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Review

The bioeconomy in Poland within the context of the European Union

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ABSTRACT

This article outlines the potential of the development of bioeconomy in Poland in the context of the European Union (EU). The analyses take into account the concept of bioeconomy, the overview of documents referring to the bioeconomy in the EU, including policy frameworks and agendas. Many countries including Poland emphasise the importance of bioeconomy, but have not yet developed a complex strategy. The state of bioeconomy in Poland is characterised by the sectors of agriculture, forestry and food production, as well as parts of the chemical, biotechnology and energy industries. In 2014 the global production volume in the Polish bioeconomy amounted to PLN 343 billion with the sector employing almost 3 million staff. However, the structure of the bioeconomy is dominated by traditional sectors, such as agriculture and agro-food industries. This article presents the analysis of research and development activity in Poland from 2009 to 2015. It reports the position of Poland on GMOs and their future development potential. It is worth mentioning that many EU states including Poland have declared themselves as being “GMO-free countries”.

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Introduction

Nowadays the development of science and technology creates new opportunities that make bioeconomy one of the fastest growing sectors of the European economy. Bioeconomy has become an important area of interest in the European Union (EU) and is associated with the implementation of various policies in the member states. The interest in bioeconomy stems from a series of challenges faced by the world economy. These include ensuring food security, managing natural resources sustainably,

reducing dependence on non-renewable resources and mitigating and adapting to climate change [1]. The concept of sustainable development tries to reconcile the economic and social development with the functioning of the natural environment. It should be remembered that the development of bioeconomy signifies not only the need for internal changes in the sector, but also for integration of science and business with the social environment [2].

The main goal of this article is to show the state of bioeconomy in Poland in the context of the EU. The analyses take into account legal issues, the perception of the GMO issue in the area of research and the state of the bioeconomy. The analysis of the bioeconomy sector in Poland covers the period 2009–2015 (depending on the data). Statistical data provided by the Central Statistical Office

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(COS) and Energy Regulatory Office (ERO) in Poland were used. The information on quantitative data regarding bioeconomy in the EU has been taken from reports and documents according to the references.

The bioeconomy concept

The basic question that arises with the attempt to determine the exact area of influence is the lack of a unified definition of bioeconomy. Despite many attempts in the literature this concept has not so far been placed within clear-cut boundaries [3]. According to Okkonen, bioeconomy refers to the sustainable production and conversion of biomass into a range of food, health, fibre and industrial products and energy [4]. Moreover, in the literature the concept of 'bio-based economy' appears. This term particularly refers to renewable resources [5]. In the OECD publication *Bioeconomy to 2030: Designing a Policy Agenda* [6], bioeconomy is defined as an innovative approach to production processes in which bio-products are created, meaning transforming life science knowledge into new sustainable, eco-efficient and competitive products. An interesting approach to the aspect of innovation is presented by Buszko [7], who defines bioeconomy as an activity in which intelligent, innovative companies, with a large knowledge and offer of bio-products and services operate.

The roots of European bioeconomy as well as several definitions and evolution cycle are shown elsewhere in this issue [see paper by Aguilar et al.]. For an insightful analysis of the birth of European research programmes, see Ref. [8]. In the view presented, bioeconomy includes all industries and sectors that produce and exploit biological resources and related services. Biotechnology has led to innovations in many branches of industry, including the agricultural, industrial and medical sectors. It plays a significant role in supporting economic growth, employment, energy supply and the production of bio-products. It also provides conditions for increasing the standard of living [9]. Many authors have identified bioeconomy with biotechnology, but biotechnology is just one of the pillars of bioeconomy. It is thought that some of the aims of biotechnology are to limit the negative impact on the environment, to emphasise use of renewable resources and to optimise agricultural production, especially food [9]. Biotechnology plays an important role, but is not equivalent to bioeconomy [7]. The most relevant definition of bioeconomy is shown by the European Commission (EC), in which bioeconomy encompasses "the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy. Its sectors and industries have a strong innovation potential due to their use of a wide range of sciences, enabling and industrial technologies, along with local and tacit knowledge" [1]. Bioeconomy is commonly understood to be a complex of issues related to the safety and security of food and energy, climate change and environment protection, as well as many social and cultural changes. It also includes the traditional sectors of the economy which produce bio-products and services by using biotechnologies (see Fig. 1).

Many biobased industries in Europe (and around the world) put a lot of effort into practising the advantages of circularity (recycling, biodegradability etc.), combining it with the benefits of biological conversion. The EC has adopted the Circular Economy Package, which includes revised legislative proposals on waste to stimulate Europe's transition towards a circular economy, to increase global competitiveness, foster sustainable economic growth and generate new jobs [10]. The concept of a circular bioeconomy includes three elements: renewable raw materials, products and consumption. Understandably, this concept refers

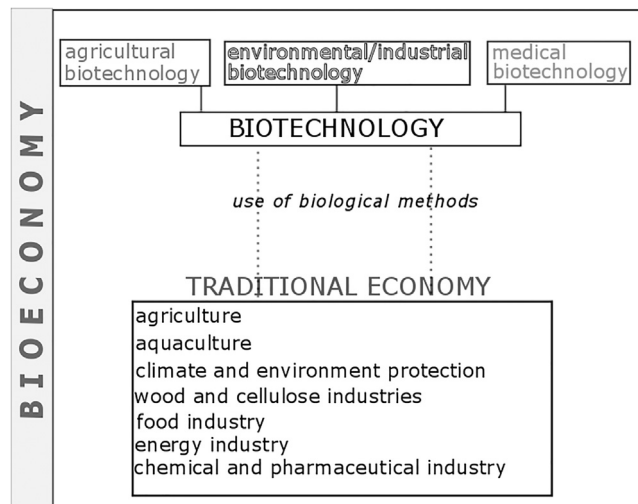


Fig. 1. Areas of bioeconomy.

not only to bioeconomy, but also in a broader context to the whole traditional economy. Bioeconomy and circular economy complement each other and they are moving towards sustainability [11].

The compatibility of human needs with the biosphere potential is the essential challenge for sustainable future for the environment and society. The Lodz Declaration of Bioregions promotes the idea of developments of bioeconomy in local biocommunities (biocities, bioregions, biovillages) [12]. The sustainable, circular biocommunities of well-educated local society living in a healthy environment, with increasing number of green industries might be the base for development of bioeconomy. A biocommunity should be living in some geographical region, like a subregion, a village or a district [12].

The bioeconomy policy in Poland in the context of the EU law

The EC launched its first strategy for biotechnology in 2002, called *Life sciences and biotechnology, a strategy for Europe* [13]. This does not imply that there was no strategy before, but earlier efforts were focused on building the foundations of European biotechnology in areas such as transnationality, industrial participation, research management and promoting industrial exploitation of results [8]. The most significant EU document is the *Strategy for Innovating for Sustainable Growth: A Bioeconomy for Europe* [1].

Many countries face barriers to accessing biotechnologies and their products because of the lack of institutional capacities and competence in creating regulations [14]. They emphasise the importance of individual biotechnology sectors, but have not yet developed a comprehensive bioeconomy strategy. In Poland, there is no single, complex and strategic document dedicated to bioeconomy. Issues related to the development of bioeconomy are incorporated in three integrated strategies, which are included in the implementation of the Strategy for the Development of the Country [15]. This document defines developmental goals for Poland up to 2020. It focuses on the increase in three areas: competitive and innovative economy, effective and robust state, and demonstration of the differences in development of the provinces. The other strategies related to bioeconomy are Strategy for Innovation and Efficiency of the Economy, Strategy of Energy Safety and Environment and Strategy for Sustainable Development of Agriculture, Rural Areas and Fisheries [16].

The majority of countries in Central and Eastern Europe have placed bioeconomy as a smart specialisation strategy. Regions choose elements of bioeconomy such as food, agriculture, green

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