Bio-based strategies and roadmaps for enhanced rural and regional development in the EU

The macro-environment surrounding BE-Rural's Open Innovation Platforms

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Abbreviations

CHP	Combined Heat and Power
CR	Centru Region
CSB	Central Statistical Bureau
EE	Energy Efficiency
EMFF	European Maritime and Fisheries Fund
EU	European Union
FLAG	Fishery Local Action Group
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GGF	Green for Growth Fund
GHG	Greenhouse Gases
GVA	Gross Value Added
IPA	Instrument for Pre-Accession Assistance
KPR	Kurzeme Planning Region
LEAP	Local Environmental Action Plan
NDC	Nationally-Determined Contributions
RES	Renewable Energy Sources
SHPP	Small Hydro Power Plant
SMEs	Small and Medium-sized Enterprises
SRC	Short Rotation Crops
SSF	Small Scale Fishery
SWOT	Strengths, Weakness, Opportunities and Threats
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
VPR	Vidzeme Planning Region
WeBSEFF	Western Balkans Sustainable Energy Financing Facility

Executive Summary

With the recent update of its Bioeconomy Strategy, the guidance of its advisory bodies and the engagement of regional groups and representatives, Europe has found a new track towards a sustainable bioeconomy. It builds from the notion that regions are the most appropriate territorial level at which to implement bioeconomy strategies, and it has found ample support in the various European mechanisms for funding research, innovation and rural development initiatives. The BE-Rural project incorporates this regional focus into its core vision, putting its regional Open Innovation Platforms (OIPs) front and center in the process of studying the potential for regional bioeconomies, and articulating and implementing strategies to make them a reality.

The richness of natural resources in the Strumica region of North Macedonia is a solid base for the future economic development with a number of prosperous SMEs. The closeness and connection to European borders and markets and the commitment of municipalities towards common development renders the Strumica region an excellent candidate for development of a bioeconomy strategy. However, the region's strong outflow of young people - particularly educated ones - as well as lack of direct investment and absence of standardised agricultural production pose challenges to bioeconomy development. Overall, better collaboration between educational institutions, research and development units, businesses, the authorities and the wider public will need to be established to secure the efforts within and beyond this project bear fruits.

In the Stara Zagora region of Bulgaria, collaboration already exists among some key bioeconomy stakeholders such as educational institutions, research and development units, and local businesses. Various levels of authority in the region have already acknowledged their co-responsibility for the implementation of a regional bioeconomy strategy. This provides solid footing for progress developing the bioeconomy in the region. The structure of Stara Zagora's economy, with a mix of small- and medium sized enterprises, offers good opportunities for growth and for the creation of new and more valuable jobs. On the other hand, public awareness of the bioeconomy concept (and environmental concerns in general) is low in Bulgaria. Collaboration among all relevant stakeholders will thus require substantial financial, human, and technical resources.

In the Polish Baltic Lagoon regions, cooperation between the relevant administrative units and interested entrepreneurs, as well as scientific entities, is also already taking place at the local level. Regional connections of various economic and social entities driven by Fishery Local Action Groups established in the regions will be the basis for creating a vision of regional development on the basis of the circular bioeconomy. The promotion of traditional, often forgotten recipes and the application of innovative technologies such as freeze-drying are the efforts being considered to bring undervalued, underused fishery resources back into the mainstream. Given the strong dependence of the regions' economies on tourism, it will be crucial to establish strong communication channels between stakeholders, identify the points of synergy and engage in close collaboration to avoid detrimental competition between economic sectors.

With the bioeconomy being on the radar screen of politicians at the national level in Latvia, and a national bioeconomy strategy through 2030 already formulated for the country, conditions are good for regional counterparts to be developed. The Vidzeme and Kurzeme regions' economic focus on primary resource sectors, primarily agriculture and forestry, renders them well-suited for a bioeconomy strategy that builds ties among businesses and other relevant institutions in the agriculture and forestry value chain. However, to achieve the set goals, large investments on innovation and product development, branding and marketing, as well as the expansion and modernization of production facilities and infrastructure, will be necessary.

Lastly, the abundance of bioresources in the Covasna region of Romania, combined with the variety of specialized clusters that have been previously established in the region and are driving innovation on renewable energy and environmental technologies, agro-foods, forestry products, and textiles, reveal promising conditions for the formulation and rollout of an integrated bioeconomy strategy. And while natural resources are ample and a large array of policy and regulation mechanisms are in place

to protect them, the main challenges in the region remain the effective monitoring of illegal extraction and enforcement of regulation. Overall, the awareness and engagement of the stakeholders in the region regarding the potential of the bioeconomy promises to drive effective action in the near term.

In providing an outline of the macro-environment at each of the OIP regions, this task has also served to shed light on key points of collaboration between them, confirming previous notions of potential synergies and revealing new areas where the regional bioeconomies of BE-Rural could complement each other and contribute to the vision of a sustainable EU-wide bioeconomy.

1 Introduction

The articulation and deployment of sound bioeconomy strategies in the five OIP regions of BE-Rural will require a solid groundwork upon which upcoming planning and stakeholder involvement activities can be built. One of the first steps in laying out this groundwork is to closely observe the current state and dynamics of the macro-environment at each of the OIP regions. Concretely, we refer to the examination of political, economic, social, technological, environmental and legal conditions surrounding and influencing the Stara Zagora region in Bulgaria, the Strumica region in North Macedonia, the Szczecin Lagoon and Vistula Lagoon regions in Poland, the Vidzeme and Kurzeme regions in Latvia, and the Covasna region in Romania. During the first semester of the project, the partners representing these regions engaged in a collaborative research exercise where all these factors were outlined and analysed using the PESTEL Analysis methodology.

Figure 1: Factors influencing strategy development and deployment

Source: own elaboration

PESTEL is a strategic analysis tool used by decision-makers to examine the external, or macro-environmental conditions prevalent in their area. It enables them to consider the 'big picture' in which they operate, thus helping them to identify factors that could influence their strategy development and decision-making (Issa et al., 2010). The main objective of a PESTEL analysis is to reveal the current opportunities to be exploited and the threats to be avoided. For this reason, the methodology is often used in combination with a SWOT (Strengths, Weaknesses, Opportunities and Threats) Analysis, which helps to scrutinize an organisation's situation on the basis of the external forces it is subject to as well as its internal characteristics.

In a PESTEL analysis, the macro-environment is divided into six main types of external conditions: *political, economic, social, technological, environmental* and *legal*. Political conditions refer to all existing or potential government policies and strategies (at the local, regional, national or supra-national level) that could influence the balance of power between different stakeholders in a certain region. Economic conditions include production, consumption, trade and financial factors at home or foreign markets (local, national, and global) that could accelerate or hinder certain developments. Social conditions are those that arise from the side of the general public and society at large and can influence political agendas as well as demand for and acceptability of certain products or services.

Technological conditions cover any relevant technical developments, including research and innovation undertakings, that define how problems are currently dealt with and could change drastically in the future. Environmental conditions include all ecological factors and natural characteristics of regions that could render them suitable or unfit for certain activities. Legal conditions include the regulatory framework and any legal mechanisms that could either restrict or enable relationships and transactions between stakeholders. Each of these six conditions are examined individually to identify any indication of changes that could represent an opportunity or a threat from the decision-maker's perspective. These changes in the external conditions may be already ongoing or expected to happen in the future (Gillespie, 2011).

A PESTEL analysis does not require proposing solutions or possible responses to the identified changes in external conditions. Deciding whether a relevant issue falls into one category or another is not crucial, as long it is captured in the analysis (Cadle et al, 2010). In the context of BE-Rural, the results of the PESTEL analyses conducted for each of the OIP regions will inform the upcoming activities of the project. Together with Task 2.5 *Analysis of the bioeconomy potential of the OIP regions*, this work aims to provide the contextual background against which the bioeconomy potential of the OIP regions will be evaluated and the business models for new technology options will be developed.

2 Bioeconomy in the EU: a brief update

The EU's goals, targets and actions for fostering the bioeconomy are defined mainly through "A sustainable Bioeconomy for Europe: strengthening the connection between economy, society and the environment – Updated Bioeconomy Strategy" and its corresponding Action Plan. This strategic document from 2018 is the latest update to Europe's Bioeconomy Strategy adopted in 2012, and resulted from the evaluation of that original strategy and its Action Plan. As critical observations made during the evaluation of the 2012 programme included a lack of policy coherence and a strong focus on industry (EC 2017), the updated strategy explicitly addresses relationships to other EU policy fields like the circular economy, biodiversity and sustainability, as well as agriculture and regional development. In that context, the EU Committee of the Regions (CoR) submitted a draft opinion in April 2019 encouraging all European regions to either adopt their own bioeconomy action plans by late 2024 or devote part of their regional smart specialisation strategy[1] to bioeconomy. The rationale is that *regions* are the most appropriate territorial level at which to implement bioeconomy strategies.

The updated Bioeconomy Strategy seeks to increase links with the EU's Circular Economy Package by promoting the transformation of agricultural, marine and forestry waste/residues into new products. Social welfare targets include creating an additional 40% growth potential for primary producers, as well as increasing jobs in rural, coastal and marginal areas by 80%.

Both the original and updated versions of the Bioeconomy Strategy pursue five main *goals*:

- Ensuring food and nutrition security
- Managing natural resources sustainably
- Reducing dependence on non-renewable, unsustainable resources whether sourced domestically or from abroad
- Mitigating and adapting to climate change
- Strengthening European competitiveness and creating jobs

To reach these five goals, the strategy defines 14 actions organised around three main *action areas*:

[1] "National/regional research and innovation strategies for smart specialisation (RIS3) are integrated, place-based economic transformation agendas that focus policy support and investments on key national/regional priorities, challenges and needs for knowledge-based development; build on each country's/region's strengths, competitive advantages and potential for excellence; support technological as well as practice-based innovation and aim to stimulate private sector investment; get stakeholders fully involved and encourage innovation and experimentation; are evidence-based and include sound monitoring and evaluation systems" (EC, 2012).

1. To strengthen and scale-up the bio-based sectors, unlock investments and markets
2. To deploy local bioeconomies rapidly across Europe
3. To understand the ecological boundaries of the bioeconomy

Particularly relevant at the regional level is *action area 2*, which is itself subdivided into four separate actions:

i. Development of a *"Strategic Deployment Agenda for sustainable food and farming systems, forestry and bio-based production in a circular bioeconomy"* (2.1). This is defined as a systemic and cross-cutting approach that links actors, territories and value chains with a long-term vision and a focus on a sustainable domestic (EU level) production. This action addresses food waste and by-products, sustainable use of seas and oceans, bio-based innovations in farming, and aquaculture among others.

ii. Implementation of five *"pilot actions to support local bioeconomy development (rural, coastal, urban) via Commission instruments and programmes"* (2.2). This is aimed at enhancing synergies between existing EU instruments to support local activities while introducing an explicit focus on the bioeconomy. Some of these pilot projects involve the so-called "Blue Bioeconomy" or "inclusive bioeconomies in rural areas"

iii. Setting up an *"EU Bioeconomy policy support facility and a European Bioeconomy Forum for Member States"* (2.3) under the Horizon 2020 Framework Programme for Research and Innovation in order to support the development of national/regional bioeconomy strategies, including remote areas and candidate and accession countries.

iv. Promoting "*education, training and skills across the bioeconomy"* (2.4). This is considered an important pre-condition for dealing with the systemic and cross-cutting nature of emerging bioeconomy approaches and value chains, which require adaptation and flexibility according to different needs across the bioeconomy sectors (EC 2018).

The most important funding source for bioeconomy related R&I at the EU-level is Horizon 2020. According to the review of the 2012 Bioeconomy Strategy, between 2014 and 2017 Horizon 2020 funded 3,860 projects relevant to the bioeconomy with over €7 Billion, which is about 28% of the overall Horizon 2020 budget (EC 2017).

Under the EU 2020 Strategy and EU Cohesion Policy 2014-2020, countries and regions are encouraged to develop their own *National/Regional Research and Innovation Strategies for Smart Specialisation* (RIS3). These strategies, financed by the European Structural and Investment Funds (ESIF) for 2014-2020, define integrated economic transformation agendas for the countries/regions. They focus on fostering policy and support for, as well as investment in, technological and practice-based innovation at the national/regional level. As of 2017, 98,6% of the EU regions have included bioeconomy related aspects in the R&I priorities of their RIS3 for 2014-2020 (Spatial foresight et al. 2017).

At the regional level, bioeconomy deployment occurs mainly through individual projects and initiatives promoted by stakeholders including regional and local public authorities, private companies, universities, research centres and/or technology and innovation service providers. These stakeholders often rely on European and/or national co-funding, but sometimes draw on local and regional resources. Horizon 2020 is mentioned in almost all documents, and 77% of the regions list it as a co-funding source for bioeconomy related activities. About 67% of the regions intend to use ESIF to finance such activities. The specific ESIF most frequently cited for application to bioeconomy initiatives are the European Regional Development Fund (ERDF), the European Agricultural Fund for Rural Development (EAFRD), the European Maritime and Fisheries Fund (EMFF), and to a lesser extent the European Social Fund (ESF). Though Horizon 2020 and ESIF are separate funding pools, countries and regions are promoting synergies between them, for instance through the creation of the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-Agri). Other EU-programmes that promote bioeconomy activities include Interreg and LIFE+ (Spatial foresight et al. 2017).

3 Analysis of the macro-environment surrounding BE-Rural's Open Innovation Platforms (OIPs)

3.1 OIP Stara Zagora, Bulgaria

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The Stara Zagora region is a Bulgarian "oblast" which corresponds roughly to district, county, or prefecture in other EU member states - it is at administrative level 3 under the EU's Nomenclature of Territorial Units for Statistics (NUTS). Located in central Bulgaria's Thracian valley, Stara Zagora has a total area of 5,151 km^2, consists of 11 municipalities (NUTS administrative level 4) and has a population of over 300,000 inhabitants. The region's geographical position is an advantage for enterprises that operate there: high quality road and rail infrastructure runs across the region and connects it to a number of international destinations.

Stara Zagora's numerous natural resources render it conducive to the development of agriculture, energy and industry. The climate is moderate continental, with relatively mild winters, land flat for the most part and fertile. About 56% of the area's farmland is cultivated, mainly in its southern plains, with cereals, sunflowers, cotton, vegetables, as well as fruit orchards and vineyards. The region is famous for its herbs, which are used in cosmetic, pharmaceutical, and food processing industry applications.

The region's economy is currently quite diverse, with unexplored business potential in the circular economy. There are abundant prospects for better use of available resources as well as application of new technologies. The OIP Stara Zagora will focus on new technologies for processing herbs and producing essential oils for the cosmetics and pharmaceutical industries. Small-scale production in this area can be combined with tourism-related activities to expand existing business. Ultimately, the OIP will establish a network among companies that will foster collaboration.

3.1.1 Political conditions influencing Stara Zagora

The Republic of Bulgaria currently does not have a bioeconomy strategy. A strategy for the Stara Zagora region is being drafted, but cannot be finalised without further political support.

National policies and strategies relevant for the bioeconomy

Bulgaria 2020, the country's National Development Programme (NDP)[2], was published by the national government in 2016 and describes the following policy priorities through the year 2020:

1. Improving access to and quality of education and training as well as quality of Bulgaria's workforce
2. Reducing poverty and promoting social inclusion
3. Achieving sustainable integrated regional development by maximising local potential
4. Developing Bulgaria's agricultural sector to ensure food security and to produce high added value goods using sustainable management of natural resources
5. Supporting innovation and investment activities to enhance economic competitiveness
6. Increasing the efficiency of public services for citizens and businesses
7. Increasing energy security and resource efficiency
8. Improving transport connectivity and access to markets

The concept of bioeconomy aligns well with the NDP's priorities, as the former also involves combining e.g. development and exploitation of new skills, poverty reduction and social inclusion, integrated regional development, and creation of high added value local products. Thus, the Bulgarian NDP could constitute a framework for action on the bioeconomy.

[2] See also: http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=766

A series of policy strategies that address climate change and disaster risk management in Bulgaria could also serve to underpin bioeconomy establishment: the country's third *National Action Plan on Climate Change (NAPCC),* published in June 2012 by the Ministry of Environment and Water outlines a concept of rational and responsible use of resources with introduction of low-carbon, energy-efficient and waste-free technologies, as well as more waste recovery and recycling.

Similarly, the "*National climate change risk and vulnerability assessment for the sectors of the Bulgarian economy"*[3] (published by the Ministry of Environment and Water in 2014) aims to develop strategies to adapt to climate change and provide information on the expected effects of climate change on various economic sectors.

Another document from the same year, *Financial Disaster Risk Management and Insurance Options for Climate Change Adaptation in Bulgaria*[4]*,* provides examples of both state-level incentives and opportunities at the local level for climate change adaptation, taking into account the profile of the specific region.

Regional and local policies and strategies relevant for the bioeconomy

Regional Development Strategy of Stara Zagora

The Regional Development Strategy 2014-2020[5] provides an analysis of the demographic, cultural, natural and economic resources of the region and outlines its main priorities. It is the major strategic document for sustainable and integrated social and economic development of the region. The goals set out in the strategy are:[6]

- strengthening research activities, technological development and innovation
- improving access to information and communication technologies
- enhancing the competitiveness of small and medium enterprises, including those in the agricultural sector
- supporting the transition to a low-carbon economy in all sectors
- promoting adaptation to climate change, prevention and risk management
- protecting the environment and promoting resource efficiency
- promoting employment and supporting labour force mobility

Smart Specialisation Strategies

Bulgaria's Ministry of Economy established its Smart Specialisation Strategies[7] (S3) in November 2015. It followed the "enterprise-discovery process" for setting economic priorities in the framework of research and innovation activities. The aim is to create a competitive advantage by developing and aligning Bulgaria's strengths in research with the needs of industry, and to respond to new opportunities and changes in the market by focusing investment in areas that increase the added value of the economy and its competitiveness in international markets.

Priority S3 objectives for Stara Zagora include:

- increasing production capacity of plant raw materials introducing combined agro-forestry systems, and increasing the efficiency of the agricultural sector
- introducing innovative biotechnology solutions for food products like nutritional supplements, beverages, food flavourings, and cosmetics

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[3] See also : https://www.moew.government.bg/static/media/ups/articles/attachments/DRM%20-%20Full%20Report%20-%20First%20Draft%20(2018-04-27)%20-%20EN%20-%20for%20printing%20v2675c5b0db190d4aa5dae48daf147c909.pdf

[4] See also: https://www.moew.government.bg/bg/analiz-i-ocenka-na-riska-i-uyazvimostta-na-sektorite-v-bulgarskata-ikonomika-ot-klimatichni-promeni/

[5] The area covers the following major municipalities: Daskalovi Brothers, Galabovo, Gurkovo, Kazanlak, Maglizh, Nikolaevo, Opan, Pavel Banya, Radnevo, Stara Zagora, Chirpan. Each municipality has developed its own development plans.

[6] See also Zelljadt et al. (2018)

[7] See also https://s3platform.jrc.ec.europa.eu/regions/BG/tags/BG

- producing goods from wood processing waste materials as well as waste from plant and livestock cultivation, and production of biomass on grasslands and in the forestry sector

Specific S3 objectives for Stara Zagora include:

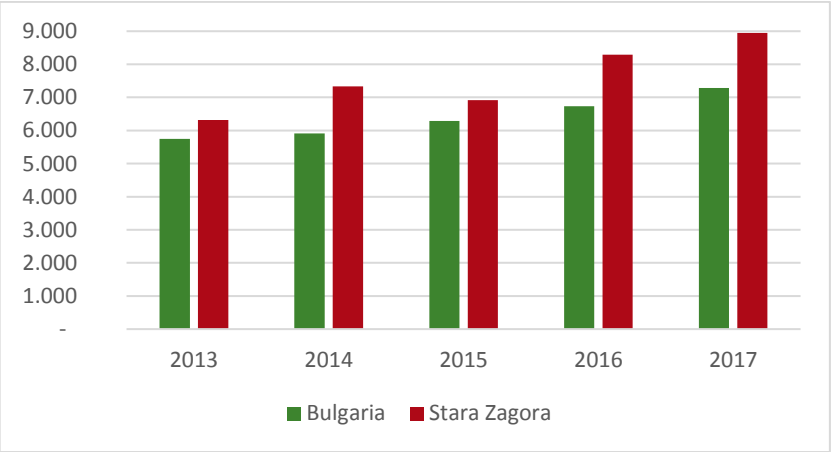
- reducing pollution from the industrial sector through recovery and recycling of its waste products
- ecosystem preservation and correlating conservation of natural resources through reduction of erosion and land loss
- mitigation of greenhouse gas emissions from the region's livestock operations

As is the case with the National Development Programme, the S3 and the Regional Development Strategy of Stara Zagora represent solid footholds for the formulation and rollout of a fully-fledged bioeconomy strategy. Stara Zagora's regional development focus is on regional clusters in the agricultural sector in combination with the processing industry, with a political target of vertical integration of these areas to increase value generation and to strengthen the competitiveness of these sectors in the region.

3.1.2 Economic conditions influencing Stara Zagora

In 2017, Stara Zagora's gross domestic product (GDP) per capita was €8,951 - 23% above Bulgaria's national average. Only the country's capital, Sofia, had a higher GDP per capita in that year. Stara Zagora's economic growth rate is also above the national average, at 10% per year between 2013 and 2017 compared to 7% in Bulgaria as a whole.

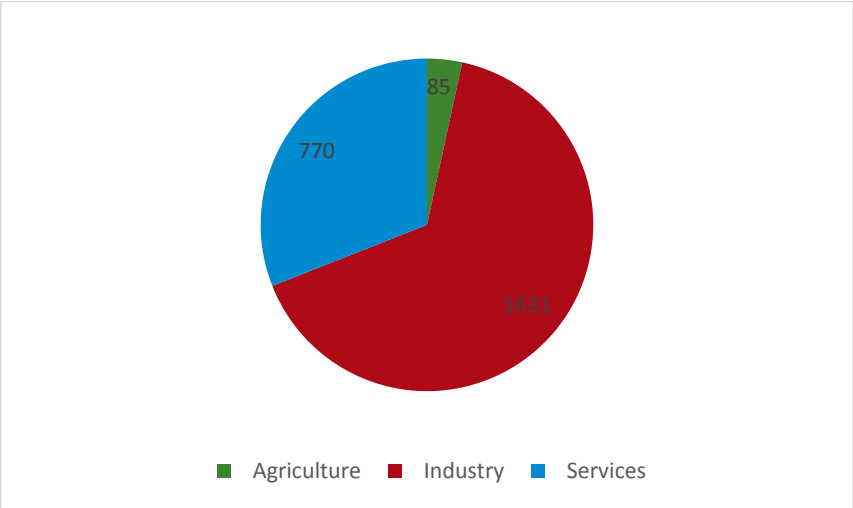
Figure 2: Growth of GDP per capita in € for 2013-2017



Source: Republic of Bulgaria (2019) calculated with an exchange rate of €0.51 per Лв (Bulgarian Lev)

The Gross Value Added (GVA) is largest in Stara Zagora's industrial sector (65.6%), followed by services (31%), and agriculture (3.4%). Pursuing a bioeconomy strategy would see the shares of agriculture and services grow.

Figure 3: GVA in Stara Zagora by economic sector in € Million



Source: Republic of Bulgaria (2019) calculated with an exchange rate fo €0.51 per Лв (Bulgarian Lev).

Table 1: Agriculture as a portion of the economy in Bulgaria and Stara Zagora in 2017

	GVA	GVA per capita	Employees
	Million €	€	FTE
Republic of Bulgaria	44669.19	7301.36	2308129
- Agriculture	2103.49	No data	71340
Stara Zagora	2492.07	8973.31	99868
- Agriculture	84.86	No data	No data

Source: National Statistics Institute, 2018

Agriculture is 4.7% of Bulgaria's GVA, whereas it comprises only 3.4% of Stara Zagora's - industrial production makes up a proportionally higher portion of GVA in the latter, given the economic importance of the Maritza Iztok energy complex described below. However, Stara Zagora's competitive advantage in agriculture is reflected in its added value *per capita* for that sector, which is higher than the country average. This shows the potential for expansion of value-added agricultural products in the region. The following table breaks down business and employment statistics for Stara Zagora's four biggest municipalities, showing the importance of agriculture in each.

Table 2: Economic indicators for the region of Stara Zagora and some municipalities for 2017

	Enterprises	Production	Operating Income	Employees
	Number	Thousand €	Thousand €	FTE
Region Stara Zagora	14830	3911844	5543430	99868
Municipality of Stara Zagora	8929	1435403	2615414	46478
Agriculture	306	53239	80619	1508
Food processing, drinks and tobacco	150	245421	270847	3232
Timber production	50	13475	14385	414
Chemicals production	10	15797	18689	243
Furniture	199	31717	33760	1279

	Enterprises	Production	Operating Income	Employees
	Number	Thousand €	Thousand €	FTE
Municipality of Galabovo	376	742991	791170	4668
Agriculture	37	7550	11034	133
Food processing, drinks and tobacco	6	572	594	32
Timber production	-	-	-	-
Chemicals production	-	-	-	-
Furniture	-	-	-	-
Municipality of Kazanlak	3121	730398	953871	31056
Agriculture	136	10494	18411	496
Food processing, drinks and tobacco	56	6465	7016	333
Timber production	39	20768	21637	426
Chemicals production	21	16539	22393	139
Furniture	91	9675	10092	494
Municipality of Radnevo	608	708243	767403	12704
Agriculture	64	16999	25124	316
Food processing, drinks and tobacco	-	-	-	-
Timber production	-	-	-	-
Chemicals production	-	-	-	-
Furniture	15	12626	14131	336

Source: Chamber of Commerce and Industry Stara Zagora, 2018.

The structure and number of employees per company in the Stara Zagora region varies widely, with a relatively balanced mix between small, medium-sized and large entities. The unemployment rate in 2018 was 4.5%, which is lower than Bulgaria's national average of 6.2% (EURES, 2019).

Spatial Foresight et al. (2017) highlighted the potential of the agro-food sector in Bulgaria, pointing out the economic importance of medicinal plants, 90% of which are exported. Bulgaria is first in Europe and one of the global leaders in volume of exported herbs, with 200 types of medicinal plants harvested to be used in the pharmaceutical industry, cosmetics products, food industry and alternative medicine. In Stara Zagora specifically, high value-added products bearing great potential to drive the region's bioeconomy include wine, tobacco, poultry and agricultural by-products - but above all the region is known for production of bio-ethereal oils, especially rose and lavender. Bulgaria ranks first in the world in production of these two oils, and within Bulgaria the Thracian valley boasts the best conditions for growing oil-bearing rose and lavender.

Stara Zagora's energy sector is still a long way from a transition to renewables, as its giant industrial complex (Maritsa Iztok) operates with electricity from locally-mined lignite. Nevertheless the third NAPCC foresees natural gas as a bridging technology as well as low carbon alternatives. Biogas could provide a portion of this transition, but depending on the feedstock (waste only, or e.g. corn-based ethanol), it could increase the pressure on land use in the region. In the long run, a transition to low-carbon energy sources in the region has the potential to provide healthier, more diverse and better paying employment options than the current coal-based power sector. According to Bulgaria's National Renewable Energy Action Plan, in place since 2012, 16% of the country's gross final energy consumption must come from renewable sources by 2020. The country has already reached this target, as the current energy mix is roughly 40% coal, 35% nuclear, and 19% renewables (Ministry of Energy, 2019).

3.1.3 Social conditions influencing Stara Zagora

Bulgaria has been in a demographic crisis for decades - its effects are becoming more tangible with each passing year: the country's population is declining at one of the fastest rates in Europe, according to the UN. In 1989 there were 9 million Bulgarian citizens - by early 2018 the population was just over 7 million. The economic crisis that befell many former "eastern block" nations in the 1990s caused a first mass exodus that saw about 1 million people leave the country by 2005. Years of deteriorating quality of health care, education, and other social policies severely reduced Bulgaria's birth rate during this time. After Bulgaria's accession to the European Union in 2007, it became easier for Bulgarians to work and study abroad - many chose to leave the country for better professional and academic opportunities. Stara Zagora does not differ from the national demographic trend in this regard, though it is one of the six districts in the country whose economy and labour market are considered most favourable: it features relatively high local taxes and fees, and inhabitants attain relatively higher education and health levels. The existence of a good diversity of SMEs and also larger companies is a good base for the take-off of new impulses. There are initiatives to stimulate new jobs in rural areas, reduce unemployment and as a side effect slow the urbanisation trend.

The better education and health status of the local population renders Stara Zagora relatively more inclined than other regions to adopt bioeconomy initiatives: the population is increasingly aware of quality and composition of its food, with demand for and consumption of organic or "ecologically clean" foods increasing. Especially the younger population appears to exhibit a change in preferences, due to growing interest in environmental issues. Nevertheless, awareness of the bioeconomy as a concept is very low in Bulgaria. Information about the topic is rarely found in the newspapers, magazines, or social media. The biggest initiative related to this issue was a three-day exhibition under the auspices of the BioSTEP project in October 2017, which showcased bio-based products. The organisers reached out to 200 people and raised their awareness on the concept of the bioeconomy - Bulgarian national press (Standartnews and Monitor) reported on the event but focused on the products showcased without linking explicitly to the concept of the bioeconomy.

Although the leading industry in Stara Zagora is manufacturing, some 15,000 people are employed in the energy sector (Chamber of Commerce and Industry Stara Zagora, 2019) - the Maritza Iztok energy complex is the major source of the region's GVA (see Figure 3 above) and includes three lignite pit mines, four coal-fired power plants that generate electricity, a briquette production factory and several businesses related to the mining and power plant operations such as warehouse and logistics facilities (Za Zemiata, n.d.). With the future of coal-fired electricity generation uncertain in Bulgaria (the country's Energy and Climate Integrated Plan anticipates renewables making up 25% of final energy consumption by 2030) the coal industry will need to undergo major changes in the upcoming years. Other regions where coal has been the major economic driver but is being phased out (including Germany's Lusatia region and Silesia in Poland) are pursuing a so-called "just transition" for inhabitants, coal miners, power plant workers and others whose jobs will become obsolete. Such a transition involves retraining of workers to gain expertise in other sectors or in renewable energy technologies. Development of a bioeconomy in Stara Zagora bears great potential for such a transition, as it offers opportunities in agriculture and tourism for those leaving the phased-out coal sector, as well as potential for modern energy sector employment with bioenergy. European and World Bank funds are available for e.g. retraining of workers in this context.

3.1.4 Technological conditions influencing Stara Zagora

Favourable soil and climatic conditions in Stara Zagora enable the cultivation of a wide variety of agricultural products including grains, oilseeds, vegetables, fruits and herbs (see the chapter on environmental conditions below). Processing these raw materials into value-added goods, for export and for domestic consumption, requires educational and research institutions with the requisite technical expertise. Stara Zagora has several such institutions: Trakia University focuses on medicine, agrarian sciences, technical sciences, economics, as well as ecology/environmental science. The Institute of Rose and Essential Oil Cultures, the Field Crops Institute, and the Agricultural Institute also drive research and technological development in the region (Zelljadt et al. 2018, p.12).

In 2017, expenditure on research and development activity in Bulgaria was €387.7 million - a 3.5% increase compared to the previous year. However, R&D expenditure as a percentage of GDP declined slightly - from 0.78% in 2016 to 0.75% in 2017. There is no data for the regions.

The aforementioned history of coal mining and electricity production in the region is an asset in terms of technological know-how for an emerging bioeconomy: existing expertise in power generation, mining, and associated logistics enterprises can be transferred to innovative agricultural and modern energy operations. The region's high quality natural resource and transportation infrastructure also provide good conditions for the cultivation and refining of bio-based products: water availability in the region is high and water supply infrastructure, like dams and canals, are adequate.

3.1.5 Environmental conditions influencing Stara Zagora

Stara Zagora's climate is transcontinental with influence from the Mediterranean Sea. In winter the weather is milder than surrounding regions, as the Sredna Gora mountain protects against cold north and northeast winds. Exotic woody species that are otherwise rare in Bulgaria thus grow in the region - these include magnolia, cedar, fig, laurel (bay), pomegranate, almond, paradise apple, and cypress.

Typically, the region's summers are warm and clear whereas winters are very cold and cloudy. The average annual temperature is 12.9 °C with an average annual rainfall of 598 mm. Over the course of the year, the temperature typically varies from -3°C to 30°C and is rarely below -10°C or above 35°C.

The way in which climate change will affect these current conditions is crucial for the bioeconomy's future, as expanding the region's agricultural activities is risky under strongly fluctuating climatic conditions. Since the late 1970s a tendency towards milder winters has been observed in Bulgaria and since the late 80s the average annual air temperature is often higher than the climate standard (1961–1990) (Ministry of Environment and Water, Republic of Bulgaria, 2012). Most climate models simulate an increase in air temperature in Bulgaria from 2 to 5°C by the end of the century, which is equally valid for the region of Stara Zagora. Climate change scenarios for Bulgaria also foresee winter precipitation increases by the end of this century, but decreases in rainfall during the warm half of the year and especially during the summer. Studies of water resources in Bulgaria, based on current trends in air temperature and precipitation as well as on simulation models and climate scenarios, show that the annual river runoff is likely to decrease during this century. Models also predict an increase in the frequency of heat waves combined with increased humidity and urban air pollution. Forest fires in low-lying areas are predicted to become more frequent - since approximately 61% of forests in Bulgaria are in the zone below 800 m altitude, the majority of Bulgarian forests would be affected by drastic climate changes (Ministry of Environment and Water, 2012).

More research is required to assess how the expected climate change effects will influence agriculture in the region, which would consist to a large extent of organic/"ecological" production under an expansion of the bioeconomy. With locally processed rose and lavender oil, medical crops and dried herbs being a main area for expansion of the region's bioeconomy, further knowledge about climate change's effects on these plants is critical. The area in question is the Kazanlak valley. The Chirpan region produces cotton, which delivers the base for the development of the local textile industry. Durum wheat allows the production and export of pasta. Fruit trees and vineyards in Stara Zagora are other fundamentals for locally produced high quality consumer (bio-)products. Projections of the effects of climate change on these areas and products is especially necessary in light of the speed at which local land area is being converted to organic agricultural production. For instance, the area used for agriculture grew by 25% from 2017 to 2018 - and area used for certified *organic* crops increased more than 18%. The main driver was the 14-fold increase in dry pulses and protein crops (including seed and mixtures of cereals and pulses) from 1,238 ha to 17,380 ha. Production per hectare also grew significantly, for example 239% for wheat and spelt. Production of leafy and stalked vegetables (excluding brassicas) intensified from 3,882 kg/ha to 10,263 kg/ha. Harvests of fruits, berries and nuts (excluding citrus fruits, grapes and strawberries) also increased significantly, due in part to expansion in area used for these crops.

Policies to foster or encourage expansion of agriculture (and the regional specialisation necessary for local bioeconomy initiatives) are lacking in Bulgaria. Since the start of the country's transition to a market economy in 1989, government officials have focused environmental policies on stopping physical harm to ecosystems: regulating polluting industries and projects that harm nature. A legislative

framework and institutional structure for the prevention and control of environmental impacts is still being developed and deployed. Since Bulgaria's accession to the EU in 2007, European funds for environmental protection activities are being used to develop environmental policies and programmes.

3.1.6 Legal conditions influencing Stara Zagora

A number of national laws and regulations could affect the development of the bioeconomy, in particular the development of bio-based business models and technologies, in Stara Zagora.

Bulgaria's Public Procurement Act of 2001, last amended in 2015, requires the Public Procurement Agency with the Minister of Economy, Energy and Tourism to prioritise "good practices" when deciding which businesses and institutions the government should procure goods and services from - the Act's Article 19c (23) includes "application of environmental, social, and innovative requirements" as good practices, which could make bio-based products and services sources of supply for government purchases. These in turn constitute a significant source of demand in a country as large as Bulgaria.

Several regulations affect bio-based business models and technologies. Bulgaria's Environmental Protection Act of 2002 (last amended in 2017, especially Articles1, 2, 3, 8, and 10) contains requirements essential to development of the bioeconomy, including the conservation of biodiversity in accordance with natural biogeographic country characteristics, protection and use of environmental components, control and management of factors that damage the environment, as well as prevention and limitation of pollution.

The Waste Management Act of 2003 (last amended in 2012 to address e.g. use of plant residues) regulates waste generation through overall reduction of waste and through more efficient resource use. It sets requirements for product end use of dangerous and / or mass waste, and extends liability for waste to the products' manufacturers in order to promote reduction of waste as well as reuse and recycling. These requirements promote circular economy concepts like reuse of waste products in other parts of their value chain.

Bulgaria's Consumer Protection law of 2006 deals with labeling and requirements to provide product information. It gives public authorities and consumer associations power to act on the consumers' rights to information about goods and services. With the expansion of organic/"ecological" production being dependent on consumer awareness, enforcement of labeling and product information requirements is key to a successful expansion of the bioeconomy.

Other pieces of legislation which would frame and thus could indirectly influence the deployment of a regional bioeconomy in Stara Zagora include:

- Competition Protection law, developed in 2008 - This law provides protection and conditions for expanding competition and free initiative in business.
- Employment Promotion Law, developed in 2001 - This law regulates public relations in the promotion and maintenance of employment, and the vocational guidance and training of adults.
- Health and Safety Legislation, developed in 1999 - This law regulates the rights and obligations of the state, employers, workers, representatives of workers at safety and health at work, of persons who work for themselves or in partnership, and of other organizations and legal entities for ensuring healthy and safe working conditions.
- REACH, CLP, Seveso are covered at the national level in the Chemical Protection Law - This law regulates the rights and obligations of natural and legal persons who produce, market, use, store and export chemicals on their own, in mixtures or in articles and mixtures for the protection of human health and the environment and the powers of the state bodies controlling production, placing on the market, use, the storage and export of chemicals on their own, in mixtures or in articles and mixtures.

3.1.7 Outlook for the bioeconomy in Stara Zagora

Putting together the six aspects above with previous studies of the region's bioeconomy potential, the following conclusions can be drawn:

- Collaboration already exists among some key bioeconomy stakeholders such as educational institutions, research and development units, and local businesses. Various levels of authority in the region have acknowledged their co-responsibility for the implementation of a regional bioeconomy strategy. This provides solid footing for progress developing the bioeconomy in the region.
- The structure of Stara Zagora's economy, with a mix of small- and medium sized enterprises, offers good opportunities for growth and for the creation of new and more valuable jobs. The existence of specialised and differentiated agricultural products (esp. rose oil, quality medicinal crops, and dried herbs) bodes well for growth in this area, both in terms of capacity and experience in the production of value-added goods.
- The region is already one of the best developed in Bulgaria, with a comparatively robust economy and good infrastructure - the fact that various representative organisations from different sectors are located in the same region makes for potential synergies that can drive innovation and with it additional growth.
- Compared to other regions pursuing a bioeconomy strategy, public awareness of the bioeconomy concept (and environmental concerns in general) is low in Bulgaria. Collaboration among all relevant stakeholders thus requires substantial financial, human, and technical resources. Those in turn have to be mobilised and supported by administrations and governance bodies at various levels - incorporating businesses will be key for success, as will informing the general public. Recent engagement of youth on environmental action constitutes a catalyst for public awareness, and could thus contribute to development of the region's bioeconomy development.

Some potential threats identified include:

- Increasing negative trends in labor supply, lack of highly qualified young workers leading to a mismatch between demand and supply in the labor market. An aging population and increased emigration of the younger generations
- Limitations on the relative share of organic farming that yields clean raw materials for the production of clean and healthy bioproducts. Risks of introduction of contaminated raw materials into such products, resulting in loss of consumer confidence
- Limitations on the knowledge and experience available in the region on new technological solutions for the production of innovative bioproducts as well as on the bioproducts themselves, including their development but also their associated requirements (e.g. packaging, storage, transportation and sales)
- High uncertainty of investment leading to insufficient financial resources to build businesses equipped with high-tech production equipment and distribution lines

3.2 OIP Strumica, North Macedonia

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The Strumica *region* is located in the southeastern part of North Macedonia, close to Bulgaria and Greece. The region consists of four municipalities – Bosilovo, Vasilevo, Novo Selo and the Strumica *municipality*, which gives the region its name. In total, the Strumica region has an area of 935 km^2 and a population of 93,024 inhabitants.

The Strumica region has a favourable geographical position, being accessible by road infrastructure from all sides and being connected to the rest of the country as well as with Bulgaria and Greece. Most regional and local roads covering the region's territory and connecting all of its settlements render it one of the country's important agricultural and industrial centres.

Due to favourable climatic conditions, the Strumica region is the largest producer and exporter of agricultural products in North Macedonia. The region's natural resources and climate are excellent for various kinds of agricultural production and animal husbandry, including viticulture, vegetable and fruit cultivation, livestock breeding and forest industries involving wood. A focus within the BE-Rural project will be the use of biomass materials generated in agricultural operations, including crop residues and by-products of processing.

Strumica's four municipalities are committed to a common economic development - with new economic areas emerging, there is a lot of unexplored business potential. Better use of the available resources and development of new technologies will only be possible if the region establishes a solid network and collaboration between stakeholders, companies, government and the population.

3.2.1 Political conditions influencing Strumica region

Neither the country of North Macedonia nor the Strumica region have published bioeconomy strategies. However, existing local strategies for economic development and energy efficiency programmes provide a solid base for developing bioeconomy roadmaps and strategies.

As part of North Macedonia's Southeast Planning Region, the Strumica region borders two EU countries (Greece and Bulgaria) and participates in numerous cross-border projects funded by the EU. Strumica is the only one of the five BE-Rural regions located in an EU candidate country, so it could contribute to diversifying the experiences and knowledge gathered regarding promotion and adoption of bioeconomy concepts across Europe.

Political conditions that favour development of a bioeconomy strategy include strong political will for EU integration and an ongoing process of structural reforms aimed at adopting EU policies, standards and best practices - including those related to bioeconomy. The Strumica region has a relatively well-developed capacity for strategic planning in a participatory manner, as shown by previous efforts of the region's municipalities to team up to build a Regional Centre for Local Economic Development. Though the Centre has been inactive the last five years, local authorities had started working together with partners from the public, private and non-governmental sectors.

In the Strumica region, the Institute of Southern Crops[8] and the Agency for Promotion of Agriculture are the main responsible entities for the successful realization of vegetable production in greenhouses (including beans, peppers, tomatos, cucumbers). In addition, many private consultants and advisors contribute to the education of agricultural producers in the application of new technologies for this sector. Individual agricultural producers in the Strumica region are organized in several associations and one regional union.

National policies and strategies relevant for the bioeconomy

[8] For more info see: https://wbc-rti.info/object/organisation/9401

The bioeconomy concept lines up with North Macedonia's priorities, especially those pertaining to regional development and addressing challenges posed by climate change. Aspects of the bioeconomy concept are pertinent to the following national climate change related documents:

- *"Macedonian intended nationally determined contributions*" (2015), adopted by the government under the Paris Agreement, is the country's "pledge" of what it will do to mitigate climate change. Every party to the Paris Agreement submitted this so-called NDC, which usually takes the form of an emission reduction target or goal at the national level. As its contribution to global greenhouse gas emissions abatement, North Macedonia promises to implement several measures aimed at bringing the country's emissions down 30% in 2030 from a business as usual scenario. That scenario foresees no new hydroelectric plants being built and energy markets staying roughly as they currently are. The mitigation scenario, on the other hand, foresees enhanced efforts to reduce distribution losses in the power grid, additional large and small hydroelectric facilities, as well as renewable energy from solar and wind power plants displacing the current (largely lignite coal-fired) electricity mix, and extensive use of biogas power plants as well as current fossil fuel power plants using cogeneration with biomass. The latter focus ties in well with bioeconomy goals of expanding Strumica's agricultural production and in particular its use of crop residues and food processing byproducts as biomass fuel.The NDC estimates the mitigation scenario (with renewable energy measures, etc.) will create more than 2000 "green jobs" in North Macedonia by 2030. However, the biomass related mitigation actions are at the upper end of the marginal abatement cost curve, and are thus more expensive to implement per unit of emission reduction they achieve compared to e.g. installation of solar thermal collectors (see NDC page 6).
- In the country's *"Second biennial update report on Climate change*" (2017) issued by the Ministry of environment and physical planning, the government assesses the potential for reducing climate change impacts in several sectors including transport and agriculture. Among the ways to reduce impacts are several bioeconomy activities such as fostering local ecological agricultural practices which increase drought resistance and preserve biodiversity (Team of experts, 2017). This builds upon the notions included in the previous biennial report from 2015 "*First biennial update report on Climate change"* which presented climate change as a driver of opportunities to incorporate positive sectoral actions like creating new "green jobs", low carbon development and raising people's awareness (Team of experts, 2015).

The following rural development and agriculture strategies include provisions that could be favourable to the bioeconomy in North Macedonia:

- *"National strategy for agriculture and rural development for the period 2018-2022"*[9] - the operational document for the implementation of the national agricultural policy and rural development. It links strategic policy documents with annual operational programs and agricultural and rural policies (Team of experts, 2018).
- "*Communication and visibility plan of the rural development network of the Rebublic of Macedonia 2019-2022"*[10] - The communication and visibility plan of the Rural Development Network should provide effective communication of the network and activities for successful promotion before defined target national and international groups. The communication and visibility plan includes media-related activities as well as public events, such as training, workshops, seminars, conferences, roundtables, forums and events (Team of experts, 2019).

Regional and local policies and strategies relevant for the bioeconomy

Numerous strategic and planning documents that have already been formulated for Strumica provide a basis for future bioeconomy roadmaps and strategies.

[9] For further information visit: http://www.ipardpa.gov.mk/root/mak/_docs/Programi/Subvencii/НАционална_Програма_за_развој_на_земјоделството_и_рурален_развој_за_период_од_2018-2020.pdf

[10] For further information visit: http://ruralnet.mk/wp-content/uploads/2019/08/Plan-za-komunikacija-na-MRR-2019-2022.pdf

At the South-east Planning Region level, the*"Regional plan for an integrated system of waste management in the South-East Planning Region"* aims to achieve an integrated and financially self-sustainable waste management system through preparation of regional waste management plans and strategic environmental assessments. The plan takes into account parameters such as waste quantity and composition, geographic origin of the waste as well as tariffs and affordability. Similarly, an *"Investment guide for the South-East Planning Region*" outlines the region's investment opportunities including support measures, characteristics of the existing industrial zones, and available investment locations.

The *"Programme for development of the South-East Planning Region 2015-2019*" is a mid-term planning document which defines the regional development goals (for investments, modern and quality education, health and social sectors, preserved and improved environment, agriculture and rural development facilities), as well as the priorities and measures which will contribute to the achievement of the mid-term goals. The regional development programmes direct all development stakeholders toward the achievement of the planned mid-term goals.

In 2006 the four municipalities of the Strumica region consolidated for better economic development and created a *"Strategic Plan for Economic Development of the Strumica Micro Region.*" The plan laid out notions to attract investment for the implementation of larger scale projects and established industrial clusters for labour mobility. It set up a partnership among representatives from the public, private and civil society sectors to build up the region's economic capacity.

A similar set of stakeholders created the *"Strategy for Local Economic Development of the Municipality of Strumica 2016-2020."* This document set five strategic goals and defined a set of activities to achieve them.The goals are: sustainable development of the economy and competitive investment, improved agriculture and quality of life in rural areas, protected and healthy environment with energy efficient public and private facilities, improved infrastructure and urban planning in accordance with annual programs and citizens' needs, and highly developed and trained workforce for the needs of the economic capacities (Team of experts, 2016).

In addition, the municipality of Bosilovo created a *local development plan for the 2019 – 2022 period* that involved local stakeholders, and the municipality of Petrich has an environmental management plan that involves among other things resource conservation, pollution abatement, as well as recovery and reuse of waste products.

All these regional and local development plans focus on gathering "clusters" in the agricultural sector and industry that can increase the employment rate in rural areas. Conditions for agricultural development are present in the region, but not yet sufficiently used toward faster economic development.

3.2.2 Economic conditions influencing the Strumica region

The main economic activity in the Strumica region is agriculture, especially production in greenhouses and vegetable production. The region is the largest producer and exporter of agricultural products in the country. Regional authorities are keen to integrate their market into the wholesale EU market for agricultural products, but so far investment toward this end has been ad-hoc rather than strategic and anticipated.

The Strumica region has mainly small and medium-sized enterprises that generally lack economic, financial, technical and administrative support. According to data from the last census in 2002 (the country's next census is planned for 2020), the GDP per capita for the municipality of Strumica was €6,883; for the municipality of Novo Selo €4,093; for the municipality of Bosilovo €5,820; and for the municipality of Vasilevo €3,980. However, unofficially in 2014 the GDP per capita in Strumica was €4,102[11], just below North Macedonia's capital, Skopje, which was at €5333.

[11] For more information visit:
http://1.gevgelija.gov.mk/index.php?option=com_content&view=article&id=9459:after-skopje-gevgelija-and-strumica-with-highest-gdp-per-capital&catid=7:2011-11-06-12-56-32&Itemid=188&lang=mk

The total number of active business entities in the region is 7,224. Out of these, 6,669 are in the Municipality of Strumica, 230 in Novo Selo, 175 Bosilovo, and 150 Vasilevo. The number of business entities related to the bioeconomy and rural development is around 900 - these include mostly individual farmers, but also other enterprises related to agriculture as well as hunting and forestry. Domestic and foreign direct investment in such businesses has been lacking, and agricultural subsidies have not been structured in a way that produced expected results. Some outside funding (in the form of loans and grants) is available in the region for measures to support the use of renewable energy. These include the WeBSEFF Program for financing sustainable energy in the Western Balkans, an eco loan from the Green Growth Fund for southeast Europe, and loans for renewable energy and energy efficiency through various regional banks.

One example of a business relevant to the local bioeconomy is the Public Enterprise Turija in the Municipality of Vasilevo in the field of water supply and collection of waste water. The rivers Strumica, Turija and Vodochnica flow through the Municipality of Vasilevo and a dam at the Turija, whose reservoir has a gross volume of 50,350,000 m^3, supplies the Strumica region's drinking water supply as well as municipal industry capacities and irrigation. There is a 2.2 MW hydroelectric power plant on this site, supplying electricity to the region.

There are currently four industrial zones in the Municipality of Strumica: one in Vasilevo, one Bosilovo and three Novo Selo. Startups and business incubators foster entrepreneurial behaviour and support start-up companies by sharing resources and services in the form of management advice, training, etc. One example is the Business Centre for Agricultural Development - Strumica, established in 1997 by the World Bank. However, there is a lack of experience and models to create associations of stakeholders united voluntarily to meet their common economic interests.

The Strumica region contains many attractions that have potential to be expanded into larger ecotourism sites, particularly in the area of balneology/wellness/spa tourism. These include Carevi Kuli, Smolare, Koleshino and Gabrovski Falls, Bansko thermal baths, and Belasica mountain. These venues attracted 30,000 domestic and foreign visitors in 2015, according to data from a 2018 development plan - capitalising on the area's ecotourism and wellness sites in connection with local culture and agriculture has excellent bioeconomy potential, given the rise in ecotourism over the past decade.

3.2.3 Social conditions influencing Strumica region

Strumica is characterised by disparities in the social and economic development of rural municipalities: compared to urban areas, there is less entrepreneurship, a lower living standard, lower availability of services, lack of infrastructure, and higher unemployment. The rate of unemployment and poverty index are relatively high, while the GDP per capita is relatively low. Unemplyment rates are 47.39% in the Municipality of Vasilevo, 43.33% in the Municipality of Novo Selo 40.52% in the Municipality of Strumica and 31.42% in the Municipality of Bosilovo.

Another significant social problem in the region is population decrease due to migration of the young population abroad, especially educated individuals. This so-called "brain drain" is increasing - 36 young people left the area in 2009 whereas 138 did so in 2013. The birth rate is also below replacement level, further decreasing the population. Measures to increase quality of life, as well as further development of the region's agriculture sector, could counteract the migration trend.

After the census of 2002, educational attainment in the Strumica region was distributed as follows: 4.4% of the population held a graduate degree, 3% an associate's degree, 31.7% completed secondary education, 30.5% completed primary education, 25.40% had incomplete primary education and 5% had no school education. These figures have likely changed significantly over the intervening 17 years.

Unfortunately, the bioeconomy is underestimated in North Macedonia, more so in rural areas. Only recently progress on raising the population's awareness, thinking and acting is being gradually achieved through forums, debates, social media, training courses, educational seminars, promotional events and gatherings, pop-up stores, printed promotion materials, audio and video materials, and prepared analyses.

Until recently, there has been little cooperation among various bioeconomy-relevant stakeholders in Strumica's population, especially minorities and vulnerable groups, given slow and inefficient administration at the national and local levels. More recently there are positive examples of integration

of these groups in local governance, education and society as a whole, accompanied with adequate infrastructural support and social programs: recently cooperation and coordination between educational institutions and the business sector has improved. The cooperation has led to improved living conditions that may decrease the migration process in the region.

3.2.4 Technological conditions influencing Strumica region

The Strumica region has potential to grow its technological base for the processing of agricultural products. However, outdated agricultural practices, underdeveloped infrastructure and limited inter-regional connectivity slows the modernization process and the uptake of new technologies.

Currently, Strumica's industry, service, energy, and transport sectors rely primarily on fossil fuels. Several concrete project ideas have been discussed at the municipal and regional levels to change that status. Various local institutions, from building owners to schools, are open to renewable energy options. These include:

- Production of thermal energy (steam and hot water) from local hotsprings. The Municipality of Strumica has explored thermal energy potential beyond its existing springs at various sites (hole B-1 in the village of Bansko with yield of 50 l/sec and T=70°C), hole D-2 in the locality Drvosh-Baldovci (yield of 5 l/sec and T=29°C), with total thermal power of the springs and additional holes being 19,51MW
- Combined heat and power at an existing thermal power plant by replacing part of the feedstock with biomass and using a back pressure turbine and/or producing electricity with a biomass-condensation turbine
- Replacing solid fuel boilers with biomass boilers (woodchips or pellets) in municipal schools
- Using biogas from agricultural operations for electricity production

Existing small-scale renewable energy facilities in the region, which could either be expanded as part of local bioeconomy development or serve as a model to be replicated, include:

1. A 11.5 kW capacity photovoltaic power plant in the Municipality of Bosilovo (PHOTON 1)
2. Nine photovoltaic plants in the Municipality of Novo Selo with total installed capacity of 437 kW
3. A planned new regional landfill in the Municipality of Vasilevo in Dobrashinci, which will take waste from all 10 municipalities in the Southeast Region and produce 2,400 MWh/yr from capture and combustion of landfill gas - enough to cover the annual electricity consumption of 370 households
4. Construction of a gas pipeline system in the Municipality of Strumica which is connected to the agricultural facilities and households to provide fuel source. So far 25 km of gas pipeline are already installed, and the rest is planned to be finished soon.
5. Several small- and mini-scale hydroelectric plants: 8 SHPP in the Municipality of Bosilovo with total generation of 3,359 MWh/yr, 5 SHPP in the Municipality of Vasilevo with total generation of 13,020 MWh/yr, 9 SHPP in the Municipality of Novo Selo with total generation of 3,623 MWh/yr, 4 SHPP in the Municipality of Strumica with total generation of 11,241 MWh/yr
6. Beyond the area's existing waste water treatment plant, which processes the waste water of half the population in the region, a number of ongoing projects are constructing smaller waste water treatment facilities

Given the region's economic focus on agriculture, the most relevant applications of biotechnologies and bio-based products are:

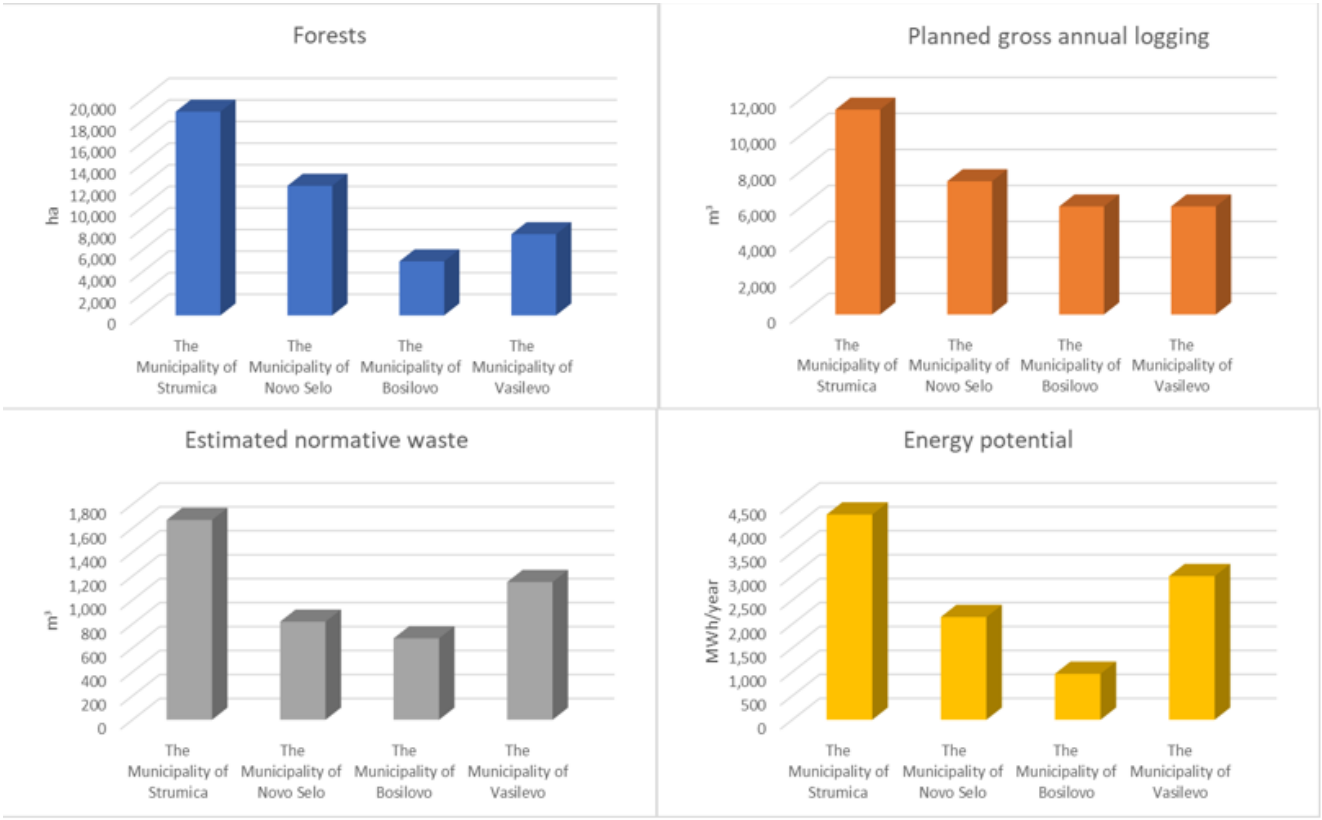
- pelletizing and briquetting of e.g. crop residues and forest biomass for combustion
- gasification or pyrolysis (from the agricultural residues for production of biochar or energy)
- anaerobic biodigesters for production of biogas from manure at livestock operations
- composting (from e.g. leaves from parks or municipal/residential landscape residue)
- extraction of nanocellulose fibres from root vegetables for production of bio-based additives like lubricants, paints, coatings, etc.

In terms of receiving funding to realise Strumica's technological potential, there is organisational precedent from prior activities with IPA funds (the EU's Instrument for Pre-Accession Assistance for countries in line to accede to the EU). A 2018 study of past implementation of IPA projects in the region cited Strumica municipality in particular as notable for promoting the importance and use of "direct involvement of public enterprises and other local actors in the absorption of EU funds" as a successful model of cooperation. This bodes well for the region's bioeconomy development, where such direct involvement in strategic planning is crucial. The IPA fund implementation infrastructure could be replicated for local bioeconomy strategy development.

3.2.5 Environmental conditions influencing Strumica region

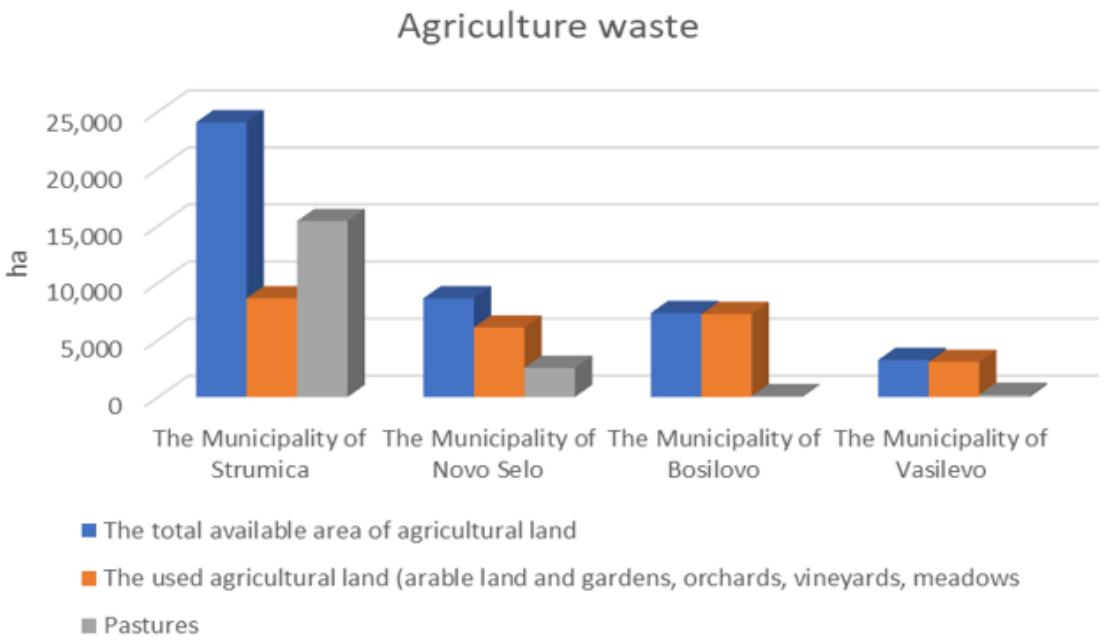
The climate in the Strumica region is sub-Mediterranean intersecting with the eastern-continental climate - this makes for long, warm summers and cooler winter temperatures. The average annual temperature is 13.4°C. The region's abundant rainfall (average 459 mm/yr) is a significant asset to agriculture, as even in the driest months there is a lot of rain. These consistent precipitation levels render the area particularly conducive to growing fruits and vegetables (peppers, melons, potatoes, tomatoes, cabbage, cucumbers), cereals (wheat, maize, barley), forage crops (bur clover, clover), industrial plants (tobacco), as well as fruit orchards and vineyards. The agricultural area in the Southeast region alone makes up 8.83% of North Macedonia's territory. This agricultural area is predominantly privately owned. Wood is the most used biomass for heating of households and greenhouses in the region. The agriculture sector is the second biggest producer of solid waste (animal and plant) in the Southeast region after the mining sector. Available RES such as biomass, biogas, biofuels (eco-diesel), waste, geothermal energy, solar (260 sunny days), and hydro are not used sufficiently. The figures below provide some insight into the issue.

Figure 4: Deforestation waste



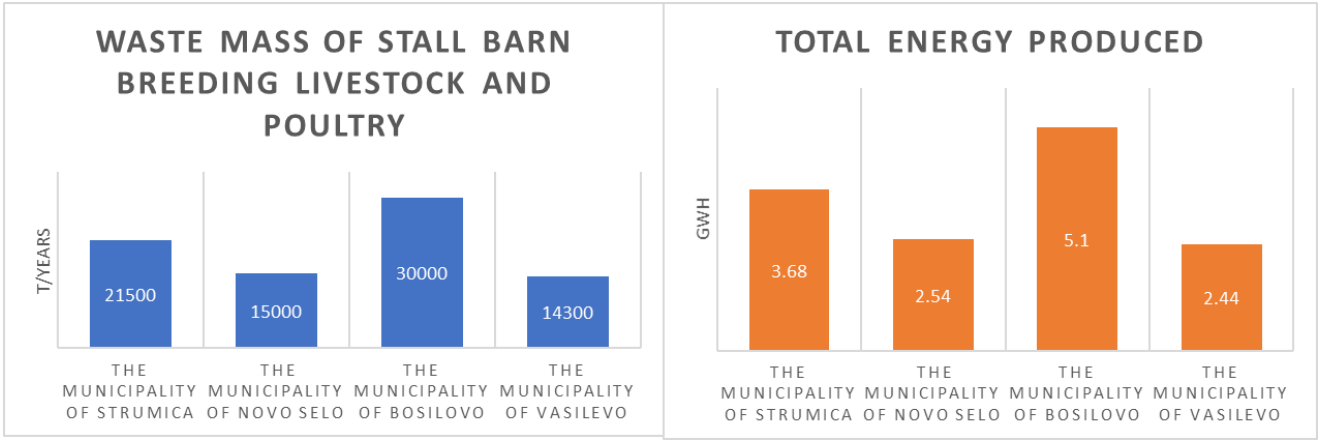
Data source: "Study on the potential and utilization of renewable energy sources in the cross-border region"

Figure 5: Agriculture waste



Data source: "Study on the potential and utilization of renewable energy sources in the cross-border region"

Figure 6: Livestock and poultry waste



Data source: "Study on the potential and utilization of renewable energy sources in the cross-border region"

3.2.6 Legal conditions influencing Strumica region

The following laws are considered relevant to the development of the bioeconomy in the Strumica region:

- In accordance with the *Law on Waste Management*, municipalities (rather than the national government) are responsible for management of certain types of waste, including organising its collection, transport and disposal. Decisions on the location of waste management facilities and local regulations on waste management are taken at the local level.
- Legislation regulating the area of *Water Management* includes water supply systems, individual sources, water use by and needs of the population, as well as industry and agriculture. Most

of the irrigation systems in North Macedonia were built in the second half of the last century, especially after a law on financing and construction of hydroelectric systems in Macedonia was adopted in 1957. That law covers the largest hydro-reclamation systems "Bregalnica", "Tikves" and "Strumica" with total area of 72,881ha.

- Surface water quality assessment is carried out in accordance with criteria defined by *Legislation of the Water-economy Basis of Macedonia*. Planned measures to improve water quality management involve implementation of the country's Law on Waters - but the country lacks funds to complete the necessary secondary legislation in line with EU requirements.
- The responsibilities of the Municipality in relation to urbanisation are as follows: *Legislation of the Spatial Plan of the Republic of Macedonia, General Urban Plan of the City of Strumica, Law on Spatial and Urban Planning, Law on Construction and Law on Construction Land.*
- Management of forests and forest land on the territory of the Municipality of Strumica is regulated by the national *Law on Forests*

Other pieces of legislation which would frame and thus could indirectly influence the deployment of a regional bioeconomy in the Strumica region include:

- *Law on Environment, Local Environmental Action Plan of the Municipality of Strumica, Law on Ambient Air Quality, Rulebook on Criteria, Methods and Procedures for Ambient Air Quality Assessment, Rulebook on the emission limit values and types of pollutants in waste gases and vapours emitting stationary sources of air*.
- *Law on Environmental Noise Protection and the Rulebook on the locations of measuring stations and measuring points*, *the Rulebook on the limit values of environmental noise levels and the Rulebook on the application of noise indicators, additional noise indicators, method of noise measurement and assessment methods with environmental noise indicators*.

The municipality of Strumica, as the largest municipality in the region, has various laws, regulations, and plans that have counterparts at the national level. However, the other three municipalities, which are less populated, do not have proper documentation of local regulations or ordinances that reflect their current management in areas relevant to the bioeconomy. Further, the regional legal documents listed here remain only partially implemented in all the municipalities - often because of high levels of corruption and prevalence of an "informal economy" in the country as a whole. Moreover, the Strumica region is undergoing a fiscal decentralisation process that requires new competences in the local self-government units (i.e. municipalities), as well as improvement of municipal human and technical capacities (particularly of small municipalities).

The main regulatory instrument relevant to bioeconomy development in the region is the Local Environmental Action Plan (LEAP) for the Municipality of Strumica under jurisdiction of the Ministry of Environment and Physical Planning and the Law for environment. (Team of experts, 2016). Issued in 2016, this plan has a six-year timeframe and supports compliance with environmental requirements in the process of accession to the EU. The goals set on the LEAP are:

- Establishment of local networks for monitoring of certain environmental areas
- Informing the public when pollution limits are exceeded, and compulsory response measures if the excess pollution is limited in the territory of the municipality
- Establishment and maintenance of an information system, i.e. registry of pollutants and substances and their characteristics for the territory of the municipality
- Establishment of measures and activities related to temporary or permanent prohibition of certain activities or supply of certain products or related to environmental protection and improvement
- Encouraging the development of environmental education and public awareness

While a well developed regulatory framework is in place in North Macedonia, implementation and enforcement remains an issue. Stricter inspection and enforcement is necessary, especially at the municipal level, when it comes to competition law, standardization of agricultural (organic) production, international quality standards like EUREPGAP AND HACCP, and construction.

3.2.7 Outlook for the bioeconomy in Strumica region

Putting together the six aspects above, the following conclusions can be drawn about the Strumica region's bioeconomy potential:

The richness of natural resources in the Strumica region is a solid base for the future economic development with a number of prosperous SMEs. The closeness and connection to European borders and markets and the commitment of municipalities towards common development renders the Strumica region an excellent candidate for development of a bioeconomy strategy.

However, the region's strong outflow of young people - particularly educated ones - as well as lack of direct investment and absence of standardised agricultural production pose challenges to bioeconomy development.

There are many opportunities for new economic zones, possibility of regional infrastructure connection, construction of Agro Stock Exchange, opportunities for utilization of natural resources, access foreign markets and development of alternative energies.

Better collaboration between educational institutions, the research and development units, entities need to be established and the stakeholders also play a part for the implementation of a regional bioeconomy strategy towards stabile and prospective bioeconomy in the region.

3.3 OIP Baltic Lagoons, Poland

Authors: Marcin Rakowski, Adam Mytlewski and Olga Szulecka (NMFRI)

The administrative division of Poland distinguishes voivodships, poviats and communes. Formally, there are no regions in Poland. However, both geographically and, above all, historically we are talking about such structures. They are not strictly connected with the borders of the administrative districts of the country. The Polish OIP covers two separate regions with similar economic structure– Szczecin Lagoon and Vistula Lagoon. These are not strictly connected to the borders of administrative districts, though the former is mostly in West Pomeranian voivodship and contains four municipalities. These are represented by the Fishery Local Action Group "Zalew Szczeciński" (FLAG "Zalew Szczeciński") - the organisation selected for the implementation of the Local Fisheries Development Strategy under the Operational Program financed by the European Marine and Fisheries Fund (EMFF). The Vistula Lagoon region contains three coastal municipalities represented by FLAG "Rybacka Brać Mierzei" and three lagoon municipalities represented by FLAG "Zalew Wiślany". Accessibility of the Vistula Lagoon waters is currently severely limited due to the need of permission for individuals to pass the Strait of Pilawa, which is controlled by Russia. The latter border situation is a serious obstacle to Polish port access and has negatively influenced development of tourist activities in the Vistula Lagoon region. The Polish authorities have decided to build a shipping channel in the southern part of the lagoon - work on this has already started.

Tourism and related services are the primary income source for both areas forming the OIP: the regions' greatest assets are the richness of nature and the beauty of the landscape. The proximity of water, presence of valuable natural areas, landscape diversity, growing hotel and catering base, and historical buildings make for interesting tourism offerings. Short-term tourism is driven by the regions' proximity to relatively large urban centers and transit routes. Industrial development is constrained, as the entire area of both regions lies within "Natura 2000" sites (protected areas). The Wolin Island, adjacent to the Szczecin Lagoon, includes the Wolin National Park, which covers an area of 10,937.40 ha. Similarly, the bird preserve area "Kąty Rybackie" covers 102.54 ha of the Vistula Lagoon area.

In addition to tourism, fishing is an important economic activity that goes on for almost the entirety of the year in the two regions (except during the period when the lagoons freeze over). Fish native to the distinctive brackish waters in the Szczecin and Vistula Lagoons is a source of income for many families in coastal locations. Small-scale fisheries generate income for the region not only for their product (fish) but by increasing the regions' touristic attractiveness. Regional industry focused on fish processing and trade is underdeveloped because the *Polish National Spatial Development Concept 2030*, the main national strategic document addressing spatial planning management in Poland, does not allow industrial investments in these regions - it allocates them instead for tourism development. Most of the two regions' businesses are registered for statistical purposes as operating in economic areas related to retail trade, hospitality and real estate services.

Intensified use of fish catches, in particular of species considered to be of low commercial value (e.g. roach, bream) could contribute to regional development: with consumers increasingly concerned about sustainable fishery practices, purchasing preferences trend toward local varieties fished by small-scale operations in a sustainable manner. Making a larger profit from sale of the fish itself (rather than from the indirect tourism benefits of a small-scale fishing village aesthetic) would foster income (and thus purchasing power, living standards, etc.) of local residents.

Better use of available resources is possible due to the development or use of new technologies, as well as a return to the tradition of using low-value fish for human nutrition. OIP Polish Lagoons will focus on the promotion of forgotten recipes and the search for new fish processing technologies for the cosmetics and pharmaceutical industries. These activities will be an additional economic stimulus for the local population, and at the same time a tourist attraction. Ultimately, the OIP will establish a solid network between fishermen, companies and local authorities and will initiate closer relations and cooperation between them.

3.3.1 Political conditions influencing Szczecin Lagoon and Vistula Lagoon

Poland as a whole has no bioeconomy strategy, but the Regional Strategy of Innovation of the West Pomeranian Voivodeship for 2011-2020 (Szcecin Lagoon area) does mention a bioeconomy based on the region's natural resources, its economic and scientific potential, as well as the use of its natural landscape and cultural heritage in the development of tourism. The 2020 regional strategy of Vistula Lagoon's area (Warmian-Masurian Voivodeship) on the other hand focuses on water economics (including the use of the natural environment) and high-quality food (including fish production and the processing industry) rather than tourism and cultural heritage.

National policies and strategies relevant for the bioeconomy

Poland's *National Development Strategy 2020* prioritises faster and sustainable development of the country in order to improve the quality of life of the population. The strategy's Strategic Area II (Objective II.2.4.) seeks to improve the framework conditions for conducting business activities - including development of the leisure and tourism industries. Activities planned under Strategic Area III (Objective III.3.3.) are also relevant to the bioeconomy, as they pertain to social and territorial cohesion. Relevant actions include development of regional, subregional and local centers and strengthening the potential of rural areas by creating new functions of rural areas and supporting the creation of new types of tourism-oriented jobs.

Given the specificities of economic activity in the OIP area, the Strategy for Sustainable Development of Rural Areas, Agriculture and Fisheries for the years 2012–2020 is an important document. Its long-term main objective is to improve the quality of life in rural areas and the effective use of their resources and potentials, including agriculture and fisheries.

Poland's Transport Development Strategy until 2020 (with a perspective to 2030) indicates that developing ports should increase their share in the socio-economic development of municipalities and coastal regions. In the case of smaller Polish ports like those in Vistula, the development priority is to strengthen their economic function as important points of local and regional development. Opportunities for small seaports and marinas are available beyond traditional functions associated with sea and floodplain fishing, such as servicing maritime passenger transport, sailing, and tourism.

European programs support Small Scale Fishery (SSF) as an important factor of coastal heritage and rural economy. In the Operational Program for Fishery and Maritime (co-financed by European Maritime and Fisheries Fund - EMFF), a parity is foreseen for investments supporting SSF.

Poland's National Strategy for Regional Development 2010-2020: Regions, Cities, Rural Areas, is the main document combining strategies defined at the national and regional level which are in line with the OIP development activities. This document sets out three specific objectives:

1) supporting the increase of regions' competitiveness

2) building territorial cohesion and preventing marginalisation processes in problem areas

3) creating conditions for effective partner implementation of territorially oriented development activities, which are part of the planned activities (details on individual priorities are provided in the regional documents)

Regional and local policies and strategies relevant for the bioeconomy

Local strategies pertain primarily to fishing: the Strategies for Development of Fisheries Areas (implemented by FLAGs), as well as strategies at the poviat and commune level, are focused on tourism development. These local strategies[12] do not refer directly to the bioeconomy, but focus on preventing social exclusion of people associated with fisheries.

[12] List of analyzed strategies at the end.

3.3.2 Economic conditions influencing Szczecin Lagoon and Vistula Lagoon

Szczecin Lagoon region

The Szczecin Lagoon includes the municipalities of the West Pommeranian Voivodeship located by the lagoon waters. West Pommeranian Voivodeship has a population of 1.7 million, including 400,000 in the capital of the province - Szczecin.

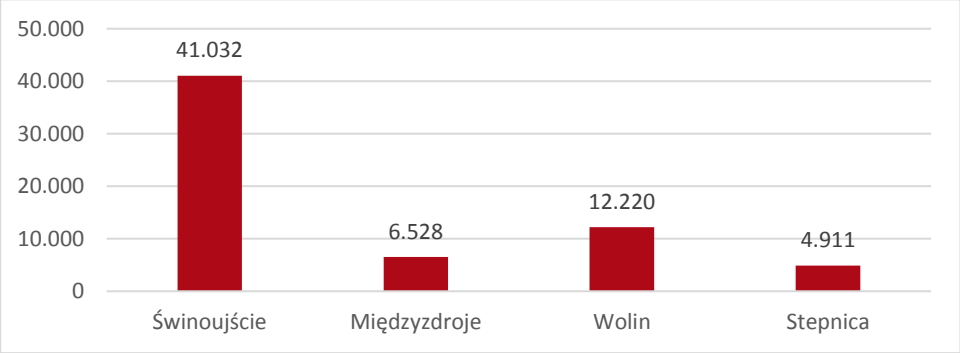
The voivodeship is not a strong region in terms of GDP - its share of national GDP in 2017 was 3.7% (Pommeranian 5.8%, Warmian-Masurian 2.6%). GDP per capita income is lower than the average (national €11,753) and amounts to €9,374. The low level of GDP is the result of the collapse of the local shipbuilding industry in 2000-2005, itself caused by the low economic efficiency of this sector (old shipyard with inefficient technology) and a difficult situation in the global shipbuiding market. Currently, the strong elements of the region's economy are the activities of two large seaports - Szczecin and Świnoujście - and the chemical industry in Police.

Szczecin Lagoon's four communes with significant fisheries importance are:

1. Urban-rural commune of Międzyzdroje (Międzyzdroje)
2. Urban-rural commune of Wolin (Wolin)
3. Rural commune of Stepnica (Stepnica).
4. Urban commune of Świnoujście (Świnoujście).

The total population of these communes is nearly 65,000 residents, of which over 41,000 live in the urban commune of Świnoujście (Fig. 7). Other municipalities are small local communities.

Figure 7: Number of citizens in local communities in Szczecin Lagoon



Due to the large number of economic entities, the entire region is characterised by a high level of professional activity. In the communes where this figure is highest, it amounts to 174-210 employees per 1000 inhabitants, which is higher than the national average. The Wolin commune, on the other hand, has a level of professional activity only 40% of the country average, see Table 3.

Table 3: Labour indicators in the Szczecin Lagoon region

Parameter	Świnoujście	Międzyzdroje	Wolin	Stepnica
number of citizens [pers]	41 032	6 528	12 220	4 911
unemployment share [%]	5,0	6,6	9,6	4,5
activity rate (active/1000 citizens)	210	190	80	174

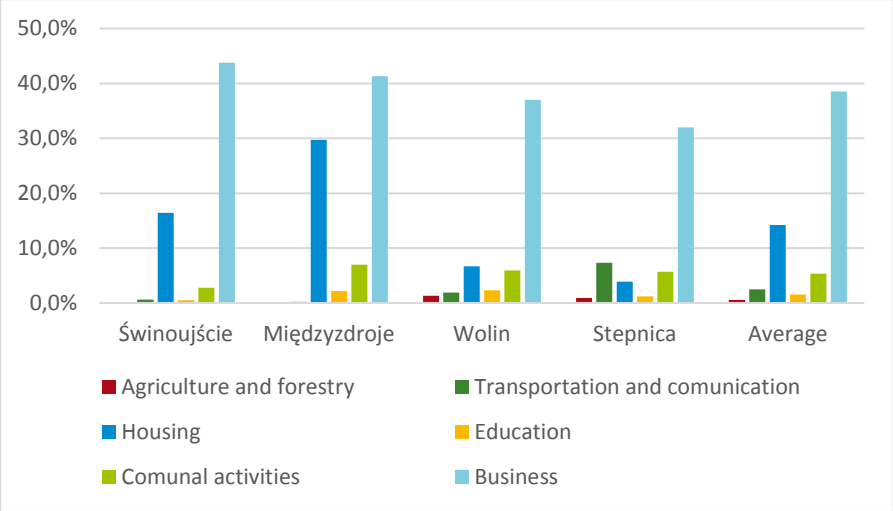
The region has varying levels of unemployment - despite the generally low average (6.4) in 2017, the commune of Wolin is well below average with nearly 10% unemployment. Entrepreneurs account for most of the region's economy, with the share of fiscal revenue sources higher than in the Vistula Lagoon region at 38% on average. The Świnoujście commune derives revenues from port activities and tourism, Międzyzdroje from tourism - these communes also show higher urbanisation and income from housing management.

Table 4: Share of income source by economic activity/sector, 2017

	Świnoujście	Międzyzdroje	Wolin	Stepnica	Average
Agriculture and forestry	0.0%	0.0%	1.3%	0.9%	0.6%
Transportation and comunication	0.6%	0.2%	1.9%	7.3%	2.5%
Housing	16.4%	29.7%	6.7%	3.9%	14.2%
Education	0.5%	2.2%	2.3%	1.2%	1.6%
Comunal activities	2.8%	7.0%	5.9%	5.7%	5.4%
Business	43.8%	41.3%	37.0%	32.0%	38.5%

Fisheries as an industry are a socially and culturally important element in the region, but local fishermen report the need to increase the value added of fishing. Gradual displacement of fishing by tourism activities threatens this element.

Figure 8: Structure of income source in Szczecin Lagoon communes

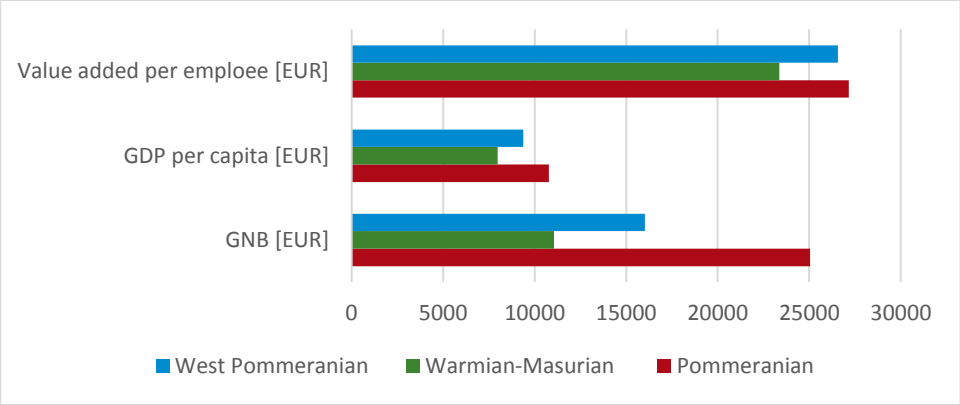


Overall, the level of socio-economic development of the Szczecin Lagoon region is relatively low compared to the national average and compared to industrially developed areas. However, growth trends are being observed in places attractive to tourists, such as coastal municipalities.

Vistula Lagoon region

The region of the Vistula Lagoon is located within two voivodships, namely Warmian-Masurian and Pommeranian. These differ with respect to industrial potential, population, and gross domestic product.

Figure 9: Main economic parameters of coastal voivodships (2017)



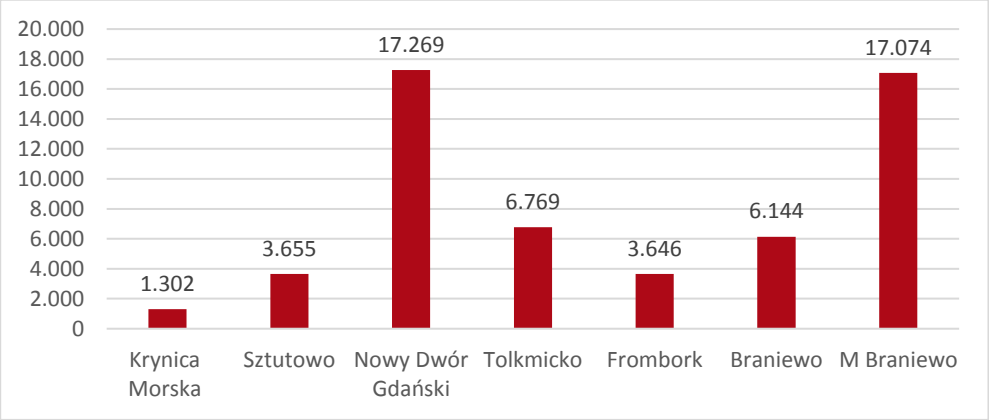
Source: Statistics Poland

The Pommeranian Voivodeship has over 2.3 million inhabitants and the large agglomeration of Gdańsk-Sopot-Gdynia and well-developed industry and services, which results in higher GDP per capita in this comparison (EUR 10.7 thousand in Pommeranian vs. EUR 7.9 thousand in Warmian-Masurian vs. 9.3 in west Pomeranian). Despite the larger area, the Warmian-Masurian Voivodeship has a significantly smaller population of 1.4 million people. The economy is based mainly on agriculture, forestry and small services. Belonging to voivodeships does not significantly affect the economic diversification of municipalities located on the Vistula Lagoon. The administrative areas in question are:

1. In Pommeranian Voivodeship:
    a. Urban commune of Krynica Morska (Krynica)
    b. Rural commune of Sztutowo (Sztutowo)
    c. Urban-rural commune of Nowy Dwór Gdański (Nowy Dwór Gdański).
2. In Warmian-Masurian Voivodeship:
    a. Urban-rural commune of Tolkmicko (Tolkmicko).
    b. Urban-rural commune of Frombork (Frombork)
    c. Rural commune of (Braniewo).
    d. Urban commune of Braniewo (M Braniewo).

All indicated communes of the Vistula Lagoon are associated in FLAGs and are considered dependent on fisheries. The population of these communes is 56,000, of which about 1/3 are residents of the urban commune of Braniewo.

Figure 10: Number of citizens in Vistula Lagoon communities



Source: Statistics Poland

In addition to population differences, there are also some socioeconomic differences among the areas within the region - due to low industrialisation, the area's unemployment rate is high and professional activity rate is low (lowest in Masurian).

Table 5: Labour and employment parameters of Vistula Lagoon region in 2017

	Krynica Morska	Sztutowo	Nowy Dwór Gdański	Tolkmicko	Frombork	Braniewo	M Braniewo	Total
number of citizens [pers]	1 302	3 655	17 269	6 769	3 646	6 144	17 074	55 859
unemployment share [%]	10.0	7.6	6.9	8.00	11.30	13.50	8.00	9.3
activity rate (active/ 1000 citizens)	184	83	144	106	127	119	132	128

Source: Statistics Poland

At 9.3%, the region's average level of unemployment is higher than the national average of 6.6%. This is the result of low industrialisation of these regions and the low share of services (apart from tourism in some municipalities). Professional activity is also relatively low, with an average of 128 employees per 1000 inhabitants compared to Poland's national average of 152 per 1000 inhabitants - it is especially noticeable in communes with low importance of tourism (Sztutowo).

Due to the lack of official statistics on the level of national income (GDP) per municipality of the Vistula Lagoon region and the industry structure of this income, Table 2 instead shows information on the income of individual municipalities.

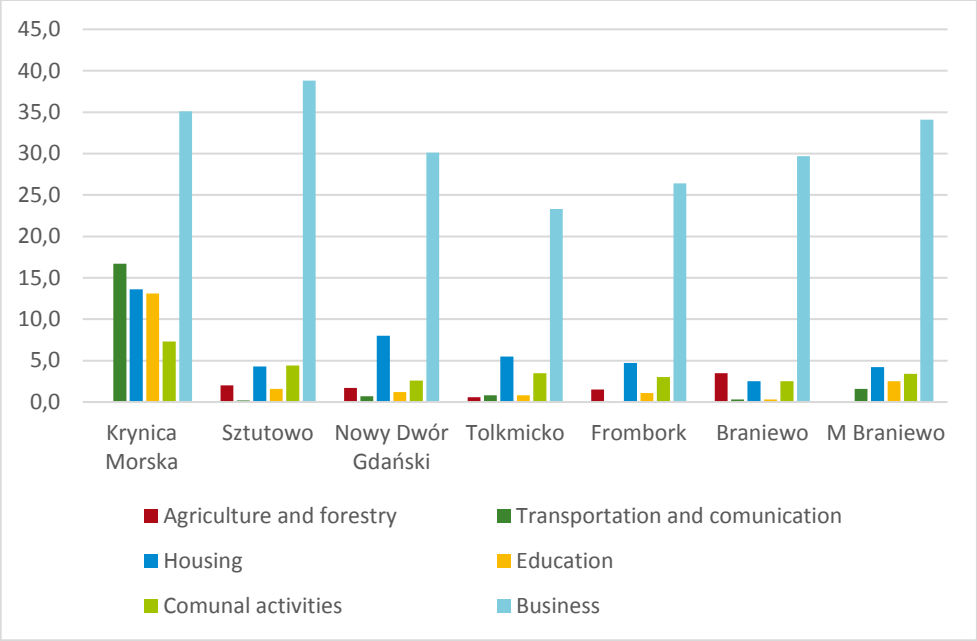
Table 6: Share of main income source in local authorities budget, 2017

Local communities government - rate of share in their income	Krynica Morska	Sztutowo	Nowy Dwór Gdański	Tolkmicko	Frombork	Braniewo	M Braniewo	Average
Agriculture and forestry	0.0%	2.0%	1.7%	0.6%	1.5%	3.5%	0.0%	1.3%
Transportation and comunication	16.7%	0.2%	0.7%	0.8%	0.0%	0.3%	1.6%	2.9%
Housing	13.6%	4.3%	8.0%	5.5%	4.7%	2.5%	4.2%	6.1%
Education	13.1%	1.6%	1.2%	0.8%	1.1%	0.3%	2.5%	2.9%
Comunal activities	7.3%	4.4%	2.6%	3.5%	3.0%	2.5%	3.4%	3.8%
Business	35.1%	38.8%	30.1%	23.3%	26.4%	29.7%	34.1%	31.1%

Source: Statistics Poland

The income structure reflects the importance of individual activities for municipalities. On average, one-third of municipalities' revenues come from the business activities of economic entities. Real estate activity is another such measure, with increases in housing volume and rental services in attractive tourist municipalities. The importance of individual sources of income is shown in Figure 8.

Figure 11: Structure of income by source in Vistula Lagoon communes



Source: Statistics Poland

The Vistula Lagoon region has a significantly lower level of economic development than the country's average and has unused human potential (economic activity).

Economy of the OIP region

The economy of the lagoons regions is strongly dependant on tourism. The season is short (beginning of May to the middle of September) and above all, tourists visiting these areas regularly want peace and quiet. Small-scale fishery is not perceived as economically important for the country. Even municipalities from the coastal region are not aware of its economic potential. In lagoon regions, sustainable fishing is more important, especially during tourism's low season. The SSF sector is not as profitable as bigger fishing fleets on a per output basis, with low-value fish species under-exploited for human consumption. Most of the regions' catch is sent out of the region, exported mainly to Eastern European countries. Promoting the low-value fish within the region is an important factor for success.

3.3.3 Social conditions influencing Szczecin Lagoon and Vistula Lagoon

The proximity of nature reserves and a few beaches, providing conditions for a quiet holiday, make tourism the region's main source of income. Fishing is the traditional activity of the region, and did not stop even with the significant migration of people after the 2nd World War, as small cities and villages were and continue to be dependent on fishing. Interest in fisheries declined, however, with the increase in tourism and related services, which are more profitable. Those remaining in the fishing sector are aging, with few new entrants into the profession given its hard and dangerous work.

The two lagoon regions' social infrastructure is rich: residents can take advantage of local libraries, school sports facilities, as well as bicycle and walking paths. Local authorities regularly organise special events like family picnics, sports competitions and thematic workshops. Residents have access to health care programmes including specifically for the elderly, church, police, and fire brigade members. The inhabitants' activity is supported by local authorities, branch interest groups, social organisations as well as organisers of professional and hobby courses.

There is an adequate number of primary and secondary schools in both of the OIP regions. Access to higher education is possible in large urban centers nearby. Vocational education and craftsmanship

are disappearing due to the change in the lifestyle of young people, their sources of income, and migration. The social problem reported in most of these communes is aging of the population.

Access to local information impacts social conditions in the region. Individual municipalities as well as FLAGs have a well-developed local information network and diverse forms of communication. In addition to electronic information and the press, there is a network of posts and bulletin boards, also serving as a place to exchange information between the municipality and the residents.

3.3.4 Technological conditions influencing Szczecin Lagoon and Vistula Lagoon

Small-scale fishing is still an activity based on a traditional technological model. The search for fish resembles hunting more than planned production. In the lagoon, where the water is shallow, various trap tools are used. Technological development in the field of fishing gear is rather about ensuring adequate selectivity of fishing, even at the expense of efficiency. The species structure of catches is planned based on fish stocks, mesh size or date of fishing, but in most cases by-catch of unwanted species cannot be avoided.

The availability of desirable species was satisfactory enough that by-catch has been treated as rubbish or food for the poor. Traditional consumption of these by-catch fish has disappeared, which has also reduced demand. That has started to change in the last five years with changes in the size of fish stocks related to climatic and biochemical changes of the sea. These have in turn had a negative impact on fishermen's income, which has resulted in increased interest in species that had been neglected.

Low-value fish are difficult to process. Traditional recipes are simple (in brine, baked, grilled or roasted), but new technologies are focused on most commonly used fish species. Initially, uses for low-value fish were assumed to be as raw material animal feed and fish oils (rich in omega 3 and omega 6 acid lipids), fertilisers, collagen, guanine, fish glue, additives to dishes from other ingredients (breadcrumbs, protein input) and feedstock in biogas production. Certain uses have proved to be ineffective at the actual volume of catch (landings). Moreover, the qualification of the entire OIP area for Natura 2000 has significantly reduced the use of technologies that have an impact on the environment.

At present, the production of animal feed appears to be the most cost-effective use for low-value fish. The technology used is typically lyphilisation (freeze-drying) to facilitate longer shelf life, lower weight, and easier transport of the product - rather than the current practice of simply feeding leftovers and cuttings to animals. Increased *human* consumption of e.g. roach and bream could be achieved through promotional campaigns that restore old traditions of eating these species.

3.3.5 Environmental conditions influencing Szczecin Lagoon and Vistula Lagoon

As it results from the provisions of the EU Water Framework Directive and the Act of 18 July 2001 - Water Law (Journal of Laws of 2005: No. 239, item 2012, as amended), the environmental objective for surface water bodies not designated as artificial or heavily modified is their protection, improvement and restoration so as to achieve good ecological and chemical status by 2015. The waters of the Polish lagoons are a homogeneous surface water. The water quality level is defined as poor, i.e. indicating hydromorphological changes and the need for corrective action, in accordance with Directive 2000/60 / EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Fish resources in Lagoons are over-exploited, which is why fishing of economically important species is subject to time and area limitation rules. The lagoons used to be covered with ice in the winter, but in the past two decades these periods are short or not happening at all. Brackish water in the lagoons is rich in nutrients but low in oxygen, as it is fed by the water of rivers with only minor exposure to open sea water. The main drivers of this eutrophication are anthropogenic: release of fertilisers and untreated sewage, lack of waste management in ports, and lack of awareness of users. Environmental investments have reduced man-made pressure on the lagoon water quality, but they are not able to change the state of the ecosystem.

Climate change may increase the number of bacteria in water. With warm weather (usually in August) there is a ban on swimming in the Vistula Lagoon because of increased density of bacteria (*Escherichia coli*).

Clean environmental conditions are an important factor in tourism. High bacteria levels reduce attractiveness of the area for tourism and decrease tourism-related income. Since that in turn may lead to economic degradation of the region, all local municipalities are actively pursuing waste reduction policies, have invested in sewage treatment plants, and run information campaigns to prevent waste.

3.3.6 Legal conditions influencing Szczecin Lagoon and Vistula Lagoon

Natura 2000, Habitats Directive and Birds Directive prevent any industrial activity - even fish processing - in the region. The Water Framework Directive obliges Member States to ensure protection, improvement and restoration of water status.

The following Natura 2000 areas have been designated on the Polish Lagoons:

- Special protection area for birds 'Szczecin Lagoon' (area code PLB320009) and 'Vistula Lagoon' (PLB280010). The purpose of designating the area is to protect populations of wild bird species, to maintain and manage their habitats in accordance with ecological requirements, and to restore damaged biotopes and create biotopes.

- The special areas of habitat protection "Oder Estuary and Szczecin Lagoon" (area code PLH320018) and "Vistula Lagoon and Vistula Penninsula" (PLH280007) are recognized as an area of significance for the community. The purpose of delimiting the area is to permanently protect natural habitats, populations and habitats of plants and animals, as well as to restore natural habitats or the proper conservation status of plant or animal species.

Fish catches

Poland's Act on Sea Fisheries of 19 December 2014 (Journal of Laws of 2015, item 222) regulates fisheries management in lagoon waters.These regulations changed several important aspects of fisheries management and thus in the way of fishing in these waters:

Sea Fisheries Inspectors issue ordinances on how to allocate fishing quotas (separately on the Vistula Lagoon and Szczecin Lagoon) and on several other fishing-related parameters. These include protection periods of marine organisms and dimension of protected area, which areas are excluded from fishing altogether, and detailed conditions for commercial fishing for both lagoons for each subsequent year. The conditions include catch limits, protective dimensions, permitted fishing gear, as well as time exclusions.

As the waters of the Vistula Lagoon constitute a border water area between the Republic of Poland and the Russian Federation, cooperation between the Government of the Republic of Poland and the Government of the Russian Federation in the field of fisheries management, including in the waters of the Vistula Lagoon, is specified in the Agreement of 5 July 1995. Pursuant to it, the Polish-Russian Mixed Commission for Fisheries Management was established - one of its goals is proper management of the basin's resources, including mutual exchange of information on the characteristics of exploited bream and zander stocks and joint determination of catch limits for these species. In the case of the Szczecin Lagoon, which borders on German waters, there is no agreement with Germany - however, the two countries exchange data and organise bilateral meetings of experts. National legislation regarding protection periods and fish dimensions applies.

Processing of landed fish

Processing of fish from Szczecin Lagoon and Vistula Lagoon landed in harbours may take place after meeting the requirements of:

- Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety, for all food business operators

- Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs, fishing as primary production, the local selling of fish can be also organised as 'direct selling' of primary processed fishery and aquaculture products, and as marginal, local and limited activity for processed fishery and aquaculture products, and as agricultural retail trade of primary processed and processed fishery and aquaculture products
- Regulation (EC) No 853/2004 of the European Parliament and of the Council of 29 April 2004 laying down specific hygiene rules for food of animal origin, in the case of supervised processing plants, or regarding the transport and storage of fishery and aquaculture products
- Act of December 16, 2005 about animal products

As per the Act of December 5, 2008 on animal products, all fishery or aquaculture production, processing or selling entities must be under the supervision of a county veterinary inspector. The large-scale processing entities need to be approved by county veterinary inspectors and the rest must be registered by that inspector.

All entities that place fish or aquaculture products on the Polish market must obtain a veterinary identification number (VIN) given by the relevant county veterinary inspector. The fish placed on the market must be properly labelled according to EU regulation No 1379/2013 and offered to final consumers according to EU regulation No 1169/2011.

3.3.7 Outlook for the bioeconomy in Szczecin Lagoon and Vistula Lagoon

Based on the above PESTEL analysis, the most important opportunities and threats to this OIP are as follows:

Cooperation between the relevant administrative units and interested entrepreneurs, as well as scientific entities, already exists at the local level. FLAGs are the main group binding individual entities. FLAG-based regional connections of various economic and social entities will be the basis for creating a vision of regional development on the basis of the circular bioeconomy. FLAGs plan to establish working groups of various stakeholders and promote information campaigns.

Such campaigns will promote the main initiative toward bioeconomic development in the region: supporting local initiatives to use low-value fish. Use of traditional, often forgotten recipes and application of innovative technologies such as freeze-drying are facets of this effort.

Threats include dependence of the region's economy on tourism and reluctance to innovate in the use of fish resources. The relatively small amount of fishing in the lagoons and the inability to plan and ensure sustainability is a threat to potential investors. The key to success will be integration and support for small and medium-sized enterprises.

Dissemination of the principles of circular bioeconomy among local society is an important element of successful implementation of the objectives of the strategy.

3.4 OIP Vidzeme and Kurzeme, Latvia

Authors: Dagnija Lazdina and Kristaps Makovskis (SILAVA)

The **Vidzeme Planning Region (VPR)** lies in the northeast of Latvia and is the country's largest planning region[13], covering 15 245 km^2 or 24% of the territory. Most of the region (currently 56%) is covered by forest, with an increasing trend in recent years[2]. Agricultural land covers around 34% of the territory. Generally, the region is characterised by a low building density and a high proportion of natural landscapes with low human impact.

Primary sectors (agriculture, forestry, fishery) make up 15.8% of the economic structure of the Vidzeme region. This is the highest percentage of all regions in the country. The sectors with the highest value added in the VPR are manufacturing, agriculture, forestry, woodworking, wholesale and retail industries. The most economically active units (largest number of companies) in the region are forestry, woodworking, agriculture and animal husbandry.

The **Kurzeme Planning Region (KPR)** lies in the eastern part of Latvia and covers 13 596 km^2 or 21% of the country. With a total population of 243 000 inhabitants, it has a population density of 18 people/km^2 - 36.2% of the population lives in rural areas. As in Vidzeme, most of the region is covered by forest – currently 53.7% with an increasing tendency over the last years[14]. Agricultural land covers around 32% of the region.

The Kurzeme region has the longest coastline of any region in the country with 350 km on the sea - this includes beaches, cliffs, dunes, coastal villages and towns, as well as a great variety of natural and cultural landscapes. More than 90% of all Kurzeme settlements are farmsteads. The total number of villages is about 500, some of which are populated only seasonally.

From the natural landscape perspective, Kurzeme is one of the most interesting regions in Latvia. This is determined by the great diversity of natural conditions - highland and lowland, pronounced relief forms, valleys of large rivers, lakes and swamps. The unique features of the Baltic Sea and the Gulf of Riga also contribute to this natural diversity.

The main economic sectors in the region are agricultural production and processing, forestry and woodworking, tourism and fishing, transport and logistics There are also a number of metalworking and mechanical engineering companies in the region, both historical and new.

3.4.1 Political conditions influencing Vidzeme and Kurzeme

Bioeconomy is a widely discussed political topic in Latvia and further work on developing it is ongoing. Latvia is the first of the Central and Eastern European countries (EU-13) to have a national bioeconomy strategy towards 2030 approved. Bioeconomy research funding is available from the EU through the Horizon 2020 programme.

Latvia's most relevant bioeconomy sectors are agriculture, fisheries, the food industry, forestry (including the timber industry), pulp and paper manufacturing, as well as the chemical, biotechnology and energy sectors. With respect to the bioeconomy, political conditions in the Vidzeme and Kurzeme regions are the same because they are defined at the country level. In the *Latvian Bioeconomy Strategy 2030***,** those national bioeconomy development goals are divided into three main groups:

1. Advancement and retention of employment in the bioeconomy sectors to at least 128 thousand persons

[13] There are five planning regions of Latvia: Vidzeme, Kurzeme, Latgale, Riga and Zemgale. The boundaries of the regions align to the boundaries of the municipalities of Latvia following the municipality reform of 1 July 2009. The planning regions of Latvia are not administrative territorial divisions, since they are not mentioned in the law that prescribes the administrative territorial divisions of Latvia.

[14] https://www.csb.gov.lv/sites/default/files/publication/2018-09/Nr_19_Mezsaimnieciba_2017_%2818_00%29_LV.pdf

2. Increasing the value added of bioeconomy products to at least EUR 3.8 billion in 2030
3. Increasing the value of exports of bioeconomy products to at least EUR 9 billion in 2030

The *Latvian National Plan for Adaptation to Climate Change until 2030*[15], adopted in July 2019, is a long-term document aimed at implementing the country's Environmental Policy Guidelines 2014-2020 and to adhere to EU legislation and the Paris Agreement. The goals and objectives of the Plan are closely linked to the United Nations' 17 Sustainable Development Goals[16] and the UN Sendai Framework Program for Disaster Risk Reduction 2015-2030[17]. The Plan analyses climate change observed in Latvia so far, and offers solutions for adaptation across a wide range of related and extreme weather conditions. The Ministry of Environmental Protection and Regional Development is responsible for coordination and implementation of the Plan.

Latvia's *Environmental Policy Guidelines 2014-2020*[18] are medium term policy planning documents designed to parallel priorities of the country's *National Development Plan 2014-2020*[19]. Their goal is to enable citizens to live in a clean environment by pursuing sustainable development activities, preserving the quality of the environment and biodiversity, ensuring sustainable use of natural resources, promoting public participation in decision-making and environmental awareness. Guidelines are developed according to Environmental Protection Law (2006)[20].

The *Action Plan for Development of a Knowledge-Driven Bioeconomy Innovation Ecosystem in Vidzeme Region in Latvia*[21] aims to create, develop and strengthen the bioeconomy innovation eco-system in the Vidzeme region. The purpose is to establish preconditions for knowledge-driven bioeconomy innovation and to provide support to those who innovate. According to the action plan, Vidzeme's smart specialization areas include high value-added wood products, smart materials, and healthy food and beverage production[22].

Policies that are related to bioeconomy development in Latvia include:

- The Smart Specialisation Strategy (RIS3) of Latvia
- Latvian Bioeconomy strategy 2030
- Sustainable Development Strategy of Latvia until 2030
- National Development Plan of Latvia for 2014–2020

3.4.2 Economic conditions influencing Vidzeme and Kurzeme

According to the *Latvian Bioeconomy Strategy 2030***,** 128,000 people were employed in bioecenomy-related sectors in 2015. According to the country's Central Statistics Bureau, Latvia's GDP in 2016 was EUR 25.04 billion, with the VPR accounting for €1.6 billion (6.5%) and KPR for €2.36 billion (9.4 %)[23].

Latvia's population in 2016 was 1.93 million, and its average unemployment rate was 7.4%. The VPR had 188,000 inhabitants in that year, and an unemployment rate of 9.0%. The average monthly salary in Latvia is about 1000 €/month, whereas that of Vidzeme is 803 €/month. Added value in the region comes from manufacturing (20%), public services (19%), trade and accommodation (13%), agriculture and forestry (12%), other industries (6%), construction (4%), transport and storage (4%) and other commercial services (21%). VPR accounts for 11% of Latvia's manufacturing added value. Most of the

[15]https://likumi.lv/ta/id/308330-par-latvijas-pielagosanas-klimata-parmainam-planu-laika-posmam-lidz-2030-gadam
[16]https://www.un.org/sustainabledevelopment/sustainable-development-goals/
[17]https://www.unisdr.org/we/inform/publications/43291
[18]http://www.varam.gov.lv/lat/pol/ppd/vide/?doc=17913
[19]http://www.pkc.gov.lv/images/NAP2020%20dokumenti/NDP2020_English_Final.pdf
[20]https://likumi.lv/ta/en/en/id/147917-environmental-protection-law
[21]http://www.rdi2club.eu/
[22]https://enrd.ec.europa.eu/sites/enrd/files/s11_bioeconomy_action-plan-vizdeme-region_suija-markova.pdf
[23]https://data1.csb.gov.lv/pxweb/en/ekfin/ekfin__ikp__reg/IKG10_110.px/

economically active companies in the region are located in Valmiera city (13%), Madona county (13%) and Cesu county (10%)[24].

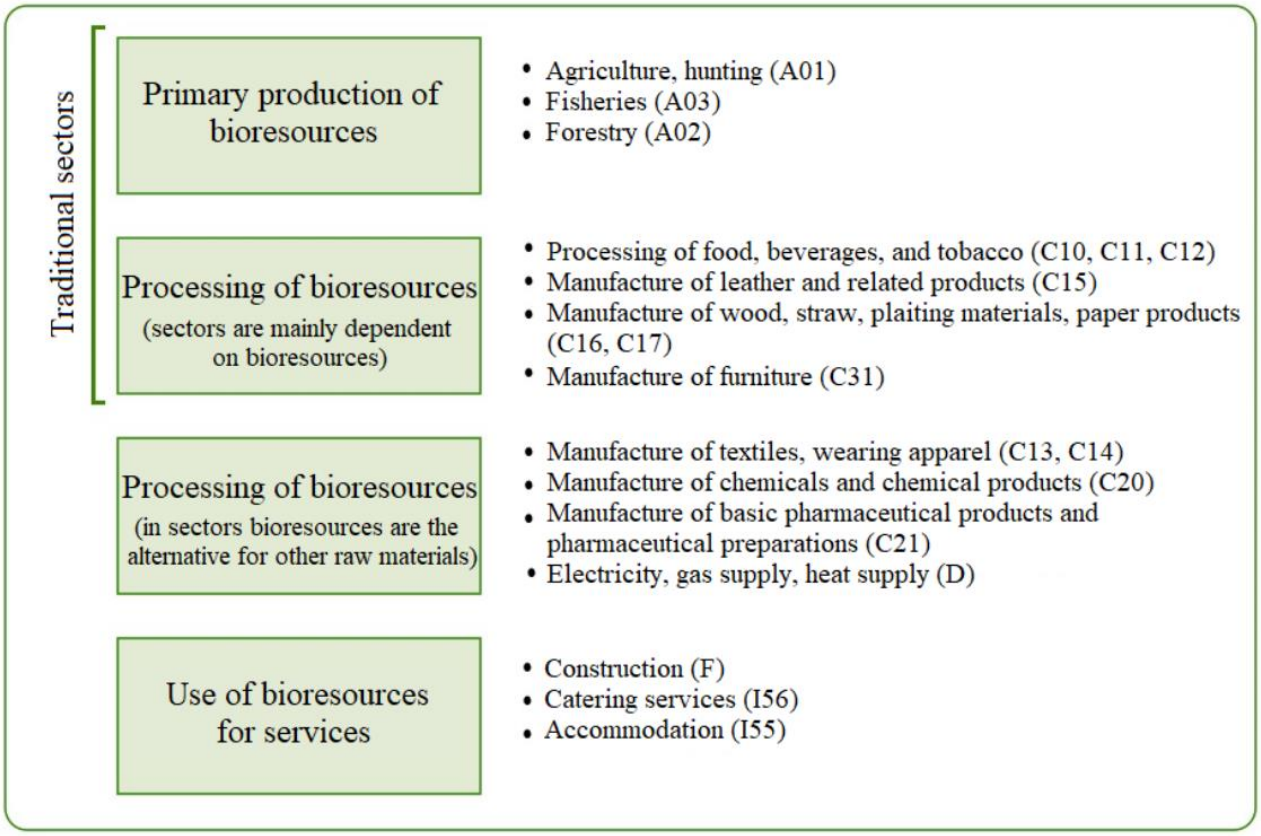
The KPR has 243,000 Inhabitants, an unemployment rate of 7.7%, and average monthly salary of €858. Added value in the region comes from public services (17%), manufacturing (16%), transport and storage (13%), trade and accommodation (12%), agriculture and forestry (8%), construction (6%), other industries (5%) and other commercial services (23%). The region accounts for 13% of the country's manufacturing added value. Most of the economically active companies in the region are located in Liepaja city (27%), Talsu county (12%) and Ventspils city (11%)[25].

Latvia's bioeconomy strategy divides the country's relevant economic sectors into several groups:

- Primary production of bioresources (mainly agriculture, forestry, fisheries)
- Processing sectors of bioresources where operation is completely or mainly dependent on bioresources (mainly production of food and animal feed, woodworking and lumber, manufacturing of leather products)
- Processing sectors of bioresources where bioresources compete with other raw materials or are an alternative for them (the chemical, textile, and energy industries as well as the pharmacy sector
- Service sectors using bioresources (mainly construction, catering and accommodation, see Fig.12).

[24]https://www.em.gov.lv/files/tautsaimniecibas_attistiba/izvertejumi/2019Vidzeme.pdf
[25]https://www.em.gov.lv/files/tautsaimniecibas_attistiba/izvertejumi/2019Kurzeme.pdf

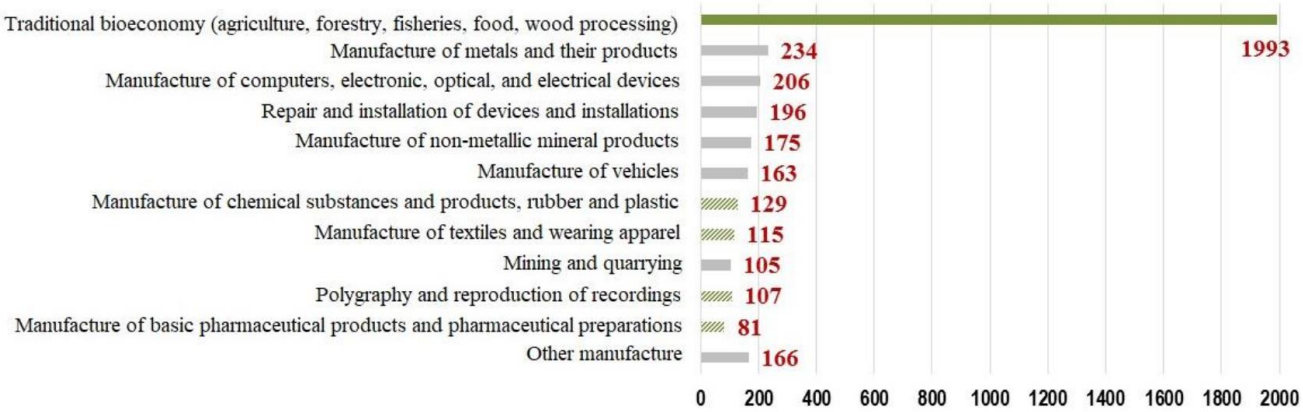
Figure 12: Sectors of the bioeconomy by NACE classification.



Source: Latvian Bioeconomy Strategy 2030, Informational Report.

The traditional bioeconomy sectors –agriculture, forestry, fisheries, food industry, as well as woodworking– accounted for 54% of the GVA of all manufacturing in Latvia in 2015. Together, that is almost six times as much as the next largest sector – manufacture of metals and their products. In absolute figures, the GVA of Latvia's traditional bioeconomy sectors in 2015 was €1.99 billion (see Fig 13).

Figure 13: Added value in manufacturing sectors in Latvia in 2015 in million €



Source: Latvian Bioeconomy Strategy 2030, Informational Report. In green – sectors completely dependent on bioresources, green underlined – partly dependent

A 2011 study of trends in Europe's forest sector[26] projected rapid growth in production of pre-treated wood products in Latvia through 2030 (54%) - this is the fastest growth among EU countries, mainly due to Latvia's competitive advantage in the woodworking and furniture industry. The Latvian government also projects increased demand for local processing of timber[27].

In Latvia biomass is an important energy source for co-generation and district heating. Latvia's primary energy balance (energy from renewable and non-renewable sources which has not undergone any conversion process) is in favor of local resources that are only renewable. Fuel wood (firewood, wood waste, wood chips, wood briquettes, and wood pellets) is the most commonly used renewable energy source in Latvia, accounting for 74% of renewable energy consumption in 2017.[28]

Both locally and at an international level, the energy industry competing for biomass with the woodworking and construction industries as well as the pulp and paper industry. Increasingly biochemical, pharmaceutical and textile producers also use biomass feedstocks - analysts thus project that the market for biomass will increase locally and also globally.

Bioeconomy industries account for about 55-60% of Latvia's total exports of goods, and the sector is critical to ensuring balanced development in the country. In absolute terms, exports from the bioeconomy sector in 2016 amounted to €4.26 billion, and the sector's total exports and imports balance was €+1.28 billion. Wood products accounted for most of this positive balance, followed by cereals, oil, and dairy products. Most of these foods are exported in the form of raw materials.

3.4.3 Social conditions influencing Vidzeme and Kurzeme

The population of Latvia, like that of all the Baltic states, has been declining since the shift to a market economy in the early 1990's. Central Statistical Bureau data shows this trend continuing in recent years, withover 14 thousand fewer Latvians in 2018 than in 2017 (see Table 7)

[26]FAO study "European Forest Sector Outlook Study II", https://www.unece.org/efsos2.html

[27] Latvijas Bioekonmikas strategija 2030, https://www.zemeunvalsts.lv/documents/view/ea5d2f1c4608232e07d3aa3d998e5135/Latvijas%20bioekonomikas%20strat%C4%93%C4%A3ija%202030%20pdf.pdf

[28]Atjaunīgo energoresursu patērīņš 2017. https://www.csb.gov.lv/lv/statistika/statistikas-temas/vide-energetika/energetika/meklet-tema/2407-atjaunigo-energoresursu-paterins-2017-gada

Table 7: Population change by statistical region

	2017				2018			
	Population at the beginning of the year	**Natural increase**	**Net migration**	**Population change**	**Population at the beginning of the year**	**Natural increase**	**Net migration**	**Population change**
Latvia	1 950 116	-7 929	-7 808	-15 737	1 934 379	-9 506	-4 905	-14 411
Vidzeme region	191 794	-1 088	-2 212	-3 300	188 494	-1 141	-1 258	-2 399
Kurzeme region	246 317	-1 378	-1 907	-3 285	243 032	1 547	-1 372	-2 919

Source: CBS database, https://data1.csb.gov.lv/pxweb/en/iedz/iedz__iedzskaits__ikgad/ISG020.px/table/tableViewLayout1/

In the last 15 years over 300,000 people have emigrated from Latvia - most of them are young people, which led to significant changes in the country's age structure. The unbalanced age structure could lead to difficulties in achieving sustainable development.

Of the 1.4 million Latvians between the ages of 15 and 74, 29% have attained a level of education equivalent to a bachelors degree or higher. For Vidzeme's 136,300 people in the same age class, that percentage is 22% and for Kurzeme region it is 21%[29].

The total number of students attending institutions of higher education (colleges and universities) in Latvia in 2018 was 80,355 - down 1.6% compared to 2017 and 6.9% compared to 2014. Nearly half (45%) of the students are studying at public universities (tuition covered by the government).

According to Latvia's Ministry of Education and Science, the number of high school students taking standard exams in chemistry, physics and biology is decreasing significantly, reflecting low levels of interest in these subjects. The share of graduates from higher education institutions in mathematics, science and technology (13%) is also one of the lowest in Europe[30].

There are no large-scale surveys revealing societal views on the concept of bioeconomy, but a 2015 survey of over 1000 respondents about forests conducted by the "Latvian Nature Fund " provides insights into the population's views on forests. Results showed that 72% of respondents aged 18 to 74 years believe the most valuable things forests provide are oxygen production and carbon sequestration, 40% think the most valuable things from forests are wildlife and forest products, 30% stated that forest is habitat for protected species and 26% answered that forests are mainly for timber production.

3.4.4 Technological conditions influencing Vidzeme and Kurzeme

Human resources are among the most important factors in bioeconomy development. Education and knowledge transfer are crucial for adopting new technologies. In Latvia, institutions of higher education

[29] Population by education and region. https://data1.csb.gov.lv/pxweb/en/sociala/sociala__izgl__ek_aktivitate__ikgad/NBG353.px/table/tableViewLayout1/

[30] https://likumi.lv/doc.php?id=266406

offer courses of study related to high added value product production and development. In general, In general terms, Latvia and also the regions are ready and capable to adopt or develop new technologies for bioeconomy development.

The *Guidelines for the development of forestry and related sectors 2015-2020 in Latvia's Smart Specialization Strategy (RIS3)* aims to increase innovation capacity as well as to create an innovation system that promotes and supports technological progress in the country's economy. This applies to the two regions as well. The RIS3's specialization areas are: (1) knowledge-based bioeconomy, (2) biomedicine, medical technologies, biopharmacy and biotechnology, (3) smart materials, technologies and engineering systems and horizontal areas: (4) smart energy and (5) information and communication technologies. The forest sector includes: (1) sustainable and productive forest growing in changing climate conditions, (2) full use of wood biomass for chemical processing and energy, (3) development of innovative high value-added wood niche products.

Technologies mentioned as most worth pursuing in the forest industry in Latvia's bioeconomy strategy are those used in processing of sawn timber and slabs - these are currently being exported, so domestic production of e.g. solid wood panels and prefab wood products could increase value added production in Latvia's furniture and construction industries.

Economies dependent on forest products are especially susceptible to changing climate conditions - bioeconomy development in Latvia thus requires technologies that enable more efficient forest management and forest resource accounting.

3.4.5 Environmental conditions influencing Vidzeme and Kurzeme

Climate change is projected to increase the vegetation period in Latvia (spring starts earlier, autumn lasts longer), which is currently 180-200 days, by 35 to 80 days by the end of the century. While overall precipitation is projected to stay the same or slightly increase, its distribution could change significantly: an increase in the frequency of droughts (especially those that are longer than 5-7 days) is expected. Likewise, the frequency of storms is expected to increase. The results of climate models that link these changes to tree growth show a generally positive impact of climate change on tree growth, with the largest additional growth for pine trees (30% in eastern Latvia and 19% in western Latvia), spruce (19%) and birch (9%)[31].

On the other hand, climate change is also expected to impact wind and pervasiveness of dendrophagic insects. Reducing the likelihood of damage from increased high winds, forests will need to be managed differently, e.g. earlier and more frequent thinning[32].

Frost days have decreased in most areas and frost periods have become significantly shorter in the coastal areas of the Baltic Sea. Significant increase in warm nights with minimum air temperature above + 20C and + 25 C has been observed in the last decade. Increasing the duration of heat periods is considered to be one of the most dangerous phenomena in the region. Indicators of extreme weather precipitation also show a positive upward trend, and this trend is most pronounced in the winter. Data of Latvian observation stations do not show data about increasing wind speed. However, during the historical period since the 19th century, the territory of Latvia has been hit by several severe storms, which have caused great damage to forestry, power lines, agriculture and other objects in certain areas.

3.4.6 Legal conditions influencing Vidzeme and Kurzeme

National laws related to the bioeconomy include:

[31] http://www.silava.lv/userfiles/file/Projektu%20parskati/2015_2010_JansonsA_LVM_klimats_kopsav.pdf

[32] http://www.silava.lv/userfiles/file/Projektu%20parskati/2015_2010_JansonsA_LVM_klimats_kopsav.pdf

- The *National Forest Law* of 2000, which promotes economically, ecologically, and socially sustainable management and use of the forest by ensuring ownership rights
- Latvia's *Agriculture and Rural Development Law* of 2004 specifies that specific regional features must be observed in implementation of rural development projects, investments in rural areas must preserve the rural environment and support producers of agricultural products
- *Law on the Conservation of Species and Biotopes* (2000)
- *Law On Compensation for Restrictions on Economic Activities in Protected Territories* (2013)
- *Spatial Development Planning Law* (2011)
- *Protection Zone Law* (1997)
- *Law on Specially Protected Nature Territories* (1993)
- *Environmental Protection Act* (2006)
- *Law on Circulation of Fertilizers* (2006)
- *Amelioration Law* (2010)
- *Energy Law* (1998)

Latvian regulations and guidelines related to bioeconomy include:

- Regulations on agricultural areas of national importance (MK Nr. 291)
- Forest and Related Industries Development Guidelines 2015-2020

3.4.7 Outlook for the bioeconomy in Vidzeme and Kurzeme

With the bioeconomy being on the radar screen of politicians at the national level in Latvia, and a national bioeconomy strategy through 2030 already formulated for the country, conditions are good for regional counterparts to be developed. The Vidzeme and Kurzeme regions' economic focus on primary resource sectors, primarily agriculture and forestry, renders it well suited for a bioeconomy strategy that builds ties among businesses and other relevant institutions in the agriculture and forestry value chain. The Vidzeme region this year published its "Action Plan for Development of a Knowledge Driven Bioeconomy Innovation Ecosystem," and is thus on the road toward a comprehensive bioeconomy strategy.

3.5 OIP Covasna, Romania

Authors: Carmen Pauna, Raluca Iorgulescu, Tiberiu Diaconescu and Daniel Cosnita (IPE)

Covasna County is located in Transylvania in the eastern Carpathian mountains, which is in central Romania and is part of the country's Centru Region (CR). The county's capital city Sfântu Gheorghe is well connected with all other Romanian cities. Covasna has 5 towns and municipalities, with 40 communes and 122 villages.

Because of its geographical position, 45.7% of the Covasna county is forested (Benedek et al., 2018), with significant dry biomass resources. Due to the relatively complex geological constitution of the county's territory, Covasna contains a wide range of reserves of useful mineral substances necessary for industry and especially for construction.

The smallest county in Romania in terms of inhabitants, Covasna was famous for its automobile industry until 1989 when its various gearbox and vehicle parts factories closed. A century-old cigarette factory in Sfântu Gheorghe was closed in 2011.

Recently, the Sfântu Gheorghe authorities have taken an important step in attracting investors, building a 16.5 hectare industrial park at Câmpu Frumos.

Covasna is a centre for spa tourism, with early spa treatments having been organised there in the 19th century: mineral water extracted from the wells was poured into wooden tubs and heated with hot stones.

The OIP in Covasna will focus on addressing fragmented value chains and implementing the circular economy concept within the county's industrial sectors (i.e. wood and furniture, textiles, agro-food, mechanical engineering, green energy). The OIP will investigate the development potential of underused biomass (plant matter and wood waste) and its implications for societal challenges (e.g., rural unemployment, marginalised communities). This will be done within a local development business model of "1 village 1 MW" based on a small-scale technology option ensuring the autonomous energy supply for civil and industrial needs.

3.5.1 Political conditions influencing Covasna

Romania does not have a bioeconomy strategy or a specific regional bio-based industry strategy. Analysis of industrial policies in the country's *National Strategy for competitiveness 2014-2020* touches on bioeconomy principles, as do the national proposal for an energy strategy 2016-2030, the *2010 Master Plan for Biomass*, and a proposed biomass law currently being discussed in Romania's parliament. Legislators are also preparing a new heating law, which couldrequire up to half of the energy produced (heat) for the domestic / district heating to be obtained from bioenergy sources. The bioeconomy and energy, environment and climate change are among the priorities of Romania's *Smart Specialisation Strategy for 2014-2020*.

Other national policies and strategies relevant for the bioeconomy are:

- *National Strategy for Sustainable Development 2030*
- *National Strategy for Regional Development 2014-2020*
- *Romania's rural development strategy 2014-2020*
- *National Rural Development Program 2014-2020*
- Romania's *Industrial Policy Document* (version 2018) involving industrial value chains, innovative clusters, stimulating innovation by investing in new products, services and production facilities in enterprises, energy, resources and energy efficiency to boost competitiveness
- *National Waste Management Plan*
- *National Strategy for Research, Development and Innovation 2014-2020*
- The new *Regional Innovation Strategies for Smart Specialization –RIS3*
- *Roadmap for developing a strategy on the circular economy in Romania*

- *An EU Industrial Policy Strategy: a Vision for 2030 - Council conclusions* (adopted on 27/05/2019)
- Cluster programmes in Europe and beyond
- Romania's *National Rural Development plan 2014-2020* includes funds for investments in farms that can produce and use renewable energy for own consumption or for other economic operators.

With so much national and EU level policy focused on bioeconomy-related issues, public subsidies favour this area: projects that apply for public subsidies therefore are more likely to receive them if they include at least partially the topic of bioeconomy, bioenergy production, and utilisation of local bioresources.

As for specific bioeconomy sectors, forestry is most relevant in Covasna given its high forest cover. Most national policies related to this sector centre around fighting forest fires. Elaboration of the national forest fire strategy and the concept of defense against forest fires is done by Romania's Ministerial Committee for Emergency Situations within the central authority responsible for forestry, which is subordinate to the National Committee for Emergency Situations.

The two most relevant forest sector entities at the local level are:

1. Covasna's Directorate for Forestry, which is subordinate to Romania's National Forest Administration – ROMSILVA[33]
2. Emergency Inspectorate "Mihai Viteazul" of Covasna County, the regional counterpart to the Romanian General Inspectorate for Emergency Situations[34]

The region's other main bioeconomy sector, agriculture, is relevant in Covasna because energy crops are eligible for direct payments from EU funds and for national transient aid funded by Romania's national budget. However, the Romanian legislation is not comprehensive in terms of short rotation crops (SRC): while in 2014 the Ministry of Agriculture provided policy support for diversification of agricultural activity including SRCs for energy production, from 2018 SRCs are accepted only for degraded areas with low quality soils. That change means production of biomass is not allowed in agricultural areas.

Amid this "top-down" regulatory context for bioenergy, Covasna county features a unique bottom-up initiative in that sector called „1 village 1 MW". Launched by the Green Energy Innovative Biomass Cluster in 2012, this programme aims to implement small scale bioenergy projects in rural Romania to supply local public buildings with bioenergy in the first phase, then later expand to supplying other local businesses and private households. On a local level, the biomass production and supply value chain can be based on local biomass residuals, such as agrobiomass, forest residues, landscape cleaning, orchard pruning, etc. This approach aims to reduce locals' energy bills while solving environmental issues related to fossil fuel burning. This initiative exists only in Covasna county thus far - more than 50 bioenergy projects have been implemented under its auspices in urban and rural areas.
Covasna country is also at the forefront in creating a framework for development of local bioeconomy: the Angustia LEADER Group elaborated a specific development strategy for 2014-2020, including the innovative investments for bioeconomy and bioenergy sector. This measure was one of the most succesful development approaches in the county, with several rural municipalities submitting project proposals and implementing bioenergy investment projects in their area.

In the forestry sector, harvesting is limited or banned entirely in Romania's high conservation value forests. In the case of national parks, Romanian law allows harvesting timber products in some areas (the so-called "buffer zones") and under some conditions (such as sanitary cuttings). Strictly protected areas and virgin forests are excluded from harvesting entirely. The country's big sawmills have thus started to import raw materials from other regions or even from abroad. The main wood products firm operating in the county, Germany-based Holzindustrie Schweighofer, has assumed a strict policy of

[33] For more information see:
http://sfgh.rosilva.ro/articole/prevenirea_si_stingerea_incendiilor__p_1140.htm
[34] For more information see: http://www.isujcv.ro/serv%20prev%20incendiilor.html

rejecting all wood transports from national parks. It has developed a local sustainability label in the form of GPS tracking: "Timflow" tracesall saw log deliveries transported to Holzindustrie Schweighofer's mills in Romania as part of its action plan to ensure a sustainable and secure supply chain. As of April 2017, all trucks delivering logs to the company's sawmills in Romania use Timflow to display GPS maps of all the routes from the loading point to the sawmill gate.

While this industry actor's efforts are useful, illegal logging is increasing in Covasna county, both in number of cases and in volume. Thanks to the strict control on forest managemant by local police, levels of illegal logging are not yet significant - but more than control of logging roads is needed to address this issue. Deep and regular audits at logging companies, as well as applications like Timflow that trace the wood's origin are required.

3.5.2 Economic conditions influencing Covasna

In Covasna County there were 9136 registered companies as of February 2019. The business sector is well developed in different industries such as in wood manufacturing, automotive components, and textile factories but also in tourism. The county has been characterised as a "traditionally underdeveloped region" (Benedek et al., 2018) but Covasna's GDP per capita and its GVA have grown roughly in line with those of the CR and Romania as a whole, driven in part by the wood industry (see Tables 8, 9 and 10).

Table 8: GDP per capita (€/hab) – Total

	2013	2014	2015	2016
Romania	7,200	7,600	8,100	8,600
CR	6,700	7,000	7,500	8,200
Covasna	5,000	5,100	5,500	6,100

Data source: Eurostat, nama_10r_3gdp http://ec.europa.eu/eurostat/data/database

Table 9: Gross Value Added (€ million)

	NACE Rev 2.0	2013	2014	2015	2016
Romania	Total - all NACE activities	126,843	133,177	140,928	152,853
CR	Total - all NACE activities	14,001	14,586	15,560	17,273
Covasna	Total - all NACE activities	926	938	1,007	1,123

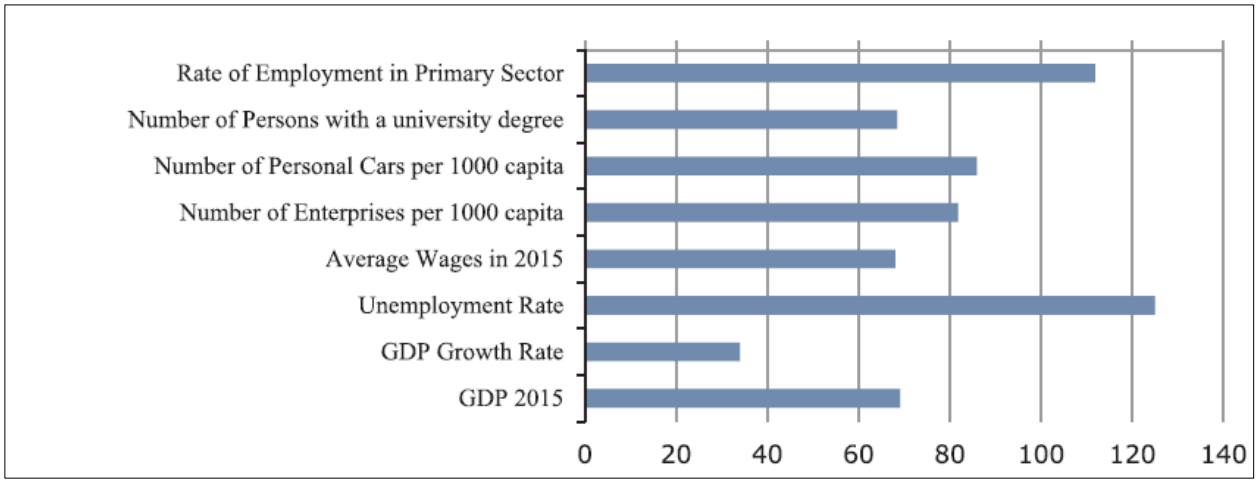
Data source: Eurostat, nama_10r_3gva http://ec.europa.eu/eurostat/data/database

Table 10: Exports (mil. EUR) of wood industry products (2016)

	Sawn Timber	Compressed wood boards	Furniture	Paper and paper products
Covasna	498	140	7	21
CR	2684	2251	335	587

Source: INS 2017; Sebestyén 2019

Figure 14: The most important core economic indicators in Covasna County compared with the national average (100%)



Source: Benedek et al., 2018.

The aforementioned changes to Romania's forestry code in 2017 negatively influenced the quantities of roundwood on the market, especially the lower quality varieties. This caused a price spike for those products within the wood industry, which therefore began importing logwood from neighboring countries. This represents a crisis for forest sector stakeholders, as in their view forest rich countries should not import logwood while large volumes of standing timber in their own territory remain unharvested. The reduced log volume and unsustainable prices recorded in the last two years has led to a strong decline in purchasing of the wood panel industry in Romania. Some of the smaller factories have stopped their production while others rely massively on imports of logs.

One local bioenergy initiative involves Covasna county farmers growing shrub willow („energy willow") on degraded or less fertile agricultural land. A short-rotation woody crop that rapidly produces large amounts of biomass, shrub willow is a very attractive biomass producer because it requires few inputs, has multiple stems, and resprouts after being cut. The plant also contains salicylic acid which can be used in biorefineries, pharma, and in production of biopackaging materials. Over 120 hectares in Covasna county are in shrub willow production. The first mechanical harvesting from an area of 20 ha took place in February 2013 in Poian Village, Covasna County (Mihaescu, 2013). A firm called Kontrastwege SRL distributes energy willow seedlings and popularises the practice of developing plantations of them. It also constructs thermal power plants and consults on briquetting and pelletising machines. In 2007, the collaboration with the Swedish research institute Lantmännen Agroenergi began, after which Kontrastwege SRL became the first licensed representative and distributor of energy willow for Romania and the Republic of Moldova.[35]

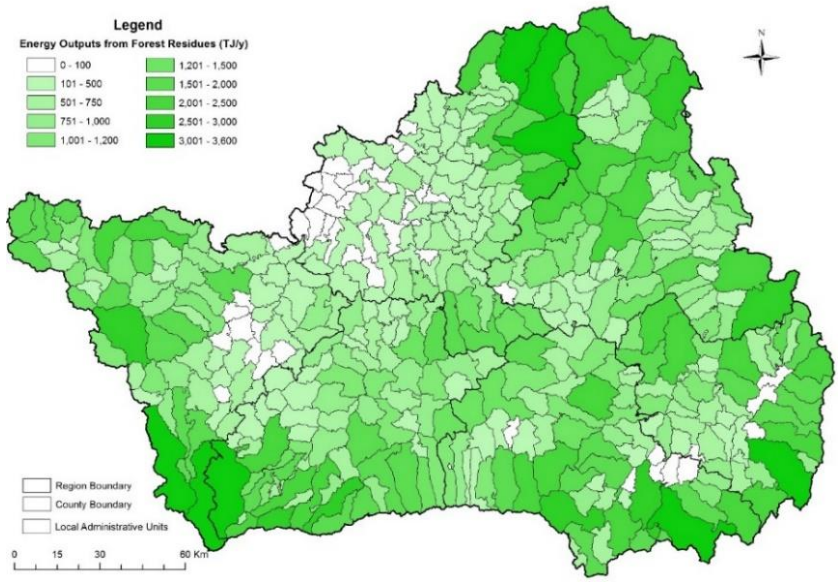
The bioenergy sector in regional forest based industry

Covasna's forest based industry generates 890,000 tonnes of wood waste annually, having an estimated value of €130 million. Most of this wood residue is converted into biomass and used as fuel for big Combined Heat and Power (CHP) plants and biomass boilers, producing heat and electricity for domestic companies but also for selling electricity to the national power grid. Most of the wood byproducts produced at sawmills and pre-processing of wood are already used for fuel, while the forest residuals from the logging process are not harvested efficiently.
According to local stakeholders, productivity as well as revenue generating potential of the biomass sector could increase if existing bioenergy and waste policies in the region were better implemented and integrated. Figure 15 illustrates the theoretical energy yields from forest and wood industrial

[35] For more information visit: http://www.kwg.ro/files/KWG_Energy_Willow.pdf and http://www.kwg.ro/ro/

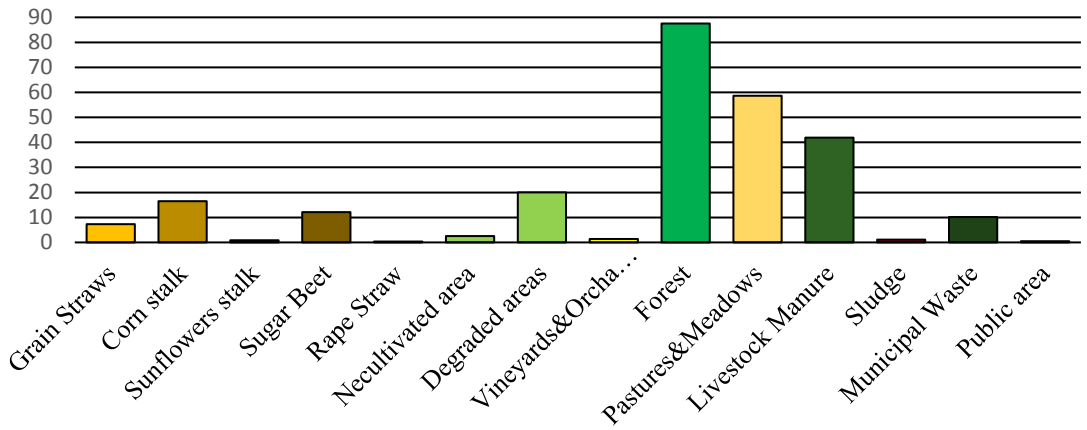
residues for the CR. Figure 16 shows the sources and the potential for integrated biomass energy for the CR. Figure 17 presents the map of energy output from wooden biomass residues, technical biomass to energy potential in the CR. The biggest Romanian biomass CHP Plants are also located in Covasna, e.g. 60 MW in Reci where 15 MW electricity and 45 MW thermal energy capacity is installed. Several timber producers have their own wood dryers and use the leftovers from their yard to produce energy.

Figure 15: Theoretical energy yields from Forest and Wood Industrial Residues in Centru Region (TJ/y)



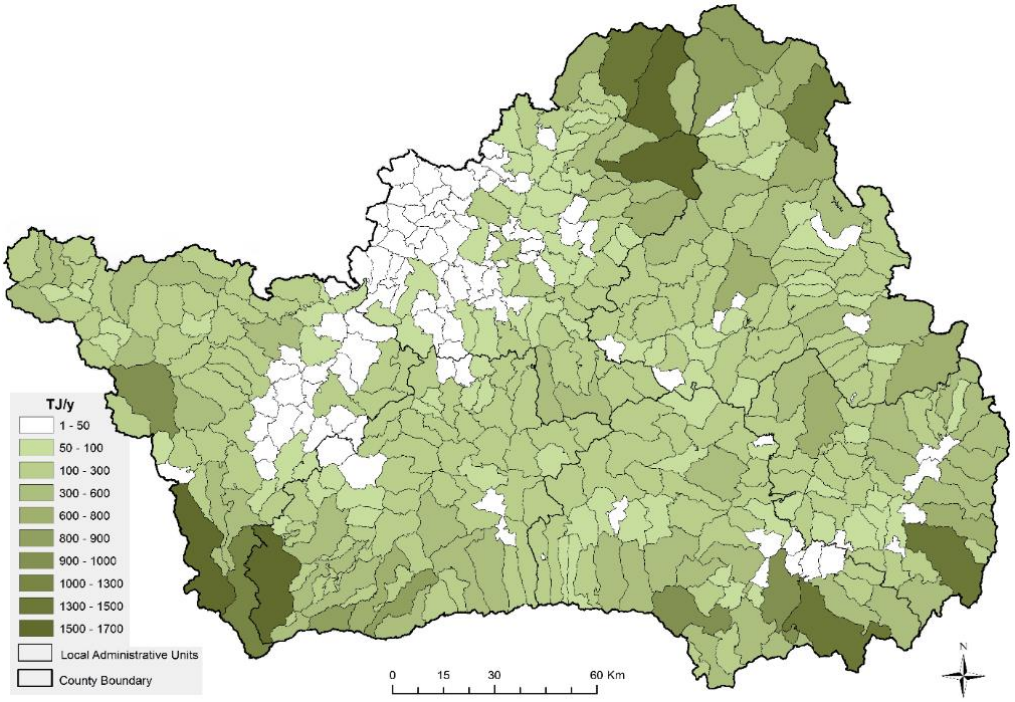
Source: Sebestyén 2019

Figure 16: Integrated biomass energy potential from Centru Region



Source: Sebestyén 2019

Figure 17: Map of energy output from wooden biomass residuals, technical biomass to energy potential in Centru Region



Source: Sebestyén 2019

Some examples of bioenergy value chains

The existing bioenergy value chains in the CR supply district heating plants located in Harghita County, Covasna County (Intorsura Buzaului and Tega) and Alba County (Sebes). At present, the total capacity operating on biomass installed in the CR is about 80 MW equivalent. The fuel used consists of woodchips, sawdust, bark, branches, and other types of wood residues. Within the Green Energy Innovative Biomass Cluster, there are more than 180 small and medium size biomass to energy projects in the region, with a total capacity of 21 MW, in more than 40 municipalities in the region.

Dalia Ltd. Greenhouses, Covasna County

Close to Sfantu Gheorghe, which is the main town in Covasna County, the area had abundance of sawmill dust which caused multiple users to develop biomass-based heating systems in greenhouses, bakeries, meat factories, etc. However, from 2015 onwards there was an increasing demand from board industries, and thus its availability decreased.

At Dalia Ltd. (the largest greenhouse in Covasna County) the turning point was a subsidy project from the pre-accession fund SAPARD. The project built in 2007 new greenhouses including a 4 MW biomass-based heating system, initially fed with sawmill biomass. After the shortage of sawmill dust, Dalia Ltd. promoted actions to trigger new biomass value chains in the region taking advantage of two opportunities: firstly, the availability of productive agricultural land leading farmers to start growing shrub willow plantations and secondly, the woody biomass that can be obtained from green areas in Sfantu Gheorghe town or from environmental works to preserve the extensive pastures of local mountain ranges. This harvesting is done by small local companies, which now belong to Dalia Ltd. Suppliers. The new value chains started the biomass supply to Dalia Ltd. after a biomass boiler was installed in Valea Crisului, 5 km from Sfantu Gheorghe in 2008 - the facility continues with a supply of 2,000 tonnes/yr on a commercial basis. The business is able to supply woody biomass at €65/tonne, which is competitive with fossil fuels. The benefits are multiple: Dalia Ltd. saves in energy costs and contributes to rural growth (it established a new facility in 2019), and farmers earn additional income

from sales of biomass. The Green Energy Innovative Biomass Cluster is engaged in the promotion and replication of the project.

Ghelinta, Covasna County
More than 20 sawmills and several logging companies in Ghelinta are involved with logging and timber production from local and regional forests. In the past five years, public buildings and businesses have installed biomass-based heating systems with almost 2 MW of total capacity. Examples include a bakery using four biomass ovens, sawmills drying their wood with heat from burning their own sawdust, and private houses installing biomass heating systems. New support programmes by the Romanian government and international donors are available, therefore the local decision makers are engaged for development the local bioenergy sector. Such plans include a new biomass-based district heating system with total annual heat production of about 9.7 GWh to supply 41 large public and private buildings as well as several residential buildings in a densely populated area of Ghelinta (Biovill 2019).

3.5.3 Social conditions influencing Covasna

More than half of Covasna county's residents live in rural settlements where there is no significant core urban area for industry. Covasna County has 55.1 inhabitants per square kilometre as opposed to 102.8 in Brasov County (the largest County in the CR). The share of Covasna's population in the 15-59 age bracket is 59%, while 23.7% are age 60 or older. Compared to other counties in Romania, this is an advantageous demographic structure: many have shares of the younger age bracket well below 50%, which leads to the social problems typical of an aging population. However, the demographic decline of the CR (aging population) will continue and accelerate in the next decades according to a population forecast elaborated by Romania's National Institute of Statistics. The population of the CR (implicitly of Covasna) will decrease until 2050, as shown in Table 11. An aging population implies a higher dependency ratio (Table 12). Romania's 1.58 fertility rate (well below the 2.1 replacement rate required to keep populations stable) is below average within Europe and adds to the demographic trend of an aging population. Direct implications of the low birth rate include closure of preschool, school, and higher education institutions - for example, in the 2010/1011 school year there were 53 fewer schools compared to the previous year at the level of the entire CR. Here, and implicitly in Covasna county, there are notable changes compared to the previous census in them regarding the population structure after the graduated studies. Thus, the share of graduates of higher education has increased significantly, while the share of people without a high school has decreased, and the share of illiterates has decreased from 2% to 1.2% (Table 13).

Table 11: National Institute of Statistics population forecast (2016)

	2011	2015	2020	2025	2050	Variation 2050/2011 Mii pers.	%
Reg. Centru	2360,8	2460,7	2391,6	2305,4	1906,8	-454	-19,2
Covasna	210,2	216,8	210,5	202,7	164,6	-45,6	-21,7

Source: Institutul de Statistica, 2018

Table 12: Evolution of demographic dependence and the aging rate in Covasna County

	1990	2000	2011	2025	2050
Demographic dependency report	57	45	48	45	73
The demographic aging rate	399	617	862	1282	3199

Source: Institutul National de Statistica

Table 13: Population structure over 10 years after the level of the education institution graduated

	CR		Covasna	
	2011	**2002**	**2011**	**2002**
Tertiary, long	6.1	12	16.4	3.8
Tertiary, short	0.5	1.7	1.9	0.4
Post-high school, foremen	3.3	3.7	2.6	3
High school	22.4	25.7	20.6	24.7
Vocational	18	15.9	16	14.3
Middle school	27.9	26.1	32.3	30.8
Primary school	17.2	12	18.4	13.6
No school graduated	4.6	1.6	5.8	1.7
Illiterate	2	1.2	3	2.2

Source: Institutul National de Statistica, Recensamantul populatiei si al locuintelor din anul 2011

Covasna County has the lowest number of employees in the CR. In line with regional trends, the share of employed people among the working age population has decreased continuously over the last two decades, reaching about 50% currently.Most affected by unemployment are those with a low level of education (19.2%, the average unemployment rate in recent years), residents in the urban area (24% the average unemployment rate among the people with a low education in the urban area), according to the data provided by ANOFM and INS.

The layoffs in the mining localities of Bălan and Baraolt are the most acute problems faced by Harghita and Covasna counties. After the closure of these mines for their low attractiveness (geographical isolation, low level of training of the labour force), it was not possible to develop viable alternative economic activities to take over the redundant labor force.

The average salary in Covasna county is 5-20% lower than in neighbouring counties like Brașov or Sibiu, therefore the county is not attractive for young generation. The biggest town has only about 50,000 inhabitants in Covasna County, while 30 km from Sfântu Gheorghe lies the large city of Brașov with well developed industry, service and tourism sectors.

The problems of the rural areas in Covasna county - but also in general - are due to lack of investment in basic infrastructure, absence of subsidies, underperforming agriculture, emigration, lack of human capital, insufficient supportive and advisory structures, and a missing overall development vision (Jordan 2016). However, there are good practice examples for the ability to identify opportunities for their development and in promoting a necessary social change. For instance in rural municipalities, represented to a certain extent different approaches, but demonstrated the possibilities that know-how transfer, innovative entrepreneurship, and personal relationships based on trust or friendship had for the development of rural communities exploiting the local human and natural potential (Havadi 2016). While emigration abroad was the main migration trend among young Romanians in the past, recent trends are toward internal migration of young people from rural to urban areas. Most young people from Covasna county who go to university after they finish high-school settle down in the city where they studied. The most popular cities among the young people in Covasna County are Cluj, Targu Mures, Brasov and Bucharest.

Civil society is relatively present in Covasna County: in every urban and rural settlement there are registered NGOs, mostly youth associations and foundations for education and keeping traditions. There are well-developed networks among the different civil organizations and regular meetings are organised mostly in Sfântu Gheorghe. One local environmental group, the Green Sun Association, has organised more than 850 events around environmental topics since its founding in 2009. It is an open group with 17 principal members and 30 volunteers.

3.5.4 Technological conditions influencing Covasna

Given the region's focus on forestry and biomass in the bioeconomy, relevant technologies apply to these areas. Modern boiler technologies at the industrial and household level are being used in

Covasna's many local biomass heating applications, from bakery ovens to office buildings. Machinery for gathering biomass residues, both in urban areas (yard waste) and forests (branches, waste wood) is expensive and requires maintenance - but makes the residue gathering process much more efficient than relying on human labour.

As for technologies outside the forest and agriculture sector, two innovative products have been developed and marketed in Covasna county. Both products were created within the AgroFood Regional Cluster. One is a whey-based energy drink whose recipe is the result of research by a team from Covasna-based Meotis Ltd. and researchers from the ICECHIM Institute in Bucharest. The use of the whey in the energy drink reduces waste at a Covasna county cheese manufacturing and dairy products company.

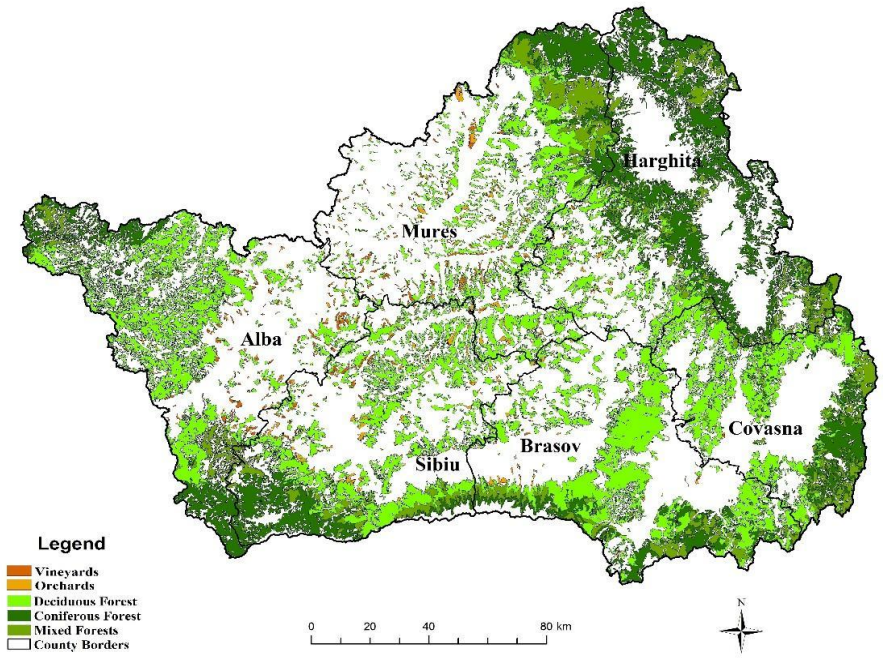
FIBRO+ natural mineral water enriched with gluten free fiberfrom organic chicory roots is, unlike many energy drinks, safe for the digestive systems of people with gluten intolerance. The product contains mineral water from Vâlcele, in Covasna county.

High-tech Industries are also present in the regional industry sector. The most relevant companies with high-tech are international automotive companies and locally-owned automotive companies in Sfântu Gheorghe. In Sfântu Gheorghe and Targu Secuiesc there are several mechanical factories producing auto parts with CNC technology. On the other hand, the wood manufacturing and furniture production is also a highly relevant industrial sector in the Covasna county. In this sector the use of CNC machines and computer driven equipment is common. In Covasna county there is no technical university but since Brașov is very close the companies from Covasna County have close relation with the R&D institutes established there. The technology transfer in different sectors is provided by the clusters from Sfântu Gheorghe. There are 6 clusters in different sectors such as Green Energy Innovative Biomass Cluster in the field of renewable energy and environmental technologies; the Pro Wood Regional Cluster in field of forest based industry; the AgroFood Regional Cluster in agriculture and food industry; the Transylvania Textile & Fashion Cluster in the field of clothing and fashion; and the Transylvanian Mechanical Engineering Cluster.

3.5.5 Environmental conditions influencing Covasna

Covasna is one the six counties of the CR in Romania covered by different types of forests (see Figure 18). Despite new regulations and regeneration of forests, deforestation is quite visible at several locations in the region (INS, 2019). However, the awareness among the local inhabitants is increasing and online reporting mechanisms have been established to enable the wider population to play a role in the reduction of illegal deforestation in Covasna County. The environmental state of public forests in Covasna County is monitored and controlled by the state-owned Romsilva company. However, their role is limited, as roughly half of the total forest area in Covasna is privately owned.

Figure 18: Different type of forests in Centru Region



Source: Corine Land Cover, ArcGIS

The arable land in Covasna is fertile and a few projects are ongoing which will trigger the modernization of irrigation to intensify agricultural activities. Forestry is considered to be operating below sustainable limits, with multianual logging being lower than the regrowth of the forest mass. However, the biomass fuel demand is increasing year by year, and with the onset of climate change leading to more frequent and widespread forest fires, the local biomass resources could become scarce.

3.5.6 Legal conditions influencing Covasna

Law 199/2000 promotes RES (renewable energy sources) while *Law 220/2008* (revised and modified in 2016) introduces a support scheme for renewable energy production in the form of green certificates.

No legal restrictions exist regarding the wood waste to energy process. The legislation regarding energy willow plantation has been updated in 2018 to restrict SRCs and maintain arable lands in good conditions.

3.5.7 Outlook for the bioeconomy in Covasna

The bioeconomy in Covasna county can be developed and expanded due to the large availability of bioresources. Opportunities identified point to the development of a detailed inventory of traditional foods, traditional recipes, agricultural products, bioresources from forest such as mushrooms, berries, mineral waters, etc. and to take into consideration the agricultural by-products for bioenergy production such as biogas and thermal energy production.

In order to achieve a well-developed bioeconomy in Covasna county innovation, close collaboration with R&D institutions is essential in the future. This is mainly the mission of the clusters which were established in previous decade.

4 Conclusions

This first exploratory exercise has shed new light on the current state of affairs surrounding the BE-Rural OIPs. While each of the regions has its own distinct characteristics and dynamics, some common denominators could be identified.

First, while the policy and regulatory mechanisms that frame and influence the bioeconomy vary across the regions –sometimes being more elaborate, sometimes driven mainly by national or supra-national level initiativies– the relevance of collaboration among the local and regional stakeholders to enable a transition from plan to action emerged almost unanimously from the analyses conducted. In general, the OIP facilitators recognize the importance of achieving early buy-in from all parties that will be affected and will affect the scene for the bioeconomy in their regions. This will smoothen the process of formulating –and later implementing– the regional strategies.

Related to this, another element that recurrently surfaced was the issue of public awareness, both in the context of the impacts that current practice and economic activities have on the regions' natural and socioeconomic systems, but also on the concept of bioeconomy itself and the potential benefits as well as detrimental effects it could have. It is clear that the concept of bioeconomy is not well known in the OIP regions, and that the acceptance of new bioeconomy initiatives, as well as the products and services associated to them, will have to be built through concerted and consistent communication efforts. In general, ensuring a better understanding of the notions behind the bioeconomy in the project's regions will be a crucial element to ensure its impact.

Regarding the socioeconomic conditions at the different regions, the issue of emigration and aging populations also seemed to emerge as a recurrent condition. This is a common challenge among rural regions in many European countries, and in former eastern-block states it seems to be exacerbated by their ongoing process of political and economic transition. This is a complex issue to tackle, as it touches upon multiple elements of society, economy, politics and culture. The realisation of synergies between public policy measures could represent a chance to start moving things forward, especially by providing the younger members of society who would be willing to return to their countries and regions, a real chance to do so. Well-formulated bioeconomy strategies could help open opportunities in this context.

Lastly, and perhaps most importantly, this task has served to provide a first concrete outline of where the key points of collaboration between the OIPs could lie. While previous experience and collaboration between the partners provided some indication, this task has confirmed some expected synergies and revealed new areas where the regional bioeconomies of BE-Rural could complement each other and contribute to the vision of a sustainable EU-wide bioeconomy.

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Long-term National Development Strategy "Poland 2030. The third wave of modernity"

http://kigeit.org.pl/FTP/PRCIP/Literatura/002_Strategia_DSRK_PL2030_RM.pdf

Strategia Rozwoju Kraju 2020

National Development Strategy 2020

http://orka.sejm.gov.pl/Druki7ka.nsf/0/7938232EA0AAD4F2C1257AD00052A8F6/%24File/972.pdf

Strategia Zrównoważonego Rozwoju Wsi, Rolnictwa i Rybactwa na lata 2012-2020

Strategy for Sustainable Development of Rural Area, Agriculture and Fisheries for 2012-2020
http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WMP20120000839/O/M20120839.pdf

Strategia rozwoju transportu do 2020 roku (z perspektywą do 2030 roku)

Transport development strategy until 2020 (with perspective until 2030)

https://www.gov.pl/documents/905843/1047987/Strategia_Rozwoju_Transportu_do_2020_roku.pdf/ead3114a-aac7-3cdd-c71d-7f88267ce596

Program Rozwoju Turystyki do 2020 roku.

Tourism Development Program until 2020

https://bip.msit.gov.pl/bip/projekty-aktow-prawnyc/zakonczony-proces-legi/inne/1599,Program-Rozwoju-Turystyki-do-2020-roku.html

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Strategia Rozwoju Kapitału Ludzkiego 2020
Human Capital Development Strategy 2020

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Strategia rozwoju portów i przystani morskich południowego brzegu Zalewu Wiślanego.

Development strategy of ports and marinas at the southern shore of the Vistula Lagoon
http://tolkmicko-umig.bip-wm.pl/public/get_file_contents.php?id=331672

Program Rozwoju Miasta i Gminy Tolkmicko na lata 2016-2025
Tolkmicko Town and Commune Development Program for 2016-2025
http://tolkmicko-umig.bip-wm.pl/public/get_file_contents.php?id=295310

Strategia rozwoju miasta i gminy Frombork na lata 2016-2026

Development strategy for the city and commune of Frombork for 2016-2026
http://www.frombork.pl/strona-415-STRATEGIA_ROZWOJU_MIASTA_I_GMINY_FROMBORK_NA_LATA_2016_2026.html

Strategia Gminy Braniewo.
Strategy of the Braniewo commune

http://www.gminabraniewo.pl/cms/

Plan zagospodarowania przestrzennego województwa warmińsko-mazurskiego

Spatial development plan for the Warmian-Masurian Voivodeship

http://edzienniki.olsztyn.uw.gov.pl/WDU_N/2018/4173/akt.pdf

Strategia rozwoju społeczno-gospodarczego województwa warmińsko-mazurskiego do roku 2025.
Strategy of socio-economic development of the Warmian-Masurian Voivodeship until 2025

https://zit.olsztyn.eu/fileadmin/katalogi_wydzialowe/ZIT/dokumenty/srsgwwm_2025.pdf

Regionalna strategia innowacyjności województwa Warmińsko-Mazurskiego do roku 2020 Regional strategy of innovation of the Warmian-Masurian Voivodeship until 2020

http://ris.warmia.mazury.pl/userfiles/file/dokumenty/PublikacjeRIS/RIS_Warmia_Mazury_PL.pdf

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http://www.ris-pomorskie.pg.gda.pl/fileadmin/docs/RIS-P.pdf

Strategia rozwoju społeczno-gospodarczego Gminy Miasta Krynica Morska na lata 2015-2025

Strategy for socio-economic development of the Krynica Morska commune for the years 2015-2025

http://bip.krynicamorska.tv/search/wynik/strat/2383.dhtml

Program Rozwoju Gminy Stegna na lata 2016-2020 z perspektywą do 2025 roku

Stegna Commune Development Program for 2016-2020 with a perspective until 2025

https://docplayer.pl/37235337-Gmina-stegna-program-rozwoju-gminy-stegna-na-lata-z-perspektywa-do-2025-roku.html

Strategia rozwoju gminy Nowy Dwór Gdański na lata 2014-2020

Development strategy of the Nowy Dwór Gdański commune for 2014-2020

http://www.bip.miastonowydwor.pl/?cid=276

Strategia rozwoju gminy Sztutowo na lata 2014-2020.
Development strategy of the Sztutowo commune for 2014-2020

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Rozwój turystyki morskiej w województwie pomorskim w aspekcie Strategii Rozwoju Województwa Pomorskiego 2020

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Regional Strategy of Innovation of the West Pomeranian Voivodeship for 2011-2020
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Development strategy of the Międzyzdroje commune for the years 2014-2025

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Development strategy of the Stepnica commune until 2025

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Strategia Rozwoju Miasta Świnoujście na lata 2014-2020.
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Development Strategy of the Wolin Commune for 2016-2026 http://bip.wolin.pl/strony/10108.dhtml

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