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THE REVIEW OF BIOECONOMIC STRATEGY IN THE WORLD

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In the past decade, bioeconomy has gained momentum as a new strategy for fostering innovation, sustainable development and green growth in industrialized and emerging economies. Published in 2009, the OECD strategy «The Bioeconomy to 2030: Designing a Policy Agenda» gave an important stimulus to the development of national and regional bioeconomy strategies. The bioeconomy can be defined as an economy based on the sustainable production and conversion of renewable biomass into a range of bio-based products, chemicals, and energy. The article presents a comparative overview of the strategies and policies for developing a bioeconomy. The analysis shows that a common direction for the bioeconomy, based on research and technological innovation is developing promptly in the world.

Keywords: strategy, policy, bioeconomy, bioenergy, biomass, the European Union, Organisation for Economic Co-operation and Development.

Problem formulation. The world economy is experiencing dramatic changes. The key issues for the future appear to be increasing human demands (food, energy, environmental public goods) that will put greater pressure on natural resources, exacerbating old scarcities and leading to new ones (water, biomasses, environmental quality) [1].

In 2030, the world will need 50% more food, 45% more energy and 30% more water than today

[3]. The growing demand will result in a scarcity of natural resources and push their prices up. The availability of raw materials and the efficiency of their use will thus become a new competitive advantage. Increasing environmental awareness and more stringent legislation will also be drivers in the manufacture of products that have a less harmful impact on the environment.

This global development lays the foundation for a change towards bioeconomy. The bioeconomy is

not a new industry; it is a combination of several primary production and refining sectors and end product markets. Typical features of those bioeconomy include the use of renewable, bio-based natural resources, environmentally friendly clean technologies and efficient recycling of materials. It is justified to refer to the transition from a fossil economy to a bioeconomy as the new wave of economic development (Figure 1).

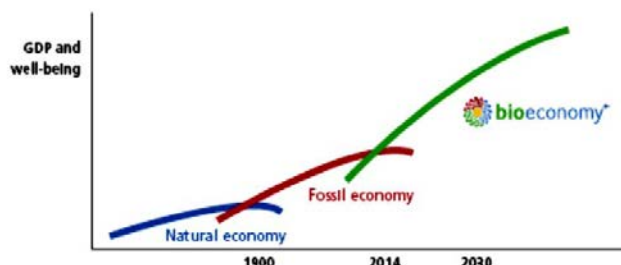


Fig. 1. Bioeconomy will be the next wave of economy

Source: [4]

Bioeconomy development is driven by changing consumer behaviour and a need to secure the preconditions for human well-being. As a result of the concern over the environment and scarcity of non-renewable raw materials, including metals and oil, the use of biomasses in the economy and across society will increase. Biomasses from the forests, fields and water systems will offer solutions for more diverse needs as the prices of non-renewable raw materials go up [4].

In this context, the concept of bioeconomy (or bio-economy, or bio-based economy) has emerged as a key strategy to match human needs while facing resource efficiency requirements, based on the sustainable exploitation of biological resources. Actually the definition of the term 'bioeconomy' is still a matter of discussion [1, 2].

Analysis of the researches and publications.

Among the research and publications in the field of bioeconomy strategy I have to provide works of Organisation for Economic Co-operation and Development, European Union et al.

Unresolved parts of the general problem. Bioeconomy is the result of an innovative revolution in the field of biological sciences. It is directly linked to inventions and to the development and use of biological processes in areas of human health, of productivity in agriculture and livestock, and of biotechnology. And so it involves a number of industrial sectors. Opportunities for the global growth of bioeconomy are related to population increase and aging, to income per capita, to the need to increase supplies of food, healthcare, energy and drinking water, and to matters of climate change.

The last few years have witnessed an exponential growth in both political and commercial momentum for the concept of the bioeconomy. The commitment to designing and supporting policies for the implementation of the concept runs high; institutions including national governments, the EU and the OECD have laid out long-term strategies to harness the progress in biological resource technologies for sustainable economic growth and improvements in physical and socio-economic welfare [5].

The transition from a fossil fuel-dependent development paradigm towards a development path that takes advantage of bio-based resources and new innovations within biochemistry and the life sciences is prompting the formulation of new strategies and policies [12].

Setting tasks. The aim of this study is to analyze national strategies and policies regarding the development of a bioeconomy.

Statement of the main material of the study.

The 21st century is characterised by major challenges. A growing global population needs to be fed sufficiently and healthily, with usable agricultural areas limited. Climate change makes it necessary to limit emissions of greenhouse gases, and the globally continuing loss of soil fertility and biodiversity demands measures to counteract these developments. The finite nature of raw materials of fossil origin, an increasing demand for raw materials, and political uncertainties: these factors will all be reflected in the market, making it essential to tap new sources of raw materials and to make use of alternatives. Thus new concepts for an enduring and safe supply of energy and raw materials, including the use of sustainably produced biomass, take on growing significance. The knowledge-based bio-economy offers the opportunity to make an important contribution to mastering these challenges and simultaneously to strengthen international economic competitiveness [7].

The field of bio-economy is developing rapidly. Today there is a variety of related technologies and raw materials on offer, and many more are not yet utilised. These technologies interconnect and work in symbiosis supporting each other – waste from one process is a fuel for another. Many technologies also operate on the sideflows or waste from other processes and provide side benefits such as reduced nutrient emissions. Bio-economic solutions use raw materials that have significant side-benefits and provide local jobs while reducing waste amounts and waste management costs. This forms an industry complex in a technical, commercial and social sense [8].

Governments worldwide are increasingly focusing on the development of national and international bioeconomies in order to address a growing number of major social, environmental and economic challenges. These bioeconomies purportedly create new employment opportunities, assist in climate change mitigation, and promote resource efficiency. Concurrent to the rise of this corporate-driven bio-based strategy, societies across the planet are struggling with converging crises in the areas of food, energy, climate and finance [9].

The onset of publications of national bioeconomy strategies and policies can be, at least partly, attributed to the publication of the Organisation for Economic Cooperation and Development (OECD) document «The Bioeconomy to 2030: Designing a Policy Agenda» [13], which states that progress in biological sciences can now offer solutions for many health and resource-related issues that the world is facing. These technologies can provide a motor for increased sustainability in economies but defining a policy agenda is required to implement the research findings and innovations that are the basis of a BE. The OECD strongly suggests that both the public

and the private sectors must take active roles in designing such an agenda in order to maximize the full potential of the bioeconomy [12].

In Europe, the European Union can be seen as the key driver of national bioeconomy policy strategies [11]. The EU strategy presented in 2012 is entitled «Innovating for Sustainable Growth: A Bioeconomy for Europe» and it is divided into two documents: a communication [14] and a working document [15]. The former sets the scene and presents the strategy and the working plan. The latter presents the action plan in more detail and also presents some scenarios and policy interaction that arises from the strategy document [12]. Additionally, the Horizon 2020 program (2014–2020) provided the basis for further development of national research and innovation strategies in Europe. To date, three holistic bioeconomy strategies have been developed in Europe (Finland, Germany, the West Nordic Countries). Most European countries, however, focus on research and innovation strategies that relate significantly to bioeconomy issues. Furthermore, bioeconomy in European countries is often treated within the wider context of green or blue growth strategies, and most recently with strategies focusing on the circular economy [11].

Some of the emerging economies in Asia are rated among the most innovative countries in the world. Therefore, it is not surprising to find bioeconomy development in policy strategies fostering high-tech, emerging industries and industrial innovation in Malaysia, South Korea, India, Japan and China. Thailand and Sri Lanka, inspired by these policies, have also developed biotechnology and bioindustry strategies. In contrast, Austral-

ia and New Zealand are concentrating more on further growth and value creation in their important primary industries. Indonesia is also focused on agricultural value chains but with a view to managing the supply of energy and food on the decentralized archipelago [11].

The «National Bioeconomy Blueprint» [16] for the USA was released in 2012, and it is divided into two distinctive parts. The first describes the background and impact of the current BE in the USA and the second deals with the strategic objectives. This is a policy document that describes the actions of the government in the area of the BE earlier, today and in the future. A BE is based on the use of research and innovation in the biological sciences to create economic activity and public benefit. The driving forces behind the BE are economic growth, societal benefits, health and environment, as well as the USA being a leading nation in the field [12].

Policy strategies that refer to bioeconomy development in Middle and South America are mainly characterized by promoting the capitalization of the countries' large amount of natural resources. Countries like Argentina, Brazil, Colombia, Mexico, Paraguay and Uruguay have defined their perspectives on the opportunities provided by the bioeconomy. Whereas Brazil and Argentina are among the leaders in bioenergy production and are among the top five users of genetically modified crops, others, like Colombia and Uruguay, have taken first steps in the knowledge-based bioeconomy (bioprospecting, agricultural technologies). Currently, the countries in Latin America do not share a common vision on bioeconomy. Bioecono-

International Bioeconomy Policy

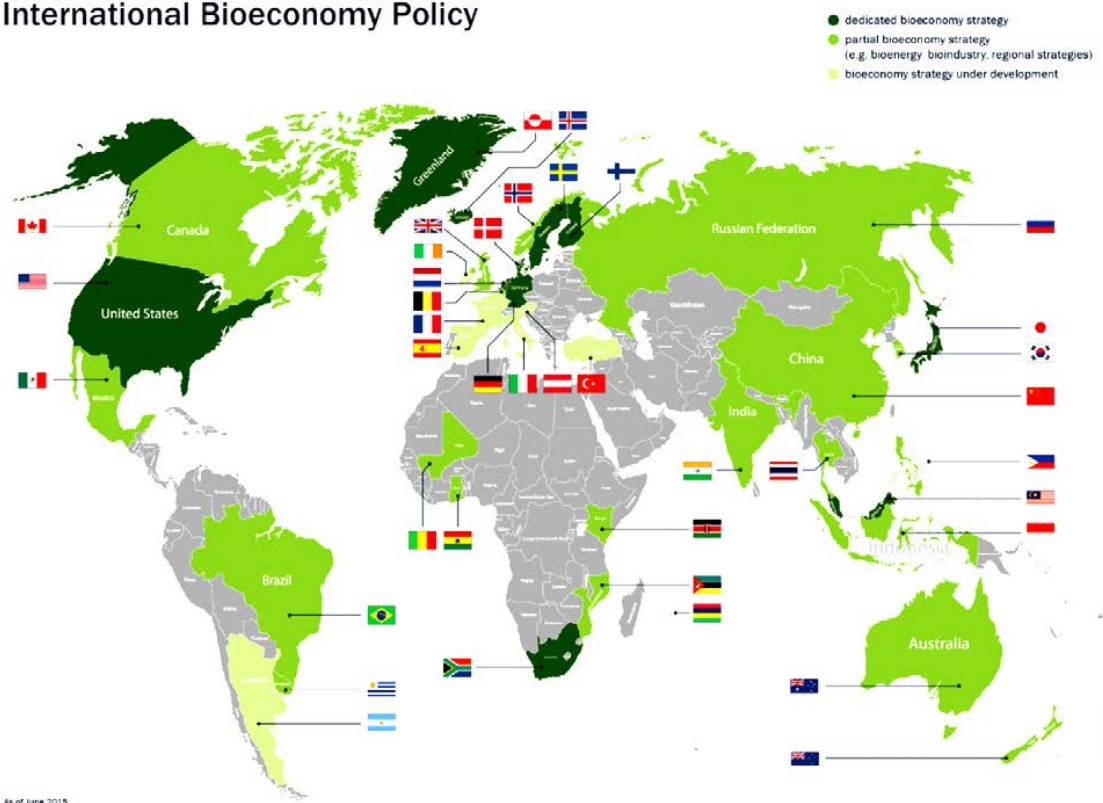


Fig. 2. Bioeconomy Strategies Around the World

Source: German Bioeconomy Council, June 2015 [6]

my is rather treated within the wider context of green growth, bioenergy or biotechnology strategies. A first attempt to establish a regional roadmap for bioeconomy development is provided by the ALCUE-KBBE project, a bi-regional platform, which promotes bioeconomy-related collaboration. The platform is funded by the European Commission's 7th Framework Program for Research and Technology Development [11].

Conclusions and proposals. Bioeconomy offers a new paradigm for long-term sustainable development in the 21st century. Its driver involves a rapid increase in the opportunities offered by the biological sciences, and their use to resolve complex and weighty problems. Meeting this challenge requires knowhow and strategic planning on the part of governments, companies, academia

and society, on a global scale. It is essential that an innovative and appropriate regulatory framework be structured to allow Bioeconomy to function. The establishment of a political agenda for bioscience should guarantee good governance practices, international cooperation and competitiveness, so that biotechnological innovations can contribute to new and better products, benefiting various aspects of human existence. The development of the Bioeconomy is likely to be impacted by public support for regulation, intellectual property and social attitudes, and research, development and innovation (R&D&I) efforts. Its creation depends on an advanced understanding of genes and of complex cellular processes, the use of renewable biomass and the multi-sectorial integration of applied biotechnology.

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ОГЛЯД БИОЕКОНОМІЧНИХ СТРАТЕГІЙ В СВІТІ

Анотація

В останнє десятиліття біоекономіка набирає обертів в якості нової стратегії для стимулювання інновацій, сталого розвитку та зеленого зростання в промислово розвинених країнах і країнах, що розвиваються. Опублікована в 2009 році стратегія ОЕСР «Біоекономіка до 2030 року: розробка політичного порядку денного» стала важливим стимулом для розвитку національних і регіональних стратегій біоекономіки. Біоекономіка може бути визначена як економіка, заснована на стійкому виробництві та перетворенні відновлюваної біомаси в діапазон біо-продуктів, хімічних речовин і енергії. У статті представлений порівняльний огляд стратегій та політики в області розвитку біоекономіки. Аналіз показує, що загальний напрямок для біоекономіки, на основі наукових досліджень і технологічних інновацій стрімко розвивається в світі.

Ключові слова: стратегія, політика, біоекономіка, біоенергетика, біомаса, Європейський Союз, Організація економічного співробітництва та розвитку.

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ОБЗОР БИОЭКОНОМИЧЕСКИХ СТРАТЕГИЙ В МИРЕ

Аннотация

В последнее десятилетие биоэкономика набирает обороты в качестве новой стратегии для стимулирования инноваций, устойчивого развития и зеленого роста в промышленно развитых странах и развивающихся странах. Опубликованная в 2009 году стратегия ОЭСР «Биоэкономика до 2030 года: разработка политической повестки дня» стала важным стимулом для развития национальных и региональных стратегий биоэкономики. Биоэкономика может быть определена как экономика, основанная на устойчивом производстве и преобразовании возобновляемой биомассы в диапазон био-продуктов, химических веществ и энергии. В статье представлен сравнительный обзор стратегий и политики в области развития биоэкономики. Анализ показывает, что общее направление для биоэкономики, на основе научных исследований и технологических инноваций стремительно развивается в мире.

Ключевые слова: стратегия, политика, биоэкономика, биоэнергетика, биомасса, Европейский Союз, Организация экономического сотрудничества и развития.