

BIOECONOMY CONCEPT PAPER

EXECUTIVE SUMMARY



SLOVAK REPUBLIC



EXECUTIVE SUMMARY OF THE STRATEGIC CONCEPT PAPER FOR BIOECONOMY: SLOVAK REPUBLIC

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Executive summary

1.1. Conceptual framework and objectives of bioeconomy

The European Union is one of the few global regions that have developed a macro-regional bioeconomy strategy and system of monitoring that builds on comparable national indicators (FAO 2018). The bioeconomy first appeared within the EU's 5th framework programme in research funding, followed by the introduction of the term Knowledge-based bioeconomy (KBBE) in the 7th framework programme. In 2012, the EU adopted its Bioeconomy Strategy that was based on research and policy coordination (EC 2012). In 2018, the Strategy was updated to reflect changes in the overall context such as the adoption of the Paris agreement and SDGs, as well as the need to strengthen policy coordination on the horizontal (overall policy coherence) and vertical level (member states) (EC 2018; Ronzon and Sanjuan 2020). More recently, the EU's Green Deal has introduced various sectoral strategies and initiatives to mobilise investments in the bioeconomy. [1]

The bioeconomy encompasses all sectors and systems that rely on biological resources (animals, plants, micro-organisms and derived biomass, including organic waste), their functions and principles. It includes and interlinks: land and marine ecosystems and the services they provide; all primary production sectors that use and produce biological resources (agriculture, forestry, fisheries and aquaculture); and all economic and industrial sectors that use biological resources and processes to produce food, feed, bio-based products, energy and services. To be successful, the European bioeconomy needs to have sustainability and circularity at its heart. This will drive the renewal of our industries, the modernization of our primary production systems, the protection of the environment and will enhance biodiversity. [2]

The European Green Deal sets the EU's ambition to become climate neutral by 2050, safeguarding people, planet and prosperity. The transition to a modern, resource-efficient, prospering and competitive economy, in which environment, health and wellbeing are priorities, requires deep and widespread action across all sectors of economy. The Bioeconomy Strategy with its systemic perspective plays an important role in achieving climate neutrality and environmental, economic and social sustainability. [3]

Despite the fact, that Slovak republic doesn't have national strategy yet, bioeconomy aspects appear in terms of sustainability, green transition in national bioeconomy-related strategies. The Ministry of Agriculture and Rural Development started elaborating the Roadmap to circular bioeconomy this year closely linked with developing of the concept "Soil – carbon and water bank". This concept makes possible to understand the complex roles of soil on holistic bases and include all systems, which are bounded on soil (water-soil-plants-climate-food-energy) and brings new component to the policy focus on assessment and financing of soil and landscape ecosystem services. [4] Public awareness focused on sustainable solutions, land management, biomass use and healthy lifestyles is also developing on national level. The transformation of the national economy into a sustainable one, whose competitiveness is based on innovative and efficient exploitation of resources is defined in Vision and strategy of the development of Slovakia until 2030 - Slovakia 2030. [5]

The main goal of the Strategic Concept Paper is to develop a conceptual base and preliminary impact assessment and to set the framework for a national bioeconomy, related policies and implementation tools, strategy/roadmap and/or action plan development, aiming to generate a

deeper discussion in Slovakia on the necessity of paradigm shift in economic thinking regarding the sustainable valorisation of biomass as renewable natural resources. The analysis of policies, institutions dealing with research and innovations, stakeholder's environment related to the bioeconomy and circular economy, the synergy of its sectors was provided in the concept paper. The concept foresees intervention requirements and strategic directions in bioeconomy sectors important for the country.

Two **promising bioeconomy areas** as working examples are part of the concept paper including the SWOT analysis of niche bioeconomy sectors based on expert assessments:

Opportunities in the **production and use of organic fertilizers** to improve implementation of circular bioeconomy and boost the local value chain. Organic fertilizers production sector has growing potential for future development. A business environment and demand for products are gradually taking off. Valorisation of biological waste and by products from the food industry (<https://sario.sk/sites/default/files/sario-food-sector-in-slovakia-2022-02-09.pdf>) has the potential to boost local value chains and increase the added value of primary producers. The added value of primary agricultural production is lower than average of EU, therefore there is significant room for expansion.

Being currently still a niche sector limited in a small market at the time being, there is a developing entrepreneur and stakeholder's environment aimed at this promising area. A platform of organic fertilizer manufacturers was established in the Slovak Republic in 2022 under the name Association of Organic Fertilizer Producers.

There is a growing interest of farmer's community (especially small and young farmers) in sustainable practices in agriculture and circular solutions. National and regional NGO organizations aimed at healthy living and sustainable land management, ecological agriculture and regenerative farming, sustainable management of biological waste, environmental issues are actively participating in the stakeholder's groups. They are contributing to increase the public awareness and dissemination of best practices.

Legislation in the area of organic fertilizers is currently the subject of intensive discussion at the European level and a dialogue is currently running at the political and expert level (Commission proposal on Sustainable Use of plant protection products (the SUR Regulation). Final political decision should be based on scientific evidence and relevant data. In the near future, it is projected that significant public resources will be devoted to the development of sustainable innovations, with a focus on the bioeconomy, circular economy, and green solutions (Smart specialization strategy RIS3 SK 2021-2027, Recovery and resilience plan).

Second promising sector included in Strategic Concept Paper concerns **agroforestry systems**. Agroforestry systems have the potential to provide environmental benefits on the microclimate, water regime and biodiversity. The trees and shrubs are considered to be stabilizing elements in a cultural, human-altered landscape, increasing its ability to adapt to climate change and to increase carbon sequestration (higher carbon removals than on land with exclusive agricultural use). This case study describes current status in the area of agroforestry systems on abandoned agricultural land in Slovakia, including the barriers and strategic directions of the intervention in this sector. Tradition in agroforestry practically disappeared after transformation of small private farms to large cooperatives and the introduction of large-scale agriculture in the second half of the past century. Due to the intermittence of their application, agroforestry systems are not systematically addressed in the Slovak agricultural or forestry legislation, which only recognizes agricultural land and forest land. Nevertheless, abandoned agricultural land has been gradually overgrown by woody vegetation throughout the decades.

Due to its character, part of that area has been converted to forest land. Still, large area of abandoned agricultural land is a subject to spontaneous vegetation succession. According to the National Forest Inventory, there has been almost 300.000 ha of such agricultural land covered by forest trees and shrubs. Case study describes barriers, including different policies (not only in the area of bioeconomy and forestry, but also policy on sustainable food systems, climate, biodiversity, nature conservation, etc.) that need to be addressed in order to create favourable conditions for the introduction of agroforestry systems.

1.2. Basic facts on biomass potential and the bioeconomy

Slovakian biomass flow indicates a dominance of biomass from agriculture, synergised with wood-based biomass streams in terms of bioenergy and biomaterials production. Capture fisheries and aquaculture are small but present part of the Slovakia bioeconomy, with imports of fishmeal and oil and seafood. Overall biomass flows in Slovakia shows the figure bellow. [6]

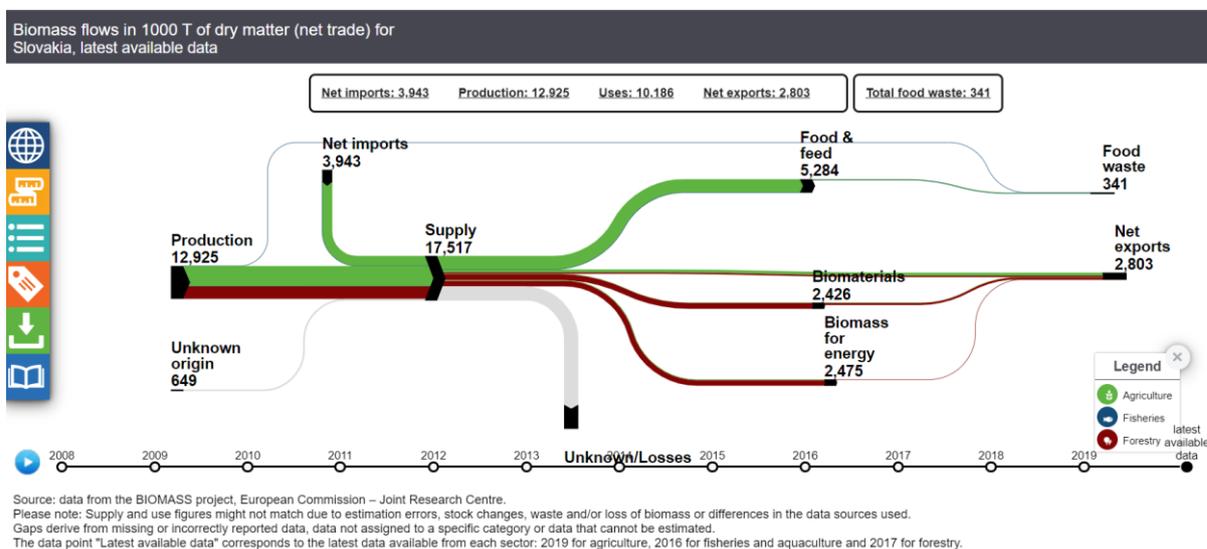


Figure 1: Overall biomass flows in Slovakia

Source: https://datam.jrc.ec.europa.eu/datam/mashup/BIOMASS_FLOWS/

According to the EC data, Slovakia generates (producing and converting sectors) 13 bil. EUR turnover and creates added value 3 bil. EUR (21K EUR/per person) in bioeconomy. 161,6 K employments worked in bioeconomy sectors in Slovakia in 2019. [7] An overview of turnover and employment in bioeconomy, including the development in the period 2008-2019 is shown in the figures below.



Source: <https://datam.jrc.ec.europa.eu/datam/mashup/BIOECONOMICS/>

Number of people employed in selected sectors

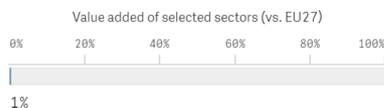
161.6k

Value added of selected sectors (Billion €)

€3

Value added per person employed in selected sectors

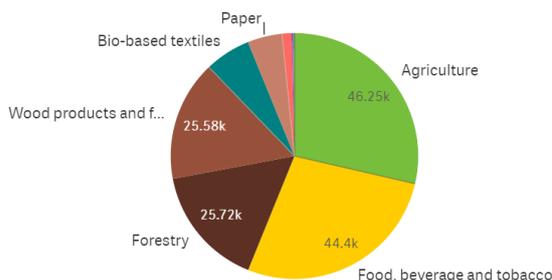
21 k€ - 38 k
EU27



Source: <https://datam.irc.ec.europa.eu/datam/mashup/BIOECONOMICS/>

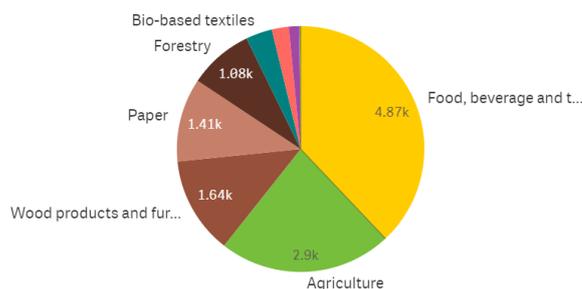
Employment by sector in Slovakia (2019)

(number of people employed)



Turnover by sector in Slovakia (2019)

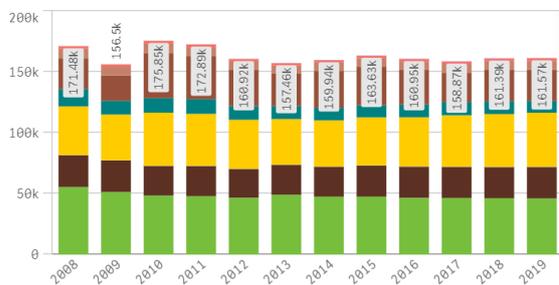
(million €)



Source: <https://datam.irc.ec.europa.eu/datam/mashup/BIOECONOMICS/>

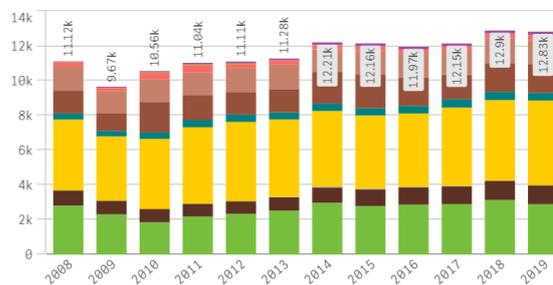
Development of the number of people employed in selected sectors (...)

(number of people employed)



Development of turnover in selected sectors (Slovakia, 2008-2019)

(million €)



Source: <https://datam.irc.ec.europa.eu/datam/mashup/BIOECONOMICS/>

1.3. Strengths and opportunities of bioeconomy

One third of all materials extracted or produced in Slovakia are biomass. Agriculture, forestry and water cover more than 80% of the territory of Slovakia. The dependence of the Slovak economy on imported resources and materials makes the economy vulnerable, while the potential for sustainable use of domestic resources remains untapped. Biomass production is characterized by low valorisation and processing. [8] All these areas could be considered as important factors in developing bioeconomy. Increasing public awareness (high level of public awareness demonstrated by NGOs and public communities) is observed on national level, focused on sustainable solutions, land management, biomass use and healthy lifestyles. It creates strong support for bioeconomy development.

Development/actions in the above-mentioned areas foresee the opportunities in bioeconomy regarding the improvement of the position of primary producers in the value chain by enabling the sustainable production of higher value-added products, reduction of our dependence on

non-renewable resources by biomass-based circular solutions, support local economy, create new jobs and improve the quality of life in rural areas by introducing innovation in biomass processing systems and biomass-based solutions.

1.4. Public and private expectations

Regarding the public and private expectations, improvement of awareness of all stakeholders on the use of biomass as a strategic resource and understanding of the concept of circular economy, knowledge for better biomass recovery in the SR and application of the “food first” principle are needed. Strengthening the cooperation and active involvement of stakeholders (farmers, companies, etc.), including introduction and use of new forms of cooperation, such as living labs, innovation centres and incubators, is the base for further development in this area. Innovative products with added value and better diversification of production, more efficient local use of bioenergy bring about opportunities for the improvement of economic position of primary producers in the value chain. Cooperation among research and private sector to improve finalisation of research outcomes through established innovations in the priority area and enhance technology transfer and cooperation in breakthrough technologies at national/international level.

1.5. Research, innovation, education

Research and innovation agenda identified by stakeholders during the preparation of Smart Specialization Strategy SK 2021 – 2027 creates a base for the innovation and transformation of the Slovak economy and define R&D themes/areas to achieve the transformation goals in 5 domains: Innovative Industry for the 21st Century, Mobility for the 21st Century, Digital Transformation of Slovakia, Healthy Society, Healthy Food and Environment.

Area of Bioeconomy has been included in the recently approved Smart Specialization Strategy (**RIS3 SK 2021 – 2027**). **Domain 5 – healthy food and environment** already includes the priority area **5-2 dedicated to Circular production systems based on biomass**. Properly implemented support for applied research and innovation would help to improve innovation potential of the studied area. The **multi-actor approach** at the regional, national and international level should be more emphasized and supported with the ambition to join the most innovative actors from the public and private spheres in the international cooperation. Synergies of the cohesion and national funds with international support tools should be wider applied (Enterprise Europe Network, Horizon Europe).

In the area of bioeconomy R&D projects will be focused on sustainable biomass production systems; innovative solutions for sustainable biosystems and biotechnologies; innovative solutions for bioenergy and biofuels; added value of biomass-based products; innovative solutions for the implementation of the circular bioeconomy; biomass cascading solutions; biodegradable materials; lignocellulosic packaging materials in the food industry; innovation in the use of biorefinery secondary products; biochemical and environmental aspects of biomass production and processing.

The themes and projects supported under the smart specialization domains in the area of RDI will be related to other domains in a number of priority areas. The aim of identifying synergies is to align and clarify the possibilities of cooperative relationships and links that will contribute to successfully achieve the transformation goals of the individual domains and the transformation of the Slovak economy. In defining cooperative relationships, it is important to focus on the following:

- considering the cross-cutting nature of the domains and supporting the implementation of comprehensive and interdisciplinary research projects addressing current societal issues;
- identifying projects and activities that aim to foster links across disciplines and may increase the potential for new ones;
- joint planning of investments in RDI infrastructure, funding of its sustainability and long-term maintenance, and sharing of research capacities of scientific infrastructure across domains.

Table 1: Transformational map for domain 5 Healthy food and environment, priority area 5-2 Circular production systems based on biomass

Priority area current state	Thematic support to meet the priority area transformation goal	Priority area outcomes
<ul style="list-style-type: none"> • Misunderstanding of the concept of biomass as a strategic resource produced from the soil on the soil. • The unsustainability of current linear biomass-based production systems. • Low added value of biomass-based production, poor finalisation. • Weak position of primary producers in the value chain. • Insufficient and incorrect use of biomass potential in the SR (large areas of state-owned forests, large farms, unused land unsuitable for food production (brownfields)). • Biogas plants built in the past without regard to local availability of biomass and long-term sustainability. • Insufficient use of closed systems for biomass utilisation on farms. • Weak and poorly supported public-private cooperation in research and development. • Lack of funding, synergies and an excessively bureaucratic system of support for research, innovation and cooperation with primary producers and businesses. 	<p>Proposals for thematic areas of project support:</p> <ul style="list-style-type: none"> - R&D projects, including demand-driven projects, living labs focused on: - sustainable biomass production systems; - innovative solutions for sustainable biosystems and biotechnologies; - innovative solutions for bioenergy and biofuels; - added value of biomass-based products; - innovative solutions for the implementation of the circular bioeconomy; - biomass cascading; - biodegradable materials; - lignocellulosic packaging materials in the food industry; - innovation in the use of biorefinery secondary products; - biochemical and environmental aspects of biomass production and processing. <div style="background-color: #4a7ebb; color: white; text-align: center; padding: 2px;">Funding sources to achieve desired outcomes</div> <p>RRF/OP SK/HE/state budget/departmental research, private sector investment/other sources of funding: Recovery and Resilience Plan</p> <div style="background-color: #4a7ebb; color: white; text-align: center; padding: 2px;">Foreseen cooperation to achieve desired outcomes</div> <p>BBI JU, HE Cluster 6, Bioeconomy Knowledge Centre JRC EC European Bioeconomy Policy Forum, BIOEAST, scientific institutions, consortia and platforms at national and international level, ministries, entities involved in AKIS under the CAP, SMEs, unions, associations, secondary schools, third sector, European research and innovation partnerships that are implemented under HE.</p>	<ol style="list-style-type: none"> 1. Improved finalisation of research results through established innovations in the priority area. 2. Enhancing technology transfer and cooperation in breakthrough technologies at national/international level. 3. Active involvement of stakeholders (farmers, companies, etc.). 4. Improved awareness of all stakeholders on the use of biomass as a strategic resource, understanding of the concept of circular economy. 5. Knowledge for better biomass recovery in the SR and application of the "food first" principle and the circularity principle in the economy. 6. Improved economic position of primary producers in the value chain (innovative products with added value and better diversification of production). 7. New research and innovation centres, living labs, pilots, innovation incubators. 8. More efficient local use of bioenergy. 9. Knowledge and data for better knowledge-based policy making, implementation of the EU Bioeconomy Strategy. 10. Support and involvement of EIP AGRI operational groups in research and innovation.

Tailored education dedicated to bioeconomy and circular economy aimed at young people at the secondary and vocational schools and universities have the important place in this area and need to be addressed.

1.6. Governance and policy actions

In the case of system changes the policy commitment is a paramount factor affecting the bioeconomy deployment. In this area attention and efforts are needed mainly in improvement of knowledge and data for evidence-based policy making, implementation of the EU policies related to bioeconomy and circular economy (Bioeconomy Strategy, Green Deal, Farm2Fork, new soil legislative, Fitfor55, etc), and also in preparation of an effective Road map for circular bioeconomy (currently under preparation) and its effective implementation.

Changes require also new or updated forms of governance and cooperation, so establishment of the inter-ministerial and inter-sectorial dialogue to promote synergies among different supporting tools and policies, such as Strategic plan CAP 2023+, cohesion funds in Operational program Slovakia, Resilience and recovery plan and other policies dedicated to support of all

stakeholders dealing with research, innovation, development of entrepreneurship with special attention to SMEs, including the access to finance and venture capital have to be in the top areas of interest of policy makers.

1.7. Conclusions and strategic actions

Strategic directions are aimed at innovation and ensure long-term sustainability of biomass-based production systems. They should improve the position of primary producers in the value chain by enabling the sustainable production of higher value added products. All system actors and stakeholders have a role in the coordinated effort of developing bioeconomy on the national level.

Taking into account the results of the analysis attempting to draw the state government interventions, the following strategic actions and directions of the intervention have been identified for successful implementation of bio-based sectors:

Policy

- **Improving policy coherence and dialogue:** enhance **inter-sectorial dialogue**, cooperation and synergies among agro, food, forestry and environmental, industry and economy policies, including the adoption and set-up of different supporting tools and their proper and effective implementation on the national level. Improve the dialogue to make better **coherence of policies** and avoid the conflict in sustainable use of biomass and help to remove administrative and legal barriers;
- **Promote innovation and ensure the long-term sustainability of biomass-based production systems;**
- **Improve knowledge and data for better evidence-based policy making;**
- **Discussion on possible new forms of governance for cross-cutting areas**, such as bioeconomy;
- **Implementation of the EU policies related to bioeconomy and circular economy** (Bioeconomy Strategy, Green Deal, Farm2Fork, new soil legislative, Fitfor55, etc.);
- **Preparation of effective Roadmap for circular bioeconomy and its effective implementation.**

Research, innovation, education

- **Implementation of innovation policies focused on bioeconomy** to achieve transformation goals identified during the preparation of Smart Specialisation Strategy SK 2021 – 2027;
- **Realisation of R&D projects**, including demand-driven projects, living labs focused on: sustainable biomass production systems; innovative solutions for sustainable biosystems and biotechnologies;
- **Improve data, regional and macro regional research and innovation collaboration and enforce knowledge transfer** to support evidence based policymaking and provide effective management and decision making tools for public and private stakeholders;
- **Provide effective necessary and tailored public financial support and incentives:** in this regard, removing administrative barriers for funding research, innovations and cooperation of public and private stakeholders is of crucial importance;

- **Tailored education dedicated to bioeconomy and circular economy** aimed at young people at the secondary and vocational schools and universities.

Industry, Farmers, Foresters

- **Involvement in dialogue and active cooperation** in this area through the preparation of Roadmap to circular bioeconomy and through established innovations in the priority area defined in RIS3 Strategy;
- **Enhancing technology transfer** and cooperation in breakthrough technologies at national/international level;
- **Improved awareness** of all stakeholders on the use of biomass as a strategic resource, understanding of the concept of circular economy;
- Knowledge for better biomass recovery in the SR and application of the “food first” principle and the circularity principle in the economy;
- **Improved economic position of primary producers** in the value chain (innovative products with added value and better diversification of production);
- **New research and innovation centres**, living labs, pilots, innovation incubators.
- More efficient local use of bioenergy.

Society

- **Improve public dialogue and awareness** towards sustainable use of biomass, land management, synergies among production and environment and sustainable regional development Public dialogue supported by all stakeholders should: promote the production and products with higher added value; exploit and disseminate the best practice examples on the implementation of innovative technologies and business models implementing the bioeconomy and circular solutions; break the barriers among the producers, enterprisers and stakeholders dealing with economic and environmental issues; provide and promote the information on tailored supporting schemes and tools; promote creation of local value chains and markets and local brands; improve the multi-actor dialogues of stakeholders; educate the all-actor stakeholders providing them with evidence based data.

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