

BIOECONOMY CONCEPT PAPER

EXECUTIVE SUMMARY



POLAND



EXECUTIVE SUMMARY OF THE STRATEGIC CONCEPT PAPER FOR BIOECONOMY: POLAND

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Endorsement: The BIOEAST Initiative aims to build knowledge-based agriculture, forestry and aquaculture in the bioeconomy. For this reason, the BIOEASTsUP Horizon 2020 EU project was launched under the auspice of the macro-regional governmental initiative to support eleven countries in building up their own bioeconomy strategies and action plans.



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Executive summary

1.1. Context and objectives

The main goal of this document, the so-called concept paper, is to propose the framework for a national bioeconomy strategy and action plan development, aiming to generate a deeper discussion on the necessity of paradigm shift in the economic thinking regarding the valorisation of biomass as a renewable natural resource. The past decade's climate change related consequences show that without carefully planning the use of available bioresources in the circular and sustainable bioeconomy, the country's viable future will be threatened. Therefore, inter-sectorial approaches concerning production and processing of bioresources and strengthening strategic planning are required.

The BIOEAST Initiative aims to build knowledge-based agriculture, forestry and aquaculture in the bioeconomy. The bioeconomy could bring climate neutral solutions which could become the core part of the sustainable economic model in Central and Eastern Europe. The strategic thinking concerning sustainable use of bioresources at a national and macro-regional level should become a priority in terms of ensuring food, energy and industrial security. To support this idea, presented in the BIOEAST Initiative Vision Paper, the BIOEASTsUP project (Horizon 2020 EU) was launched to build the concept for bioeconomy strategies in each of the eleven partner countries.

The transition towards sustainable agriculture, forestry and fisheries in the bioeconomy does require specific sustainability conditions and adoption of sector-specific transformation pathways. The European Foresight Exercise developed by the Standing Committee of Agricultural Research [13] set forth the five principles of the sustainable bioeconomy: food first, sustainable yields, cascading approaches, circularity and diversity should be strived for. The transition cannot be governed by markets and technology, but strong strategic orientation and constant monitoring is necessary. The premises of the transition should be enabled by principles and political willingness.

The proposed model of the bioeconomy development strategy with special focus on agriculture is based on two pillars, i.e.: (1) strengthening traditional, relevant (when taking into account economic indicators) sectors of the economy and improving their "sustainability" by implementing the proposed transformation paths; and (2) developing economic activities or 'niche or novel sectors', which are prospective accelerators of changes in the face of global challenges that guarantees their upscaling. This approach constitutes the basis for policy planning at the national and regional level in these EU countries where bioeconomy development strategies were triggered by a dialogue between science and administration as well as industry stakeholders. The main objective of the proposed approach is to accelerate the bioeconomy transition to a knowledge-based sustainable system covering the key bio-based sectors, strongly related to agriculture in line with the European Green Deal.

The conceptual study on the directions of bioeconomy development in Poland can serve as a collection of postulates developed by research centres for policymakers at the national and regional level. The document points to the current state-of-the-art and to recent achievements of science, both in the field of technology as well as a diagnosis and identification of the directions of socio-demographic and economic changes, mainly from the point of view of social science and humanities. This is a position document intended for discussion by policy makers and stakeholders towards a bioeconomy strategy build-up process. It attempts to set up a

coherent vision of a strategic approach with the aim to tackle the problem of the adverse effects of human interaction with nature, or rather to integrate these relationships in a holistic (and systemic) perception of the Earth as a community of resources, values and rights. We point out the need that sustainable development of bio-based sectors should first be ensured, on which the concept of bioeconomy imposes a double burden of providing food for the growing population and biomass to be used for products and processes.

1.2. The concept of a systemic approach to bioeconomy

The definition of the bioeconomy has been evolving over the years, so that in recent period the focus on sustainable use of biological resources predominates [12]. As a result, the actual characterization of the bioeconomy emphasizes the aspect of sustainability and circularity. According to the latest report of the European Commission (May 2022) [11], 'bioeconomy policy should be based on all three dimensions of sustainable development, namely environmental, economic and social ones respectively specified as: (1) management of land and biological resources, taking into account the ecosystem boundaries; (2) sustainability of value and consumption chains; and (3) the pursuit of social justice and just transitions. The circular economy is a concept aiming at the rational use of resources, according to which materials and products should remain in the economy as long as possible, and the generation of waste should be kept to the minimum. The definition of bioeconomy formulated in the Roadmap for the Circular Economy (CE) in Poland [15] indicates that bioeconomy is a closed-loop economy i.e. a biological cycle in the economy is one of the two pillars of the CE, alongside the technological cycle. The biological cycle in CE is related to the management of renewable resources – the so-called biomass – throughout its life cycle. This includes production of agricultural raw materials, production of goods (e.g. food, feed, bioenergy), processing, sale of goods, the use phase, and bio-waste management.

The Polish National CAP Strategic Plan (2022) indicates the necessity to pay special attention to the biomass and production of bio-based products. The bioeconomy sector in Poland in 2019 was responsible for 14% of employment and it generates an annual value of 147 billion euro [16]. The data show that the largest share in the bioeconomy turnover in the EU and in Poland is represented by the food, feed and beverage production sectors, which account for nearly half of the total turnover. The turnover of bio-products, including the production of chemicals and chemical products, pharmaceuticals, plastics, paper, textiles, bio-fuels and bioenergy, and the wood industry sector, is worth around 690 billion euro – according to Commission's platform for management and analysis of data and the output from models addressing issues of resource economics and sustainability (Data M): for these sectors throughout European Union. The agricultural and forestry sector is mainly responsible for the production of raw material for the biomass processing industry. Agricultural products generate 17% and wood products 4% of the total product value in the economy [9] with notable regional differentiation regarding input-output coefficients [6].

The most relevant paths for the transformation of the current fossil-based economy to a sustainable circular bioeconomy system [9] comprise the following directions: (1) sustainable intensification of the productivity of the primary sector; (2) replacement of fossil fuels in energy production and increasing the share of energy from renewable sources; (3) new or more efficient biomass use streams; (4) increasing the use of high value added intermediates; (5) valorisation (monetization) of ecosystem services.

1.3. Strengths of the bioeconomy in Poland

- Poland belongs to the EU countries with a high potential in the production and use of biomass [7] and resulting waste biomass resources [5], with the prospect of further development to supply the internal and external market.
- Based on the volume of cited publications in world scientific literature, agricultural and biological sciences as well as biochemistry, genetics and molecular biology are the most studied topics in Poland.
- It has a significant potential of RDI institutions at disposal: 10 agricultural universities, 7 universities educating in the field of forestry, 2 universities educating in fields related to fisheries, 12 agricultural institutes, 1 forestry institute, 2 institutes dealing with fields related to fisheries, 24 institutes dealing with bio-products and biomass processing (Łukasiewicz Research Network); and a significant secondary educational potential in the field of agriculture (62) and forestry (11) supporting bioeconomy extension and knowledge transfer.
- Lessons learned so far from implementation of innovations by sectors such as agriculture, food, forestry, renewable energy, can be used both to absorb innovations and to adapt to the new challenges of the bioeconomy [17].

1.4. Weaknesses of the bioeconomy in Poland

- Insufficient knowledge on the level of sustainability, including the carbon footprint and circularity of bioeconomy sectors (according to expert opinions), which makes it difficult to coordinate work aimed at achieving climate neutrality.
- Deficient recognition of relationships between sectors of the economy [7].
- Low level of interaction between bio-based industry and science, even lower in the agricultural sector, only one in five enterprises declares maintaining interaction and cooperation with research centres (except for the pharmaceutical sector), and a small number of national patents for bioeconomy technologies [4].
- Low average productivity of farms in Poland, in comparison to the EU, being a result of agrarian fragmentation, lower soil quality and a relatively shorter growing season than in most of the European countries [14, 8].
- High dependence of the Polish economy on global value chains based on the use of foreign inputs in exports (reverse participation) and the provision of intermediate goods and services, further used in the exports of other countries [2].
- Labour productivity in bioeconomy sectors in Poland is below the EU-27 average [2].
- Poorly developed and insufficiently integrated prospective bioeconomy sectors, such as: biogas and biomethane sector (use of heat, fertilizing products for the circular economy), inland fishing sector (very low carbon footprint, local market) [1].
- Poorly developed bioeconomy clusters (business support institutions) [4].

1.5. How to develop bioeconomy sectors to ensure sustainable development - which sectors require intervention and which are the growth drivers?

One of the most important aims behind the development of the Polish Bioeconomy Strategy and Action plan is to create the ecosystem, which can help the sustainable transition to a climate neutral future and add value to the locally available bioresources. Thus, the ultimate aim is to create value-added processes, which contribute to increasing the living standards of the Polish and macro-regional society.

It is proposed to plan interventions in four intervention areas:

- Conventional sectors including agriculture, timber and food production

Niche sectors:

- Organic Agriculture
- Agro-energy: biogas and biomethane
- Aquaculture

The work conducted as part of the BIOEASTsUP project, literature review, analyses of available data carried out by the networks of experts, thematic-working groups of the BIOEAST initiative, and consulted at the level of national working groups, allowed the identification of the following interventions, which should help as drivers for bioeconomy deployment:

- **Conventional bioeconomy sectors** in Poland include agriculture and forestry, as biomass production sectors, and those with the food-industry, which all constitute the most important part of the Polish Bioeconomy, thus they are representing the main challenge in the sustainable transition. The productivity of farms in Poland is one of the lowest in the EU as a result of agrarian fragmentation, as well as lower soil quality and a shorter growing season than in Western European countries. In such a situation, the need to reduce the use of mineral fertilisers and plant protection products is linked to the need to implement technological progress and improve knowledge and skills in the biomass production and food/feed processing sector. Therefore, the conventional bioeconomy sectors require regional planning coordination towards: (1) the review of production technologies to increase their productivity: including the exploitation of marginal and abandoned land, reducing the use of natural resources and increasing the use of biobased fertilizers; (2) reconsidering the biomass value-chains by overarching systemic management of agricultural biomass to fully exploit its economic potential for both food and non-food use, i.e. food and non-food valorisation should be connected by promoting the interconnection of production and processing sectors of the bioeconomy (including production of biomaterials, biomethane, etc.); (3) developing monitoring systems to monitor the carbon footprint of processes and products; (4) strengthening the relationship between the main sub-sectors of the food sector, the biogas and biomethane sectors, and the production of bioproducts and bio-based carbon as well.

In order to accelerate the transformation process, it is necessary to undertake the following actions in conventional bioeconomy sectors: (1) significantly strengthen the relationship between business, science and educational activities in the field of sustainability and climate change, as well as in the search for novel technological, organizational and social solutions; (2) bring about a significant reduction in the level of inputs and costs of the use of plant protection products and fertilizers; important investments are necessary, as well as an appropriately large scale of production on farms and the use of modern techniques

and technologies, which will allow for compensating the reduction of the applied doses of fertilizers and plant protection products with higher effectiveness of their impact (i.e. precision farming), as well as "regenerative" farming (inter alia, no-till, digital maps of soil and crop abundance, monitoring, application of measures depending on the needs of plants, etc.); (3) implement a system for data collection, assessment, monitoring and management of biomass for the food chain and for non-agricultural use in bioeconomy sectors; (4), implement a system to assess the carbon footprint of products and define actions to achieve climate neutrality in the agricultural sector and at the supply chain level, to enhance the competitiveness of agriculture; (5) create sustainable relationships between key sub-sectors of the food sector, the biogas and biomethane sector and the production of bio-based products; (6) carry out systematic educational activities regarding sustainability and climate change, waste management, responsible consumption and healthy diet.

A SWOT analysis of the traditional (food systems) and of the three niche sectors of Polish bioeconomy identified by experts: organic farming, biogas and biomethane, and inland aquaculture based on strategic niche management principles resulted in the following points [**Hiba! A hivatkozási forrás nem található.**]:

- Development of the **organic farming sector** as a niche sector in Poland, which, in the future, is to significantly increase its impact on the economy, should include: **(1)** increasing the number of producers and consumers of organic farming products; **(2)** changing the perception of consumers in assessing the value of organic farming products as high value added products; **(3)** increasing technical capabilities of organic farming and the availability of knowledge and dissemination of information on organic farming in Poland; **(4)** increasing the possibility of interaction between producers and consumers in order to boost consumer involvement in the sustainable development of organic farming.

In order to eliminate barriers to the development of the organic sector in Poland, it is necessary to: **(1)** increase the level of the institutional – non-financial support to farmers, through technological support, advisory services, market information; **(2)** support the market mechanisms aimed at the development of value chains.

In order to reduce the risk of unfavourable changes, the following are needed: **(1)** farms that have stronger market power, **(2)** processors that will primarily focus on organic production, **(3)** strong market surveillance, also by the non-governmental organisations; **(4)** efficient network of knowledge dissemination; **(5)** efficient market information.

- Development of the **biogas and biomethane sector** with high potential for the management of integrated supply chains in agriculture (by-products) and food industry as a crucial sector for energy independence to exploit waste that requires the following measures: **(1)** stabilization of the economic and legal context for biogas and biomethane producers; **(2)** promotion of sustainable business models of biogas plants for waste management and for agriculture as a necessary element for recycling of waste biomass to maintain soil fertility; **(3)** support for modern technical solutions, including flexible demand driven meso and micro installations.

In order to **eliminate barriers** to the development of the **biogas and biomethane sector**, efforts should be made to change: **(1)** the perception that a biogas plant creates an unfavourable change in the ecosystem through negative environmental impact and creating a hardship for small communities (odour nuisance). In order to **reduce the risk** of adverse

change, it is necessary to **(1)** implement monitoring of the processes in biogas plants regarding sustainable substrates through cooperation with specialized laboratories; and **(2)** introduce carbon certificates for biogas plants that take into account the avoided emissions.

- Development of the **inland aquaculture** in Poland requires: **(1)** creating conditions for developing new business models for products with high added value; **(2)** creating support systems for fish farms, which will include a fee for ecosystem services provided by the sector, especially for water management and water retention, providing habitats for many valuable species and places for recreation; **(3)** establishing local partnerships of science, business and administration for strengthening cooperation within the sector and for educational purposes; **(4)** promoting products of inland fisheries as products with high added value and low carbon footprint.

In order to eliminate barriers to the development of the inland fishing sector, it is necessary to review the existing legal regulations in the light of the latest strategies with the aim to eliminate the provisions that constitute a hindrance. In order to reduce the risk of unfavourable changes, a monitoring system is needed that will consider the impact of the sector on the environment and will be able to present a range of values resulting from the supply of products with high added value in a short supply chain.

2. Synthesis of actions and conclusive comments

Strategic directions to develop over-arching intersectoral bioeconomy appropriate strategic actions can be supported in three areas with regard to:

- **Market intervention:** introducing sustainability criteria for the national production system could help the deployment of bio-based products; the high added value products and related delivered ecosystem services should be promoted; special programs to be launched to support new business models and cooperations in local/micro cluster partnerships.
- **Research, innovation and education:** research agenda as a functional part of the macro-region Strategic Research and Innovation Agenda (SRIA) with the most important elements for bioeconomy: **(1)** increasing the agricultural productivity through sustainable intensification; **(2)** cascading the use of agricultural and forest residues potential (increasing circularity) and the added value of biomass through innovative bio-products and technologies, **(3)** new and modern bio-refinery technologies and products. Significantly strengthen the relationship between business and science and educational activities in the field of sustainability and climate change.
- **Governance and policy actions:** **(1)** set up a Polish Bioeconomy Council to ensure long-term engagement at the national level to act as a catalyser for interministerial coordination; **(2)** enforce the relationship between the main sub-sectors of bioeconomy and niche sectors in frame of bioeconomy strategy or action plan; **(3)** evaluate and monitor policy adoption by appropriate indicators valid for different environmental policies, e.g. sustainability indicators (carbon footprint, water footprint, energy footprint), annual expenditure on education in individual departments/sectors, added value of products from bioeconomy sectors, number of newly created jobs.

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