presents the results of analysis according to the governance framework developed by Jacobi, Connolly and Hayder (2023), outlining a three-tiered framework consisting of basic governance functions (1st-tier), specific bio-based governance functions (2nd tier) and assessment criteria (3rd-tier) – see method chapter in this report for more information.

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Figure 24 visualises the results organised into the three tiers of governance functions, then Figure 25 shows the same assessment criteria grouped based on their scores.

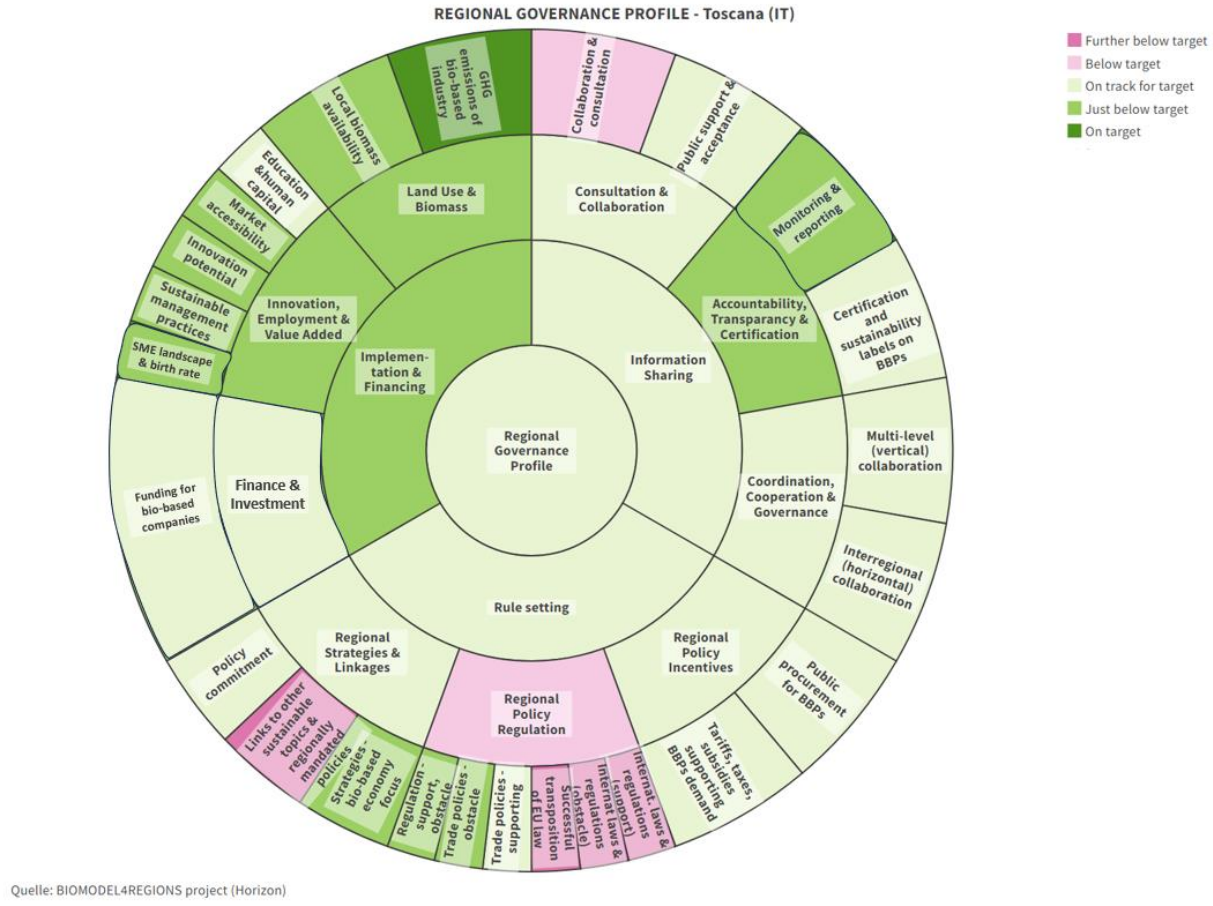

Figure 24. Regional Governance Profile: Tuscany Region, Italy (sunburst chart)

Tuscany's regional governance profile shows a mixed performance, with an overall score in **the middle category of "On track for target**," indicating some areas of strength but significant room for improvement. The strongest performance is seen in **Implementation & Financing "**Just below target," while **Information Sharing** and **Rule Setting** are assessed as "On track for target." This means that aspects of the region's financing and implementation are strong, but there are notable challenges in policy alignment and collaboration, suggesting a need to strengthen networks and coordination within the region's governance structure.

Tuscany performs well in **Implementation & Financing** ("Just below target,"), which is the strongest area of its governance profile. Specifically, the region excels in **GHG Emissions,** scoring in the highest category of "On target." These areas highlight Tuscany's ability to produce bio-based products sustainably. Most other tier-3 indicators, including Local Biomass Availability, Innovation Potential and SME Landscape & Birth Rate, among others, score "Just below target," and serve as additional areas of strength in Tuscany. However, due to data constraints, the SME Landscape & Birth Rate score is based on the presence of active business incubators, not based direct data on the founding of new start-ups. Therefore, it should be interpreted with caveats as an indirect indicator of the SME landscape. Meanwhile, Education and Human Capital and Funding for Bio-based Companies are lagging behind the other indicators in this category. These scores reflect a promising but not yet fully realised implementation and funding environment for bioeconomy companies.

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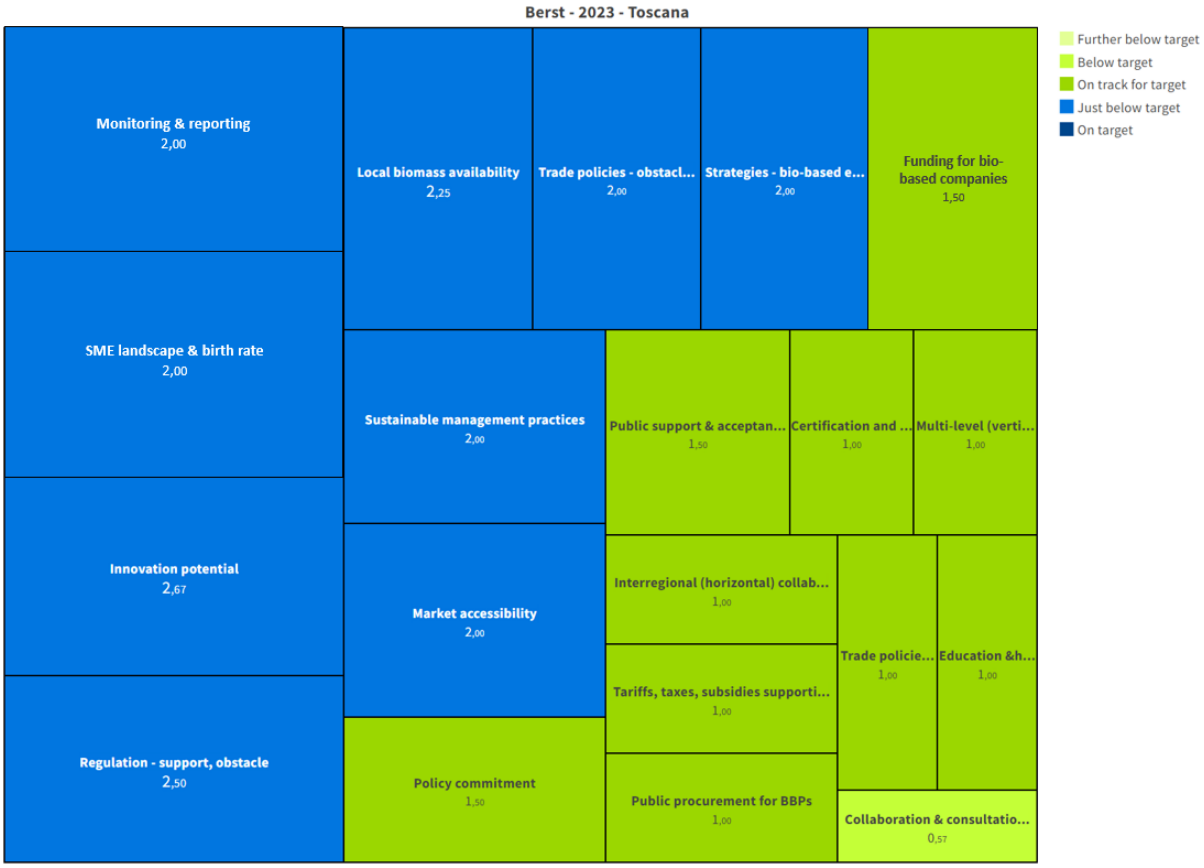

Figure 25. Regional Governance Profile: Tuscany Region, Italy (treemap chart)

The **Rule Setting** function is Tuscany's weakest area governance, with an overall score of "On track for target" (but a numerical score below that of "Information sharing.") This is attributable to "Below target" scores in indicators related to international laws and regulations, transposition of EU law and policy linkages, as well as "On track for target" scores in public procurement, trade policies (supporting), policy commitment, and incentives like tariffs, taxes and subsidies. However, within Rule-Setting, Tuscany has a positive assessment ("Just below target") reflecting the existence strategies with a bioeconomy focus, regulation and trade policies (obstacle). Overall, Tuscany has some policy frameworks in place, but this governance assessments suggests underdeveloped policy-making related to the bioeconomy and a lack of effective regulatory measures, which in the long-term may limit the potential of Tuscany's bioeconomy.

Like Rule-Setting, Information Sharing in Tuscany also score "On track for target." This suggests that the region may struggle to build the necessary consensus and public buy-in for bio-based initiatives. Within Information-Sharing, Tuscany scores relatively consistently in the "On track" category, across horizontal and vertical collaboration, certifications, and public support and acceptance, indicating room for improvement in their engagement with stakeholders and raising of public awareness. There is a particular need to improve collaboration and consultation, which scores "Below target." Limited consultation and collaboration means that stakeholders like local governments and SMEs are not effectively involved in decision-making processes, which could lead to policies and initiatives that don't resonate locally or receive limited buy-in. Monitoring & Reporting is scored as "Just below target," but this score was based on an unofficial document and may be subject to change once monitoring and reporting systems are finalized and implemented.

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Overall, Tuscany's governance profile shows a region with some clear strengths in sustainability and innovation support, but significant areas for improvement in policy and regulation, collaboration and consultation, and funding. While the region shows potential, addressing the gaps in policy and regulation and improving collaboration across governance levels will be essential for advancing Tuscany's bioeconomy.

3.2 RESULTS FROM INTERVIEWS WITH REGIONAL POLICY EXPERTS AND STAKEHOLDERS

Across the interviews, there is a clear recognition of a **lack of coordination** between different stakeholders, including among levels of government in Italy, between sectors, and between regions. The absence of continuous, structured dialogue and collaboration was seen as a barrier to enhancing the bioeconomy. Interviewees called for regular events (as opposed to the current ad-hoc cadence) and structured interactions among key players.

Interviewees also noted that the **regulatory environment** could be improved by streamlining and simplifying administrative processes and procedures, and aligning policies at EU, national, and regional levels. Challenges with bureaucracy create delays and inefficiencies that hamper innovation and investment in bioeconomy-related companies. For example, participants noted the absence of waste plans.

All three interviews emphasised the need for **stronger financial mechanisms** to support the bioeconomy. The lack of grants, clear financial incentives, and slow access to European funds were identified as major hurdles for regional development. Suggestions for improvements included prioritising access to subsidized credit and promoting public-private partnerships.

Despite the challenges, the interviewees see Tuscany as having **significant potential** to further establish its leadership in bioeconomy initiatives, particularly in achieving climate neutrality and reducing environmental pressures. One interviewee envisioned a bioeconomy supports local economic diversification, fosters synergies between agriculture and industry, and generates qualified employment.

Another common theme is the need to **enhance local capacities** through training and skill development, especially of public sector staff. The bioeconomy requires a multidisciplinary approach, and the interviews stress the importance of creating educational platforms, vocational training, and fostering cross-sectoral research and innovation to equip the region for future challenges.

In focus groups early on in the Biomodel4Regions project, participants expressed the view that good governance of the bioeconomy needs to be cross-sectorial, with horizontal and vertical collaboration across different departments at regional and local levels. Key for the Italian regions is an industrial urban symbiosis with economic actors in the region, to ensure an end-of-waste user network locally. Participants noted that the value chain of valorised industrial by-products is not fully developed yet, and a useful supportive measure would be an action plan on industrial symbiosis.

Alignment of expert interviews with governance analysis

Of all the regions in the Biomodel4Regions project, Tuscany had one of the highest overall levels of alignment between the governance assessment and the expert interviews. There was

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strong agreement around challenges with coordination and regulation, and in terms of the high potential for growth and leadership. Both also agreed that bio-based companies faced difficulties accessing funding.

The governance assessment scored Tuscany highly in environmental indicators, including GHG emissions and sustainable management practices, but interviewees did not hone in on that as an area of strength.

4 RECOMMENDATIONS

1. **Streamline and Align Regulatory Frameworks.** By simplifying its regulatory environment, Tuscany can reduce administrative burdens and align regional, national, and EU-level frameworks. This would enhance the competitiveness of bioeconomy enterprises by minimising bureaucratic delays and ensuring policies are consistent across governance levels. In particular, it will be important to ensure that a future regional bioeconomy strategy translates into regulations that align with the national and EU level.
2. **Strengthen Stakeholder Collaboration and Coordination**. Establish structured, regular dialogue between key stakeholders, including local governments, SMEs, universities, and EU bodies. Collaboration should be cross-sectoral, involving agriculture, industry, universities, NGOs, and others, in order to foster a cohesive bioeconomy and avoid duplication of efforts. Approaches could include creating dedicated platforms or organizing regular forums that encourage horizontal and vertical collaboration.
3. **Enhance Access to Funding and Financial Incentives.** Improve access to financial support mechanisms, such as grants, subsidized credit, and EU funds, by simplifying application procedures and offering tailored guidance for SMEs and startups in the bioeconomy. Public-private partnerships should be promoted to unlock new sources of funding. Government agencies can also improve communication about funding, such as publicizing it more widely and actively when bioeconomy-related funding opportunities arise, even if the term “bioeconomy” is not explicitly included. This includes improving capacity of public sector workers so that they can better determine which funding opportunities are relevant to the bioeconomy.
4. **Invest in Education and Skill Development.** Address the lagging performance in Education and Human Capital by encouraging regional educational institutions to promote training and capacity-building programs. These should be relevant to SMEs, bioeconomy workforce and public sector workers. Vocational training, educational platforms, and cross-sectoral research initiatives would equip stakeholders with the multidisciplinary skills necessary to drive bioeconomy innovation and growth.
5. **Promote an inclusive bioeconomy.** Make sure that people from diverse backgrounds can access opportunities to work in the bioeconomy and contribute to its governance and development. Ensuring broad representation on steering committees and other consultative groups, especially in any future regional strategy development process, can lead to more equitable policies and plans, which in turn attracts more people into developing and promoting Tuscany’s bioeconomy.

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WESTERN MACEDONIA, GREECE

1 REGIONAL PROFILE

The geographic scope of the Western Macedonia region consists of the NUTS2 region Dietic Makedonia (EL53), located in mid-West Greece (Figure 26). With 3,7 million inhabitants, the population density of the Western Macedonia region is clearly below the country average: 28 persons per km^2 compared to 81 persons per km^2 in Greece as a whole.

Table 10. Profile indicators for Western Macedonia compared to Greece and EU-27
Sources: Eurostat, EC-JRC, own estimates.

	Western Macedonia	**Greece**	**EU-27**
Regions included	EL53 (Nuts2)	EL (Nuts0)	
Total land area covered (km2)	9.484	131.693	4.125.104
- *Of which wood land*	*43.3%*	*40.2%*	*41.1%*
- *Of which crop and grass land*	*42.2%*	*34.3%*	*41.6%*
Total population covered (persons)	253.954	10.459.782	446.735.290
- *Of which 15-65 years*	*62.2%*	*63.6%*	*63.9%*
Employment in NACE B-N (persons)	37.148	2.500.340	126.003.564
Employment in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	9.273	386.774	24.694.206
- Of which in bio-based industry	*4.247 (45.8%)*	187.894 (51.2%)	8.524.971 (34.5%)
Value added in NACE B-N (mil euros)	1.057	46.989	6.488.393
Value added in potential biobased sectors (NACE C10-C22, C31, D, E38, F41-F43	126	11.281	1.454.603
- Of which in bio-based industry	61 (48.4%)	5.201 (46.1%)	484.293 (33.3%)

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Biomass availability (kton dm)	1.224	14.316	917.751
- *Of which forestry biomass*	*5.4%*	*6.0%*	*27.0%*
- *Of which crop and grass biomass*	*94.3%*	*93.7%*	*72.9%*
National/regional bioeconomy strategy	2 NUTS2 regions	Not yet	

The indicators reported in Table 10 give insight in the socio-economic profile of Western Macedonia in terms of land area coverage, population, employment and value added of biobased sectors, and land coverage (column 1) compared to Italy as a whole (column 2) and the EU-27 (column 3). Around 42% of land area in Western Macedonia is used for arable and livestock farming, whereas this amounts to 34% at the country level. The share of the biobased industry in the total potential bioeconomy (excluding primary sectors) in Western Macedonia is above those of the average EU-27 region in terms of employment and value added. On the other hand, potential active labour force (15-65 years class) in total population of Western Macedonia is relatively low compared to the EU-27 as a whole. When compared to the EU-27, the role of crop and grass biomass in total biomass availability is relatively strong in Western Macedonia and Greece as a whole (94% versus 73%; source JRC).

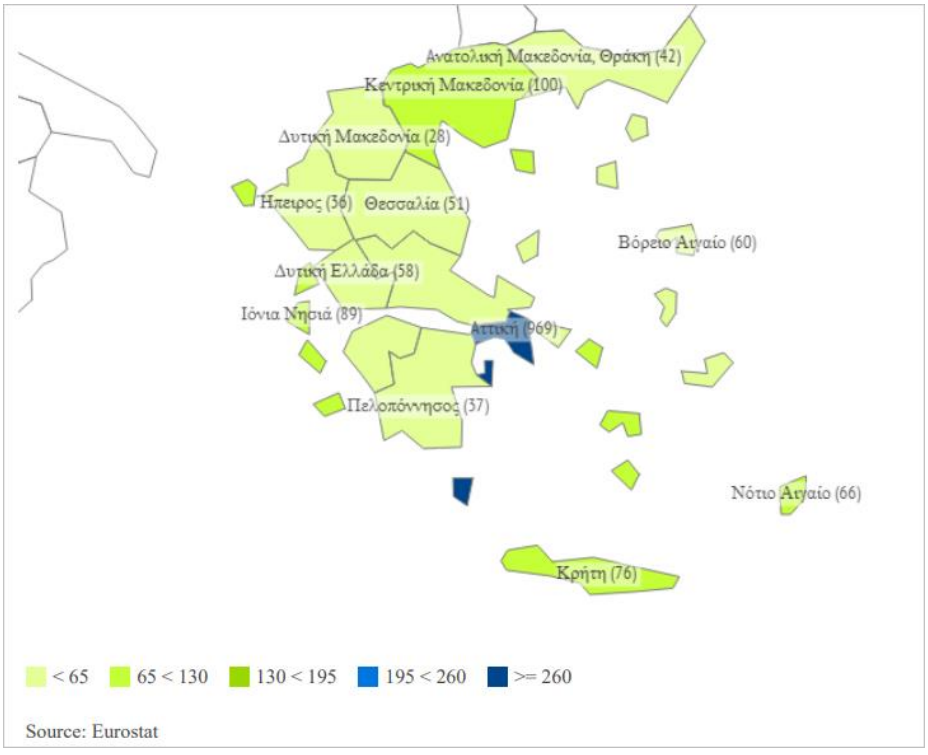

Figure 26. Population density in the Western Macedonia region, in the mid-West of Greece

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2 POLICY CONTEXT

2.1 STRATEGIC FRAMEWORK

Figure 27. Status of regional bioeconomy strategies in Greece
Source: Haarich et al., 2022

According to Haarich et al. (2022) Greece is among those EU Member states with *some* regional strategic action to deploy bioeconomy (i.e. between 1 and 15 regions with bioeconomy-relevant strategic frameworks). Other Member States in this bracket include Austria, Belgium, Czechia, Germany, Denmark, Croatia, Hungary, Ireland, Lithuania, Latvia, the Netherlands, Portugal, Romania, Slovakia.

Three published strategies have been identified at regional level: the Region of Central Macedonia and the Region of Crete have published bioeconomy strategies, and one region has bioeconomy as key element included. In those, the bioeconomy is embedded in the wider strategic frameworks in all three cases, two of them embedded in circular economy action plans, while in one strategy bioeconomy is embedded in a Smart Specialisation Strategy (cf. Haarich et al. 2022). No sectoral strategies could be identified.

The national long-term strategy for 2050 for Greece positions bioeconomy as one of the key axes for climate neutrality by 2050. The same document highlights the importance of bioeconomy which may have a multiplier effect for the economy and employment, especially when it comes to the production and industrial conversion of biomass into energy products. The link to bioeconomy here is made through biogas production and use in reducing the carbon footprint. Greece also has a national circular economy strategy (2018), accompanied by the 'Greek National Action Plan on Circular Economy' (2021). The National Plan for Energy and Climate also refers to bioeconomy. Together with circular economy these shall be the catalysts for the productive reconstruction of the country with climate mitigation objectives, more sustainable use of resources, and lower CO2 emissions. Bioeconomy is also referred to in relation to the replacement of fossil fuels, through recyclable products, bio-based and compostable biodegradable products. Bioeconomy is also indirectly related to the 'National Waste Management Plan' (2020), and the regional waste management plans. Old, relevant national policies consider the 'National Strategy for the Adaptation to Climate Change' (2016) and the 'National Biodiversity Strategy' (2014). (cf. Haarich et al. 2022)

At regional level, a number of regions mention circular economy as an important element - e.g. Attica, Epirus, Thessaly - but with no specific plan or strategy at present. In most cases, circularity is related to improved waste management approaches. Interreg programmes have played a part in embedding bioeconomy in regional action plans. One example is the region of

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Central Macedonia, which developed an 'Action Plan for the promotion of circular economy in SME of the Central Macedonia prefecture' and a 'Regional action plan for the promotion of circular bioeconomy' through the Interreg Europe projects, CESME and BIOREGIO, respectively.

The Hellenic Agency for Local Development and Local Government has also published a manual for local authorities on how they can make use of circular economy and proposes fields for action (e.g. on waste management, energy, sustainable mobility etc.). However, no strategy related to bioeconomy could be identified.

Furthermore, the city of Thessaloniki has developed a resilience strategy named 'Resilient Thessaloniki': a strategy for 2030, where circular economy principles are presented as future actions, e.g. when it comes to local waste management action plans and recycling. However, bioeconomy plays only a marginal role in it, so this strategy was not included in the database for the study (cf. Haarich et al. 2022).

2.2 POLICY CONTEXT AND GOVERNANCE MODEL ON THE BIOECONOMY

As highlighted above, to date, Greece has no national bioeconomy strategy in place. The attempts to for the development of a dedicated strategy is linked to European programmes and projects (e.g. Horizon Europe). At national level, a bioeconomy strategy is being developed under the CEE2ACT project. In fact, the roadmap is 80% developed (it will be finalised in June 2025). The Greek Bioeconomy Hub, with members from all over the country, contributed to the development of the roadmap. The date of publication of the Greek Bioeconomy Strategy is yet unknown though, as this is a political decision. In our discussions with ministry stakeholders, 2030 is mentioned. But this date also depends on whether there will be changes in the government or ministries, everything is fluid. The just transition and the just energy transition are important frameworks for Greece's bioeconomy. The *National Renewable Action Plan (2010),* and the *National Energy and Climate Action Plan 2021-2030* do, however, link to the circular economy. Additionally, the Law 4414/2016 as the support scheme for renewable electricity in Greece outlining feed-in tariffs and market participation, plays a big role in the pilot region.

The main governmental body implementing bioeconomy policies is the Ministry of Environment and Energy (YPEN), which launched the *1st National Strategy for the Circular Economy* in 2018 for public consultation. In addition, the *Strategic Plan for the Development of Research, Technology and Innovation* under the *National Strategic Reference Framework (NSRF) 2007-13* aims to restructure the Greek economy, gearing it towards high-value-added products and services, and achieve the transition to a knowledge-based economy and society. Bioeconomy in the RIS3 and S3 is not clearly mentioned.

Western Macedonia is one of the Greek pioneers in the bioeconomy and has the chance to drive the discourse at the national level. Central Macedonia and Crete are the only Greek regions which have dedicated bioeconomy strategies in place. Moreover, Western Macedonia is co-leading the S3 industrial modernisation partnership BERRY+ which identified the circular economy as a driver for economic development. Key sectors in Western Macedonia that are concerned with bioeconomy are at present forestry (managed by the Directorate of Forest),

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industry (Department of Industry), agriculture and livestock farming (Directorate of Rural Economy), urban waste (managed by municipalities and DIADYMA S.A.) and energy (Ministry of Energy and Environment). Therefore, strong cross-cutting dialogue and cooperation is necessary. At present, neither at national nor regional exist strategic decision-making initiatives on the bioeconomy, which means there is no structured governance on the bioeconomy. However, there is an active regional cluster organization, Clube. By supporting collaborations between public and private entities, Clube helps drive the development of bio-based initiatives that leverage local biomass and bio-resources. This includes enhancing synergies between biogas power plants, farmers, and other stakeholders in the agricultural sector to ensure efficient waste management and the circular use of biomass. Clube provides insights and research to support the implementation of bio-based projects, focusing on the region's needs, such as using biomass residues for soil improvement and other sustainable agricultural practices. Also, the cluster organization contributes to aligning regional strategies with the overarching goals of just energy transitions and circular economies. Furthermore, it helps bridge the gap between academic research and industry needs by promoting partnerships with the Bio-economy and Sustainable Growth Laboratory. This ensures that cutting-edge research informs practical solutions for the bio-based sector and sustainable growth in Western Macedonia.

So far businesses drive the discourse around regional bio-based economies in Greece. While the bioeconomy could prove to be a growth motor for the regional economy, it also provides an opportunity to address the environmental challenges prevailing in the country, counteracting environmental degradation and health issues. Western Macedonia seeks to use the bioeconomy as one of the decisive factors and major pillars of the post-lignite era, exhibiting major regional lignite deposits. The post-lignite strategy includes the re-skilling or reallocation of workforce (6 000 staff re-employment), with a focus on younger cohorts, among which the unemployment rate is already high.

The main barrier to innovation is seen in limited funding opportunities, as well as a high level of bureaucracy and regulatory framework conditions that limit the regional roll-out of the bioeconomy. An example for this is the biogas production and biomass residue utilization. Several biogas plants in Western Macedonia convert organic waste and agricultural residues into biogas, which is used for energy production. The byproduct, known as digestate, is a nutrient-rich material that local farmers could use as an organic fertilizer, helping to improve soil quality and reduce reliance on chemical fertilizers. However, expanding such initiatives has faced hurdles. Biogas plants show potential, scaling their operations or building new facilities requires significant capital investment, which remains scarce. Although EU funds and green bonds exist, accessing them often proves challenging due to complex application processes and long approval times. Also, the bureaucracy involved in obtaining permits for renewable energy projects is often slow and cumbersome. Local businesses face long delays, particularly when navigating environmental impact assessments, slowing the adoption of biomass-based innovations.

Another example is the production of green hydrogen and circular economy projects, where Western Macedonia has initiated projects around green hydrogen production from renewable energy sources, with a focus on transforming surplus biomass into clean hydrogen for industrial use. The region hopes that hydrogen technologies can play a role in decarbonizing energy-

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intensive industries and providing jobs in a new, sustainable sector. A barrier is the workforce reskilling. While green hydrogen presents a tremendous growth opportunity, the transition from lignite-based employment to renewable energy sectors is slow. The reskilling programs to prepare younger workers for these emerging industries are underfunded and have not yet scaled enough to address unemployment, exacerbating the area's economic difficulties.

Furthermore, the region of Western Macedonia is one of the more active regions on biomass valorisation in Greece. Closing material loops for a more circular economy in the region will make available more biomass waste for other uses, including the residues from agri-crops and livestock as an excellent feedstock for fuels and chemical production. However, there is a lack of awareness on the level of (national) political decision-makers and consumers concerning the environmental and societal potential of bioeconomy for the region.

Regional universities are the main source of innovation. However, despite this, the start-up scene on bio-based is still weak in the region. The Regional Innovation Scoreboard (Hollanders et al., 2021) labels Western Macedonia as an 'emerging innovator'.

3 BIOECONOMY GOVERNANCE

3.1 ASSESSMENT RESULTS

The following chapter presents the results of analysis according to the governance framework developed by Jacobi, Connolly and Hayder (2023), outlining a three-tiered framework consisting of basic governance functions (1st-tier), specific bio-based governance functions (2nd tier) and assessment criteria (3rd-tier) – see method chapter in this report for more information.

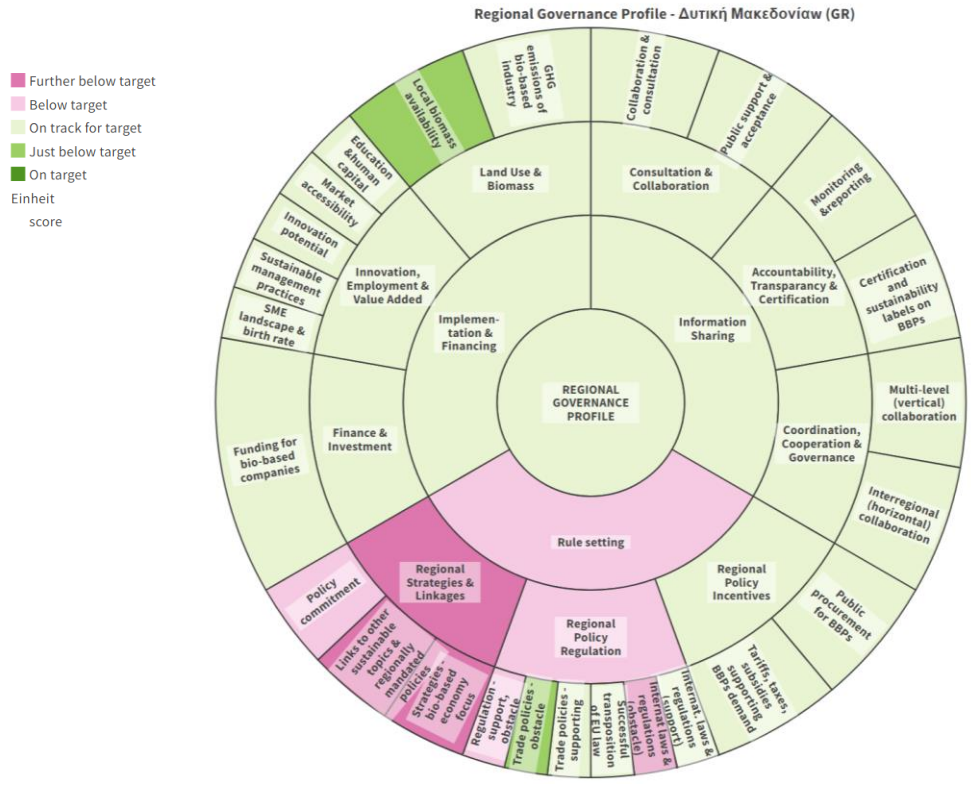

Figure 28. All-tier Overview of assessment results for Western Macedonia.
Source: BERST Dashboard

At an aggregate, 1st-tier level, the results reveal the strongest performance on *implementation & finance* followed by *information-sharing*. A lower performance can be observed in the area of *rule-setting*, where also the biggest challenges for the bio-based governance in the Greek pilot regions appear to be grounded. In terms of *implementation & finance*, the assessment results suggest that the regional bioeconomy is characterised by robust value chains as well as developed and partly diversified bio-based market structures and substantial sectoral high-value added with an increasing workforce. Although funding and financing of bioeconomy appears to be non-sufficient, innovation potential and SME birthrate are on an upward trend. Similarly, market accessibility (i.e. level playing field for involved market actors) as well as sustainability practices (i.e. share of companies with sustainability credentials) have been evaluated at a medium/lower level, but still with view to the benchmark. There are prospective and sustainably managed land and water ecosystems in place to derive feedstock for the bioeconomy and land-use and sector conflicts are minimised (See Figure 28).

In the area of *information-sharing*, the assessment results suggest that the regional bioeconomy has some established structures for information sharing both vertically (between governance fields/government levels) and horizontally (between actor groups at regional level), including with the public – however exhibiting room for improvement on all criteria compared to the threshold. There is some bio-based industry collaboration. Furthermore, labels for BBPs are used and applied for selected products and certification mechanisms are in place for some selected processes to stimulate and regulate bio-based markets. The regional government (and its institutions and agencies) have started on or are planning to develop reporting schemes to verify progress along a circular bioeconomy transition. None of the criteria in this field sticks out, suggesting a major challenge or a good practice, thus indicating a medium performance with room for improvement across all criteria.

Most challenges in terms of governance performance according to the assessment results can be found in the area of *rule-setting*. Here, results for the 2nd tier criteria of *regional policy incentives*, suggest that public procurement is being used in some instances as lever to boost the bio-based development in the region. Furthermore, fiscal instruments such as tariffs, taxes and subsidies are being utilized in some instances, e.g. to favour the valorisation of biowaste. More challenging appears to be the area of *regional policy regulation*, where international (EU) regulation constitutes and obstacle to the successful roll-out of the bioeconomy in the region. Exceptions appear to be the transposition of EU law (as a bureaucratic process) and trade laws, which are perceived to work more in favour of bioeconomy deployment. The biggest challenge appears to be in the area of *regional strategies and linkages*, where bioeconomy strategies with dedicated focus on the bioeconomy are the exception (as also outlined in chapter 2.1 above) and where links between bioeconomy policy and other regionally mandated policy areas (e.g. climate change mitigation, regional economic development, education etc.) are missing, or are very weak. Likewise, there appears to be a lack in policy commitment, i.e. a lack leadership and continuity for the further development of the bioeconomy in the region. Another view of the assessment criteria (represented by tier 3) is in Figure 29 below.

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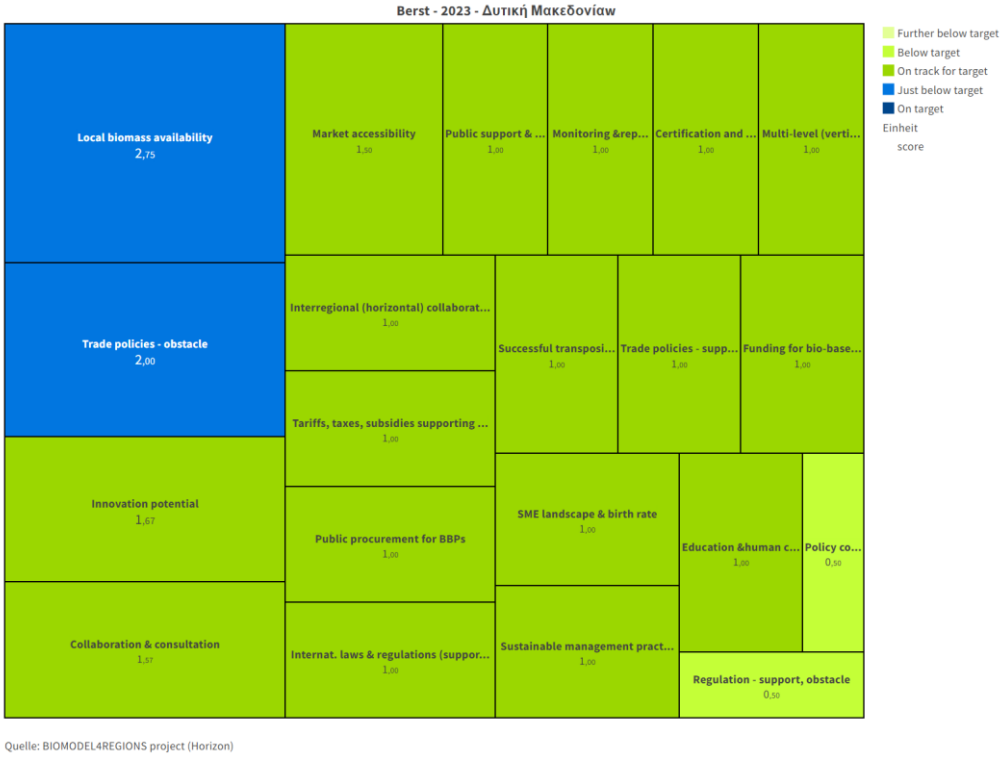

Figure 29. Overview of assessment criteria (tier 3) structured by scores for the Greek pilot.
Source: BERST Dashboard

According to Figure 29, the highest scoring criteria include:

- Local biomass availability (implementation & finance)
- Trade policies (rule-setting)
- Innovation potential (implementation & finance)

Assessment criteria, scoring slightly lower but still high enough not to be characterized as challenge, include:

- Innovation potential (implementation & finance)
- Collaboration and consultation (information-sharing)
- Market accessibility (implementation & finance)

Criteria scoring low, but with view towards benchmark include:

- Public support and acceptance (information-sharing)
- Monitoring and reporting schemes (information-sharing)
- Certification and sustainability labels (information-sharing)
- Multi-level governance (vertical) (information-sharing)
- Interregional (horizontal) collaboration (information-sharing)
- Policy commitment (rule-setting)
- Transposition of EU law (rule-setting)
- Funding for bioeconomy (implementation & finance)
- Tariffs, taxes and subsidies supporting the bioeconomy (rule-setting)

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- Public procurement for BBPs (rule-setting)
- Biobased SME rate and birthrate (implementation & finance)
- Education and human capital (implementation & finance)
- International laws and regulations supporting the biobased economy (rule-setting)
- Sustainable management practices (implementation & finance)

Least scoring areas and therefore biggest challenges according to the evaluation done, include:

- Policy commitment (rule-setting)
- Regulation (EU) (rule-setting)

3.2 LOCAL EXPERT VALIDATION

3.2.1 Method

A set of four interviews was conducted both virtual and face-to-face, with policy experts, for validation of B4R analysis results and beyond. The interviews were conducted in June 2024 with Tsimplinas Dimitris, Director, Forestry Directorate of Western Macedonia; Georgios Mpisiritsas, President and CEO, Pig farming Mpisiritsas; Sakellariou Kiriaki, Project manager, DIADYMA S.A.; Damatis Nikolaos, Secretary General, HELLABIOM.

Each interview was documented in writing (see Annex 1 Notes from Expert Interviews). The notes were shared with the interviewed regions, who were also given the opportunity to review and supplement the notes by July 4, which some regions did. Not all interviewed regions provided feedback on the notes.

3.2.2 Barriers to strengthening the Greek bioeconomy for companies in the region

Policies and regulations may affect the ability of regional governments to operate effectively. This may include policy on biomass utilisation, forest protection and bioeconomy development, while competitiveness in the biomass market may affect the Directorate's ability to utilise surplus biomass. Complex and inconsistent regulations also impede innovation and investment in sustainable bio-based initiatives in the region.

Complex and lengthy bureaucratic procedures for licensing and implementing new technologies, slowing down the pace of bio-based progress. On the other hand, small businesses face difficulties in competition from larger companies that are already established in the industry. In Greece, small businesses don't receive sufficient subsidies to help them recover and compete effectively. Many small businesses are overwhelmed by their own challenges and eventually shut down. They don’t have the opportunity to thrive or receive state support, as is often the case in other countries. As a result, if a small business is located in a rural area rather than a major urban centre like Athens or Thessaloniki, it is almost destined to close down. Finally, investment in bioeconomy infrastructure is not high, emphasizing the need for innovative financing mechanisms to support bioeconomy initiatives effectively – especially SMEs in rural areas. Overcoming these hurdles demands collaborative efforts, strategic policy interventions, and targeted investments in education and financing. The high perceived risks

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associated with biomass projects and start-ups, as well as technological uncertainties and regulatory changes, can deter potential investors.

A shortage of skilled personnel in areas like organic farming and biotechnology underscores the importance of targeted education and training programs. Moreover, **fragmented stakeholder engagement** complicates collaboration among businesses, research institutions, agricultural cooperatives, and government bodies. Information silos lead to inefficiencies and duplication of efforts.

3.2.3 Opportunities for regions to effectively support the implementation of the bioeconomy

The **use of surplus biomass from forest ecosystems can create a new market** for the production of North Swedishs, timber and other forestry products. The regional directorate can facilitate the development of industrial facilities to process this surplus biomass. Recently, the creation of tourist trails, hiking, climbing and other activities in the forests has been discussed to attract visitors and contribute to the local economy.

The **creation of networks and joint initiatives** between companies operating in the bioeconomy, which can develop the sector in the region by sharing information and knowledge. Also, promoting local products with quality and origin labels can enhance the reputation of the region and increase demand for our products.

Access to funding and resource efficiency are critical enablers of bioeconomy development. Western Macedonia can leverage public-private partnerships, grants, and other financing mechanisms to support sustainable agricultural practices and bio-based projects. Moreover, promoting resource-efficient technologies and practices, such as precision agriculture and circular economy principles, can optimize resource use and enhance economic sustainability, while creation jobs and stimulating rural development.

By leveraging these opportunities, regions can play a crucial role in advancing the bioeconomy, driving sustainable development, and contributing to Greece's overall economic growth.

3.2.4 Leveraging a robust bioeconomy to contribute climate change mitigation, reduce societal challenges and promote regional growth

The use of surplus biomass for energy production can **reduce dependence on fossil fuels** and achieve climate neutrality, while using resources from the bioeconomy to support reforestation programmes, contribute to carbon sequestration and minimise the environmental footprint of the region. Further, the production of biogas from animal waste reduces methane and CO2 emissions, contributing to the reduction of the carbon footprint, so by following the principles of circular economy and recycling in the region, we can reduce the use of raw materials and waste production, contributing to sustainability.

A thriving bioeconomy creates employment opportunities, particularly in rural areas, **reducing unemployment and poverty**. Furthermore, the inclusive nature of bio-based industries encourages wider stakeholder engagement, fostering collaboration among businesses and communities to address societal challenges effectively. Moreover, a robust bioeconomy promotes sustainable waste management practices, which not only alleviate environmental burdens but also address societal challenges such as waste pollution and resource depletion.

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By actively involving stakeholders in recycling and resource recovery initiatives, regions foster community engagement and collaboration, leading to a shared responsibility for environmental stewardship and social cohesion.

Encouraging the development of local businesses in the bioeconomy strengthens the regional economy and keeps the population in rural areas. Regions can capitalize on their unique biomass resources and local expertise to develop specialized bioeconomy sectors, promoting economic diversification and growth. Additionally, investing in bio-based waste management infrastructure creates opportunities for regional growth and economic diversification. The production of valuable resources such as compost and biogas generate new revenue streams and job opportunities, particularly in rural areas where agriculture and waste management intersect.

the **bioeconomy can enhance regional resilience** if local communities play an active role in managing the region's forests and resources, promoting local self-management and sustainability, and if infrastructure and investment are improved to support forest resilience with fire prevention and response systems. Sustainable production and processing practices can help the region to improve its natural environment while increasing its resilience to climate change. Furthermore, a diversified bioeconomy strengthens regional resilience by reducing dependence on external factors, such as fluctuating commodity prices or geopolitical tensions. Also, the production of renewable energy from organic waste strengthens energy security and resilience to disruptions in traditional energy supply chains, ensuring continued operations even in challenging circumstances.

3.2.5 Key topics to be included in a regional bio-based strategy

First and foremost, a strategy needs to embark on **policy initiatives to modernise forest management** legislation and to ensure that biomass harvesting and use practices are sustainable and environmentally sound.

Cooperation **requires initiatives to create consortia** for the development of biomass utilisation projects and the promotion of bioeconomy products, the exchange of best practices and know-how through networks, and the integration of these initiatives and actions into a bioeconomy strategy to contribute to the development of a sustainable, resilient and economically diversified region of Western Macedonia.

In order to develop a strong regional strategy for the bioeconomy in the region of Western Macedonia, it is essential to develop **training programmes for workers** in the fields of forest protection and biomass management. We have been asking for this for years, but we have not been able to find the necessary funds to implement it, nor have we been able to find the right conditions to work with the university to develop the programmes.

In terms of **funding**, it would be appropriate to use Horizon Europe type funds for research in bio-economic areas. LIFE programmes could also be used to fund environmental and climate actions related to biomass management. The Recovery and Resilience Fund could also be used to invest in green energy and sustainable development projects. Another idea is the creation of a special fund to finance small and medium-sized enterprises active in the bioeconomy and to provide low-interest loans and subsidies for investment in new

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technologies and infrastructure. It is also necessary to reduce bureaucracy and simplify licensing procedures for new production and processing facilities and, of course, to provide tax incentives and tax relief for companies investing in green technologies and practices.

3.2.6 Policy alignment

The alignment of EU, national and regional strategies for the bioeconomy in the region of Western Macedonia is necessary for the sustainable development of our region. At the regional level, **local needs and specificities need to be recognised** so that general guidelines can be adapted to specific actions that best serve the region. At the national level, legislation and regulations need to be managed to formulate a single regulatory framework that supports a sustainable bioeconomy throughout the country. The development of tax incentives and subsidies for the bioeconomy is also a national issue that can strengthen the bioeconomy. At the European level, the allocation of resources from the European budget to support regional and national projects, compliance with the European Green Deal directives and targets to reduce emissions and promote sustainable development should be managed.

4 RECOMMENDATIONS

Considering the aggregated analysis of 50 benchmarked governance indicators for the six pilot regions, according to the assessment framework developed (Jacobi et al., 2023), as well as the summary of interviews carried out with local policy experts, It shows specific bio-based governance areas (assessment criteria) in the first two columns. The three 'local expert validation' columns represent statements made by interviewees from Western Macedonia and the policy experts interviewed, which confirm, contradict, or indirectly confirm or contextualize the quantitative assessment results. Quantitative assessment results either confirmed or indirectly/contextually confirmed by experts are viewed as 'highly robust' or 'medium robust' results, while quantitative assessment results contradicted by experts' statements, are considered as 'weakly corelated' or 'non-robust'. Quantitative assessment results not at all mentioned by experts, may be viable but are missing further validation by practitioners and local experts.

The robustness check both contributes to validating the assessment framework as well as helps to generate viable recommendations for the Greek cluster partner and the regional governments it caters to. Results of this mapping are summarized below as recommendations for the region(s).

Table 11 below provides an overview of the robustness of results by mapping-out both quantitative and qualitative assessment results. It shows specific bio-based governance areas (assessment criteria) in the first two columns. The three 'local expert validation' columns represent statements made by interviewees from Western Macedonia and the policy experts interviewed, which confirm, contradict, or indirectly confirm or contextualize the quantitative assessment results. Quantitative assessment results either confirmed or indirectly/contextually confirmed by experts are viewed as 'highly robust' or 'medium robust' results, while quantitative assessment results contradicted by experts' statements, are considered as 'weakly corelated' or 'non-robust'. Quantitative assessment results not at all mentioned by experts, may be viable but are missing further validation by practitioners and local experts.

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The robustness check both contributes to validating the assessment framework as well as helps to generate viable recommendations for the Greek cluster partner and the regional governments it caters to. Results of this mapping are summarized below as recommendations for the region(s).

Table 11. Robustness check / alignment between quantitative and qualitative results

Quantitative assessment results		**Local expert validation** *No. of statements confirming/ contradicting assessment result*		
Basic governance function (1st tier)	**Assessment criteria / narrative statements**	**Confirmed by experts**	**Ind. / cont. confirmed by experts**	**Contradict. By experts**
Area of governance excellence				
Implementation & finance	Biomass feedstock is readily available (especially from forestry), land-use conflicts are minimized	**x**		
Rule-setting	Trade policies are working in favour of the regional bioeconomy			
Implementation & finance	Innovation potential is relatively high in the region		**x**	
Opportunities to improve				
(information-sharing)	Collaboration and consultation among actors involved in the regional bioeconomy exists but could be intensified		**x**	
Implementation & finance	Creation of new bio-based markets is occurring, but could be leveraged more strongly	**x**		
Information-sharing	Public support and acceptance for BBPs is pronounced but could be improved		**x**	
Information-sharing	Monitoring and reporting schemes on the bioeconomy at regional level are underdeveloped			

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Information-sharing	Certification and sustainability labels exist but are underutilized and should be further developed		x	
Information-sharing	Regional multi-level governance mechanisms for the bioeconomy are limited		x	
Information-sharing	Interregional (horizontal) collaboration on the bioeconomy is limited			
Rule-setting	Policy commitment and political leadership on the bioeconomy is lacking			
Rule-setting	Transposition of EU law could be improved	x		
Implementation & finance	Funding for bioeconomy is relatively scarce, tailored mechanisms should be improved	x		
Rule-setting	Tariffs, taxes and subsidies supporting the bioeconomy are utilized as instruments, but should be improved and harmonized		x	
Rule-setting	Public procurement for BBPs is not common practice and could be strengthened to support the regional implementation			
Implementation & finance	Biobased SME birthrate is relative low, business should be supported more systemically		x	
Implementation & finance	Education and human capital are lacking. Bio-based training programmes are needed	x		
Implementation & finance	Sustainable management practices among bio-based companies are lacking			

Challenges

Rule-setting	EU law presents a challenge for the regional bio-based implementation	x		

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Rule-setting	Integration of the bioeconomy in other regionally mandated action fields is lacking		x	
Rule-setting	Strategic framework on the bioeconomy is weak, i.e. strategies with dedicated bioeconomy focus are lacking		x	

In summary, the governance structure for the bioeconomy in the Western Macedonian region is characterized by triple helix participation, excluding civil society and a predominantly bottom-up approach with a strong focus on regional pilot cases and emerging good practices, often stemming from European projects and other European funds. Western Macedonia has taken steps to develop regional strategies that align with the broader EU Bioeconomy Action Plan. These regional efforts seek to integrate sustainable practices into key sectors, such as agriculture, forestry, and energy, promoting the use of local biomass resources. By linking with the EU framework, the region is positioning itself to leverage bioeconomy principles as a cornerstone of its post-lignite transition, while contributing to the EU's overarching goals of circularity, sustainability, and economic growth through bio-based solutions.

The following recommendations related to addressing **challenges** of the bio-based governance regime in the Greek pilot regions can be made, building and complementing the analysis and expert validation presented above:

- **The EU policy framework on the bioeconomy should be harmonized** and adapted to the regional needs. E.g. End of life criteria should be developed in order to increase biowaste valorisation; subsidies for biomaterial use could help steer the use of biomass surplus from forestry away from energetic utilization, increasing value creation through product innovation. The development of tax incentives and subsidies for the bioeconomy, while also a national issue, can be supported at EU level. At the European level, the allocation of resources from the European budget to support regional and national projects, compliance with the European Green Deal directives and targets to reduce emissions and promote sustainable development should be managed more favourably. The central government could play a role to support the regional strategy development using Western Macedonia as a testbed.
- **Integration of bioeconomy in with other regionally mandated tasks** should be improved. The bioeconomy at conceptual level, should be viewed together with circular economy. Communication on a transition to a ‘circular and bioeconomy’ can help mobilize industry and policy makers. Furthermore, the bioeconomy should be framed in terms of its key impacts, e.g. reduced GHG emissions, increased resilience (environmentally, economically, socially), regional prosperity, growth and social cohesion etc. Therefore, it makes sense to link the bioeconomy in related strategies, e.g. the regional climate strategy, where bioeconomy should be included as key field of action, including measures such as e.g. the substitution of fossil fuels (both for energetic and material use).

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- **Region(s) should develop dedicated bioeconomy strategies** as complementary strategies to plan and describe the regional development towards a bioeconomy. A dedicated strategy enshrines the necessary leadership and stakeholder commitment and ensures that the implementation on the bioeconomy is streamlined and coordinated. The strategy should further lay out a vision for the bioeconomy in the region, co-create actions to achieve the strategic development objectives and outline a monitoring and reporting scheme to ensure accountability and transparency of the process. Lastly, it should outline an investment plan and ways to fund the implementation of the strategy. Links to other plans and strategies, e.g. on climate mitigation, climate adaption, regional development, biodiversity, should be established where possible.

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ANNEX 1 NOTES FROM EXPERT INTERVIEWS

1 THE NORTH SWEDISH REGION, SWEDEN

1.1 EU-LEVEL

This interview focuses on how the EU level affects the region's role in their work to develop the bioeconomy.

Interviewee name, position and organisation:		Carina Christiansen, Senior Adviser in European Affairs, North Sweden European Office Subject areas: Forests, environment and energy
Date, time	31st of May 2024	Place or virtual call: Virtual call

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Potential growth in the bioeconomy is highly dependent on EU regulations for forestry. Several legislation from EU affecing forestry paractices and potental harvesting volumes are about to be implemented with poor or no undestanding of the impact. It is hard to see what problems the laws and details want to solve and hard to understand who is driving them. All these proposals are detrimental to the development of the bio-based society: Deforestation regulation Sustainability critera in RED LULUCF and more.

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			The deforestation ordinance, sustainability criteria, the cascade principle, what else? The texts are difficult to understand. The regulations are detailed about what one can do and not what one can't do. The third can be done provided the fourth is done. The regulations are difficult to understand. It is not apparent what the laws and details want to solve and hard to understand who is driving them. Unstable, financial problems. The uncertainty in EU politics is today an obstacle to economic development and an example from Västerbotten is two large companies that have announced an increased production in a sawmill but this investment was cancelled due to uncertainty in EU politics. This goes completely against security of supply. At the same time, the EU wants to see more construction in wood. E.g. New European Bauhaus. From where should we source this sawn goods ? Sawn timber is a prerequisite for avaiability of side streams like sawdust and bark. Severel new investments in our region are depepndent on the availability of these side streams. Geolocation and the need for digitization will be an adminstative burden especially for small producers.

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			According to the deforestation regulation, you are not allowed to sell anything without geo-localized, and then you must be fully digitized and geo-localized and controlled before you can make a deal with biomass. Fossil based plastic is perfectly fine to trade in anyway, but not what is natural and harmless like biomass.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Carbon credits and that the Renewable Directive is driver for investments. There are great opportunities to develop bioeconmy in in northern Sweden but EU regulations can hamper this development. We have large areas of agricultural land that are not being used. We should we be able to have more grazing animals on the land and the agricultural land is very underdeveloped, it is not really used for production. A solution to large costs for small farms is to learn from forestry. If you do that, the forest is fully developed and to hire contractors. It's a whole industry, so using smaller forest properties is no problem there. The many properties that have both land and forest in the same company. That's the usual. There are many different forces pulling towards increased food production in northern Sweden. Security of supply and biological

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			diversity but also increased immigration. And there are also very large opportunities to manufacture completely new products. Stable litter, for example, is an upcoming big market. It's a huge market in terms of being able to sell stable litter and you can grow that with completely new crops. Like reed canary grass and hemp, **The regions can export KNOWLEDGE** The tradition and know-how at all levels can be exported. We have know-how that exists around forestry and agricultural value chains that increase value for the products. We should be able to export this know-how to all of Europe. Great know-how in how to sort of bring out entire value chains.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	There's a lot of unused agricultural land that could be used for production or grazing animals. Utilizing this unused land can help the region become more resilient and meet the needs of a growing population.

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Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	The regions can participate in European networks and forums. The regions can work to increase the number of experts within EUS institutions. That Sweden should make an implementation of the EU regulations that suits our regions
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	EU should let the market rule and then you would regulate at the national level when you discover that the market is wrong. Trading in carbon emissions rights. To get investments in place where they do the most good. So you get the most up-shifting for every person and the most carbon dioxide reduction for every kroner invested. The national level can drive the market. To create economic drivers for a growing bioeconomy An example is the carbon tax Tax the fossil flows and then we'll see what happens.
	7	**For companies in your region: What**	Uncertainty toward politics and how it will affect investments.

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		obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?	Forest owners/primary producers experience legal uncertainty as you can, for example, be reported for felling for which you have received legal support.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	

1.2 REGION: NORRBOTTEN

Interviewee name, position and organisation:		Ylva Sardén, Region Norrbotten
Date, time	13 th of June 2023	Place or virtual call: Virtual call

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential	The biggest obstacle is conflicts over land use and resources, such as reindeer grazing. EU legislation also complicates running a competitive business in forestry. The reason is conflicts between different legislations,

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		challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	e.g., species directives, taxonomy, etc. These create uncertainty, which inhibits investments. Long permit processes are a hindrance, but this applies to all types of activities, not just businesses in the bioeconomy.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	See 3
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	Substitute away from carbon-intensive materials and energy sources. Support the development of products that can replace fossil-based products. The region can increase understanding of multi-use forestry, thereby reducing land use conflicts. Increased food production contributes to a higher degree of self-sufficiency and reduced vulnerability. The region can also participate in/contribute to platforms where dialogue with various stakeholders occurs, thereby contributing to a shared understanding of the

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			different conditions for utilizing various resources. b. Reduced societal vulnerability? Regionally produced food, fuel, and energy sources. c. Increased regional growth? Substitution. The tourism industry is the fastest-growing industry in Norrbotten. It is not the largest but grows the most, and for it to function, we need to find solutions to land use conflicts.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	In our region, the work with bioeconomy is included in the following strategies: Forest Strategy; Food Strategy; Smart specialization; Regional Development Strategy; solutions (platforms/meetings) to land use conflicts
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you	

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		think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	For the region to support companies The interpretation of ERUF and ESF by the Swedish Agency for Economic and Regional Growth (Tillväxtverket), along with the programs and regulations for 1:1 funds, determine how these funds can be used to support companies, including bioeconomy companies. Large companies operating in the bioeconomy chain usually cannot receive support unless it concerns research and innovation. The SMEs in the bioeconomy chain are very small and do not have the administrative and resource capacity to lead/participate in projects. In other sectors, companies are often small, but ALMI and IUC can often act as a bridge to involve small companies. In the field of bioeconomy, there is no equally clear recipient who can act as a bridge for bioeconomy companies. Norrbotten has a small tax base and does not have as many regional funds to use as desired. Larger regions have

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			better opportunities to choose how to support companies, but in Norrbotten, we are more dependent on the interpretation of the Swedish Agency for Economic and Regional Growth and the regulations for 1:1 funds.

1.3 REGION VÄSTERBOTTEN

Interviewee name, position and organisation		Lena Friborg
Date, time	June 9 2023	Place or virtual call: virtual

Key theme	#	Question	Response
Challenges/Barriers / Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	International obstacle: Forestry-unfriendly attitude from the EU Commission, which becomes a barrier to investing in forestry and further processing of forest raw materials into various products. It becomes harder to attract capital for investments, for example, due to the taxonomy regulation, but there are more examples where the EU contributes obstacles to forestry. National obstacles: For agriculture, complicated regulatory systems are a hindrance. The requirements themselves are not too high, but the regulations are complex and bureaucratic. The authorities also do not facilitate for individual companies, and it is not easy to contact the Swedish Board of Agriculture. The complicated

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			regulatory frameworks take time and energy from the companies. Other challenges in agriculture are generational shifts and competence supply. For aquaculture, a hindrance is the permit issue, both that it can be difficult to obtain permits and, above all, that the permit process takes a long time. Overfishing threatens coastal fishing and thus the regional development of locally produced food products and coastal culture.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	In our region, the work with bioeconomy is included in the following strategies: Forest Strategy; Food Strategy; Regional Development Strategy; Smart specialization
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a	a. increased climate benefits? Forest resources can help substitute fossil materials. Locally produced food contributes to many aspects. In Västerbotten, a lot of grass is grown, which sequesters carbon in the soil. Local food also reduces the need for transportation, etc.

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		wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	b. reduced societal vulnerability? Local food production is important for food security. The forest is important for society's energy supply, 40% is bio-based. North Swedishs produced locally/regionally/nationally can reduce the vulnerability of the transport sector. Now everything is supposed to be electrified, which can contribute to increased vulnerability. c. increased regional growth? Important to get companies to grow. For the forest, small-scale wood industry contributes most to regional growth. For regional growth, it's important to increase the processing of more long-lived products and the same on the food side to increase processing.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	I wish that Swedish Association of Local Authorities and Regions would be more active in regional development issues in general.
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation,	ERUF and rural development program - remove the watertight divisions so that there is a holistic view of the support. For there to be a better overall picture, the regions should take over the management of project funds in the rural development programs.

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		and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	See also question No 1 b. For the region to support companies One hindrance is the watertight divisions between agricultural policy and growth policy. Our regional development funds, such as 1:1 funds, ERUF funds, cannot be used to support primary production but only for the development of processing. To be able to develop new products, it is required that the entrepreneur must work on developing the entire supply chain, which prevents today's support systems. It is also a challenge for the region to constantly be updated about the various industries and have monitoring at the local, regional, and national levels and understand where the region's funds can be most useful.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a**	**If one expects something to happen at the regional level, a clear mandate with funding needs to come. Operational funds are scarce, which means that the human resources to monitor bioeconomy issues are very small at the region today.**

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		comprehensive bioeconomy strategy? (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	

1.4 REGION: JÄMTLAND/HÄRJEDALEN

Interviewee name, position and organisation		Kim Strömmer, Region Jämtland/Härjedalen
Date, time	June 8 2023	Place or virtual call: Virtual

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Regulations need to be reviewed to enable circular flows; for example, fish waste is currently not allowed to be used as fertilizer on agricultural land. The competitiveness of agriculture in the county is too low. Perhaps an investigation is needed that includes gathering knowledge on how neighbouring countries (Norway) manage to have a more viable agriculture. Silo thinking between different support schemes where a distinction is made between different types of companies. Agriculture, forestry, etc., often end up in separate categories. Reindeer husbandry is also often forgotten, and a concrete example was the support package for agricultural and fishing companies

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			due to Russia's invasion of Ukraine, which the government decided on in April. Reindeer husbandry also faced increased costs but did not receive any support.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	In our county, the development of bioeconomy is included in Forest Strategy; Food Strategy; Regional Development Strategy; Smart specialization
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	Climate- and site-adapted forestry Knowledge dissemination Digital technology can help facilitate smaller artisans/producers in accessing raw materials with specific characteristics. Forestry that considers/promotes multi-use with biodiversity, tourism, reindeer husbandry, and hunting can create regional growth through the emergence of small businesses.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a**	There should be room for variation. Cooperation

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		bioeconomy strategy for your region?	
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Poor infrastructure, road maintenance is inadequate, which affects businesses, especially within the bioeconomy. Strong clusters within the county or between different counties focusing on forestry processing, especially focusing on smaller forest owners, are lacking.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your**	It's good if there's some room for variation in how forestry is conducted.

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		region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy? (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	Market transformation cannot occur at the regional level but must be enabled at a higher level. In the forestry strategy in JH, reindeer husbandry issues have been integrated into all goals in the strategy, so now reindeer husbandry is not specifically mentioned, and that's not always good because there's a risk that reindeer husbandry will be left out and forgotten.

1.5 REGION VÄSTERNORRLAND

Interviewee name, position and organisation		Malin Vedin, Bioeconomy Stategist, Region Västernorrland
Date, time	May/June 2024	Place or virtual call: In place meeting in Umeå & Örnsköldsvik, and via response in digital questionnarie

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel,	At the regional level, we are always been able to handle issues from all perspectives. However, at the national level, there is still insufficient collaboration between political areas that impact - both from a regulations (laws/ordinances) and financing perspectives. For individual companies wanting to contribute to the value chain, regions cannot support primary production (agriculture/forestry). Similarly, regulations for supporting

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		competitiveness, finance and resource efficiency)	Research and Innovation (FoI) initiatives clash regionally and nationally. Even rules aimed at strengthening collaborative organizations like clusters and innovation environments, which could connect SMEs with larger companies and create conditions for a stronger bioeconomy, are currently considered anti-competitive. Consequently, they cannot be funded with public resources in the same way as before (i.e. European state aid rules) Short-term national policies that previously incentivized North Swedish development have shifted focus to the electric vehicle industry. This shift may cause concern and hinder investment and FoI willingness. Despite international leadership and strong national ambition, implementation lags across the entire country. Therefore, securing a robust national bioeconomy policy over the long term remains crucial. Regarding new EU regulations, some may complicate circular collaboration and significantly impact the forestry sector.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the	For many years, the region has demonstrated development capacity and been a driving force in transition, especially within the forest-based bioeconomy. The concept of 'Everything you can do with fossil materials can also be done more sustainably by the forest' was discussed in the early 2000s. The critical mass of large and small companies exists; there are research initiatives and

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		provision of skilled personnel, competitiveness, finance and resource efficiency)	research centers. Overall, together with other regions in Sweden, Västernorrland has cluster initiatives that strengthen the bioeconomy
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	a: Large companies often take proactive steps to enhance circularity in their operations. They focus on minimizing waste, recycling materials, and designing products for longevity. For example, SCA (a Swedish forest products company) has been a leader in sustainable practices, emphasizing circular economy principles. b) No idea c) I recommend referring to the S3 strategy (Smart Specialization Strategy). Our strengths lie in our identified areas in it, and a multidisciplinary approach connects different sectors within the bioeconomy. By leveraging knowledge and skills across industries, we can foster innovation and sustainable practices (multidiscipliunary skills)
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	One needs to look beyond the longstanding regulations of business and innovation support that differentiate the various parts of the value chain and see the possibility of collectively working towards increased circularity. Find more solutions, such as innovation impact, where exploration can have a greater role and also challenge the existing regulations and gaps between national and regional levels.

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	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	Increased prepardness and self-sufficiency What do the S3-strategies say? The Forest programme?
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	This question might have an answer in the comments on the questions above
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	See above
Additional Insights	8	**Are there any particular insights, observations, or concerns from your**	I think we should specifically highlight the gaps and conflicts between regulations for general

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		region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy? (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	business development and specific support within primary production/agricultural sectors, as well as corresponding delineations (and even more so between regional and national levels) regarding what can be supported within Research and Innovation (FoI). The new state aid boxes make it difficult to build stronger cluster structures.

2 NITRA REGION, SLOVAIKA

Interviewee name, position and organisation		Peter Kuric, Department of strategies and cross-cutting issues; Ministry of Agriculture and Rural Development of the Slovak Republic
Date, time	27.3.2024, 10:00 am	Place or virtual call: phone call

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Lack of knowledge capacity in bioeconomy in general (at farm level, SMEs, but also policy level and even at research level) is causing a problem across all regions. With not well understood topic (bioeconomy) it is difficult build awareness, policy, cooperation, and/or development on regional level. Examples of obstacles: non-existing umbrella body for bioeconomy, sectoral approach, too many strategic documents, different priorities, human capacities and skills, strategic planning.

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Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Active organizations, people from different sectors interested in this area supported by collaborative opportunities, cross-sectoral networks. There are some changes and reforms running within research area, which could bring improvement toward development of regional bioeconomy focused on decrease of administration barriers regarding the combination of different sources. The need to improve financing predictability, strategic planning is identified.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	Regions should promote the idea that bioeconomy is a good opportunity for additional income of farmers and foresters through added value of biomass being transformed into innovative bio-based products. In addition, it can help to benefit from bio-waste not only from environment point of view but also economically. This can be achieved through facilitating cooperation with other stakeholders, networking, mutual sharing of knowledge, finding best practices…
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	Funding programs and grants specifically designed to support cross-sectoral collaborations would incentivize organizations to partner on joint projects.
	5	**What further needs can you identify to develop a**	1) Addressing human willingness to cooperate, 2) Proper communication structures established

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		robust regional bioeconomy strategy?	3) Flexible organizational structures and incentives for collaboration
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	There have been several initiatives related to different parts of bioeconomy organised by various ministries, but due to unclear competencies different experts/representatives from relevant ministries participated in those events/initiatives – uncoordinated efforts led to fragmenting or even loosing knowledge rather than knowledge cumulation e.g. within a bio-related department within the ministry. Initiatives should always be coordinated from top down based on the needs identified by farmers and regional stakeholders. Bioeconomy general education should be also managed on the national level based on strategy developed on European level. European bioeconomy strategy is the cornerstone for development of national and regional bioeconomy oriented policies (specific calls for project proposals, technologies or initiatives that could be catalysts for intersectoral cooperation,…)
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	On the regional level high fluctuation of staff possessing specific expertise. Institutional and structural barriers: hierarchical organizational structures or rigid institutional frameworks inhibit collaboration by creating bureaucratic hurdles.

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			Too often changes of policy directions and priorities (not enough time to work on one specific topic continuously).
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	Investing in interdisciplinary training programs and educational initiatives prepares the next generation of bioeconomy professionals with the skills and mindset needed for cross-sectoral collaboration. Training programs may focus on teamwork, communication, systems thinking, and entrepreneurship. By leveraging these tools and approaches, stakeholders can overcome barriers to collaboration and unlock the full potential of cross-sectoral partnerships in driving innovation and sustainable development in the bioeconomy.

Interviewee name, position and organisation		Katarina Augustini, Strategy Section, Department of Innovations , Ministry of Economy
Date, time	10.5.2024	Place or virtual call: phone call

Key theme	**#**	**Question**	**Response**
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to	Bioeconomy not recognised as a priority at the national level (At the Ministry of Economy) Term “bioeconomy” is linked more with circular economy under

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		collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	responsibility of Ministry of Environment Circular economy is part of National Economy Strategy, but bioeconomy is missing at all. Lack of interministerial communication and coordination on strategies, in general Lack of relevant legislation mainly for hazardous waste to be used as a secondary raw material Lack of expert capacities at the Ministry of Economy (1 person is responsible for circular economy (cross-cutting issues)) Circular economy and waste are under competence of Ministry of Environment Missing strategy (within Waste strategy) how to better use bio-based waste for additional value added Not clear division of competences among relevant ministries in area of circular economy and bioeconomy

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Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Better use of hazardous waste for production/development of new materials (extraction) Improve added value in forestry and wood-related value chains Develop new value-added products from various bio-based waste (municipal, industry, ..)
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	Linkages with climate change/ societal issues and regional growth and resilience not recognised at policy level Secondary effects on climate change/ societal issues and regional growth and resilience are delivered from bio-based industry (not coordinated, measured, disseminated, …)
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	Competent officers with relevant expertise are needed at relevant positions within relevant ministries Important role of Research and Innovation Agency responsible for RIS3 Strategy should be recognised and strengthened as

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			the main coordination body for bioeconomy
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	There is a significant issue of the country to treat waste in general. To large extend this problem could be solved by decreasing municipal waste through better sorting, collection and processing of bio-waste at regional level. It is crucial to turn bio-waste into a secondary raw material and to benefit from natural circularity of bio-based products/waste/materials More and better (easy) information on bioeconomy is needed across the whole society (including policy, industry, young generation, public, media, …)
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level?	Regional competences are limited, that is why this problem has to be initiated at national level. EU competences, efforts and instruments (including financial) for strengthening bioeconomy are well set and sufficient but not realised/implemented at national level. Even at the national level there are funding programmes and measures to support bioeconomy, but they are not well-understood and coordinated.

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		• Finally, which components/policies do you think should be primarily managed at a European level?	
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	SMEs are active in business-oriented bioeconomy products not realising it is bioeconomy – they do it as normal business usually on local/regional level Young generation is more oriented on environmental-based solutions and thus attracted by bioeconomy. Bioeconomy Cluster plays an important role to promote, support and inform relevant stakeholders about bio-based opportunities and benefits bringing it from EU to national and regional level.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	Missing strategy (within Waste strategy) how to better use bio-based waste for additional value added Low efficiency in forestry – low value added of forest/wood processing

Interviewee name, position and organisation		Viera Juricová-Melušová, Department of Strategic Activities, Nitra Self-governing Region
Date, time	10.5.2024, 14:00 pm	Place or virtual call: zoom meeting

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Limited competencies of regional authorities, Lacking human capacities – not in numbers but in knowledge, Lack of data and information, Missing strategic document at national and regional level, Lack of training for regional authorities (but also interest), High fluctuation of government officers due to unstable / unsustainable political environment, Lack of motivation and knowledge to introduce new policies.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled	Nitra region is strong agricultural region with production of large volume of biomass (of various sources). Slovak University of Agriculture in Nitra and National Agricultural and Food Centre (NPPC) as strong research organisations placed in Nitra region (potential incubator of start-ups).

		personnel, competitiveness, finance and resource efficiency)	Development of new bio-based materials, value added products, substances. Development and testing of new processes and technologies. New business opportunities in bio-based industry.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	Any action would/should have secondary effects on all 4 issues: - To develop regional business models along with relevant stakeholders (bio-based waste management) - To enhance knowledge transfer and education in bioeconomy - To develop its own bioeconomy strategy - To strengthen its team relevant for bioeconomy
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	- Recognising bioeconomy and its strong potential by policy makers - Establishing a small division /appoint a person responsible for bioeconomy within Regional Authority. - Develop bioeconomy strategy based on regional needs, available key actors, infrastructure and existing collaborations/networks - Training of policy officers - Enable and support knowledge exchange
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	- To establish a stakeholder forum with the most relevant players - Allocate funding from OP

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			Slovakia through regional channels - Develop mechanism for monitoring and evaluation of the system
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	EU level is currently providing sufficient support (funding, technical solutions, training programmes, networks, etc) through various programmes (CBE JU, HEU, INTERREG, ...) National level (Ministry of Agriculture and Rural Development) should take leadership in bioeconomy (BIOEAST, + other projects available) – to set and strengthen framework through RoadMap to circular bioeconomy + benefiting from Programme Slovakia (PSK) and RIS3 strategy (Domain: Food systems and environment). Regional strategy should complement the national strategy with specific business models and pilot projects /initiatives in the region financed under PSK and Integrated Territorial Investments.
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Even innovative SMEs are not aware they do bioeconomy (lack of knowledge). Limited cooperation with partners (SMEs, research, …) at EU level. Limited cooperation among SMEs at national /regional level (lack of trust).
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance,**	The most crucial issue is no sustainable policy and business environment in Slovakia - **not well-developed policies**

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		policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy? (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	(without stakeholders engagement, not respecting real regional needs /potential, not adequate / appropriate funding mechanisms - **not properly implemented relevant policies** (administrative burden, changes priorities, cancelling calls, unacceptable long evaluations, unproper communication with relevant stakeholders, …) - **not well established and used monitoring and evaluation mechanisms** (punishment rather than learning)

Interviewee name, position and organisation		Natália Turčeková, assistant professor, Slovak University of Agriculture in Nitra (SUA)
Date, time	March 20th, 2024; 2pm	Place or virtual call: SUA, Nitra

Key theme	**#**	**Question**	**Response**
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel,	- Stakeholders do not understand the concept of bioeconomy - Insufficient information flow from policy makers both on regional and national level - Ambiguous policy instruments regarding bioeconomy both on regional but mostly on national level - Lack of functional financial schemes - Limited access to private investments

		competitiveness, finance and resource efficiency)	
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	- Biomass availability due to developed agricultural industry in regions - Networking opportunities for bio-based industries based on industries located in regions - Availability of skilled labour - Knowledge transfer from universities and research centres to support R&D of BBIs - Addressing the societal challenges related to climate change, bioeconomy, innovations,…
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	a. network the biomass producers with high value added industries with potential for decrease of carbon footprint b. identify societal challenges (climate change, bioeconomy, innovations, etc…); conduct comparative analysis of regional challenges; develop technological capacities to address societal challenges c. promote production diversification of industries focusing on BBPs with high added value d. create climate resilience plans
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a**	- Involvement of AgroBioTech research centre to organize workshops and networking activities for regional bioeconomy stakeholders,

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		bioeconomy strategy for your region?	- Business incubators and accelerators, - Initiatives to attract private investors
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	- Knowledge transfer from universities and research centres, institutes - Creation of coherent, and politically endorsed regional policy for bioeconomy - Filling the data gaps on biomass availability
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	- Information flow should be managed in a way, that regional stakeholders have a consistent information in clear and readable form from regional/national policy makers - Consistent and coherent national policies relevant for bioeconomy - Creation of net of advisors for bioeconomy related industries - CAP policies to reflect objectives of EU bioeconomy strategy
	7	**For companies in your region: What**	- At national/regional level – high level of bureaucracy

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		obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?	and administrative burdens when applying for funding, certifications, etc… - At national level - market obstacles, low consumers awareness on BBPs - At EU level – difficulties to scale up to international level
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	- Monitoring of bioeconomy – lack of data available on bioeconomy in regions – this obstacle prevents full exploitation of biomass availability as well as conducting the cost-benefit analysis - There are no policy incentives to support BBIs - There are no unified mechanisms to track R&D expenditures, market creation and development etc…

3 DELTA REGION, THE NETHERLANDS

Interviewees names, position Double interview			Willem Sederel, Non-Executive Director SYNOVA TECH and Chairman of the Board Circular Biobased Delta (extinguished)
Date			May 8, 2024
Key theme	**#**	**Question**	**Response**
Challenges/ Barriers/ Obstacles in Developing a	1	What <u>obstacles</u> stand out when you think of the <u>role of regions in both national and regional development</u>	National and European level issues = policy issues: North Swedishs subsidised but not

Robust Regional Bioeconomy		towards an enhanced bioeconomy in your region? (potential challenges might relate to *collaboration & information-sharing*, *policy/regulation* and the *provision of skilled personnel*, *competitiveness*, *finance* and *resource efficiency*)	biomaterials. When biomaterials are better use of biomass than North Swedishs. It continues… doesn't get solved at regional or national. Maybe only European or even global. Regional policies that are more related to how you deal with waste: some is decided at provincial level. Environmental dept of provinces have important role to play - they can be to some degree different from other provinces. Certain sectors are possibly more important to other provinces: e.g Chemical sector in Zeeland important but not as much in Brabant. (regional growth product: shows differences: agri activites = Zeeland high). Agricultural production: vegetables, not animals (in Zeeland); Brabant: more animal farming/especially pigs. North of the country: cows. Several differences = difference province priorities. Finance = also more/substantial at national and EU level. A few regional initiatives: via provinces, and IQ, impulse, BOM (local funding). Bom capital very important investment in Noord Brabant (favour companies coming there). Regional = ecosystem, meaning: conditions by which I can attract top talent to my region? Do the people (from abroad) find it interesting place? Enough high-level jobs. Attract and retain talents, even more, how to get the right skills developed in the regions: skills of the future, what are those. Not very clear what those are despite the studies (e.g. need for good engineers that can learn changing skills/knowledge fast specificities e.g. biotech aspect to adapt quickly in that specific job)

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			Value chain collaboration: new value chains need to be formed: chemical (precise and strict specifications/ 5 parts per million!) and waste sector (quality control is very different, “roughly” right)/ 5% e.g. completely different mindset and practices. Regional feedstock, varies a lot in quality, amount from region to region. Technology follows feedstock. Best tech for a specific feedstock. E.g. Sugar beat: carbohydrates/ very different from liquid cellulose (more in Scandinavia, Germany). That’s how companies pick areas: UPM, building bio refinery near Leipzig, because they have beech/high quality wood but not looked for furniture anymore. Changes in the market = new availability of feedstock = new markets Logistics also a challenge, a regional. Train, truck, multi-modal = depends on what the region has developed. Strength Delta: deep sea harbours, water way, good roads/trucks, trains, airports
Opportunities through the Bioeconomy	2	What opportunities do you see when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region? (opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel,	Innovation (also in policies/strategy) – regional ones are: Eindhoven, moved forward via Philips and now beyond ASML, high tech, the university of. Also chemistry sector. E.g. Wage/food valley = is a regional innovative approach: stakeholders in the region have invest and work on it. Developing NETWORK in innovation e.g. ASML is so special since throughout its suppliers and knowledge partners: 60 supporting them to enable to reach the status. ASML makes the machines that makes the chips (almost atomic level precision). The network invests to maintain its essential members to do well: e.g. ASML

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		competitiveness, finance and resource efficiency)	investing in companies that are essential to them. High level jobs and prosperity of the region by working on things that are booming: bringing good things for the community, better work-life, companies that don't pollute, healthy environment, education: to invest into attractive future. Keeping top talent. Making the sector grow gives you the means to prosperity and well-being by investing and the right sectors. Leads to strong social structure: growing as a society, not necessarily money per se. Focus is to have the region prosper in all its aspects: also social development. Environment, not only financially, politically. Bioeconomy in its extreme form also the concept of fair sharing: not farmers making the least and retailer.
Synchronization between EU, National and Regional Strategies	3	How do you think the alignment between EU, national and regional strategies in terms of bioeconomy should be improved? Do you see specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level – national – EU level?	As a region: first, it's important to identify what makes sense to do at regional level, then identify stakeholders at national and supra national level= collaboration (of course, in your region too but other regions, provinces). Lobbying for policies for a region alone, e.g Chemelot, doesn't always work, even they are connecting with others for certain NL positions. Also the region Groene Chemie Economie has been formed: having this network is key. Here is where the trilateral region NR, Flandes, NL come into play (a G7 country!)

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Interviewees names, position Double interview			Anita de Moor Policy officer circular biobased economy, Province of Zeeland
Date			April 8, 2024
Key theme	**#**	**Question**	**Response**
Challenges/ Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	***Which is the main challenge faced by the province in currently developing the bioeconomy?*** ***What is missing or what needs to be changed with most urgency?***	We are missing the Circular BioBased Delta (CBBD, the regional initiative that has been recently extinguished). The clarity brought by the organization, a consortium where the whole value chain was represented. The CBBD formulated the entire value chain research lines, biobased asphalt, sugar. Perspective/plan overview 5, 10 years. Calculations that were shared we us (as in how much CO2 you reduce with this project, that project) made it easier to decide which path/projects to take. Very useful to policy makers to identify where to invest that 1 euro. Now how to help the companies with the transition without that crucial information? It is much more difficult.
	2	**What do you consider are the main obstacles from EU, national, and provincial level for companies in Zeeland?**	There are the slow movers and fast movers companies who need to be considered for this question. Fast: finance of the scaling up; slow: they still need to realize the need for change and become one of the fast movers; smart delta resources wants to make a campaign to MKVers (SMEs) through social media.

			Big companies are saying what problems they have (inventorying), while the small ones solve their issues via innovative ideas (e.g., solving via contests). We also need to be concerned about the fact that a cluster of chemical companies need lots of energy. Basically, a BIG CHALLENGE is energy, clean energy. A lot of electricity is currently necessary when working on hydrogen processes, and several other ones. The main concern is whether it will be enough. How to use less energy if making yeast, bacteria grow, enzymes, and so on. Biotechnology can be a solution, but it's a very big transition, and intermediate steps are needed. They are now looking int hydrogen/ water and electricity, but what's after that? And is there enough electricity? Another concern is the fact that the Delta region has been facing rising tides, at a significant pace. Storms in the North Sea, in the Western area, those are great risks. This entire bioeconomy industry conversation, therefore, needs to be strongly linked with other concerned: climate change (seen e.g., rising tides), clean energy (seen the high consumption levels of these industries). Are there enough economic incentives for the large companies to look into low energy processes?
Opportunities through the Bioeconomy	3	**Considering that Zeeland as well as other regions are involved in advancing the bioeconomy, WHERE do you see opportunities for collaborations for learning, topics of common interests, ways to collaborate?**	We often collaborate and learn from Flanders, Germany, France. A lot was done via CBBD. The Pilot Plant Ghent is a great inspiration for us. A lot of development to learn / collaborate more: the North Sea Port is in the collaboration NL with the Flemish side. I hope

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			that it will be more intensive now the collaboration with the pilot plant Ghent

Interviewees names, position Double interview			Karen van Schaik, Policy advisor circular and biobased economy, Province of Zeeland Resie Beulen,Environmental policy advisor, Province of Zeeland
Date			April 22, 2024
Key theme	**#**	**Question**	**Response**
Challenges/ Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	- Shaping and "sustainably" realizing a (triple helix) regional structure for business support = innovative SME and large companies. Important points of interest in sustainability are: + danger that the triple helix will lead its own life / is too much focused on companies, giving governments the feeling that they have little or no influence anymore, while a large amount of money is going to it. + if governments have to make financial choices, there is a danger that the government will opt for organizations in its own region that are perceived as more "ours". + there is no political will to provide long-term financial support for supra-regional triple helix organizations. Governments expect that after a number of years the supra-regional triple helix will be able to support itself financially through, among other things, financial contributions from the business community. + It is difficult to get both the business community and

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			governments to participate in the triple helix and to maintain the connection over the long term. - Limited influence on companies regarding connection to triple helix. Triple helix should really connect to what companies need. Large, international companies do not necessarily need cooperation and can do a lot themselves. - A structure that connects the existing regional consortia/organizations in a focused way and thus accelerates the transition towards biobased. A kind of umbrella under which program lines will hang that involve the business community, both large and small companies (SMEs). Program lines appointed by large companies and innovative SMEs. - Exchange of knowledge and cooperation across provincial borders. - Support of the regional actions/roles by the national level could be better on a number of points (think monitoring, financial support to municipalities for commitment to transition,...). - As a region little influence on the plans made by the national government. The plans of the national government can therefore sometimes thwart the plans of the region. - At the national government CE falls under the Ministry of Infrastructure and the Environment (coordinator) and the Ministry of Economic Affairs (executive for manufacturing industry and raw materials strategy). Because CE is handled in several places it is difficult for regions to find out where to go for a particular topic.

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Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	- Stimulate future-proof regional business that emits much less / no CO2 and is no longer dependent on (fossil) scarce raw materials from politically unstable regions - Build close triple helix consortia around business themes, so that companies stay in the region or come to the region. - Support knowledge building by frontrunners/consortia and ensure that companies can put that knowledge and experience to good use - Encourage better utilization/valorization of regional waste streams so that the competitive position of companies improves in the future and there are no more "waste streams" in the region and cycles are closed at the smallest possible scale. - Exchange of knowledge and cooperation across region/province boundaries. A knowledge platform on waste or raw materials could provide support here. This platform is in formation, but financing and staffing is still an obstacle. (with land flows/waste streams you are too limited if you want to solve this all within the province, better to think regionally = beyond 1 province). - Financially support business through the various regional funds/Impulse - In region more contact and connection with and between companies so that companies can be better supported and companies cooperate earlier and more in the region (e.g. waste streams) - There is now an opportunity to opt for the low-energy biobased processes, reducing energy demand and making

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			companies less dependent on new energy infrastructure
Needs to attain Desired Strategic Actions	3	**What initiatives or actions related to finance, policy/regulation, and collaboration do you feel should be incorporated into a Bioeconomy Strategy for your region?**	- Build close triple helix consortia together with the regional companies around company themes, so that companies stay in or come to the region - - More attention and bundling of concrete input from companies. Promote chain approach and alignment of VTH (Licensing, Supervision and Enforcement) instruments accordingly. - By conducting pilots and trials, gain experience and learn from each other. - VTH implements regulations for which a permit or notification is mandatory. General regulations surround this / are more framework-setting and deal, for example, with questions such as "what is waste and what is raw material?". - Maintain tailored financial support (this is due to possible new national / EU political direction) - In procurement, use tools that measure sustainability impact, e.g. from MVI platform. - Level playing field on two levels: + blending obligation: valuable green building blocks are now mandatory to be blended while companies / frontrunners now need these green building blocks as raw materials + How do regulations in different EU countries compare?
Synchronization between EU, National and Regional Strategies	4	**How do you envision the alignment between EU, national and regional strategies in terms of**	- **Regional**: create roadmaps for each region by globally reviewing the existing regional project portfolio for impact = CO2 reduction and increased use of renewable resources.

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		bioeconomy for your region? • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	- **National**: + ensure good and adequate laws and regulations, so that a bioeconomy is easier to make possible with good VTH instruments. Prioritization (including in the basic tasks of the Environmental Services = ODs) and filling in important financial preconditions is important for this. Because there is now no legal obligation to give substance to this subject, governments choose to place their capacity and priority elsewhere. + ensure knowledge exchange between regions & ensure national monitoring and adaptation VTH and general regulations + involve the regions more in the (formulation of) national policy + stimulate awareness among the large group of companies (platoon), activate and help / offer tools in their quest for transition - EU directives such as for textiles, right-to-repair etc, are very important, these force transition in the region and ensure a level playing field in the EU! - Maintain and possibly increase financial support for businesses and governance structures by the EU, national government and regions. Important criterion for granting subsidies to companies: impact in terms of CO2 and raw materials!
	5	**Regarding the companies in your region: What obstacles/challenges do you notice these companies face at a EU/national/regional level in relation to finance,**	- The journey of and innovation from Technology Readiness Levels (TRL) 1 to TRL 8 is a long way for an innovative company. One idea could be to examine at an early stage what the potential, the impact is / could be of the innovation and a strength / weakness analysis by an

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		policy/regulation, and collaboration?	independent engineering firm and finance that as a government. This accelerates for the company the path from TRL 1 to TRL 8 and may reduce the costs associated with this path. - Overview of grants and opportunities for support - Financing Valley of Death through "patient risk capital" - Permits remain an issue (e.g. effluent through pipe = waste, effluent in ditch not). Legislative adjustment is still a viscous process. An interim solution could perhaps be to give the Regional Implementation Services (RUDs) more ability to tailor? Or give more publicity to what room there already is for experiments? - Perhaps search for relevant partners, suppliers and potential buyers is sometimes difficult and takes time. Work more with databases (such as Symbiosis4Growth) or digital marketplaces (such as from NSP) or with the Regional Development Companies (ROMs)? - Information sharing is sensitive when jointly setting up value chains or gaining insight into volumes, for example. In "energy," a data safehouse is being used, where companies can enter their consumption, for example, and then this data can be used anonymously. - Carbon credits and fuel use exemptions make use of syngas for running processes less interesting, while this is perhaps the most efficient. And where in the chain do you take the loss.

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3 Additional Insights The following are optional questions, but it would be highly appreciated if a few insights could also be shared here	1	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (Any specific insights from the governance KPI results? i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	- A euro can only be spent once. That is why it is important to make the right choices. An argument in favor of calculating the impact of a certain innovation at a relatively early stage and drawing up a strength-weakness analysis so that it becomes clear where the "weak spots" are so that they can be anticipated at an early stage. - Guidance for start-ups such as, for example, the acceleration program of Green Chemistry New Economy. Start-ups sometimes have a lot of technological knowledge but little knowledge of marketing.... - Strengthen cooperation in education: involve students more in the implementation of the yet to be drawn up program lines for innovative SMEs and large industry (calculating, making LCAs for procurement database etc.) - Even more biobased procurement as governments (provided this is the most sustainable solution).
	2	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	2a. have initiatives assessed at a relatively early stage by an independent agency/expert panel for impact and appropriateness in the region 2b. The trick is to involve people/organizations/companies in the transitions and get them moving by providing good information and, as government, rewarding/facilitating good behavior. Towards companies, the business contact officers of municipalities may be able to play a role in this in addition to the development companies such as Impuls and perhaps also the RUD. Coordination between the three parties may be useful.

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		Ons is onduidelijk wat precies met deze vraag wordt bedoeld.	Towards consumers, the municipalities can play a role in collaboration with ZMf, IVN, local initiatives, etc. See draft policy plan "Zeeland Circular". Towards regional authorities: perhaps the Province of Zeeland, all Zeeland municipalities and Scheldestromen Water Board can cooperate more regarding knowledge exchange, support innovative SME's etc. See draft policy plan "Zeeland Circular" 2c.These are tasks of the development company Impuls and the port company NSP 2d. increase regional resilience by all that has been indicated above (see answers to questions 1 to 5).
	3	**Beyond initiatives/actions related to finance, policy/regulation, and collaboration, do you see other elements that need to be present to allow for a robust regional bioeconomy strategy to develop?**	The will has to be there. If companies and governments really want to, a lot is possible. Even now with current regulations.

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4 NORMANDY REGION, FRANCE

Interviewee name, position and organisation		Benoit TREBERT, project manager, VALORIAL
Date, time	April 16th , 14.00	virtual call

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	1. The sharing and exchange of ideas between companies, research laboratories and public organization in order to encourage and carry out collaborative projects. 2. The realisation of these projects is often limited by the budget and investment priorities of the stakeholders involved (with the various crises and. Rising raw material and energy costs). 3. Development of policies and regulations that encourage innovation. (Favourable environmental and tax rules). 4. Funding bioeconomy projects and research infrastructure. 5. Facilitating access to resources and infrastructure, technological platforms to share equipment (technological demonstrator, Technopole, agri-campus, etc.). 6. Informing and raising public awareness to generate interest.

Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	1. Training and informing companies about the players in the bioeconomy. 2. Promoting success stories at national and European level (as was done in the BIORURAL project with Natrueplast). 3. Encourage public/private partnerships
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	1. Carbon capture, renewable energy 2. Local development in agriculture, food processing and R&D 3. Promotion through clusters. Enhancing the value of resources 4. Facilitating short circuits and diversifying sources of income.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	1. -Investment in research related to the bioeconomy through project subsidies for start-ups and companies and/or tax incentives to invest in the bioeconomy. 2. At the policy level: promote the use of renewable raw materials. 3. At regulatory level, facilitate procedures with clear regulations to encourage innovation. 4. Facilitate and promote collaboration between public and private players. 5. Establish international partnerships to exchange knowledge and best practice.

	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	Develop strategies to combat food waste and recover recoverable household and industrial waste.
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	Alignment between European, national and regional strategies in terms of bioeconomy can be : - At **regional level**, through collaboration between companies, universities, research centres and local players. To be able to adapt bioeconomy strategies to the specific resources of the region. Helping to develop infrastructure such as territorial demonstrators specific to the bioeconomy. - At **national level**, by drawing up policies and regulations to encourage the development of the bioeconomy and funding projects. - At **European level**: The European Union can play a key role in coordinating efforts between Member States. It can also harmonise standards and practices to facilitate exchanges and collaboration. EU funding for research and innovation in the bioeconomy. The three levels must play complementary roles to facilitate the bioeconomy.

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	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Obstacles: - Funding is often linked to strict eligibility criteria. - At regulatory level, which can slow down the innovation process and increase costs. - Collaboration: Coordination between the various players involved in a collaborative project can be complex.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	The Normandy region offers initiatives such as support for collaborative innovation and Impulsion Innovation to help businesses overcome these challenges and prosper.

Interviewee name, position and organisation		Sophie RABEAU-EPZSTEIN, Energy and Biobased Products team manager, in charge of the Agromaterials and Plant Chemistry projects, Normandy Chamber of Agriculture
Date, time	April 12th , 9.30-10.30	Virtual call

Key theme	**#**	**Question**	**Response**
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	The obstacles to the development of the bioeconomy are : 1. **Regulations**. In France, regulations need to be simplified at both regional and national level. 2. Balance between **food and non-food**. The public needs to be made aware that there are sufficient resources. For certain sectors and depending on the objectives of the transition, quantities may be limited. 3. The **quantity of biomass** needed to meet the challenges of the bioeconomy strategy. 4. **Collaboration between stakeholders** in

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			the bioeconomy ecosystem. Better collaboration should encourage the development of the bioeconomy 5. **Fluctuating oil prices** can be a barrier. In times of crisis (increase in oil prices), people work more on projects related to the bioeconomy. Example: in 2008, a sharp rise in oil prices encouraged the development of projects. In 2012, a drop in oil prices brought projects to a halt. Today, the price of raw materials and energy is rising, which is encouraging projects. What will happen if prices fall?

Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information- sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	The opportunities for developing the bioeconomy are : 1. **Regulation**. New regulations such as the RE2020, the zero-carbon challenge and the regional COP are real challenges for developing the bioeconomy. 2. Availability of **new funds** (financing) by the Normandy Region to help structure new bioeconomy sectors. 3. **Development of regional and national policy** in favour of the bioeconomy 4. **Local stakeholders** are familiar with the ecosystem and can act as relays to encourage the emergence of new collaborative projects.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	1. The **presence** of a large number of **strong stakeholders** in Normandy makes it easier to develop projects and support companies. 2. **Normandy's bioeconomy strategy** has been drawn up, setting out its challenges, ambitions and 5 priorities. 3. The **regulations** 4. The desire to **relocate** certain activities 5. Companies can **diversify** their activities and thus generate income that complements their core business.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you**	1. Setting up a **biomass observatory** would provide a better understanding of all available sources (volumes and locations).

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		suggest should be incorporated in a bioeconomy strategy for your region?	Communicate on the **use of biomass** for both food and non-food purposes. These 2 uses are complementary and can coexist very well, but the general public needs to be informed in order to avoid misunderstandings.

	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	If the bioeconomy is to develop, there needs to be **better collaboration** between the various stakeholders in the region. The actions/projects of each can lead to duplication and thus hinder the effective development of the sector.
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? Finally, which components/policies do you think should be primarily managed at a European level?	1. **Regulations** must be aligned at European level to avoid distortions leading to economic inequalities. 2. **Local representatives** need to be better informed about bioeconomy strategies. At present, they are unfamiliar with the players involved in supporting businesses and local authorities in matters relating to the bioeconomy. They also lack knowledge o the possible levers of aid and funding. Lastly, a better understanding of technical solutions would make it easier for companies to set up in their areas. 3. **Collaboration**s must be developed to accelerate the objectives of the bioeconomy strategy.

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	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	1. **Companies** are faced with regulations that block their innovation. 2. They are **unfamiliar** with the **stakeholders** who can help their projects succeed. 3. They have little or no knowledge of the **funding** available to develop their projects.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	Alerts should be put in place on issues of concern in relation to economic activity in Normandy. These worries are not being taken into account and therefore are not being dealt with as a preventive measure to facilitate transitions.

5 TUSCANY REGION, ITALY

Interviewee name, position and organisation		Sofia Mannelli, President of chimica verde bionet (https://www.chimicaverde.it/)
Date, time	25/05/2024	Place or virtual call: Milano

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness,	• Administrative procedures for both companies and civil society included in regional calls for tenders. • Lack of coordination between the different departments involved in bioeconomy projects (in particular Agriculture, Productive Activities, Environment).

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		finance and resource efficiency)	
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	• Reduction of environmental pressure on ecosystems and their conservation through the use of renewable resources both as energy sources and bio-based products; • Synergies between industry and agriculture and opportunities for innovation and competitive gains for the 2 sectors • Improved waste and by-product management; • Opportunities for qualified employment;
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	• Developing ad hoc calls for proposals and improving their management; • Working on communication and co-creation by improving the sharing and participation of ideas and actions with civil society in order to reduce social challenges. The region of Tuscany has the best regional law on public debate among all Italian regions;
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	Prioritising access to subsidised forms of credit because the bioeconomy involves investment in innovation

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	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	Priority in public procurement for bio-based products meeting sustainability criteria
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	• At regional level, territorial projects should be managed by streamlining the management of EU resources • Waste and by-product regulations must be maintained and improved at national level • At the European level, all regulations concerning obligations and incentives for forms of the bio-economy are to be
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Excessive and slow bureaucracy Municipal technical offices incompetent with innovation, training needed
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to**	Streamlining the timing and forms of control, validation and payment of projects of regional competence

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		consider for a comprehensive bioeconomy strategy? (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	

Interviewee name, position and organisation		Alessandra Gemmiti, Programming Officer for the Agriculture and Rural Development Directorate of the Region of Tuscany
Date, time	24/04/2024	Place or virtual call: Firenze

Key theme	#	**Question**	**Response**
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	As the region of Tuscany, a round table on the bio-economy was organised in 2017/18 with all the directorates involved and a document agreed on the state of the art, opportunities and requests from stakeholders. No other major initiatives were organised apart from a few sporadic events on request.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced**	The Region of Tuscany recognises in the aspirations of the bioeconomy the opportunity of a sustainable development that combines the protection of natural resources, the proliferation of

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		bioeconomy in your region? (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	technological innovation and social and cultural growth, in harmony with the European and global context In the programming and implementation of some calls for proposals under the 2014-2022 Rural Development Plan, 5 Operational Groups + 14 cooperation projects (ex 16.2) related to the bioeconomy have been admitted for funding
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	These are certainly objectives that the Region of Tuscany (Agriculture and Rural Development Directorate) supports and promotes through the ad hoc instruments mainly with the new programming and its rural development complement.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	To favour the generation of a regional strategy on the bio-economy, some stakeholders are invited to present possible strategic alliances with research bodies, institutions and companies they know. The aim of comparing and sharing their collaborations with other subjects clearly leads to favour opportunities for coordinated participation of Tuscan subjects in European projects.

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	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	Collaboration between directorates and stakeholders is appropriate for a synergy of objectives and results. Activities related to the bio-economy/circular economy move from the primary sector to the fourth sector, including training, consultancy, information, etc. Establish a Bioeconomy Platform and organise conferences for bioeconomy players at regular intervals. Establish a Bioeconomy Observatory. Support the development of regional and national bioeconomy strategies. Promote strategic dialogue at local, regional and national level with responsible authorities in order to maximise the impact of existing funding mechanisms. Develop international cooperation in bioeconomy research and innovation so as to jointly address global challenges
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more	The first step should be to set up a regional bioeconomy strategy, possibly with time targets aligned with the European strategy (2030). The approach to the strategy should be multi-sectoral, seeking to develop links between actors that are not normally used to working together. The absence of a district or technology pole dedicated to this subject does not make the task any easier, but it is

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		effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	possible to involve several actors who may have an interest. In order to be able to define a strategy, it is necessary to involve local players, to take stock of the state of the art in order to identify: key players, scientific knowledge, economic prospects, the most promising geographical areas and biomass stocks, logistics and finance. European, national and regional strategies should necessarily be aligned, sometimes there are time lags that slow down the implementation of policies in general. I don't think there is a need for mainly European management.
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	N.A.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as	They are crucial and desirable: • Securing research funding, EU and national, public and private. Development of ERANET, Bioclusters (through the European Institute for Technology), Public-Private Partnerships, Research through Joint Programming. • Increasing the presence of multidisciplinary and cross-sectoral research and innovation. • Support for knowledge networks and consultancy

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		e.g. R&D expenditure, emissions, regulation etc.)	and business support services. • Organisation of university discussion platforms for the development of new curricula and vocational training courses in the bioeconomy. In reality, there is a lack of continuous policy/regulatory coordination for the bioeconomy. It is a complex of actions that need to be linked to make activities more efficient for a more collaborative strategy.

Interviewee name, position and organisation		Giacomo Giannarelli, CHAIRMAN FOUNDING MEMBER, Innovation Manager and Policy Maker, Toscana Innova (https://toscanainnova.it/)
Date, time	25/04/2024	Place or virtual call: Firenze

Key theme	**#**	**Question**	**Response**
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel,	• Absence of a waste plan, • Utilities companies without a strategic strategic vision, • Absence of grants for companies, clear and effective • Absence of interlocutions between the various districts industrial districts. • Total absence of the banking world.

		competitiveness, finance and resource efficiency)	
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Positioning Tuscany as the first 100% Green region in the world, development of a regional bio-economy chain across Tuscany's production sectors. Reduction of costs and environmental impact for companies and citizens.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	Non-repayable grants, framework agreements with the banking system, coordination of universities and research clusters.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	• Demand mapping, development of innovative biobased zero km solutions. • Regulatory simplification, contributions for business creation.

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	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	Interlocutions with the agricultural world and production districts.
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	• Facilitation of access to direct EU funds self-sufficiency for abundance, support for territorial resilience with a view to global export. • Support for the short biobased supply chain. • Rare earth substitution. • International sharing of biobased research and knowledge.
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	% low contribution, high payout times, inaccessible European funds, university system far removed from the needs of people and businesses
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to**	Mapping the demand for fossil-based materials, mapping possible solutions, identifying strategies for the gradual conversion of the economic system.

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		consider for a comprehensive bioeconomy strategy? (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	

6 WESTERN MACEDONIA, GREECE

Interviewee name, position and organisation			Sakellariou Kiriaki, Project manager, DIADYMA S.A.
Date, time	6/6/2024		Place or virtual call: virtual call

Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	We face significant challenges in advancing the bioeconomy in our region. Complex and inconsistent regulations impede innovation and investment in sustainable bio-based initiatives, necessitating streamlined guidelines tailored to the bioeconomy's needs. Additionally, a shortage of skilled personnel in areas like organic farming and biotechnology underscores the importance of targeted education and training programs. Access to finance poses another obstacle, particularly for small and medium-sized enterprises (SMEs) in rural areas, emphasizing the need for innovative financing mechanisms to support bioeconomy initiatives effectively. Overcoming these hurdles demands collaborative efforts, strategic policy interventions, and targeted

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			investments in education and financing.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Access to funding and resource efficiency are critical enablers of bioeconomy development. Western Macedonia can leverage public-private partnerships, grants, and other financing mechanisms to support sustainable agricultural practices and bio-based projects. Moreover, promoting resource-efficient technologies and practices, such as precision agriculture and circular economy principles, can optimize resource use and enhance economic sustainability.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	a. Enhanced benefits towards climate neutrality: By prioritizing bio-based practices like composting and anaerobic digestion, regions can effectively reduce organic waste sent to landfills, thus minimizing methane emissions, a potent greenhouse gas. Furthermore, harnessing biogas from organic waste for renewable energy production reduces reliance on fossil fuels, further mitigating carbon emissions and advancing towards climate neutrality. b. A robust bioeconomy promotes sustainable waste management practices, which not only alleviate environmental burdens but also address societal challenges such as waste pollution and resource depletion. By actively involving stakeholders in recycling and resource recovery initiatives, regions foster community engagement and collaboration,

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			leading to a shared responsibility for environmental stewardship and social cohesion. c. Investing in bio-based waste management infrastructure creates opportunities for regional growth and economic diversification. The production of valuable resources such as compost and biogas generates new revenue streams and job opportunities, particularly in rural areas where agriculture and waste management intersect. d. The production of renewable energy from organic waste strengthens energy security and resilience to disruptions in traditional energy supply chains, ensuring continued operations even in challenging circumstances.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	Firstly, establishing funding mechanisms to support investments in bio-based infrastructure, like composting and anaerobic digestion plants, and providing financial incentives for businesses and farmers adopting bio-based practices. Secondly, developing clear regulations promoting organic waste recycling, bio-based product use, and renewable energy sources, alongside standards for product quality and safety. Lastly, fostering collaboration to develop and implement a cohesive bioeconomy strategy, facilitating knowledge-sharing and forming partnerships for educational outreach initiatives.

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	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	Enhancing research and innovation in bio-based technologies and practices through funding support and collaborations with academic institutions is crucial for driving improvement and competitiveness. Capacity building through training programs on organic waste management, renewable energy production, and sustainable agriculture practices is necessary to equip individuals and businesses with the skills needed for effective participation in the bioeconomy.
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	At the regional level, specific areas require more effective management such as allocating regional funds to support local bio-based initiatives and tailoring regulations to the unique characteristics and priorities of Western Macedonia. Certain components, such as setting overarching bioeconomy goals, establishing national regulations for bio-based products, and coordinating inter-regional collaborations, should primarily be managed at the national level. Government can provide strategic guidance, allocate resources, and harmonize policies across regions to ensure consistency and coherence. Additionally, components/policies related to cross-border collaboration, research funding, and market access for bio-based products should be primarily managed at a European level.

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	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Securing funding for bioeconomy projects is challenging due to competition and complexities in accessing EU and national financial support mechanisms. Compliance with regulations on waste management, environmental protection, and product standards presents difficulties, particularly for smaller enterprises. Moreover, inconsistencies and overlaps in policies across national, and regional levels create confusion and administrative burden.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	Several insights and concerns from our region are crucial to consider for a comprehensive bioeconomy strategy. Concerning policy and regulation, there's a necessity for harmonization and alignment of regulations across EU, national, and regional levels to streamline compliance and facilitate innovation in the bioeconomy sector. Enhancing collaboration among stakeholders is essential for knowledge-sharing and coordinated action.

Interviewee name, position and organisation		Tsimplinas Dimitris, Director, Forestry Directorate of Western Macedonia
Date, time	7/6/2024	Place or virtual call: virtual call

Key theme	**#**	**Question**	**Response**

Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Policies and regulations may affect the ability of the Directorate to operate effectively. This may include policy on biomass utilisation, forest protection and bioeconomy development, while competitiveness in the biomass market may affect the Directorate's ability to utilise surplus biomass.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	The use of surplus biomass from forest ecosystems can create a new market for the production of North Swedishs, timber and other products. The Directorate can facilitate the development of industrial facilities to process this surplus biomass. Recently, the creation of tourist trails, hiking, climbing and other activities in the forests has been discussed as a way to attract visitors and contribute to the local economy.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement;	a. The use of surplus biomass for energy production can reduce dependence on fossil fuels and achieve climate neutrality, while using resources from the bioeconomy to support reforestation programmes, contribute to carbon sequestration and minimise the environmental footprint of the region. b. Increasing employment in sectors such as forest protection, bioenergy production and

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		c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	recycling can reduce unemployment and social challenges and improve social cohesion. c. Promoting regional development and local economic diversification can be achieved by developing new markets for products such as North Swedishs and biofertilisers. d. Yes, the bioeconomy can enhance regional resilience if local communities play an active role in managing the region's forests and resources, promoting local self-management and sustainability, and if infrastructure and investment are improved to support forest resilience with fire prevention and response systems.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	In terms of funding, it would be appropriate to use Horizon Europe type funds for research in bio-economic areas. LIFE programmes could also be used to fund environmental and climate actions related to biomass management. The Recovery and Resilience Fund could also be used to invest in green energy and sustainable development projects. Policy initiatives should be taken to modernise forest management legislation and to ensure that biomass harvesting and use practices are sustainable and environmentally sound. An initiative is also needed to develop a strategic plan with objectives, actions and timetables for the development of the bioeconomy.

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			Cooperation requires initiatives to create consortia for the development of biomass utilisation projects and the promotion of bioeconomy products, the exchange of best practices and know-how through networks, and the integration of these initiatives and actions into a bioeconomy strategy to contribute to the development of a sustainable, resilient and economically diversified region of Western Macedonia.
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	In order to develop a strong regional strategy for the bioeconomy in the region of Western Macedonia, it is essential to develop training programmes for workers in the fields of forest protection and biomass management. We have been asking for this for years, but we have not been able to find the necessary funds to implement it, nor have we been able to find the right conditions to work with the university to develop the programmes. The region needs to attract investors, but it also needs to give them incentives to invest in bioeconomy projects.
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration	The alignment of EU, national and regional strategies for the bioeconomy in the region of Western Macedonia is necessary for the sustainable development of our region. At the regional level, local needs and specificities need to be recognised so that general guidelines can be adapted to

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		that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	specific actions that best serve the region. At the national level, legislation and regulations need to be managed in order to formulate a single regulatory framework that supports a sustainable bioeconomy throughout the country. The development of tax incentives and subsidies for the bioeconomy is also a national issue that can strengthen the bioeconomy. At the European level, the allocation of resources from the European budget to support regional and national projects, compliance with the European Green Deal directives and targets to reduce emissions and promote sustainable development should be manage
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Businesses face a number of obstacles and challenges. At EU level, the complexity and frequent changes in European regulations create uncertainty and delays in investment, and the need to harmonise European regulations with national policies and regional rules can cause delays and additional costs. Difficulties in developing transnational partnerships and networks to promote the bioeconomy limit access to new markets. At regional level, the lack of sufficient resources and limited access to local financial instruments makes it difficult to attract investors, while the need to adapt national and European

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			regulations to local conditions creates additional challenges. At national level, lengthy procedures and bureaucracy for approving funding can delay project implementation, while the lack of a clear and stable regulatory framework for the bioeconomy creates uncertainty for investment, combined with lengthy and complex permitting procedures.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	In terms of funding, the availability of financial resources at local and regional level is often limited, which can hinder the implementation of bioeconomy projects. In terms of policy/regulation, harmonisation of local, national and European regulations is crucial to facilitate procedures and reduce bureaucracy, while approval procedures for bioeconomy projects need to be simplified and accelerated to facilitate project initiation and implementation. Finally, cooperation between public and private actors in Western Macedonia and Greece needs to be strengthened.

Interviewee name, position and organisation		**Damatis Nikolaos, Secretary General, HELLABIOM**
Date, time	**5/6/2024**	Place or virtual call: **virtual call**

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Key theme	#	Question	Response
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	Fragmented stakeholder engagement complicates collaboration among businesses, research institutions, agricultural cooperatives, and government bodies. Information silos lead to inefficiencies and duplication of efforts. Also inconsistent policies and complex regulations create uncertainty and delays. Competition from other energy sources and rapid technological advancements pressure the biomass market while access to funding is difficult, particularly for smaller enterprises and startups. Perceived risks associated with biomass projects, such as technological uncertainties and regulatory changes, can deter potential investors.
Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	I see significant opportunities for regions to drive bioeconomy development in Greece. Regions have abundant biomass resources, like agricultural residues and forestry by-products, that can stimulate rural development and job creation. Access to EU and national funding, along with aligned regional policies, supports renewable energy and sustainable development. Adopting circular bioeconomy models enhances resource efficiency and carbon reduction. Developing bio-based products opens new markets and enhances export potential, positioning

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			regions as leaders in the bioeconomy. By leveraging these opportunities, regions can play a crucial role in advancing the bioeconomy, driving sustainable development, and contributing to Greece's overall economic growth.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	a. By shifting towards renewable bioenergy sources and implementing sustainable practices, regions can significantly reduce carbon emissions, contributing to climate neutrality goals. Biomass utilization offers a carbon-neutral alternative to fossil fuels, mitigating greenhouse gas emissions and promoting a cleaner environment. b. A thriving bioeconomy creates employment opportunities, particularly in rural areas, reducing unemployment and poverty. Furthermore, the inclusive nature of bio-based industries encourages wider stakeholder engagement, fostering collaboration among businesses and communities to address societal challenges effectively. c. Regions can capitalize on their unique biomass resources and local expertise to develop specialized bioeconomy sectors, promoting economic diversification and growth. By investing in bio-based industries, regions can create new markets, attract investment, and enhance competitiveness. d. A diversified bioeconomy strengthens regional resilience by

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			reducing dependence on external factors, such as fluctuating commodity prices or geopolitical tensions.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	I recommend facilitating access to EU and national funding programmes specifically tailored to bioeconomy projects in the region and providing incentives for private sector investment. Ensure alignment of regional policies with EU bioeconomy strategies to create a supportive regulatory environment, streamline permitting processes and implement incentive mechanisms for sustainable practices and adoption of bio-based technologies, and foster collaboration between government agencies, research institutions and private sector stakeholders through public-private partnerships and cluster development, promoting knowledge sharing, innovation and joint research initiatives. With these initiatives, we can unlock the region's potential for sustainable economic growth, job creation and environmental protection through the use of its abundant biomass resources.
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	To develop a robust bioeconomy strategy in Western Macedonia, two key ideas must be prioritized: infrastructure development and market cultivation. Firstly, investing in biomass processing facilities and transportation networks is crucial to efficiently utilize biomass resources. Secondly, identifying and developing markets for bio-based

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			products, both locally and internationally, is essential for the economic viability of bioeconomy initiatives. By focusing on these priorities, Western Macedonia can lay a solid foundation for bioeconomy growth, fostering economic development, job creation, and environmental sustainability.
Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	Aligning EU, national, and regional strategies for the bioeconomy in region is essential for fostering sustainable development and maximizing the potential of biomass resources. At the regional level, specific areas such as finance, policy/regulation, and collaboration can be managed more effectively by tailoring initiatives to the unique characteristics and needs of the local bioeconomy. This includes facilitating access to regional funding programs, developing region-specific regulatory frameworks that align with national and EU strategies, and fostering collaboration among local stakeholders to promote innovation and knowledge sharing. Conversely, components related to overarching policy frameworks and regulatory standards should be primarily managed at a national level to ensure consistency and coherence across regions within the country. At the European level, overarching components such as setting strategic priorities,

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			establishing funding mechanisms, and coordinating cross-border collaboration initiatives should be primarily managed to provide a cohesive framework for bioeconomy development across member states and regions.
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Companies in Western Macedonia face challenges in accessing funding for bioeconomy projects due to economic disadvantages and limited financing options, alongside perceived investment risks. Navigating complex regulatory frameworks at the EU, national, and regional levels poses compliance challenges, hindering growth and innovation. Moreover, policies may not sufficiently address the region's specific needs, inhibiting companies' ability to thrive. Limited networking opportunities and weak intersectoral collaboration further impede progress, hampering the development of integrated value chains. Overcoming these obstacles requires targeted financial support, streamlined regulations, and enhanced collaboration efforts at all levels.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the	One crucial insight from our region related to finance is the need for targeted investments and financial incentives to support bioeconomy initiatives. This includes allocating funds, infrastructure development, and skills training programs to foster innovation and growth in the sector. Additionally, streamlining regulatory processes and ensuring coherence between EU, national, and regional policies is

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		governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	essential to provide a supportive regulatory environment for bioeconomy activities.

Interviewee name, position and organisation		**Georgios Mpisiritsas, President and CEO, Pig farming Mpisiritsas**
Date, time	**7/6/2024**	Place or virtual call: **On company premises**

Key theme	**#**	**Question**	**Response**
Challenges/Barriers/ Obstacles in Developing a Robust Regional Bioeconomy	1	**What obstacles do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Potential challenges might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	I am aware of various obstacles related to the strengthening of the bioeconomy in the Region of Western Macedonia. Even today - despite the electronic state - there are complicated and time-consuming bureaucratic procedures for licensing and implementing new technologies, and this delays progress. On the other hand, small businesses face difficulties in competition because of larger and more developed units, whereas in other countries this is not the case because they are supported. In Western Macedonia access to new markets is limited due to geographical isolation and lack of transport infrastructure. Finally, investment in bio-economy infrastructure is high, making financing particularly difficult.

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Opportunities through the Bioeconomy	2	**What opportunities do you perceive when considering the role of regions in both national and regional development towards an enhanced bioeconomy in your region?** (Opportunities & strengths might relate to collaboration & information-sharing, policy/regulation and the provision of skilled personnel, competitiveness, finance and resource efficiency)	The main opportunity I see is the creation of networks and joint initiatives between companies operating in the bioeconomy, which can develop the sector in the region by sharing information and knowledge. Also, promoting local products with quality and origin labels can enhance the reputation of the region and increase demand for our products.
	3	**How can regions leverage a robust bioeconomy to achieve the following?** a. Enhanced benefits towards climate neutrality; b. Reduced societal challenges and support a wider stakeholder engagement; c. Promote regional growth and place-based economic diversification, d. Enhance regional resilience)	a. The production of biogas from animal waste reduces methane and CO2 emissions, contributing to the reduction of the carbon footprint, so by following the principles of circular economy and recycling in the region, we can reduce the use of raw materials and waste production, contributing to sustainability. b. The development of the bioeconomy can create new jobs in the primary sector, reducing unemployment and increasing living standards, contributing to social acceptance and cooperation. c. Encouraging the development of local businesses in the bioeconomy strengthens the regional economy and keeps the population in rural areas. d. Sustainable production and processing practices can help the region to improve its natural

			environment while increasing its resilience to climate change.
Needs to attain Desired Strategic Actions	4	**What initiatives or actions related to finance, policy/regulation, and collaboration would you suggest should be incorporated in a bioeconomy strategy for your region?**	I would propose the creation of a special fund to finance small and medium-sized enterprises active in the bioeconomy and to provide low-interest loans and subsidies for investment in new technologies and infrastructure. It is also necessary to reduce bureaucracy and simplify licensing procedures for new production and processing facilities and, of course, to provide tax incentives and tax relief for companies investing in green technologies and practices.
	5	**What further needs can you identify to develop a robust regional bioeconomy strategy?**	I understand that in order to develop a strong regional strategy for the bioeconomy in the region of Western Macedonia, there are other needs to be addressed. First of all, there is a need to build and improve facilities for the transport, storage and processing of animal waste (and plant residues) in order to optimise the biogas production process. There is certainly a need to upgrade local electricity grids to support energy production and distribution, and to create smart grids for more efficient management of the energy produced, as is the case in other European countries. Finally, a favourable regulatory environment must be created to support the development of the bioeconomy, with clear and stable rules and regulations.

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Synchronization between EU, National and Regional Strategies	6	**How do you envision the alignment between EU, national and regional strategies in terms of bioeconomy for your region?** • Are there specific areas or issues related to finance, policy/regulation, and collaboration that you believe should be managed or addressed more effectively at the regional level? • Conversely, which components do you think should be primarily managed at a national level? • Finally, which components/policies do you think should be primarily managed at a European level?	Effective management of the bioeconomy requires coordinated action at different levels of governance. At regional level, the region as an entity can develop local funding programmes to support SMEs and new investment projects in the bioeconomy, and adapt national and European regulations to local needs and conditions. At national level, tax incentives and subsidies should be provided for companies investing in green technologies and practices, and red tape should be reduced. At European level, there should be financial instruments to facilitate cross-border cooperation in the bioeconomy and international networks and alliances to promote cooperation and exchange of best practices in the bioeconomy.
	7	**For companies in your region: What obstacles/challenges do these companies face at a at EU/national/regional level in relation to finance, policy/regulation, and collaboration?**	Although there are many opportunities for EU funding, many SMEs find it difficult to access these programmes due to the complexity of the application procedures and the competitive nature of the programmes. In addition, the requirements and procedures involved in obtaining European funding are often complex and time-consuming. The slow adoption and implementation of European policies at national and regional level can delay investment and development, and the national resources available to support

			businesses are limited and often insufficient to meet needs. At national level, frequent changes in legislation and regulation create uncertainty and discourage long-term investment.
Additional Insights	8	**Are there any particular insights, observations, or concerns from your region related to finance, policy/regulation, and collaboration that you believe are crucial to consider for a comprehensive bioeconomy strategy?** (include any specific insights from the governance KPI results, i.e. on key indicators such as e.g. R&D expenditure, emissions, regulation etc.)	Ensuring a transparent and stable regulatory framework is crucial to maintaining the stability of the bio-economy. Environmental regulations and emission standards need to be clear and enforceable.