POWER4BIO
REGIONS FOR BIOECONOMY

Summaries of 5 new regional implementation plans

Deliverable 5.4

MAIN AUTHOR: DBFZ,

MAIN CONTRIBUTORS: BZN, UNFU, MAE, USB, SUA

DATE: 31ST MARCH 2021

PUBLIC

Project POWER4BIO "emPOWERing regional stakeholders for realising the full potential of European BIOeconomy"
Grant Agreement no. 818351
H202-RUR-2018-2020

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 818351

Document Factsheet	
Project duration	From October 2018 to March 2021
Project website	https://power4bio.eu/
Document	D.5.4: Summaries of 5 new regional implementation plans
Work Package	WP5 - Developing and reinforcing the bioeconomy in EU regions
Task	Task 5.3 Developing regional bioeconomy strategies and roadmaps in CEE regions (M16-M30)
Version	1
Version date	31.03.2021
Main Author	Laura García Laverde (DBFZ)
Contributors	Katalin Kalai, Kornél Mátéffy (BZN), Orest Kiyko (UNFU), Aleksandra Luks (MAE), Eva Cudlínová (USB), Danka Moravčíková (SUA).
Reviewers	Marco Franchin (META), Ignacio Martin (CIRCE)
Type of deliverable	Report
Dissemination level	PU Public

Table 1 Document Factsheet

Document History			
Version	**Date**	**Main modification**	**Entity**
Draft 1	03/03/2021	Inputs of regional reports integrated	CEE regions DBFZ
Draft 2	23/03/2021	Final inputs of regions after revisions	DBFZ
Consolidated	25/03/2021	Consolidated for first reviewer	DBFZ META
Final Draft	29/03/2021	Final draft provided for final revision	DBFZ CIRCE
Final	31/03/2021	Integrated comments of final reviewer.	DBFZ

Table 2: Document History

ABBREVIATIONS

BDO: Butanediol

BRL: Business Readiness Level

BSAT: Bioeconomy Strategy Accelerator Toolkit

CAP: Common Agriculture Policy

CEE: Central and Eastern European

CSF: Common Strategic Framework

EAFRD: European Fund for Rural Development

ERDF: European Regional Development Fund

EMFF: European Maritime and Fisheries Fund

ESF: European Social Fund

HTC: Hydrothermal Carbonization

KIP: Regional Innovation Platform for Bioeconomy and Circular Economy in South Bohemia

NSK: Nitra Self-Governing Region

MW: Mega Watts

PHA: Polyhydroxyalkanoates

PHRSR: Nitra Strategy Paper of the Programme of Economic Development and Social Development

RBH: Regional Bioeconomy Hub

RDI: Research, Development and Innovation

RES: Renewable energy Source

RIS3: Regional Strategy for Research and Innovation for Smart Specialisation

SBAB: South Bohemia Association for Bioeconomy

SDG: Sustainable Development Goals

SR: Slovak Republic

SWOT: Strengths, Weaknesses, Opportunities and Threats

TRL: Technology Readiness Level

VEAs: Voluntary Environmental Agreements

PROJECT PARTNERS

CIRCE: Fundación CIRCE Centro de Investigación de Recursos y Consumos Energéticos

DBFZ: DBFZ DEUTSCHES BIOMASSEFORSCHUNGSZENTRUM GEMEINNUETZIGE GMBH

WR: STICHTING WAGENINGEN RESEARCH

META: META GROUP SRL

NAIK (former AKI): NEMZETI AGRARKUTATASI ES INNOVACIOSKOZPONT

NAK: MAGYAR AGRAR-, ELELMISZERGAZDASAGI ES VIDEKFEJLESZTESI KAMARA

EPC: EPC Project Corporation Climate. Sustainability. Communications. mbH

DRAXIS: DRAXIS ENVIRONMENTAL S.A.

BZN: Bay Zoltán Nonprofit Ltd. for Applied Research

UNFU: Ukrainian National Forestry University

CAGPDS (former CAPDER): Junta de Andalucía – Consejería de Agricultura, Ganadería, Pesca y Desarrollo Sostenible

MAE: Mazovia Energy Agency

USB: University of South Bohemia

CCB: Chemie Cluster Bayern GMBH

SPRING: Sustainable Processes and Resources for Innovation and National Growth

EWI: VLAAMS GEWEST (Government of Flanders)

SUA: Slovak University of Agriculture in Nitra

ECRN: European Chemical Regions Network (ECRN) e.V.

PUBLISHABLE SUMMARY

The bioeconomy has proposed a development path independent of fossil resources. With the potential to contribute to the reduction of CO2 emissions, the achievement of the SDGs and the revitalization of the economy in rural areas. In the implementation, the important role of the regions has been identified to make this vision possible, the integration of its actors, the establishment of value chains from the regional level and the consolidation of multi-governance structures for its coordination. Bioeconomy strategies and roadmaps serve as instruments for coordination of entities and efforts at the regional level. They allow regions to identify potential bioeconomy development pathways and how to link them to existing plans and programs in the region. During the 2.5 years of POWER4BIO, five Central and East European (CEE) regions have worked on developing their strategies and finally action plans for implementation. This has led to the involvement of regional stakeholders, the development of a regional bioeconomy vision and the formulation of measures to foster the bioeconomy in the regions.

This report is a continuation of Deliverable 5.3, focused on detailing the development and final results of the regional bioeconomy roadmaps and/or progress at the point of conclusion of the project. The report presents a synthesis of the process of each of the CEE regions to define their roadmap. It connects the analysis that was carried out in previous years (Task 5.1 and 5.2) and how this served for the definition of specific actions or definition of projects to be carried out in the coming years in each region. It also introduces the bioeconomy lead markets and proposed pilot actions for each region and finally a selection of their roadmap is shared, including policy and financial instruments that have been considered in the regions for its operationalisation.

At the end of POWER4BIO and counting with the support and guidance offered during WP5 and the resources developed in the project (other WPs), three regions now have a bioeconomy strategy. Of these, the Lviv region (Ukraine) and Nitra (Slovakia) have used the Smart Specialisation Strategy as the basis for the bioeconomy strategy. The region of Mazovia (Poland) has developed a stand-alone bioeconomy strategy.

On the other hand, the Southern Great Plain region (Hungary) was not able to develop the strategy, as this is not allowed by the administrative order of their country (only national or county level strategies), however the region and the new Hungarian bioeconomy cluster have developed a recommendation document with possible actions to be taken to impulse regional bioeconomy that is intended to support the national bioeconomy strategy process. Finally, the South Bohemian region has achieved the formalization of the RBH into what is now the South Bohemian Association for Bioeconomy. This legal platform now provides a better positioning of regional bioeconomy stakeholders with other regional and national platforms, supports the development of regional and national level strategies and leads the pursuit for political initiative for the development of the regional bioeconomy strategy for South Bohemia.

TABLE OF CONTENTS

1 INTRODUCTION

The development of a sustainable bioeconomy starts in the territories of the regions, with sustainable regional production systems, the construction of value chains that integrate the primary sector and consider intersectoral and interdisciplinary synergies. Thus, the EU regions adopting the bioeconomy as a pillar of regional development are currently engaged in the tasks of aligning and coordinating the current bioeconomy initiatives, and identifying possible routes of action that will propel their development and their new opportunities. Regions are shaping their bioeconomy action plans according to their particularities and specific contexts, using them as strengths and according to priorities that benefit their regional stakeholders. For this, the development of bioeconomy strategies with their respective action plans are fundamental instruments that allow regions to clearly identify their bioeconomy vision - which supports goals already set for sustainable regional development - as well as their actors, resources, processes, infrastructure, among others, and to set specific commitments for advancement.

In the last 2.5 years, the Central and East European (CEE) regions together with their stakeholders - established RBH[1] -, have analysed their regional conditions and developed their regional bioeconomy visions. These has been translated into regional bioeconomy strategies and finally operationalized into action plans - roadmaps - considering the instruments already in place in their regions (programs that already have financial and policy instruments deployed), and even introducing new instruments for the implementation of desired projects and other actions in the coming years.

This final report summarizes the progress of each of the CEE regions participating in POWER4BIO regarding the development of their roadmaps. It connects the status reported in the Deliverable 5.3 (regional bioeconomy strategies) with their actual progress in finalizing the strategy in some cases and developing their action plans. It also indicates the resources or best practices used by the regions that helped them in this development.

At the end of POWER4BIO, three of the five participant CEE regions now count with a regional bioeconomy strategy and their respective action plans, namely Mazovia (Poland), Lviv (Ukraine) and Nitra (Slovakia). In the case of Southern Great Plain (Hungary), their progress is presented on the contribution of its regional analysis to the national bioeconomy strategy process and the possible action plan for the regional bioeconomy that has been put forward by the National Bioeconomy Cluster. Finally, the progress in the South Bohemia region (Czech Republic) presents the consolidation of its RBH into what is now the South Bohemia Bioeconomy Association and its current activities to achieve the development of its regional strategy.

This report also depicts the activities carried out by the CEE regions following the methodology developed in the project for bioeconomy strategy and roadmap development, which is now the back bone of the POWER4BIO Bioeconomy Strategy Accelerator Toolkit (BSAT). Thus, connecting in the examples and experiences of CEE regions the use of resources developed during the project, while also presenting that no one regional case is the same as the other and experiences in the implementation of a methodology do not look the same in each region. It is flexible and to be enriched by regional actors.

[1] Regional Bioeconomy Hubs

It is our intent that this report contributes as well to other regions also in search of good examples and practices during the development of their regional bioeconomy strategies. To be able to identify in the detailed information delivered by each CEE region, particular lessons to shape their own actions towards planning strategically the shaping of regional bioeconomy based development.

1.1 Methodology for bioeconomy roadmap definition

As previously introduced in the Deliverable 5.3: *Summaries of 5 new regional bioeconomy strategies,* the methodology provided to CEE regions for the development of roadmap definition has been a guideline for strategy and roadmap development. In the course of adapting the eight steps provided in the guideline, to the final methodology for the BSAT - Bioeconomy Strategy Accelerator Toolkit, five steps have been grouped as the process for strategy development, while four steps have been indicated for roadmap definition and finalization (this final as nine steps of the process). The steps for roadmap definition are directed towards detailing actions to operationalize main strategic goals and priority areas.

Figure 1: Steps to operationalize strategy with roadmap definition.

1. **Derive specific goals within priority areas, specific actions and responsible for implementation.**

   For each priority area defined within the strategy (See Phase 3 in BSAT), first outline specific goals to be reach, making sure they relate to the overarching strategy goals and ultimately support the regional bioeconomy vision. Based on the specific goals concrete actions are defined, which reflect the strategy regional analysis carried out previously (see Phase 1 in BSAT). The specific actions should build on regional strengths and opportunities to counteract identified threats and reduce the effect of regional weaknesses. By the end of Phase 4, the specific actions planned in this step should count with a timeline for implementation, designated regional actors in charge and to be involved, as well as indicators to be monitored.

2. **Assign specific policy, financial mechanisms and resources to the defined specific actions**

   This step is focused on making sure that all specific actions outlined in the previous step count with the necessary financial and policy mechanisms as well as other required resources to enable their implementation. These mechanisms have been identified in steps 3 and 4 during Phase 3 (BSAT), and during this step of the roadmap it is important to make sure planned activities can be covered through these mechanisms. Otherwise adjustment in planned actions are required or additional financial resources should be included. This step includes indispensable administrative coordination among regional institutions (ministries/departments) involved in the preparation of the strategy and roadmap and institutions managing the assigned resources to be used. Finally, it is essential to appoint responsible institutions for implementation and monitoring during this step.

3. **Draft roadmap of the regional bioeconomy strategy**

   The strategy document is drafted with engaged working and steering groups. The engaged actors in the draft should include an interinstitutional technical team (as in the strategy development) and have to consider all results derived from the participatory process and previous regional analysis for the draft. The draft roadmap should include a clear indication of – or connection to- priority areas, planned actions, timeline and priority for implementation, responsible institutions, and monitoring system. Furthermore, there should be clear the coherence between vision and overarching goals of the strategy with the roadmap.

4. **Presentation, feedback and finalization of strategy and roadmap**

   The drafted roadmap document should be made available for consultation with regional institutions/administration involved in its development as well as collect and consider the feedback from the stakeholders involved during its preparation. After feedback, the final version of the strategy and roadmap is ready for dissemination.

1.2 Summary of regional advance in regional bioeconomy strategy and roadmap development.

As a continuation of reported strategy development process in Deliverable 5.3 (November 2020), this document focuses on reporting the final update of CEE strategy and roadmap development between November 2020 and February 2021. The efforts of CEE regions, in some cases to continue the regional bioeconomy strategy development, in other cases to define a roadmap to operationalize the defined bioeconomy strategy, are hereafter detailed.

The regions with already very advanced development on their new bioeconomy strategy as reported in Deliverable 5.3, namely Lviv (Ukraine) and Mazovia (Poland) have completed also the steps for

roadmap definition. With a defined set of actions within areas of priorities and a timeline for their implementation during the next years, their roadmap planning has been finalized. Both regions are now at the final steps previous to the official publication of their regional bioeconomy strategies and roadmaps. The region of Nitra (Slovakia), after a long process of policy alignment, is advancing at the time of publication of this report in the definition of specific actions in its roadmap. The strategic actions will be mainly embedded in the Smart Specialisation Strategy (2021-2027). At the same time, Nitra has advanced in the identification of potential financial instruments, policies and programs that will support the planned actions. Currently, proposals on investment projects in 13 priority areas are being collected, representing planned actions, with time implementation span and proposed budget identified.

Methodology steps / CEE regions	Step 1. Define specific actions and responsible for implementation	Step 2. Assign specific policies, financial mechanism and resources to defined specific actions	Step 3. Draft roadmap	Step 4. Presentation, feedback and finalization of strategy and roadmap
Lviv Region				
Mazovia				
Nitra				
Southern Great Plain*				-
South Bohemia*				

	Achieved
	In progress
	To be carried out

Table 3: Individual advance of regional strategy and roadmap process in relation to the recommended methodology.

South Bohemian region finds itself on the development of the strategy, triggering and guiding a stronger collaboration and discussion among regional actors for the definition of priority areas. While South Bohemia is working through the steps of Phase 3, current discussions based on the regional analysis carried out during the project serve the purpose also to advance in steps 1 and step 2 of Phase 4. Although the region is not developing a stand-alone regional bioeconomy strategy, regional bioeconomy priorities have already been included in the regional innovation strategy and the inclusion of bioeconomy thematic in the National Agriculture Strategy was achieved. The region is waiting for the development of the National Bioeconomy Strategy in the Czech Republic to provide additional impulse at the regional level and legitimization of their bottom-up initiative. The case of South Bohemia is noteworthy. It is one of the regions that had to start introducing the bioeconomy topic in its region, which was previously little known. Nor was there any entity, cluster or working group at the regional level that integrated the actors and issues of importance in the regional bioeconomy. At the start of POWER4BIO, the University of South Bohemia took the lead in coordinating a first exchange between regional bioeconomy stakeholders to establish the Regional Bioeconomy Hub (RBH). To date, this initiative has been transformed into a legal entity, the South Bohemian Association for Bioeconomy. This

has constituted a breakthrough in the positioning of the regional bioeconomy, the continued establishment of trusting relationships between regional stakeholders and provides a platform for exchange with national platforms such as the Czech Biotechnology Platform CEBIO and Czech Biogas Association.

Southern Great Plain region with the new Hungarian Bioeconomy Cluster has developed an analysis and recommendations document for the development of regional bioeconomy to bring it forward to the national actors working on the national bioeconomy strategy in Hungary. At the start of the project, there was still no group or entity that would represent the bioeconomy at the regional or national level, although there was an initiative to found the National Bioeconomy Cluster. Under the leadership and coordination of Bay Zoltan Nonprofit Ltd, Southern Great Plain's representative in POWER4BIO, the Hungarian Bioeconomy Cluster was founded and at the regional level the RBH, which now acts as an integrated part of the national cluster. All the steps of the methodology for the creation of a new strategy and roadmap were followed to the extent that they were applicable to the specific case of the region. The result is a recommendations document developed by the Hungarian Bioeconomy Cluster and Southern Great Plain RBH - *Bioeconomy recommendation material for the Southern Great Plain region* - to contribute to the ongoing process for the establishment of the National Bioeconomy Strategy. The recommendations include potential actions with identified financial instruments available and considerations for implementation. The final decision over these proposed actions are leave to consideration within the framework of the national strategy.

2 SUMMARY OF REGIONAL ROADMAPS

2.1 Lviv Region (UA)

The SWOT-analysis[2] method was used to determine the priorities in the development of the bioeconomy development strategy of the Lviv region. This is a situational analysis, which consists of identifying and assessing the strengths and weaknesses of the bioeconomy sector, its opportunities and threats based on the state of the environment as well as the strategic position being occupied by the Lviv region. At the same time, the opportunities are defined as a chance to do something new: launching a new product, winning new customers, introducing new technology, rebuilding business processes, etc., and the threats which can cause losses and the loss of existing advantages: emergence of new competitors, appearance of substitute goods, etc. The logic of the SWOT-analysis is presented in Figure 2.

The assessment was carried out within the framework of the workshop “Bioeconomy development strategy of the Lviv region”, which was attended by a lot off stakeholders. Quantitative assessment of the characteristics by experts allowed to determine (after statistical processing of results) to formulate the weighted average values for understanding of weightily of combining the characteristics of the internal and external environments of the bioeconomy sector of the region's economy. On this basis the problem field was formed and a rating of necessary actions for strategic measures was compiled.

[2] Regional SWOT analysis reported in confidential deliverable from Task 5.2 in POWER4BIO. Additional to this the region of Lviv carried out a further detailed SWOT analysis during RBH establishment.

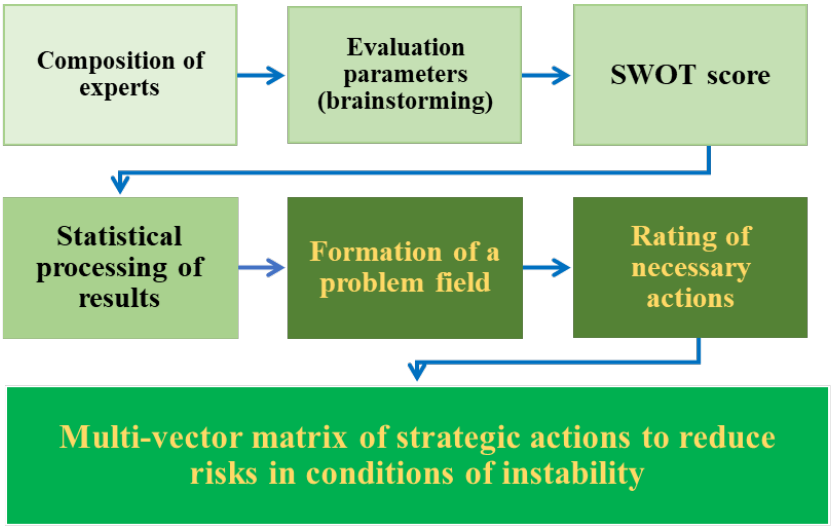

Figure 2: Logic of the SWOT-analysis

The assessment was carried out within the framework of the workshop "Bioeconomy development strategy of the Lviv region", which was attended by several stakeholders. Quantitative assessment of the characteristics by experts allowed to determine (after statistical processing of results) the weighted average values for the understanding of weightily of combining the characteristics of the internal and external environments of the bioeconomy sector of the region's economy. On this basis, the problem field was formed and a rating of necessary actions for strategic measures was compiled.

The analysis of the bioeconomy potential of the Lviv region carried out with various methodologies allowed the creation of a strategic vision to strengthen the competitiveness of the regional bioeconomy. The vision is based on the following three key positions:

1. Bioeconomy is a locomotive for building the future of a prosperous sustainable society. The forest sector is the leading one in the regional bioeconomy.
2. The transition from an economical linear model to the circular one (rational and sustainable use of the bio resources).
3. Development of the human capital for the bioeconomy providing competence, skills, jobs.

The main components of the bioeconomy development strategy of the Lviv region are identified as i) resource availability, ii) innovative education and knowledge dissemination, iii) partnership between leaders in the bioeconomy sector and government, iv) competitiveness of the bioeconomy sector, are presented in Table 4.

Table 4: Bioeconomy development strategy of the Lviv region

Strategic measures as a result of SWOT-analysis (workshop on 6/21/2019)	Rating based on SWOT-analysis	Strategy components and specific actions	Players involved
1. Resource Support for the Bioeconomy			
Developing a strategic balance of timber and agro-raw materials to determine the amount of waste for the bioeconomy sector	8	Calculation of the amount of bio-raw material in the Lviv region (wood and agro raw materials)	Regional
Establishment of a regional biomass exchange to facilitate access to the resource and balance exports of bioeconomy sector products	7	Facilitating access to bioresources	National, regional
		Development a mechanism for providing bioeconomy sector of raw materials	Regional
Coordination program of interaction between regional leaders and key players to identify priority areas for development of the bioeconomy sector of the region	4	Providing the best businesses determined on the base of the regional rating by the additional volume of timber	Regional
2. Waste management			
Developing a strategic balance of timber and agro-raw materials to determine the amount of waste for the bioeconomy sector	8	The search of additional sources of biomass (wood and agro-raw materials)	Regional
		Calculation of the amount of waste generated at bioeconomy enterprises of the Lviv region	Regional
		Implementation of the resource efficiency system at bioeconomy enterprises	Regional
3. Competitiveness			
Development of measures to increase the investment attractiveness of the bioeconomy sector of the region	2	Development of measures to promote successful business models in bioeconomy with high added value	National, regional
		Increasing the investment attractiveness of the forest sector and the bioeconomy potential of the Lviv region	Regional
		Providing of the “Woodworker's Rating” in Media	Regional
		Supporting export potential in the context of the development of bioeconomy sectors	National, regional
		Supporting small business in bioeconomy through targeted preferential lending and reimbursement of part of the loan interest	Regional
		Supporting the investment attractiveness of the Region's bioeconomic potential	Regional
4. Public-private partnership			
Public-private partnership	1	Development of a new state program “Regional wooden house-building” for the bioeconomy development	Regional

		Improvement of the “Regional Target Program of Forestry Development of the Lviv Region” of the bioeconomy development	Regional
		Development and improvement of the “Comprehensive program of support and development of agricultural production in the Lviv region” given the development of the bioeconomy	Regional
		Development and Improvement of the “Program for Increasing the Competitiveness of the Lviv region” given the development of the bioeconomy	Regional
Public-private partnership	1	Strengthening the work of the Export Promotion Center given of the development of the bioeconomy industries	National, regional
		Development and Improvement of the “Program of regional competition for local development projects in the Lviv region” given of the development of the bioeconomy	Regional
		Development and improvement of the “Energy saving program for the population of the Lviv region” given of the development of the bioeconomy	Regional
		Development and improvement of the work of the Forest Sector Council under the umbrella of the Lviv Regional State Administration givenof the development of the bioeconomy of the Lviv region	Regional
5. Cooperation			
Formation of investment program of the bioeconomy sector development. Creating new jobs in the bioeconomy sector with the corresponding wage level	5	Involvement the representatives of the Association "Bioeconomy cluster" in solving topical issues of the bioeconomy of the Lviv region	Regional
		Involvement the representatives of the Association of Woodworkers and Loggers of the Lviv region to solve topical issues of the bioeconomy of the Lviv region	Regional
		Involvement of all members of the Forest Sector Council in solving topical issues of the bioeconomy of the Lviv region	Regional
		Collaboration with the united territorial communities of the Lviv region and involving them in solving various problems through bioeconomy approach	Regional
		Cooperation with the Center for business promotion and attraction of EU4Business programs for creating competitive advantages of the bioeconomy of the Lviv region	National, regional

6. Knowledge and education			
Educational programs, research in the sphere of the innovative biotechnologies	6	Creating a network of educational, scientific institutions and enterprises to provide the bioeconomy sector with qualified personnel	National, regional
		Development of research initiatives for introduction of innovative technologies in the bioeconomy sector	National, regional
		Initiation of implementation and promotion the bio-environmental projects and expertise	National, regional
		Bioeconomy promotion	National, regional
		Development of educational programs in the bioeconomy sphere	National, regional
		Initiation and promotion of environmental projects and expertise	National, regional
7. Dissemination (dissemination of knowledge)			
Development of measures to increase the investment attractiveness of the bioeconomy sector of the region	2	Promotion of the bioeconomy ideas at national level	National
		Organizing bioeconomy conferences	National
		Participation in the work of profile exhibitions	National, regional
		Publications in the media	National, regional
		Forming a circle of bioeconomy experts to stimulate the creation and development of SMEs in this branch	Regional
		Dissemination of successful samples (successful business models of the bioeconomy) following the examples of EU countries	National, regional

2.1.1 Summary of Bioeconomy roadmap for Lviv Region

For each component of the strategy, the deadlines for the implementation of specific measures and the main executors were determined (Table 5).

The process of development of the bioeconomy development strategy of the Lviv region lasted from October 2018 to March 2021. The roadmap for the implementation of the bioeconomy development strategy of the Lviv region is presented in Figure 3.

Table 5: Deadlines of implementation of strategic measures and main executors

Number	Component name	Deadline	Main executors
1	**Resource Support for the Bioeconomy**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional State Administration, regional stakeholders
2	**Waste management**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional Forestry Administration, Lviv Regional State Administration, regional stakeholders
3	**Competitiveness**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional Forestry Administration, Lviv Regional State Administration, regional stakeholders, regional media
4	**Public-private partnership**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional Forestry Administration, Lviv Regional State Administration, regional stakeholders, regional media
5	**Cooperation**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional Forestry Administration, Lviv Regional State Administration, regional stakeholders, regional media
6	**Knowledge and education**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional Forestry Administration, Lviv Regional State Administration, regional stakeholders, regional media, Ukrainian National Forestry University
7	**Dissemination of knowledge**	2021-2027	Center of Bioeconomy, Forest Sector Council, Lviv Regional Forestry Administration, Lviv Regional State Administration, regional stakeholders, regional media

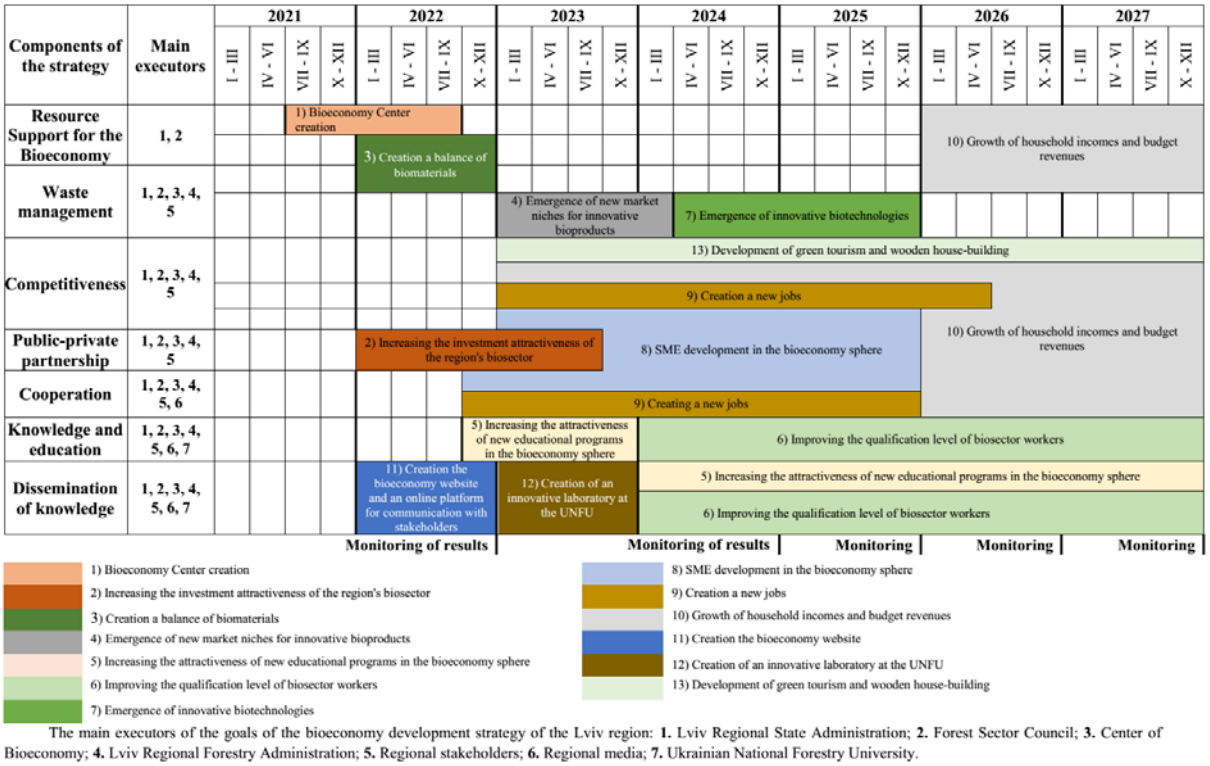

Figure 3: Roadmap for the implementation of the Bioeconomy Development Strategy of the Lviv region, main goals and executors

2.1.2 Specific policy and financial mechanism to enable implementation.

Financing the implementation of the Lviv region bioeconomy development strategy

To financially concretize the implementation of strategic measures a model of the so-called "financial butterfly" (Luigi Amati, META Group, "How to finance bio-based food and feed and its value chains using ESIF"), (Figure 3) can be used.

In our opinion, funding sources for the necessary tasks in the Lviv region should be diversified and be both internal and external. The importance of the development of the bioeconomy sector of the region is not in doubt, but the relative scarcity of financial resources determines their involvement from various sources.

- **Budget funds:** funds of the regional and federal budgets (non-repayable investments, interest-free loans with prescribed conditions for their repayment, grants, etc.).
- **Funds of internal and external private investors** through the mechanism of investment and marketing certificates for business entities in the bioeconomic sector (training, internship, technology, equipment, etc.).
- **Enterprise-owned funds through:**

- encouraging self-financing through the introduction of subsides ("tax holidays", reduction of the tax rate on all profits, provided that a certain part of it is invested, etc.);

- stimulation of accelerated depreciation for bioeconomy enterprises exporting products with high added value (application of a special tax rate and reinvestment ratio of part of depreciation deductions in biotechnologies).

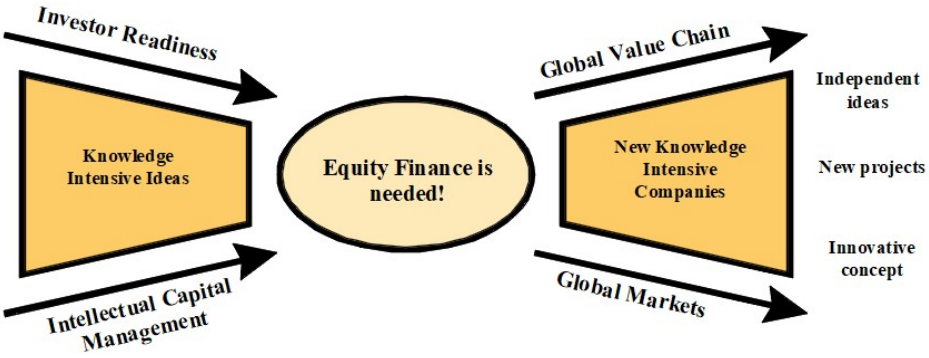

Figure 4: The model of the "financial butterfly"

Taking into consideration the low bioeconomy maturity and absence of bioeconomy strategy on state and regional levels, it is very difficult to choose several financial instruments to be used for Lviv region bioeconomy development. The unstable economic and political situation in Ukraine is also a very relevant factor to be considered.

That is why we will look for different financial sources and tools combining them for innovative bio-based solutions, such as:

- EIF: European Investment Fund;
- EFSI: European Fund for Strategic Investments;
- ERDF: European Regional Development Fund;
- ESIF: European Structural and Investment Fund;
- Venture Funds;
- Regional State;
- Competitiveness program;
- Comprehensive program to increase energy efficiency, energy-saving and development of renewable energy in the Lviv region for 2021 - 2025;
- Education development program of the Lviv region for 2021 - 2025;
- Comprehensive program of support and development of agriculture in the Lviv region for 2021 - 2023;
- Forestry development program of the Lviv region for 2017 - 2021;
- Environmental protection program of the Lviv region for 2021 - 2025;
- Strategy of mountain areas development of the Lviv region for 2018 - 2022;
- Comprehensive program for the development of culture, increasing tourist attractiveness, preservation of national memory, cultural heritage and promotion of the Lviv region for 2021 - 2023.
- Development strategy of the Lviv region for the period 2021-2027.

Financing of bioeconomy projects and implementation of the bioeconomy development strategy of the Lviv region should be carried out within the Strategy of development of the Lviv region for the period up to 2027, particularly the implementation of tasks such as:

Bioeconomy development (woodworking and furniture industry, printing, food industry, organic agriculture, bioenergy, biotechnologies). The aim is to create a single coordination centre for bioresources management in the region in order to effectively use these bioresources on the principles of "cascade economy", when waste from one production becomes a raw material for another and so on. The estimated amount of funding for the task is summarized in Table 6.

Table 6: Estimated financing of bioeconomy development projects

Estimated amount of financing, UAH million							
In general until 2027	Including by years (2021-2027)						
	2021	2022	2023	2024	2025	2026	2027
1.23	0.25	0.23	0.19	0.14	0.14	0.14	0.14

Promoting the development of small and medium businesses. The goal is close mutually beneficial cooperation between business, science and government based on the innovation of scientific and practical solutions for the use of renewable bioresources for the successful development of the region. The estimated amount of funding for the task is summarized in Table 7.

Table 7: Estimated financing of projects to promote of the small and medium businesses development

Estimated amount of financing, UAH million							
In general until 2027	Including by years (2021-2027)						
	2021	2022	2023	2024	2025	2026	2027
20.3	2.3	2.6	2.9	2.9	3.0	3.2	3.1

Increasing investment attractiveness and international promotion of the region as a leader of the bioeconomy development. The aim is to promote the bioeconomy through awareness of its importance as a leading area of socio-economy development of the region. Strategy for popularization and formation of a conscious attitude to the benefits for the population from the bioeconomy development. The estimated amount of funding for the task is summarized in Table 8.

Table 8: Estimated financing of projects to increase investment attractiveness and international promotion of the region as a leader of the bioeconomy development

Estimated amount of financing, UAH million							
In general until 2027	Including by years (2021-2027)						
	2021	2022	2023	2024	2025	2026	2027
12.2	2.6	3.6	1.6	1.1	1.1	1.1	1.1

Scenarios of bioeconomy development of the Lviv region

Forecasting possible developments in the implementation of the proposed strategy for the bioeconomy sector of the Lviv region is based on the application of the GE/McKinsey model. This model consists of a matrix of 9 cells for reflection and comparative analysis of strategic positions and directions of business activity of the sector (Fig. 5).
One of the main advantages of this model is that different weighting factors can be assigned to different factors (X and Y axes), depending on their relative importance for a particular branch (sector). This makes the assessment of each business more accurate. The model considers the attractiveness of the market (Y-axis) and the relative advantage of the sector in the market (X-axis).

For strategic forecasting, three different assessments were performed (actual, optimistic and pessimistic) – Table 9. The basis of the actual assessment was the analysis of competitive assets of the region and for the two other scenarios (optimistic and pessimistic) used forecasts for 2021 - 2030 for Ukraine in general and the Lviv region in particular, made by such organizations as: Ministry of Economy of Ukraine (consensus forecast), National Bank of Ukraine, Institute of Economic Forecasting of the National Academy of Sciences of Ukraine, Department of International Cooperation of the Cabinet of Ministers of Ukraine, State Statistics Committee of Ukraine, International Monetary Fund, World Bank, Doing Business, The Global Competitiveness Report, Transparency International (Table 9). All three scenarios of analysis for competitive positions of the bioeconomy sector of the region are presented in Table 9 and Figure 5.

Market attractiveness	strong	medium	weak
average	**Position protection in the market** *Investing in development to the maximum. Concentration of efforts on the strengths preservation*	**Investing in development** *Selective development in the directions of the strongest parties with simultaneous strengthening of vulnerable areas*	**Selective development** *Focus on a small number of strengths with the subsequent exit from business if there is no sustainable growth*
average	**Selective development** *Maximum investment in attractive branches. Increase profitability by increasing productivity*	**Receiving income** *Protection of existing positions. Concentration of investments in segments with a high rate of return and low risk*	**Slight expansion** *Finding ways to develop without high risk or minimize investment and improve business organization at the operational level*
low	**Protection and change of landmarks** *Concentration in attractive segments with protection of strengths for the maximum immediate earnings*	**Receiving income** *Positions protection in the most attractive segments. Updating the product range, minimizing investment*	**Exit from business** *Selling a business at the time of receiving the highest price for it. Reduction of fixed costs and avoid investment*

Competitive positions in the market

Figure 5: Matrix of strategic analysis of the GE / McKinsey model

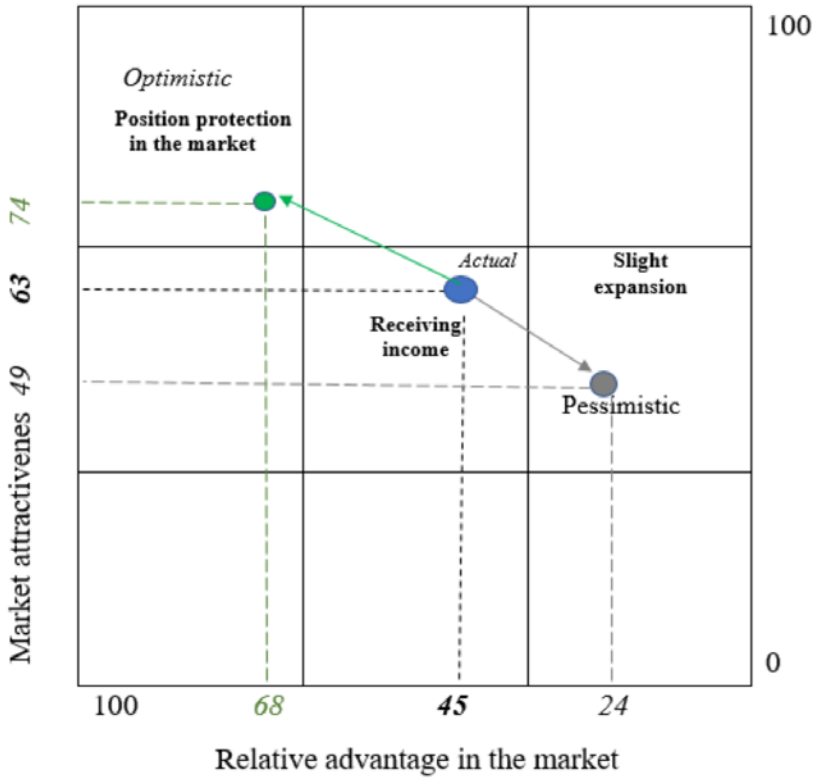

Figure 6: Competitive positions of the bioeconomy sector of the Lviv region in the strategic space of the GE/McKinsey model

Table 9: Factors of analysis of the competitive position of the bioeconomy sector of the Lviv region

Strengths of the biosector of the Lviv region (X axis)	Max. score	Assessment*			Indicators of attractiveness of the bioproducts market (Y axis)	Max. score	Assessment*		
		A	O	P			A	O	P
1. Relative market share	*15*	*3*	*8*	*1*	*1. Market growth rates*	*20*	*15*	*16*	*10*
2. Growth of market share	*10*	*8*	*9*	*3*	*2. Product differentiation*	*15*	*12*	*14*	*10*
3. Distribution network	*10*	*3*	*6*	*1*	*3. Features of competition*	*15*	*12*	*10*	*10*
4. Distribution network efficiency	*15*	*5*	*8*	*3*	*4. The rate of return in the sector*	*15*	*9*	*11*	*7*
5. Qualifications of the employees	*10*	*6*	*8*	*4*	*5. Values of consumers*	*25*	*10*	*15*	*8*
6. Consumer loyalty of the sector's products	*10*	*5*	*8*	*3*	*6. Consumer loyalty to the trademark*	*10*	*5*	*8*	*4*
7. Technological advantages, patents, know-how	*10*	*3*	*6*	*1*					
8. Marketing advantages	*10*	*4*	*6*	*1*					
9. Flexibility	*10*	*8*	*9*	*7*					
Overall rating	*100*	*45*	*68*	*24*		*100*	*63*	*74*	*49*

A – actual assessment, O – optimistic assessment, P – pessimistic assessment.

One of the important directions for the implementation of the provisions of the Association Agreement with the European Union, as well as economic integration with the EU, is for Ukraine the common market and ensuring involvement in global value chains. In order to do that, Ukraine has to adopt smart specialisation as the main approach to regional development.

The application of this innovative approach is determined as a key component of cooperation in the framework of the European Goodneighborliness Policy on the possibility of using the European Structural and Investment Funds.

One of the priorities of smart specialization of the Lviv region is bioeconomy development *(Lviv Region Development Strategy until 2027).* Bioeconomy of the Lviv region combines those industry branches that use bio-resources as raw materials for the production of products or those that produce biological waste. The main sectors of the bioeconomy of Lviv region include the woodworking and furniture industry, organic agriculture, food industry, printing, bioenergy and biotechnologies.

But nowadays significant amounts of bio resources in the region are not accounted for and do not have a single coordination center for managing their effective use. An important element in solving this problem should be a system of resource efficiency for enterprises working with bioresources. This system should be based on the principles of a "cascade economy" when waste from one production becomes a raw material for another and so on.

Bioeconomy strategy of the Lviv region includes some very actual objectives for the near future, such as

1. Institutional, organizational and scientific strengthening of the Association "Bioeconomy cluster" in order to intensify support for the bioeconomy development in the Lviv region.
2. Methodological, scientific and organizational support of the entrepreneurial discovery process (EDP) regarding the smart specialization of the Lviv region in the bioeconomy sector.
3. Promotion of benefits from the bioeconomy development of the Lviv region as a strategic competitive advantage in the long-term perspective.
4. Development and implementation of small and medium business support programs in the bioeconomy sector.
5. Support for innovative educational programs that initiate specialist training for the bioeconomy development.
6. Supporting green tourism and the wooden house-building developments as high-tech bioeconomy elements of the Lviv region.

2.2 Mazovia Region (PL)

The strategy development of the region of Mazovia reached the consultation phase during the end of 2020. The region placed a specific strategic focus on agricultural waste, municipal waste and sewage as main priority areas, which have been further detailed in Deliverable 5.3. During the definition of strategy and roadmap, the region had into account the SWOT[3] analysis carried out with the following key findings:

[3] Regional SWOT analysis reported in confidential deliverable from Task 5.2 in POWER4BIO.

- **Strengths** of Mazovia region reside on the biomass potential from agriculture, waste resources (agri-food, livestock farming, pulp companies, municipal waste and sewage sludge), as well as information regarding the availability of several types of biomass feedstocks. There are biomass transport companies and adequate road infrastructure, as well as in-place structures for waste management and material recovery. The region counts with a chemical and agri-food cluster, competencies on biomass, renewable energies and residues, an interest in developing green chemical industry and available high-level education on renewables. It also holds strong and consolidated markets on food, nutraceutical, agricultural, pharmaceutical, cosmetic, polymers, fibres and composites, and a market on chemicals in development. Furthermore, the region counts with advisory services for new industrial projects in sustainable chemistry. Finally, there are national and international private investments that have financed projects (foreign investment of 1-3% region´s GDP).
- **Opportunities** present in the region are the possible use and adequation of current industries – potential biorefineries, the potential valorisation of by-products from large biogas installations (Syngas production), valorisation of agriculture by-products, business accelerator mechanisms for R&D+i infrastructure, being existent for other applications but not for bio-based ones yet. Other opportunities are represented by the modernization of agriculture, storage, trade, industry and services, open up a new market for health-oriented food, as well as building a market for profiled food based on nutrigenomics. Also, there is potential in the reconversion of the chemical sector, which holds a strong presence in the region. The possible use of the commercialisation channels that the chemical industry has established for future regionally-produced biochemicals represents a promising starting point for the development of a bioeconomy sector in this region. The most promising areas are creating specialties in biodegradable polymers, as well as expanding the existing range of applications of wood materials and products, creating new composites. Regarding facilitating policy framework, the region can replicate the monitoring procedures applied in waste management to other agro-industry streams.
- **Weaknesses** are mainly the lack of accountability of waste resources and a missing platform to provide information about available resources, lack of sustainable chemical applications, need to strengthen road and trail transport networks and lacking centres to manage waste streams. On the other hand, the financial framework for R&D is not optimal. There is a lack of supportive public institutions promoting investments, loans, project implementation, and measures to build opportunities for bioeconomy business such as market research, promotion of bioeconomy new projects and available opportunities. Further weaknesses are the lack of a start-up funding programs and of synergies with other regions (knowledge transfer). Finally, a stronger engagement of stakeholders along the value chain is needed as well as increasing awareness-raising about the environmental and social impact of fossil-based products concerning bio-based ones.
- Finally, **threats** being considered by the region in developing their bioeconomy are the lack of skilled workforce for biorefineries concepts, as well as other required skills for new biomass-based value chains. Lack of political will to move away from conventional technologies, which also influences that technology transfer, is slow. Moreover, there are still delays in making the necessary changes to the system within the following matters: - legal, - fiscal, - financial, - administrative and organizational. Although the bank sector might support the financing of bioeconomy projects, other alternatives are missing at the moment, possibly influencing the low interest of the strong chemical sector in producing bio-based chemicals, with also low legal and technical

support to promote the bio-based markets. Likewise, climate change, water shortage and other related effects are also considered as possible threats for bioeconomy development.

Regional bioeconomy lead markets and proposed pilot actions.

Based on findings from the SWOT analysis the Mazowieckie Voivodeship has defined overarching priority areas as follows:

- Bio-innovation, including in agriculture, to develop new chemicals, products, processes and value chains for biotechnology markets in rural and coastal areas, with the participation and increased benefit of raw material producers;
- New opportunities for the forestry sector to replace unsustainable raw materials in construction, packaging with biomaterials and ensuring more sustainable innovation in sectors such as textiles, furniture and chemicals that rely on forest resources, as well as new business models based on valuation of forest ecosystem services.
- Addressing issues such as food waste, waste and by-products (including recycling of nutrients), resilience, and the need to ensure nutritionally sensitive food production.

The following economic areas, leading-edge technologies and service processes of high development potential, were proposed as a basis for determining the region's specialisation and directly or indirectly included in the activities concerning bioeconomy:

Economic areas:

- chemical sector,
- medical sector,
- agri-food sector,
- energy sector,
- IT sector,
- construction sector.

Leading technologies:

- biotechnology,
- information and communication technologies,
- nanotechnologies,
- photonics,
- electronics.

Service processes:

- B2B services,
- R&D services,
- S2B services (science and business).

Additionally, for the bioeconomy strategy and roadmap, general provisions were formulated to be interpreted and applied to many of the technologies described in Deliverable 3.3 and 4.1, with several of them being considered suitable for implementation. In particular, the roadmap considers activities directed to technologies and value chains of interest such as:

- Sugar production from lignocellulosic biomass through hydrolysis
- Bioconversion of organic side streams by black soldier fly-producing insects, lipid & protein for feed
- Growing mushrooms on coffee grounds
- Production of renewable hydrogen via thermolysis of biomass
- Bio-coal production via Hydrothermal Carbonization (HTC) of sewage sludge
- Production of 1,4-butanediol (1,4-BDO) from sugar by fermentation

The following business models from Deliverable 4.1 were considered to be implemented in the region during roadmap definition, while others were used as inspiration to depict in the roadmap needs and possibilities of the Mazovia region:

- On-farm production of renewable energy based on biogas from liquid cattle and pig manure by anaerobic digestion
- Conversion of bio-waste into pure bio-nanocellulose-based packaging material by a bacterial fermentation process

2.2.1 Summary of Bioeconomy roadmap for Mazovia Region

The Roadmap stems both from the "Bioeconomy Development Strategy for the Mazowieckie Voivodeship" and the national and regional goals of sustainable development described in the Strategy. The following five strategic goals are depicted in Table 10, planned for the period of 2021 - 2030.

Specific actions recommended for Mazowieckie Voivodeship´s bioeconomy		
Main strategic goals	**Action planned in the roadmap**	**Implementation** (Short-medium-long term)
Efficient management of resources in accordance with the principles of sustainable development	• Ensuring sustainable soil fertility through preventing soil degradation, improving the pH of acidic soils, increasing the availability of fertilisers.	Medium
	• Adaptation of branches and directions of production, plant varieties and animal breeds to natural, economic and organisational conditions.	Medium-Long
	• Sustainable balance of organic matter.	Long
	• Reclamation of degraded soils and protection of agricultural land.	Long
	• Sustainable balance of nutrients (fertilizers).	
	• High index of soil vegetation.	Medium

	• Observing the principles of proper agrotechnology and zootechnics.	Long
	• Introduction of integrated soil monitoring systems to optimise irrigation and the use of plant protection products[4].	Medium
	• Construction of small water reservoirs, devices and systems for water retention and modernisation of existing devices and systems to increase the share of small-scale water retention in the water balance.	Long
	• Promotion, construction and development of already existing circular facilities (in the case of the fisheries sector, aquaculture facilities using recirculation and water retention methods in production are of particular importance.	Long
	Among other actions.	
Increasing the use of renewable biological resources in sectors creating high added value	• Production of high quality food: - Reformulation fo existing products - improving existing and introducing new, innovative food production and processing technologies, among others.	Long
	• Processing aimed at obtaining wood and wood-based materials with extended durability under conditions of internal and external use, increased resistance to destructive factors such as biotic, fire, weathering, photolithic ageing factors	Long
	• Use of wood as the main elements of large-size structures,	Long
	• Development of wood-based materials for modern construction applications: - new generation materials that would show better properties, lower emissions, biodegradability, but also, under normal use, resistance to biological agents (fungi, insects, rodents), - technologies for the extraction of bioactive compounds from forests, wood industry waste, including conifer waste, for economic use, - modern, biodegradable, reusable and removable wood and wood-based, paper and cardboard packaging, - products, processes and technologies for the management of industrial waste using wood, optimisation of the use of production residues from solid wood processing for products with high added value.	Long
	• Development of new technologies for the production of innovative and generic medicinal products, biological	Long

[4] MINROL http://www.gios.gov.pl/pl/stan-srodowiska/monitoring-jakosci-gleby-i-ziemi

	and biosimilar drugs, medical devices and dietary supplements as well as foodstuffs for special nutritional purposes.	Long
	•Development of new sources of biocatalysts and unique metabolites, construction and modelling of effective biocatalytic tools for biosynthesis and bioconversion process-es, bio-refining and biotransformation and for environmental protection processes.	
	•Biomass thermal processing based on the capture of chemical carbon in the form of charcoal or biocarbon, combined with energy production based on volatile components, with no or minimal carbon content (BECCS - Negative CO2Energy).	Long
	Among other actions.	
Contribution to the implementation of climate policy	• Taking measures to reduce greenhouse gas emissions from agriculture and the agri-food chain (e.g. rationalisation of nitrogen fertilization, proper storage and application of natural fertilizers, promotion of bean plant cultivation, use of nitrification inhibitors, extending the life span of females, slurry acidification, composting of natural fertilizers).	Long
	• Carbon sequestration in soil and biomass produced in agriculture (e.g. catch crop cultivation, conservation tillage, maintenance of permanent grassland).	Long
	• Increasing carbon accumulation in biomass and forest soils.	Long
	• Mobilisation of wood resources, also from non-forest areas.	Long
	• Restoring stands after natural disasters and increasing and rebuilding forest resources to improve the greenhouse gas balance.	Long
	• Developing and disseminating knowledge on climate-friendly practices.	Long
	• Public procurement and preference for CO2 reduction solutions.	Long
	Among other actions.	

Strengthening the research potential of scientific units and development of cooperation in business - science - environment relations	• Integration of the activities of the science, education and development sector (including, among others, research institutes, universities and scientific units),	Long
	• Encouraging cooperation between the science sector and business and creating strategic business partnerships (including greater use of the potential of KIS, EIP, Smart Labs and National Key Clusters Working Groups),	Long
	• Transfer of knowledge from the science sector on innovative solutions to reduce the negative environmental impact of bioeconomy sectors,	Long
	• Reducing uncertainty in the implementation of innovations and hig-risk innovative projects, support for SMEs,	Long
	• Intercollegiate integration, working groups consisting of experts with experience in implementation and business understanding.	Long
	Among other actions	
Shaping and promoting pro-environmental and pro-health behaviour of consumers	• Disseminating knowledge about the principles of nutrition, food traditions of the country and the region and the quality of agri-food products among the society and promoting healthy consumption patterns,	Long
	• Creating innovative communication and education tools to help consumers make in-formed dietary choices,	Long
	• Use of innovative technologies to create tools for better nutrition planning and assessment of nutrition at the individual and the collective level,	Long
	• Introducing innovative ways to increase the recognition of food of high quality,	Long
	• Creating innovative tools to detect food adulteration,	Long
	• Developing tools and modern research techniques and food quality markers (including bioavailability of ingredients) for assessing the impact of food products on human health,	Long
	• Developing methods of analysis and selection of dedicated food at population and individual level,	Long
	Among others actions	

Table 10: Selection of roadmap actions for Mazowieckie Voivodeship´s bioeconomy

The Strategy's executors and at the same time its stakeholders will be as follows: local government units from the area of Mazowieckie Voivodship, units from the economic sector and business support institutions, economic self-governments, non-governmental organisations, units from the education and scientific-research sector, health care and social welfare institutions, universities, local governments of other Voivodships, as well as all inhabitants of the region. The coordinator of the monitoring system (the department responsible for the development of the bioeconomy of the Marshal's Office) will be responsible for the detailed definition of the scope of evaluation - study objectives and evaluation criteria.

2.2.2 Specific policy and financial mechanism to enable implementation.

The following policies and policy mechanisms are already in place and will be used for the implementation of roadmap planned actions:

- Regional Operational Programme of Mazowieckie Voivodship 2014 -2020 and 2021 -2027. The main role of the Operational Programmes is to strengthen and effectively use the economic and social potential for sustainable and intelligent development of the Voivodship.
- National Operational Programmes - basic tools for the implementation of interventions with financial contribution from EU funds. For the implementation of the Bioeconomy Development Strategy, the programs developed for the EU financial perspective 2021-2027 will be crucial, using the funds of the Common Strategic Framework (CSF), i.e. the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Fund for Rural Development (EAFRD) and the European Maritime and Fisheries Fund (EMFF).
- Legal-administrative and planning instruments: studies of various forms and a wide range, i.e. Voivodship spatial development plan, spatial development conditions studies, local spatial development plans, decisions on environmental conditions of project implementation, waste management plans, etc.
- The Mazovia Regional Innovation Strategy 2020 and the innovation support system and smart specialisation of the region play an important role in the development of the bioeconomy. From the next financial perspective, it will be necessary to develop a new generation of Regional Intelligent Specialisation compatible with the bioeconomy development strategy.
- Financial mechanisms: among others, multiannual financial forecasts, financial aid granted to local government units, public-private partnership, tax preferences.
- Information and promotion instruments: among others, trainings, courses, conferences, cyclical international, supra-regional and regional bio-economic forums, platforms for exchange of information and experience.

Due to the dynamically developing situation related to the coronavirus epidemic, a flexible approach is foreseen to integrate new emerging policy measures. In the EU, emergency measures are planned to be taken to rebuild the EU after the pandemic, preserve jobs and stimulate the economies of individual countries (including Poland). To this end, the intention is to make greater use of the following five policy measures described in D4.2:

1. Direct regulation – a command and control approach using obligatory standards and licenses that require people/companies/market players to change their behavior and punishes them if they are detected to be non-compliant;

2. Economic instruments – includes all instruments changing price incentives (taxes, subsidies, feed-in tariffs), but also quantity constraints (tradable) quota, tariff-rate quota), and charges. These instruments give people incentives to voluntary (e.g. based on their own rational cost-benefit calculations) change their behavior;

3. Voluntary approaches – could be codes of good practice, self-regulation and other industry-led initiatives. Financial incentive schemes could be part of these instruments. These approaches typically encourage rather than force people or businesses to show the desired behavior;

4. Information and advice sharing systems – policies aimed at raising the awareness and facilitating changes in behavior;

5. Market-based signaling approaches – labelling, traceability, voluntary certification schemes and farm assurance schemes. These approaches are often related to informational problems (lack of information about product quality and food safety) hindering the proper functioning of markets;

6. Other measures/instruments not in the categories above such as vision documents, road maps, strategies

All 10 examples described in D4.2 have been studied carefully. All of them were considered in the activities described in the Strategy and the Roadmap. Their descriptions have been adapted to the conditions of the Mazovia Region.

Financial Instruments and measures

The regional bioeconomy strategy mentions financial documents which are already in place and which will be used for implementation in the chapter about financial framework. The success of the implementation of the Roadmap is largely dependent on the financial capacity of local government units in the Voivodship and private business entities operating in its territory. In order to effectively implement the Strategy, the self-government of Mazowieckie Voivodship will look for all available sources, tools, methods and possibilities to implement specific objectives in order to make the vision proposed in the document come true. Planning financial outlays for the implementation of the Bioeconomy development policy after 2020 (in the financial perspective 2021-2027) is hampered mainly by the ongoing work on the shape of the national development policy and the ongoing negotiations on the future shape of the EU Multiannual Financial Framework. Therefore, the financial framework of the Strategy was defined in a directional way by indicating potential sources of financing. Due to the wide scope of the planned interventions, the financing system of the Strategy will be based on the principle of assembly of financial resources from various sources using various support tools. The catalogue of public funds, including the following, is crucial for financing the Strategy:

- funds from the budget of Mazowieckie Voivodship;
- the European Union budget,
- the state budget,
- funds of local government units,
- other public funds.

An important role in financing development interventions will also be played by private funds, which can be used to co-finance projects implemented under operational programmes or in the formula of public-private partnership. Direct initiatives of the private sector, in particular of entrepreneurs, will take part in the implementation, translating into the growth of the economic potential of the region.

Funds from the budget of Mazowieckie Voivodship will finance development expenditures directly or co-finance development expenditures financed from other sources. The financial condition of all entities implementing the Strategy will also affect the possibility of absorbing funds from other sources, primarily EU funds. Some of the resources from the above catalogue will be used directly for the implementation of the Strategy, others - by using various implementation tools. Below are those tools which are of the greatest importance in terms of their potential to be used to implement the objectives of the Strategy.

Due to the ongoing process of agreeing on the shape of the cohesion policy for 2021-2027, at this stage, it is not possible to definitively determine the scope of support under the individual operational

programmes, nor the number of funds that will be available to Mazowieckie Voivodship. According to the draft general regulation of 29 May 2018, it can be assumed that cohesion policy support will focus on a limited number of objectives. The most important tool for the Voivodship under the cohesion policy will be the regional operational programme, which is planned for 2021-2027. The document is developed, managed and implemented by the Board of Mazowieckie Voivodship. Other tools that Mazowieckie Voivodship will use to implement the Strategy will be national operational programmes covering the bioeconomy sectors. The scope of their intervention will result from objectives set out in EU regulations, as well as needs and investments that are significant from the point of view of the economy and development of Poland set out in strategic documents, in particular SOR, KSRR 2030 and integrated sectoral strategies, while maintaining the established demarcation of support between the national and regional level. Assuming as above, the national operational programmes will support those objectives of the Strategy that are consistent with them.

The following programmes will also be used to implement the Strategy:

- those managed directly by the European Commission,
- tools using European Investment Bank resources,
- other international financial institutions,
- The Norwegian Financial Mechanism and the Financial Mechanism of the European Economic Area.

National sources of funding will be of great importance to the implementation of the Strategy for Development of the Bioeconomy in Mazovia. Regional policy will be implemented through national development programmes, including multi-annual programmes, as well as other instruments based on public funds. It will also be possible to benefit from the professional system of development institutions, by using the instruments offered by:

- the Polish Development Fund,
- Bank Gospodarstwa Krajowego [National Economy Bank],
- Polska Agencja Rozwoju Przedsiębiorczości [Polish Agency for Enterprise Development],
- Korporacja Ubezpieczeń Kredytów Eksportowych [Export Credit Insurance Corporation] S.A,
- Polska Agencja Inwestycji i Handlu [Polish Investment and Trade Agency] S.A.
- Agencja Rozwoju Przemysłu [Industrial Development Agency] S.A,
- The National Fund for Environmental Protection and Water Management,
- The National Centre for Research and Development.

It is planned to include new financial instruments related to the Reconstruction Program after COVID 19, such as: Reconstruction Plan for Europe, EU instrument reducing the risk of unemployment in an emergency (SURE), EU Coronavirus Investment Initiative, National Reconstruction Plan for Poland.

2.3 Nitra Region (SK)

As previously described in Deliverable 5.3, Nitra Self-Governing Region (NSK) initiative on bioeconomy focuses mainly on food-security, particularly to reduce dependence on food imports and in increasing efficiency on agriculture activities. The SWOT[5] carried out for the region highlights the following aspects:

- Among key **strengths** of the region, it is worth mentioning the large variety of agricultural biomass available (wheat straw, barley, rapeseed straw, oil seeds, corn stove/grain maize, sugar beet), as well as current utilization of agriculture and forest wastes, energy crops and municipal waste. Good infrastructure in place with installed electrical capacity (11,19 MW) that corresponds to the 11,55% of all biogas plants in Slovakia, good transport networks and existent biomass logistic centres. On the other hand, several research institutes, clusters, industrial sites and universities are working on the bioeconomy. Current regulations support the utilization of agriculture feedstock in biorefineries or in the sustainable chemical sector. Several funding mechanisms are in place, which can be used for bioeconomy projects, and the region is in a good position to provide direct or intermediate financing for the development of sustainable chemicals projects. Finally, a discourse regarding sustainable consumption and environmental actions exists in the region, with opportunities to be reinforced.
- **Opportunities** for the region lie in the region´s biomass availability and its further exploration and the exploitation of established biogas production in the region – 13,5% of all Slovakian biogas plants. Furthermore, the support programs of the Ministry of Agriculture and Rural Development of the Slovak Republic for small, medium-sized and big food enterprises, could help to increase the share of the representation of Slovak products in the domestic market, with agriculture producers (including young and small farms) as potential innovators. The region counts with active foreign investment, the possibilities support the development of the sustainable chemical industry. Finally, bioeconomy activities have already been considered in strategic documents at the national level as well as in the Programme of economic and Social Development of Nitra region (2016 – 2022).
- **Weaknesses** have been recognized with regards to the current strong utilization of biomass for bioenergy, difficulties to mobilise resources and difficulties with waste treatment. These aspects together with the lack of completely developed biomass logistic centres lead to a supply chain in need of optimization. Low participation of farmers and other actors as entrepreneurs in the agriculture field, while also small and middle entrepreneurs are scarcely represented in the new bio-based value chains of the region. Regarding funding, lending in the banking sector is not very well consolidated and synergies should be explored with funding lines set-up in neighbouring regions, national and European level. Finally, there are few channels available to disseminate information related to responsible and sustainable consumption, plastic disposal and/or CO2 emission reduction at the regional level, leading to a lack of active civic society with awareness of bioeconomy.
- **Threats** to the current regional bioeconomy are mostly the need for consolidation of biomass processing industries, low development of technologies related to biomass value chains, need for investment in the modernization of transport infrastructure to facilitate biomass mobilization and new bio-based businesses, and a missing comprehensive analysis about forest biomass potential.

[5] Regional SWOT analysis reported in confidential deliverable from Task 5.2 in POWER4BIO.

The region does not have yet the competencies nor enough instruments to implement new bio-based industries or biorefineries together with low preparedness of the R&D sector to face bioeconomy demanding challenges.

The priorities of regional bioeconomy vision and strategy have been derived particularly from the national framework, reflecting regional aspects and needs: updated *RIS3 strategy of the Nitra Self-Governing Region for the years 2021–2027*, and *Programme of Economic and Social Development of the Nitra region 2016-2022*. Nitra region will not have a specific bioeconomy strategy, but the bioeconomy and related issues are included and prioritized also in the strategic document (entry proposal was approved by the regional government in December 2020) - *Proposal of the structure and content of the entry report for the elaboration of the Strategy Paper of the Programme of Economic Development and Social Development (PHRSR) of the Nitra Self-Governing Region (NSK) until 2030*. POWER4BIO project has contributed to the formulation of the main objectives, challenges, problems and impulses to which the NSK PHRSR will respond. The strategy reflects the following aspects found also in SWOT analysis: availability and use of resources, market/economic aspects, the transition towards bioeconomy, public and institutional support and governance, and social aspect. Within these mentioned aspects, the strategy proposes approaches for responding to opportunities, which are based on the threat's identification (see the report from cross-visit in Nitra).

Regional bioeconomy lead markets and proposed pilot actions.

Nitra has placed its focus on the utilization of agriculture biomass for high-added-value products, as well as the food industry, and on tapping the synergies with the existent automotive manufacturing industry. Proposed selected pilot actions (Register of Projects of Program of Economic Development and Social Development of Nitra Self-Governing Region) – key and complementary pilot projects:

- Regional Innovation and Development Centre for Industrial Development, Smart Mobility and Agriculture and Food Processing:
    - Completion of research infrastructure to support the recovery of primary agricultural production and value-added in small and medium-sized enterprises in industry, agriculture and food.
    - Regional and domain clusters.
    - Development of financial instruments (in particular the Innovation Fund, innovative vouchers) and measures for the start-up and implementation of innovative projects
    - Promotion of education and development of human capital.
- Support for the development of the food industry following agricultural production in the region:
    - Circular economy and eco-processing of waste from the food industry.
    - Vocational training in line with labour market needs.
    - Innovation cluster facilitating the transfer of know-how and innovation in the agri-food sector.
- Stabilization of the rural region by strengthening the regional agri-food system:

- Construction of logistical infrastructure for harvesting and storage of agricultural crops.
- Circular economy, green recovery and waste disposal.
- Sustainable smart energy systems.
- Smart information system for the agri-food sector.
- Vocational training aligned with labour market needs.
- Promoting Social Entrepreneurship.

- Development of waste recovery centres infrastructure:
  - Investment in current waste management infrastructure
  - Building digital waste management infrastructure.
- Model implementation of the regionally integrated RES system exploiting the specific energy potential of NSK:
  - Completion of regional processing chains for waste collection, recycling and treatment.
  - Sustainable energy regional clusters – capacity building of cooperation, advice and education in the field of regional sustainable energy.
  - Strategic planning for sustainable energy, including low carbon strategies, and support for their implementation.

Exemplary technologies and rural concepts as depicted in Deliverable 3.3 and Deliverable 3.4 respectively are going to be taken into account in the next steps of roadmap definition. Both deliverables have been promoted to stakeholders in the region during the communication in working groups. Likewise, business models illustrated in Deliverable 4.1 will be considered.

2.3.1 Summary of Bioeconomy strategy and roadmap for Nitra Region

These BE impulses have been identified as the main challenges to which the strategy should respond (summary of outputs, inventory and analysis):

- specific potential of sub-regions for high added agricultural production value.
- bio-based agriculture and food industry.
- effective adaptation and absorption of leap changes in the region's economy, cooperation in development, transforming the economy into an innovative circular green and smart economy based on sustainable and effective evaluation of human, natural, technical, technological and institutional resources of the region (greening of services).
- restoring regional food self-sufficiency.
- transforming agriculture into sustainable modern precision farming, bio-agriculture and its integration into a sustainable agri-industrial system, a complex maximizing the added value of a regional product.

Defined selected key priorities and aims of the strategy:

- An innovative, sustainable and competitive economy:
    - Transforming the economy into a circular economy, including waste management
    - Building smart infrastructure in an innovative regional economy, building infrastructure for the emergence, diffusion and use of innovation in relation to established as well as emerging industries and services, promoting the creation of an innovative environment, with an emphasis on the food sector.
    - Building production domain and territorial clusters of strategic planning regions based on the concept of public-business cooperation, academia and civil society, especially in industry and agri-food complex.
    - Creation of a comprehensive offer of tourism based on local specificities of the regions.
- Sustainable regional agri-food complex and in particular the processing and distribution chain:
    - Establishment of economic units closing production and consumption cycles within the region and its strategic planning regions.
    - Transforming agriculture into sustainable agriculture.
- Environment, ecosystem services and green infrastructure:
    - Integrated water infrastructure and streamlining of waste management.
    - Prevention of disasters and mitigation of the effects of climate change.
    - Recultivation of brownfields and environmental loads.
- Smart energy, transport and technical infrastructure and debt recovery in these areas:
    - Completion of the service system of the population with smart technical infrastructure.
    - Building and developing smart mobility of the population, including transport infrastructure.
    - Completing the smart infrastructure support infrastructure for the regional economy.
    - Promoting energy efficiency and sustainable energy mix in the region.

Furthermore, the strategy is a medium-term/long-term development strategy, but it also includes a level of short-term, i.e. implementation, so that its implementation is realistic, committed to public sector budget programming, and real availability of resources. The key of the strategy is the integration of cross-sectoral measures in order to promote the most effective assessment of development potentials and solutions to the problems of the Nitra region as a whole, its strategic and planning regions, towns and municipalities, through their interconnection. The implementation of the strategy is based on horizontal and vertical integration of resources. Integrated investment packages integrate public and private sector investment, EU-supported investment, national, regional and local investment. The investment part of the strategy will be reflected in the National Investment Plan ensuring this integration at the national level on the principles of sustainable development set out by the Vision and the development strategy of Slovakia until 2030.

Institutions responsible for the monitoring of strategy and roadmap implementation are the regional government in cooperation with members of the preparatory team/entry report processors, and Members of the Partnership Council (members representing local territorial self-government, members representing business, academia, education and civil society, and members representing the state administration).

Every priority is defined in relation to concrete political goal/goals and regional challenges. NSK also monitors the processing of PHRSR NSK and effective response to changes in external conditions, UN Agenda 2030 priorities, challenges and priorities defined by the EU for the new programming period 2021-2027 and main implementation documents of Agenda 2030 in the SR National regional development strategy.

2.3.2 *Specific policy and financial mechanism to enable implementation.*

The main drivers of supporting the development of the bioeconomy strategy development in Nitra region are represented by important strategic initiatives (BIOEAST), and strategic documents at the national level:

- Updated RIS3 strategy – domain Healthy food and healthy environment.
- Rural Development Programme of the SR 2014 -2020.
- Strategic Plan of the Common Agricultural Policy (2021-2027) .
- Greener Slovakia – Strategy of the Environmental Policy of the Slovak Republic until 2030.
- Low-carbon strategy of the Slovak Republic until 2030.
- Strategy of economic policy of the Slovak Republic until 2030.

The priorities of regional bioeconomy vision and strategy preparation derived particularly from the national framework, reflecting regional aspects and needs:

- Updated RIS3 strategy of the Nitra Self-Governing Region for the years 2021–2027.
- Programme of Economic and Social Development of the Nitra region 2016-2022 (ongoing preparation of new PESD 2030).

The use of novel policy measures has not yet been decided and it is under consideration in undergoing strategy preparation (the best examples from Deliverable 4.2 will be considered). Regarding financial mechanisms, standard existing ones are currently considered, such as state budget and its supporting mechanism, European funds, as well as public-private partnerships (PPP) in certain cases. New financial instruments to be implemented are innovation vouchers and a regional innovation fund.

2.4 South Bohemia Region (CZ)

In the South Bohemia region, the newly established South Bohemian Association for Bioeconomy (previously South Bohemia RBH) is supporting the development of a regional bioeconomy strategy, providing the platform for expert discussions along with regional focus sectors: forestry, agriculture, waste and non-traditional sources of biomass. Although a National Bioeconomy Strategy not available, the regional representatives are developing a recommendations document for the bioeconomy in South Bohemia. This considers the SWOT analysis carried out during the project[6] for the region:

- **Key strengths** are based on the registered potential of biomass from forest and agriculture, as well as the potential of unutilized waste biomass, with available information about the format on which biomass is supplied. This is also accompanied by existing infrastructure for transport logistics and final utilization of biorefineries concepts. It is also important the available potential of sewage sludge, which is centralized in some medium-large plants. The region counts with the presence of chemical, polymer, farming and animal husbandry, agri-food and bioeconomy clusters and a stimulus from the region for business innovation. Furthermore, the region counts with institutions dedicated to R&D fields in bioeconomy relevant subjects, as well as high-level education and vocational training in the field of residues. The existence of industry in the region in the food and nutraceutical sector, agricultural sector, pharmaceutical and cosmetic sector and polymers, fibres and composite materials sector is the base for a wide range of bio-applications in the region. Although the region does not count yet with a stand-alone bioeconomy strategy, several other regional strategies foster the transition towards bioeconomy, such as the regional innovation strategy, sectorial strategies and regulations promoting energy crops in marginal lands.
- Some of the most attractive **opportunities** for the region reside on significant potential from pulp and paper resides and the potential creation of a new value chain based on the apparent market pull for sewage sludge biomass. Also, the improvement of the waste stream logistics management, setting up new waste logistic centres and possibly adapting existing ones to manage additional biomass feedstocks. Furthermore, there is room for upgrading high-level and vocational education in the field of bioeconomy and the development of synergies training and research institutions with industry to shape professional profiles needed for the transition towards bioeconomy. Possible synergies among existing sectors are to be explored (food, agriculture, pharmaceutical and cosmetic and polymers, fibres and composite). Regarding funding, it should be evaluated the possibilities to finance bioeconomy projects by venture capital or business angels' organizations, while promoting the involvement of banking sector to support bioeconomy projects. Finally, there is room for awareness-raising actions towards the understanding of bioeconomy and circularity to mobilize industry as well as end-user's acceptance.
- The main **weaknesses** identified are the incompleteness of biomass assessment (quantities for bioeconomy, potential of some waste streams, potential of alternative raw materials), as well as a lack of biorefinery concepts developed in the region. A current lack of interest from regional companies in bioeconomy sectors and a low rate of new firms in the region, which is exacerbated by a lack of public institutions supporting industries in business planning and risk assessment. Then, regarding research and innovation, there is a lack of expertise in bioeconomy related fields, with a latent need to develop training programs and to synergize biomass projects and biomass industries

[6] Regional SWOT analysis reported in confidential deliverable from Task 5.2 in POWER4BIO.

with R&D programs. Furthermore, the biomass markets and chemical industry should be further developed, and industries with expertise in waste valorisation are scarce. Market analysis for the bio-based products has not been conducted, or feasibility studies of potential markets regionally and cross-regional. There is a need for a certification and/or standardization institution in the region and investment programs for start-ups. Finally, the general public considers the primary sector is not promoting or involved sufficiently in the GHG reduction strategy therefore not joining at the moment the transition towards more sustainable practices in the bioeconomy framework.

- The region experiences **threats** regarding the competitiveness of uses for biomass resources, a potential increase in demand from regional companies that already use them and/or reduced availability due to foreign biomass demand. Waste heterogeneity among the different collection sites might be problematic and there is a great need to raise awareness among industry actors, regarding the benefits and opportunities of waste stream value chains. Still, policies should be developed in the region in terms of investment in research and innovation. The number of factors leading to a right framework is significant: key factors such as infrastructure, workforce and transport availability, as well as economic, financial, technological, political and knowledge, long-term stability which involves quite an effort and time to prepare in order to achieve it.

Findings in RBH workshops (Including SWOT analysis carried out with regional stakeholders)

FORESTRY

Internal		**External**	
Strengths	**Weaknesses**	**Opportunities**	**Threats**
1. High potential of South Bohemian Region 2. New chemical, pharmaceutical and also traditional products 3. Tradition of Czech forestry, traditional source 4. Good regulation 5. positive perception in the population 6. The company Lesy ČR (Forests of the Czech Republic, state enterprise) is a strong player	1. Species composition, composition of forest stands 2. Lack of labour force 3. Lack of technological capacity for processing 4. System inflexibility, excessive regulation, conservatism 5. Export of biomass to Austria 6. Inefficient system of measurement of produced wood mass	1. Education 2. Bark beetle calamity – future change of wood composition 3. New technologies 4. Monetization of ecosystem services 5. Carbon subsidies 6. Subsidy possibilities for technology, pharmacy, conversion of non-forest land to forest, landscape‘s water retention ability	1. Biotic factors - bark beetle 2. Abiotic factor - drought, frosts 3. Fluctuations in supply and demand - bark beetle 4. Labour market - lack of people 5. Ecosystem decay, mood in society - no intervention possibility in NP, co-firing of coal and wood

AGRICULTURE

Internal		**External**	
Strengths	**Weaknesses**	**Opportunities**	**Threats**
1. Variability of crops in South Bohemian Region 2. A large amount biomass	1. Diversion from food and forage crops production to production for (dependent on) the subsidies	1. Recycling of organic matter (biomass) 2. New technologies 3. Tradition of working with water in the landscape	1. Climatic conditions, soil value (through estimated pedologic-ecological unit) 2. Subsidy instability

Internal		External	
Strengths	**Weaknesses**	**Opportunities**	**Threats**
	2. Landscape drainage risks 3. The risk of erosion		3. Low flexibility of specialized agricultural holdings. They are not forced to change - everything is contracted and given in advance. Small producers are blocked by unsuitable subsidy schemes

WASTES

Internal		External	
Strengths	**Weaknesses**	**Opportunities**	**Threats**
1. A stable source 2. Low seasonality in comparison with other sources 3. The tradition of composting 4. Legislative interest - future landfill ban	1. Inadequate legislation 2. Networking 3. Informing of the municipalities	1. New technologies for new resources 2. Applied research 3. Biomass for energy supply of small settlements / municipalities 4. Presentation of good practice 5. Education	1. lack of market participants 2. insufficient infrastructure for non-energy processing 3. competition for resource in energy production or other technology

NON-TRADITIONAL SOURCES

Internal		External	
Strengths	**Weaknesses**	**Opportunities**	**Threats**
1. High efficiency of light utilization - algae 2. The possibility of growth in controlled cultivation 3. The emergence of bioactive valuable substances	1. Find cheap sources of raw materials 2. Harvesting 3. Climate conditions 4. Enough amount of water 5. Economic conditions in general	1. Connection to other European states 2. University environment - knowledge economy 3. Utilisation in pharmaceutical branch food and cosmetics	1. Failures of technological equipment 2. Long-term bad weather period 3. EU legislation

Additional analysis has been carried out during the South Bohemian cross-visit event in the framework of POWE4BIO and taken into consideration during the current discussion of the South Bohemian Bioeconomy Association.

Regional bioeconomy lead markets and proposed pilot actions.

Technology examples from Deliverable 3.3 and 3.4 in POWER4BIO were considered appropriate to implement in the region. Stakeholders in the South Bohemian Association for Bioeconomy have been informed about exemplary technology solutions, which at this stage are seen as an inspiration for the

future development of regional bioeconomy given the lack of development conditions in legislative, policy, financing, equipment and infrastructure. Some of the similar activities are running in experimental conditions in the Biology Centre of the Academy of Sciences and several working places at the University of South Bohemia. Thus, recently several parts of public deliverables in POWER4BIO are being translated for more user-friendly stakeholders' purposes.

A pre-selection of applicable technologies selected from Deliverables 3.3 and 4.1 have been summarized in a "*Catalogue of bio-based solutions for South Bohemia*" and disseminated among regional stakeholders with their potential use among Czech LAG, being accepted with high interest**.** Following project examples seem to be the most favourable as regards future strategy creation cases as technology solutions and business cases.

- HOST – Production of biogas from cattle manure anaerobic digestion. 'Green gas Kampen (Dairy farmer de Groot).
- TERRANOVA – Hydrothermal Carbonization (HTC) of Sewage Sludge.
- PILZE-NAGY – Production of oyster mushroom and oyster mushroom substrate based on straw, combined with the valorisation of the by-products of mushroom production and other agricultural and food industrial processes by producing electrical energy in a biogas plant".
- GREEN SUGAR – Production of fermentable sugars from waste resources.
- BESTICO – Bioconversion of organic side streams by black soldier fly - producing insects, lipid & protein for feed.
- KENDERHÁZ MAGYARORSZÁG – Insulation material made by using hemp hurds and lime-based binder.
- HEMPIRE – Natural insulation material made by using hemp hurds and own-produced limestone-based binder.
- "GREEN GAS KAMPEN" RENEWABLE BIOENERGY INSTALLATION – On-farm production of renewable energy based on biogas from liquid cattle and pig manure by anaerobic digestion.
- TERRANOVA HTC TECHNOLOGY – Hydrothermal carbonization of sewage sludge.
- MAKEGROWLAB – Conversion of bio-waste into pure bio-nanocellulose-based packaging material by a bacterial fermentation process.
- NAFIGATE – Production of polyhydroxyalkanoates (PHA) using waste cooking oil.

2.4.1 Summary of Bioeconomy Strategy and roadmap for South Bohemia

As previously highlighted in section 1.2 in this report, one of the key milestones in the process to develop the regional bioeconomy strategy in South Bohemia has been the establishment of the South Bohemian Association for Bioeconomy (SBAB). The formalisation of the experts' group in RBH to a legal entity enables the Association to be partner for the state/regional administration and to apply for grant and projects. Likewise, the SBAB became the leading body in the Regional Innovation Platform for Bioeconomy and Circular Economy (KIP) within the Regional RIS3 strategy to broaden the network and it has become member of the Bioeconomy platform of the Czech Republic. Currently also working on its involvement in the S3 thematic platform (Bioeconomy Pilot of the Vanguard Initiative) with observer status.

The South Bohemian Association for Bioeconomy has identified key activities to support further steps in the development of a regional bioeconomy. This includes taking the leading role in the dissemination

of upcoming workshops, seminars and conferences to the general public and regional experts. Likewise, to influence the preparation of regional and national documents and strategies related to bioeconomy via Regional Innovation Platform within the RIS3 Strategy of South Bohemian Region and with the help of Bioeconomy platform of the Czech Republic on the national level. As well as, it will integrate new stakeholders from the South Bohemia region.

These actions are intended to build necessary bases regarding:

- Encouragement of the private sector (entrepreneur stakeholders) to start a business in the bioeconomy field (Spin-off and supportive conditions after spin-off).
- Finding adequate financial support/fundraising.
- Cooperation with the executive part of the administration.
- Proclamations vs. everyday practice.
- Legislative/policy barriers.

The regional bioeconomy is expected to contribute to achieving all of the seventeen Sustainable Development Goals (SDGs), and in particular to SDGs 1 & 2 (Zero Hunger & Good Health and Well-Being), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action). Within CR national strategy "CR for 2030" there are expressed 6 goals and 3 of them could be used for bioeconomy support (3. Resistant Ecosystems, 1. People and Society, 4 Economic model).

2.4.2 Specific policy and financial mechanism to enable implementation.

Bioeconomy is being included as an integral part of regional strategic documents of South Bohemian Region such as:

- Development program of the South Bohemian Region 2021–2027.
- Regional RIS3 strategy of South Bohemia Region for 2021-2027.
- Regional Appendix to National Research and Innovation Strategy (RIS 3) for the period 2021–2027.
- Strategic development plan of the Smart Region South Bohemia for the period 2019–2023.

These advances are central considering that there are still policy or regulatory barriers and obstacles for bioeconomy implementation, such as:

- *EU and national policy + Subsidies / Financing*

  (Potential) Bioeconomy stakeholders are still waiting for a stable environment for their activities. Lots of activities seem to be very promising before recognizing and understanding the conditions. The start of broader bioeconomy use in the region should be initiated top-down with adequate policy and financial support.

- *Legislative/ Bureaucratic barriers*

  There's a key role of regional or state administration to start and (to some extent) manage this process and this role is still not understanding and accepted by the administration itself.

There's a lot of directives, restrictions and limits related to the past, disabling bioeconomy implementation which is still in function that needs to be respected by the executive part of the administration.

It is expected in the region that the future policy will be a combination of regulative, financial, and information and consultation tools. Other voluntary tools will reflect the set-up scheme.

From the South Bohemian point of view there are interesting examples of biomass mobilisation especially in combination with limitations of environmental impacts an or tools for making bio-products financially more attractive. It should be defined among regional experts which activities are eligible to include in the bioeconomy strategy and which not.

In the meantime, the Bioeconomy Association has identified from Deliverable 4.2 attractive good policy practices related to waste, forestry and agriculture biomass use, networking activities supported by regional specialisation strategies and policy mechanisms to make bio-products more attractive financially (e.g. Act on the Carbon Dioxide Tax on Certain Energy Products in Denmark).

Furthermore, regarding financial instruments identified in the region, a combination of economic instruments are regarded as the best approach to support the regional bioeconomy, including:

- Subsidies – there are not special subsidy titles for bioeconomy but some of existing titles for innovation, environment, agriculture have very similar effect.
- Voluntary environmental agreements (VEAs).
- Green taxes.
- Tradable emission allowances .

2.5 Southern Great Plain (HU)

As previously explained in Deliverable 5.3, the region of Southern Great Plain will not generate a regional strategy, given the administrative restrictions that do not allow for strategy preparation at this level. Only at national or county level. The preparation of the national bioeconomy strategy is ongoing and Southern Great Plain RBH acts through the Bioeconomy Cluster to contribute towards the national strategy and later to support on its implementation. In the framework of this work package, the bioeconomy cluster with the RBH has generated a summary position document specifically for the region, *bioeconomy recommendation material for the Southern Great Plain region,* as their contribution to the national level bioeconomy strategy.

The SWOT analysis carried out during the project[7] for Southern Great Plain revealed:

- **Key strengths:** regional availability of biomass, mainly from the agriculture sector which supplies 90% of regional biomass (including agricultural waste and by-products); existing integration of biomass residues on bioenergy sector, such as manure and food industry waste for biogas and/or

[7] Regional SWOT analysis reported in confidential deliverable from Task 5.2 in POWER4BIO.

biomethane production; advantageous geographical location to facilitate biomass mobilization. The region had a Research and Innovation Strategy for Smart Specialisation-(RIS3) for the previous programming period (2014-2020), but the RIS3 for the next programmatic period (2021 – 2027) is not published yet. The agriculture sector sustains a strong agricultural market as well as certain agri-food innovations (e.g. insect-based protein production, algae-based feed supplements, etc.) present in the region. Furthermore, policy support is at the moment present in the national initiative for bioeconomy strategy development, which could lay the basis for dedicated funding for bioeconomy R&D+I. One additional strength is the harmonization with other types of funding for the agriculture, forestry and energy sector (from Common Agricultural Policy, National Forestry Strategy and National Energy Strategy) is key.

- **Key opportunities** reside in the availability of wood resources with 12% of Hungarian forest situated in the region and tapping available waste resources. Several strategies are available at the national level, which supports research and innovation in important sectors belonging or in relation to bioeconomy such as the National Waste Management Plan, Food Economy Strategy, Second National Climate Change Strategy and National Sustainable Development Framework Strategy. Furthermore, value chains based on agroindustry by-products hold high potentiality, to be mobilized and used in strategic bioproducts of interest for the region, for entrepreneurship promotion for initiatives that use these resources, attracting private investors and the creation of new jobs.
- **Weaknesses** reside in the lack of companies capable of processing and transforming waste and agro by-products into high added value products. It is also mentioning the need for improvements of existing infrastructure to mobilize biomass, such as the freight train railway network and other key infrastructure to facilitate the establishment of sustainable chemical industries and biorefinery concepts in the region. Moreover, there is no specific funding for the bioeconomy, nor focus on the bioeconomy in existing funding institutions and there is a lack of promotion of high-added value products from agricultural biomass. Finally, awareness about the bioeconomy and what it entails has to be built in the region, among different sectors and civil society and exists a lack of clarity on the legal situation and policy background for waste valorization.
- The **threats** to minimize are long administrative periods to approve procedures of new technologies related to waste, as well as legislative and economic hurdles to valorize waste resources. Another threat is the lack of measures for the implementation of research and innovation initiatives, mostly if these are focused on the valorization of waste resources.

Three priority areas were specified in the recommendation document: *i) knowledge sharing and transfer, ii) development and innovation, iii) rural development*. These areas were chosen based on the findings of the RBH meetings and the cross-visit. During these events, the key areas of the discussions were the awareness-raising, pilot actions/flagship projects, mentoring programme for businesses, education, RDI – all of which are incorporated into the three categories of the recommendation document.

The three priority_areas are linked to the following main aspects of the SWOT: the existence of raw materials, infrastructure, RDI activities and good practices (Strengths); logistical difficulties, low number of high-added value products, missing links and lack awareness (Weaknesses); existing clusters, events organised, active actors, availability of unexploited resources (Opportunities); lack of strategy and funding, long administrative periods to approve procedures related to new technologies (Threats).

Regional bioeconomy lead markets and proposed pilot actions.

Although in Hungary the utilization of corn as a feedstock for bioethanol production is relatively developed, this practice raises some concerns regarding the use of arable lands for fuel production instead of food production. Thereby SGP would like to choose a different approach, which builds on the natural endowments of the region, developing new value chains relying on feedstock that could be easily produced in the region without endangering the current value chains. These feedstocks are elderberry, herbaceous plants, hemp, fish, algae, lignocellulose and sewage sludge.

There are already some projects in the region that are involved in the development of fishponds and in algae and lignocellulose utilization. These projects are supported by the National Research, Development and Innovation Office, but the used financial instruments are not specifically for bioeconomy related projects and do not form part of the implementation of any kind of bioeconomy related policies. The projects are supported because of their excellence and novel approach.

The regional bioeconomy strategy recommendation made by the Hungarian Bioeconomy Cluster will be taken into the consideration at the national level bioeconomy strategy development process, since from one side the Cluster itself is a participant in this process and it is in contact with the relevant authorities and experts, and from the other side, the recommendation was read and commented by the leading mandatary of the strategy development process.

2.5.1 *Summary of recommended actions for Southern Great Plain bioeconomy*

Given that National Bioeconomy Strategy for Bioeconomy is still in development, here are presented the regional level recommendations developed by Hungarian Bioeconomy Cluster.

Specific actions recommended for Southern Great Plain´s bioeconomy		
SWOT component	**Action planned in the roadmap**	**Implementation time-span (Short-medium-long term)**
-by-products produced by agro-industry represent an interesting development direction to exploit -12% of the Hungarian forests are situated in the region	Assessment of potential biomass available	Short
-sectors having experience in biomass uses -existing infrastructures linked to the agricultural sector	Analysis of existing practices	Short

-logistic issues can hamper the implementation of biomass valorisation technologies		
-there are already some relevant clusters, which could be developed	Creation of supporting institutions and support of cluster activities	Medium
-low level of awareness regarding bioeconomy concept in society hold back the sale of bio-based products -regional bioeconomy cannot be successfully developed if the awareness level of stakeholders remains low	Awareness-raising	Short
-the lack of specialized experts could slow down the bioeconomy on long term	Training activities and higher education programs	Long
-conferences and events related to biomass utilisation, agriculture and food industry organised in the region could be used to create synergies to promote bioeconomy knowledge transfer	Networking, matchmaking events, cooperation	Medium
-insufficient policy support, lack of clarity of the legal situation and policy surrounding -several national level strategies promote relevant thematic areas	Develop a system of supporting policies	Medium
-already existing initiatives for funding at national level -many actors in the bioeconomy field are already participating in research and innovation programmes at national and international level as well -no funding available to promote academic research in the field of waste management	Search for public funding sources on multiple levels	Short
-already used Common Agricultural Policy related indicators could be used to follow the development of the bioeconomy sector	Indicator and monitoring systems	Medium
-long administrative periods to approve procedures related to new technologies for waste management and	Creation of standards and certificates in the industry	Long

processing slow down the market entrance		
-it is important to focus on the demands of the market, and the results of research and development projects should be market ready products	Assessment of the demand of the market	Short
-without specifying concrete bioeconomy related RDI areas it is harder to create adequate supporting financial instrument	Integrate bioeconomy related topics in the regional and/or national RDI framework	Long
-it is really important to local stakeholders know each other and to find possible connection points	Creation of local product and value chains, cooperation between local stakeholders	Medium
-most of the agricultural products commercialised by regional actors are not products with high added value -scarcity of regional funding to boost new processed agricultural end products with higher added value	Creation of jobs with higher added value	Medium
-biogas plants could use different materials such as wastewater, manure, food industrial wastes	Local energy supply	Long
	Biodiversity	Long
-lack of mechanisms to communicate concerns about environmental aspects	Quality of soil and environment	Long

Table 11: Specific actions recommended for Southern Great Plain´s bioeconomy

Although the document made by the Hungarian Bioeconomy Cluster is just a recommendation, thereby there is no responsible institution for the implementation, the possible roles could be predicted. The Ministry of Agriculture is accredited to coordinate the national-level bioeconomy strategy involving different stakeholders and experts. The Cluster itself gives feedback to the ministry from the viewpoint of affected SMEs, research and education institutes. The Cluster is also involved in RDI, knowledge transfer, networking, awareness-raising and other support activities. Probably the creation of supporting financial instruments will be the task of the Ministry for Innovation and Technology through the National Research, Development and Innovation Office, based on the strategy created by the group coordinated by the Ministry of Agriculture.

By the recommendation document, in the early stage, the monitoring system would rely on the already used Common Agricultural Policy (CAP) indicators. This would enable to get relevant data about the current status of the bioeconomy and to follow its development through the next few years without a year's long planning and implementation of a totally new monitoring system. Currently, in Hungary, the Ministry of Agriculture and its institutions are responsible for the CAP monitoring system.

2.5.2 Specific policy and financial mechanism to enable implementation.

As the bioeconomy in Hungary will probably rely mostly on the performance of agriculture, thereby it is clear that the bioeconomy related policies should follow the goals and policies of CAP. The implementation of the proposed actions in Southern Great Plain will be in line with the national bioeconomy strategy and its actions (which is are under development). For extended information about the policy framework considered for regional recommendations and national bioeconomy, please refer to Deliverable 5.3[8]

During the regional analysis and in the final regional recommendations no new policy measures were recommended, since it was not the scope of the document. The document can only recommend good practices to be taken into account.

The recommendation highlights the importance of relevant clusters, which could support the collaboration and coordination of industrial and research stakeholders and drive bioeconomy transition in the region. This kind of good examples has been mentioned also in the Deliverable 4.2. The document also mentions the importance of standards and certifications systems, which could strongly support the market entrance of different types of biomass-based products.

There are already some good examples in Hungary regarding financial instruments that could be used for the implementation of the roadmap. For instance, financial instruments offering support for businesses to develop new products with criteria that the beneficiaries have to generate income from the developed products after the supporting period. These instruments could be a good step towards a market-oriented bioeconomy sector; the only problem is that there are no bioeconomy focused financial instruments and probably there will be none until the national level bioeconomy strategy implementation begins.

By the strategy recommendations, there is a need for a paradigm change in the case of financial instruments. The goal should be to create market-ready products with high added value. From one side the instruments should motivate the applicants to develop a product, which will actually generate income after the support period by offering loans or grants with a low funding rate (max. 50%). Thereby beneficiaries share the risk of the RDI project with the supporter and are motivated in the development of marketable products. From the other side, these instruments should support not just the development of Technology Readiness Level (TRL) but simultaneously the increase of Business Readiness Level (BRL) as well to help the beneficiaries to speed up the market uptake of the developed products.

[8] Deliverable 5.3: Summaries of 5 new regional bioeconomy strategies

3 CONCLUSIONS

In the development of Task 5.3 all CEE regions applied entirely or sections of the proposed methodology. In more than one region it has been observed the enrichment of the proposed steps and actions according to usual regional planning process and stakeholders needs. For instance, during the roadmap development process Lviv region decided to introduce a scenario analysis for and Nitra region requested proposals for specific project with specific estimated budget to institutions involved. At the end it has been important during the whole development of Work Package 5 that regions find guidance, tools and resources, but also could count with the flexibility to adapt these to their own conditions and administrative process.

While not all regions have finalized their strategies and one region in particular (Southern Great Plain) will not develop a regional strategy given administrative limitations, the work done by each of the regions presents an enormous effort to establish a bioeconomy concept within the region. In this way, also paving the way for its understanding at the policy level, by the industries in the sectors of greatest interest to each region and other key stakeholders for their development. Also, the regional analysis to develop their strategies and more concretely their action plans has made clear the instruments available (whether specific to bioeconomy or not), and opened the vision to a myriad of possibilities to strengthen the development of projects and support to small and medium enterprises.

It is noteworthy the use of Smart Specialization Strategies, which have facilitated the alignment of bioeconomy priorities within the framework of the areas of greatest relevance for the region. It has also allowed building on a solid planning instrument with which the regions are already familiar. Particularly influential has been the end of the 2013-2020 program period, which has allowed regions to identify opportunities to include new bioeconomy priorities and specific action plans in the revision of RIS3 for the next period (2021-2027). This is the case of South Bohemia, which included additional priorities in its Regional Innovation strategy, the Nitra region, which has built its entire strategic plan on the basis of the regional RIS3 and the Regional Development Plan, or also the case of Lviv, which has developed for the first time its RIS3 with strong focus on bioeconomy.

The development of a stand-alone strategy was only carried out by Mazovia region, with a detailed plan of action directed towards the technological advancement of the region, the effective utilisation of waste resources and with a strong focus on sustainability and the recognition of climate change effects over future development of regional bioeconomy activities. These stand-alone strategies highlight the importance of the bioeconomy in the region and facilitate the recognition of all the policies, strategies, programs and plans that so far are spread across several of the regional institutions, thus resulting in a coordination for effective actions and their implementation. Finally, in framing and aligning the regional bioeconomy strategy with other regional strategies, cooperation goals between regions and goals to achieve SDGs for each region have been considered.