Strategic Challenges for Sustainable Governance of the Bioeconomy: Preventing Conflict between SDGs

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Abstract: The paper analyzes approaches to understanding the concept of the bioeconomy in highly cited journals, and bioeconomy strategies in associations of countries (the OECD and EU) and at the national level. Strategic challenges for sustainable bioeconomy governance are identified and an understanding of this concept is presented. The main aims, such as decoupling, the use of biotechnology, the use of sustainable biomass in the production process, and a high level of corporate social responsibility, are proposed for the identification of industries related to the bioeconomy. Specific goal achievement within the bioeconomy strategy and possible risks of conflict between SDGs are presented in the model. The bioeconomy should be considered a tool for achieving SDGs; the most relevant being 2, 3, 7, 9, 12, and 13–15. However, the achievement of bioeconomy goals can lead to a conflict between SDGs in practice. Therefore, this aspect must be taken into account at the stage of developing bioeconomy strategy and regulated in governance, to prevent conflicts between SDGs and to involve citizens and stakeholders in participating consciously in this process.

Keywords: bioeconomy; sustainable development; sustainable development goals (SDGs); stakeholders; risks; bioenergy; strategy

1. Introduction: Relevance, Research Hypothesis and Methodology

The concept of sustainable development entered the vocabulary of economists, politicians, scientists, and other stakeholders in 1987 after the publication of the World Commission on Environment and Development’s report “Our Common Future”. Significantly popularized through the publication of the Brundtland Report in the late 1980s, sustainable development was defined as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [1]. Since then, numerous publications on the concept of sustainable development have been published, including books and articles. Despite its popularity, this concept remains a challenge in the context of the unambiguous interpretation of politicians, the business, and the scientific community.

Further analysis of this term and its implications, as well as the recognition of the economics of biological systems, suggested that sustainable development should also consider equity and irreversibility, as well as uncertainty, risk, and the processes of learning associated with technological change and environmental vulnerability [2].

The abstractness of the concept of sustainable development was eliminated with the adoption of the Global Framework for Indicators for Sustainable Development Goals (SDGs) in 2015, which serves as a guide for countries to achieve sustainable development. The SDGs are a set of 17 goals that aim to end poverty, protect the planet, and ensure prosperity for all. Each goal has targets and indicators to measure progress, and stakeholders are invited to contribute to the implementation process.

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(SDGs), developed by the Intergovernmental and Expert Group on Indicators and agreed on at the 48th session of the United Nations Statistics Commission [3]. Having received target indicators in the form of 17 SDGs, it became clear that the traditional linear economic system is to be changed, and national strategies, business strategies, and tools to achieve them must be developed and implemented. The concept of sustainable development was often conceptualized using circular and bioeconomic models, which were known long before the introduction of the concept of “sustainable development,” but which in modern conditions gain new meaning. The combination of circular and bioeconomic models with the support of the state, business, and society can create a basis for achieving the goals of sustainable development.

The above terms are very common in political and scientific circles, and most who use them are sure to interpret them correctly, but in very different ways, each in the direction of achieving their own goals. Due to their wide but self-interpretive definitions, these concepts allow different actors (governments and businesses) to make related pledges without necessarily making any significant changes in their policies, strategies, and actions [4].

Our research hypothesizes that the possibility of the sustainable development of the bioeconomy in any country is determined by the vision of this process at the political and legal level, and requires appropriate assistance because it affects both the business environment and citizens seeking SDGs. At the same time, we believe that in the process of implementing the concept of bioeconomy in society there are strategic challenges for sustainable governance, the proper implementation of which at the level of the state and business structures should prevent the conflict of SDGs. Bioeconomy, contributing to the achievement of some SDGs, may slow down the process of achieving other SDGs. Each country needs to take this into account in its strategy and involve citizens and key stakeholders in conscious participation. If such a vision is not declared in the development strategy of a country or region, it negatively affects the possibility of the formation and development of a bioeconomy, and point efforts of enterprises at the micro-level will not give the desired result.

To prove our hypothesis, we analyzed the works of leading scientists and strategic documents in which the desire to develop the economy, considering sustainable development based on bioeconomy in particular, is declared. We analyzed: (1) Scientific publications in journals indexed in the Scopus database (firstly, the articles from journals included in Q1 or Q2 according to Scimago Journal & Country Rank). The website of this database enables the processing of a large amount of statistical information, the analysis of which allows us to realize professional forecasts [5]. At the first stage, all articles with the keyword “bioeconomy” were analyzed. According to the results of the analysis, some research areas were excluded (non-economic publications). Thus, in particular, the term “bioeconomy” is often used in the fields of chemical engineering and biochemistry. As these topics are not within the scope of our study, all such articles were excluded. As a result, we see the dynamics of growth in the number of publications on the keyword “bioeconomy,” which indicates a significant interest from the scientific community. (2) Strategies for the development of the bioeconomy in OECD countries, the EU, and countries with bioeconomies with significant innovation or raw material potential. As for strategies, a content analysis of national strategies and associations of countries was conducted to adopt best practices for implementation into Ukrainian national legislation, which may also be useful for countries with a similar level of economic security.

Finally, the main focus and ideas of the documents are compared and discussed, and conclusions are made.

It should be noted that when talking about bioeconomy, we use the term “bioeconomy” as a substitute for the terms “bio-based economy,” “biobased economy,” and “bio-economy.” For more information on the fine line between these concepts, we recommend Louise Staffas [6].

The results presented in the article will stimulate further research and help in the development of strategies for the bioeconomy that prevent the conflict of SDGs.
2. Literature Review

Studying modern bioeconomy as a concept of sustainable development, we should pay attention to the origins of this concept, which appeared in the middle of the 20th century. Georgescu-Roegen, an economist and mathematician from Romania, is called the father of the bioeconomy school. Roegen’s pioneering conception was initially strictly biothermodynamic and applied in an exclusively economic universe, conceived as a closed adiabatic space [7–9]. Built around a consistent frame, Georgescu-Roegen’s bioeconomics consisted of redefining the economic sphere, both as a discipline (economics) and as a set of practices (economy), in relation to its bio-physical environment [10]. Many works have been devoted to the analysis of Georgescu-Roegen’s contribution to the emergence of the bioeconomy [11–15]. We will not dwell on this question, having set a slightly different task, but could not fail to mention the historical origins of the bioeconomy.

In their article, Yuichi Tei, Ung-II Chung, and Gheorghe Săvoiu [16] successfully linked the four classical principles of bioeconomics of Nicolas Georgescu-Roegen with the seven modern principles of bioeconomics, which are: I. The technological optimism of the economy is absolutely unreasonable and unfounded. II. Production involves the transformation of a limited stock of raw materials and energy; any economic growth is only apparent, that of output per input, and implicitly a real entropic degradation of energy resources. III. The Earth has limited resources and energy, and is not the property of a given generation. IV. The principle of conservation of resources and energy remains fundamental. V. The excesses and bioeconomic criminality of consumerism must be discouraged, and resources should become global, which includes human resources, which will never have a passport. VI. Bioeconomic policies involve no risk, because the economic process is irreversible, and the historical variable is impossible to modify or adjust. VII. Restriction of life focuses on exosomatic, short, and tumultuous comfort, and the expansion of a more monotonous and long-lived lifestyle. The excessively structured and monopolized economic process has ever-growing entropy [16]. We do not fully agree on the correctness of principle VI, as in the process of implementing the bioeconomy in practice there are many risks associated with the desire of a certain part of humanity to benefit and ignore the 17 SDGs. Bioeconomy in practical terms emerges through the interaction between biotechnology developers and economists, and therefore there is a private commercial interest that often does not take into account environmental costs, especially at the societal level, nor consider the needs of future generations.

The emergence of potential risks in the process of implementing the bioeconomy is described in particular in the scientific papers of such scientists as Braun, V.; Sahn, D. [17,18]; and Swinnen, J. and Riera, O. [19]. The risks of bioeconomic transformation significantly depends on the country, namely its political conditions, level of social responsibility of business and society, current path of economic development, availability of bioresources and level of need for them, etc. These aspects should be taken into account when developing a bioeconomy strategy. This strategy should be circular and developed in the locations of primary biomaterials.

Authors agree that “Bioeconomy solutions potentially reduce the utilization demand of natural resources, and therefore, represent steps towards circular economy, but are not per se equivalent to sustainability. Thus, production may remain to be achieved against losses in natural resources or at other environmental costs, and materials produced by bioeconomy are not necessarily biodegradable. As a consequence, the assumption that emerging bioeconomy by itself provides an environmentally sustainable economy is not justified, as technologies do not necessarily become sustainable merely through their conversion to using renewable resources for their production” [20]. Székács, A. [20] sees the solution to this conceptual contradiction on the basis of bioethics, because a strong concept of environmental ethics is that no technological intervention can be imposed on nature beyond its receptive capacity.

Scientists [20,21], whose opinions we share, believe that SDGs are to be considered a priority and the basis for any bioeconomic innovation. Implemented by all stakeholders
(primarily the state and business structures), they will help to avoid the risks described above [22]. The role of the state in this process is very important [23].

In [24], scientists analyze policy strategies aimed at expanding and promoting the bioeconomy of more than forty countries. Assessing strategies in the context of global SDGs, they argue that pathways to sustainability depend on the establishment of effective governance mechanisms. However, there are two main challenges in creating an effective governance structure for a sustainable bioeconomy: enabling governance and constraining governance. In general, states address the second fundamental challenge of sustainable bioeconomy development (constraining governance) to a much lesser extent than the first challenge (enabling governance) [24]. We believe that another challenge is the efficiency of business process management and implementation of the SDG of each enterprise, whose activities fall under the characteristics of the bioeconomy.

Achieving the UN goals in the field of sustainable development requires an understanding of the needs of individual countries and their expectations related to the bioeconomy, because these expectations are often too optimistic. To study promising events in the global bioeconomy over the next 20 years, the German Bioeconomy Council conducted an online survey of 345 experts from 46 countries. According to the results of the study [25], the future bioeconomy must, first of all, meet the needs of mankind in the energy, agriculture, and food sectors. Also, innovative products based on renewable resources are expected to be of great importance. Although all UN goals will affect future success stories in the field of the bioeconomy, five were selected in the sample, namely: SDG 12 (responsible consumption and production), SDG 9 (industry, innovation, and infrastructure), SDG 13 (climatic action), SDG 7 (available and clean energy), and SDG 11 (sustainable cities and communities).

The International Council for Science, examining the nature of the relationships between SDGs, found that the four SDGs analyzed in detail (SDG 2, SDG 3, SDG 7, and SDG 14) are mostly synergistic with the other SDGs. This is based on the premise that a science-informed analysis of interactions across SDG domains—which is currently lacking—can support more coherent and effective decision making, and better facilitate follow-up and the monitoring of progress. Understanding possible trade-offs as well as synergistic relations between the different SDGs is crucial for achieving long-lasting sustainable development outcomes [26]. We will talk about this aspect later in the Section 3.

3. Results

There are many approaches to defining the concept of bioeconomy, and often the content of the definition depends on the type of stakeholders, whether they are representatives of government agencies, NGOs, businesses, or consumers, as well as whether they are from the country within which the concept is being implemented or is planned to be implemented. The statement of Jouni Korhonen et al., who studied the concept of the circular economy, is valid for the bioeconomy. These authors argued that “a single universal definition borders the impossible and should not be attempted, because it will always exclude some interests and because it is dynamic and evolving. However, this should not be used as an excuse to not develop the concept, its methodologies and practices, its policies and strategies” [27].

The general concept of “bioeconomy” is that of an economy based on the sustainable exploitation of biological resources. However, when putting this concept into practice, a number of qualifications or different focuses can emerge [28].

The first practical step towards the introduction of the bioeconomy is to declare such a desire at the state level with a clear vision of the essence and stages of implementation, directions, and prospects of bioeconomy development, and to transmit this information to potential stakeholders.

Leading world states have adopted the concept of bioeconomy at the political level, as presented in a separate dedicated document on bioeconomy strategy, such as Finland, France, Germany, Greenland, Ireland, Italy, Japan, Malaysia, Norway, South Africa, Spain,
Thailand, and the United States (Table 1). Some countries, as members of the OECD, have also implemented a bioeconomy strategy at the national level. More than 25 countries have developed bioeconomy-related strategies; for example, a strategy for bioenergy development. Ukraine and other Eastern European countries have a bioeconomy-related strategy, but they also have the resource and human potential, and therefore the need, to develop a strategy that would promote the development of the bioeconomy in priority areas for that particular country.

Table 1. Bioeconomy strategies in associations of countries (OECD, EU) and at the national level in chronological order.

| Region (Country) and Year of Implementation |
|-------------------------------------------|
| The Concept of Bioeconomy Implemented at the Political Level | OECD Countries | Germany | Japan, Thailand | EU | United States, Norway, Malaysia | South Africa, Belgium | Finland, Greenland | Italy, Spain, France | Ireland | Canada |
| Year of implementation | 2009 | 2010 | 2010 | 2012 | 2012 | 2013 | 2014 | 2016 | 2018 | 2019 |

We agree that “the understanding of country strategies is indeed often affected by the unclear or outright absence of a definition of the terms “bioeconomy” and “bio-based economy”” [28].

Here is the essence of the bioeconomy, highlighted in the strategies of associations of countries and in countries leading the promotion of the concept of sustainable development (Table 2). Interestingly, all strategies have their definition of the bioeconomy and differ in the aspects that they consider worth promoting. Furthermore, this is correct, because each country has a different potential for implementing the concept of bioeconomy in real business.

The analysis of bioeconomy strategies in different countries enables generalizing the following priorities of the strategy: the USA, India, and South Korea have focused attention on biotechnologies, mainly in the field of public health services; the countries of South America and Russia have focused in the bioeconomy on the value of biomass in primary industries, including agriculture, forestry, and fisheries; Germany has focused on the use of biotechnology, waste processing, the integrated use of biomass, and supporting the sustainable production and use of renewable resources in the agricultural, forestry, and fisheries sectors, as their products are a key source of raw materials for the bioeconomy; and Finland, Greenland, Japan, and Thailand have focused on the use of marine biomass and biotechnology for their processing.

Why is there no ambiguity at the political level? Probably because in different countries this concept is based on slightly different industries. This means that achievable potential depends on the climatic, industry, and other features of the countries implementing the concept. Therefore, we consider it appropriate for each country to interpret the bioeconomy, taking into account its bioeconomic potential and its ability to ensure its sustainable development. Later in this article, we present our definition of the concept of “bioeconomy,” which can be taken as a basis for the formation of development strategies for countries with similar resource potential as Ukraine.

From the analysis of articles published in leading scientific journals, we see that the concept of bioeconomy originates in a wide variety of theoretical fields, and there is a fine line between such concepts as sustainable development, bioeconomy, circular economy, and
green economy. In this study, we focus on the bioeconomy. The number of articles with the keywords “bioeconomy,” “bio-based economy,” “biobased economy,” and “bio-economy” in Scopus has been growing rapidly since 2000, and there are now 18,458 articles.

Table 2. Definition of the concept of bioeconomy in bioeconomy strategies.

| Country or Association, Year | Bioeconomy                                                                 |
|-----------------------------|-----------------------------------------------------------------------------|
| European Commission, 2012 [29] | Bioeconomy is the production of renewable biological resources and the transformation of these resources and waste into value added products such as food, feed, biological products, as well as bioenergy. The bioeconomy is the production of biomass and the conversion of biomass into value added products, such as food, feed, bio-based products and bioenergy. It includes such sectors as agriculture, forestry, fisheries, food, pulp and paper production, as well as parts of chemical, biotechnological and energy industries. |
| European Commission, 2018 [30] | The bioeconomy covers 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. |
| OECD, 2009 [31] | Bioeconomy is the set of economic activities in which biotechnology contributes centrally to primary production and industry, especially where the advanced life sciences are applied to the conversion of biomass into materials, chemicals and fuels. |
| White House, 2012 [32] | A bioeconomy is one based on the use of research and innovation in the biological sciences to create economic activity and public benefit. The U.S. bioeconomy is all around us: new drugs and diagnostics for improved human health, higher yielding food crops, emerging biofuels to reduce dependency on oil, and biobased chemical intermediates, to name just a few. |
| Federal Ministry of Food and Agriculture, 2013 [33] | “Biobased economy” takes natural materials cycles as its point of orientation; it bases itself upon a structural transition from an economy based on finite resources of fossil origin—mainly petroleum—to an economy more strongly based on renewable resources. The bioeconomy spans a bridge linking technology, the economy and ecological issues, by applying biological processes and resources, further developing them and thus enhancing their performance capability, as well as making their use more efficient and sustainable. The bioeconomy not only replaces raw materials sourced from fossils; it also develops wholly new products and processes. |

The interdisciplinary nature of the bioeconomy (both at the level of scientific study and sectoral participation in this concept) can be seen from the results of the analysis of the Scopus database by scientific fields. The largest share belongs to publications in environmental science (18.3%), followed by agricultural and biological sciences (11.8%); energy (11.7%); social science (8.4%); business, management, accounting, and similar (4.8%); economics, econometrics, and finance (4.5%); and others.

The need to develop the concept of bioeconomy is emphasized by the study of its various aspects in many scientific fields. Thus, three visions of the bioeconomy are formed:

- the biotechnology vision, emphasizing the importance of biotechnology research, application and commercialization in different sectors of the economy;
- the bioresource vision, focusing on the processing and upgrading of biological raw materials, as well as on the establishment of new, related value chains;
- and the bioecology vision, highlighting sustainability and focusing attention on ecological processes that allow for the improved use of energy and nutrients and promote biodiversity, including agricultural practices that avoid monocultures and soil degradation [34].

According to scientists [35,36], there are a number of key drivers of bioeconomy development, which include the demand for sustainable, renewable biological resources and bioprocesses to replace nonrenewable resources; the need to improve the management
of renewable resources; the need to respond to global challenges such as energy and food security in the face of increasing constraints on agricultural water, productive land, and carbon emissions; the rapid uptake of biotechnologies in agricultural production; and the opportunity to “decouple” agricultural growth from environmental degradation through more sustainable production methods employing biotechnology [35,36].

Analyzing the strategies of countries and the works of scientists (in particular [24,35–40]), we see that the concept of bioeconomy is often idealized, and its potentially negative consequences are mostly not mentioned. When developing a bioeconomy strategy, it is important to consider the potential risks to ecosystems. Even countries with potentially large bioeconomies (the US, Brazil, and Argentina) do not take into account the problems of risk management, which does not contribute to the sustainability of the bioeconomy.

In this context, scientists [41,42] discuss three dimensions of sustainability (environmental, economic, and social), and some thermodynamic (energy and extremity) and environmental indicators applied to bioenergy systems are also given. Researchers point to the risk that in a circular bioeconomy, the global bioenergy sector may face problems due to the new demand for biomaterials from the same sources.

Regarding scientific works on this issue, scientists draw attention to the need and prospects for the bioeconomy to enable the achievement of sustainable development goals, but also emphasize the possible risks and the need to take them into account when developing national strategies.

When writing about risks, we understand the possibility of conflict between the SDGs due to the development of the bioeconomy: the achievement of one goal may lead to deterioration in the context of achieving another one. Therefore, this aspect must be taken into account at the stage of forming a strategy for the bioeconomy in a country to prevent conflict between SDGs. Achieving SDGs within the concept of bioeconomy and possible risks of conflict between SDGs are presented in Figure 1.

Figure 1. Model of preventing conflict in achieving SDGs by sustainable governance of the bioeconomy.

As we can see, in striving to make progress on SDG 13, there is a conflict with goals 3 and 15. This happens when the stimulation of biofuel production occurs without constant
management of that process. That is, biofuels can be produced only from sustainable biomass, primarily waste from the forest and the agricultural sector, preventing deforestation for this purpose. It is necessary to use certified equipment that does not harm the environment.

Concerning SDG 7, its achievement may conflict with SDG 2 and 15, as unscrupulous business entities may use agricultural land to grow biofuels for personal gain, depleting soils, and not follow requirements for this kind of farming.

Within the concept of the bioeconomy, innovations are introduced into industry (SDG 9), but if the principle of decapping is not followed, there is a conflict with SDG 12.

Economically developed countries promote bio-based applications in chemical or pharmaceutical sectors (SDG 3), which may conflict with SDG 10. Due to restrictive patent rights and often lengthy and costly licensing procedures, the associated benefits accrue only to the affluent segment of the world’s population [24].

In our previous research, we concluded [43–45] that the transition to the bioeconomy is an irreversible process, but developing countries face a number of challenges. Analyzing the potential of bioenergy development in Ukraine (as the most promising direction for the bioeconomy), we see that to achieve strategic goals it is necessary to use economic and legal tools for developing the production and consumption of biofuels produced from so-called “sustainable resources,” taking into account their bioeconomic aspects and preventing conflict between SDGs.

It is not possible to apply the same management decisions to stimulate the bioeconomy in different countries, taking into account specific political, economic, social, and environmental conditions. Therefore, it is important to develop a strategy at the national level. This is relevant not only for Ukraine, but also for other Eastern European countries, which are lagging behind on this issue.

Therefore, the bioeconomy is not always good in the context of sustainable resource use. The level of circularity of its functioning is of fundamental importance for the sustainability of bioeconomic development. This is because “in the circular economy concept, the linear production model (“take, make and dispose”) is replaced by a circular model in which the waste products that would be disposed in the linear model are kept within the system—waste materials are drastically reduced, and wastes are recycled and remanufactured” [46].

Production is the most important part of the economy according to most economic theories; classical, Marxist, developmentalist, Schumpeterian, most representatives of Keynesian, institutional, and even behavioral theories lean towards production. Production is the core of the economy and the economic activity of an individual enterprise. Therefore, we compare the production process in the context of a circular bioeconomy and a linear bioeconomy, and present it in Figure 2.

Within a circular economy, complex resource use is possible both within one enterprise and within different business entities, along with through the intermediate link—the consumer, who must be “included,” that is, interested in participating in the circular economy. The concept of bioeconomy should be supported by the concept of a circular economy; only with its development and implementation in tandem can most of the goals of sustainable development be achieved. Another important factor for a particular country is the real achievable potential of industries in the process of elaborating bioeconomy strategy.

To ensure the achievement of the SDGs and the growth of the circular bioeconomy, it must comply with the principle of decoupling, i.e., the ability of the economy to grow without a corresponding increase in energy and resource use and environmental impact, and take into account aspects of social responsibility. In this context, the National Policy Strategy on Bioeconomy [33] states: “The goal of securing the availability of renewable resources and producing such resources must not be allowed to be attacked at the expense of soil fertility, effective management of water resources, or climate protection”. This statement should be included in the strategies of all countries.
Therefore, the bioeconomy is not always good in the context of sustainable resource use. The level of circularity of its functioning is of fundamental importance for the sustainability of bioeconomic development. This is because “in the circular economy concept, the linear production model ("take, make and dispose") is replaced by a circular model in which the waste products that would be disposed in the linear model are kept within the system—waste materials are drastically reduced, and wastes are recycled and remanufactured” [46].

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*—effectively used resources from the point of view of the business entity, the state and society within the circular bioeconomy; **—resources are used effectively only for a narrow circle of people; waste is present that pollutes the environment

Figure 2. The cycle of linear and circular bioeconomy using the example of bioenergy as a potentially important sector of the bioeconomy.

At this stage of development of social and business realities, we consider the concept of bioeconomy a tool to achieve SDGs without conflict with other goals. However, the most relevant are the following goals: 2, 3, 7, 9, 12, and 13–15. Thus, the bioeconomy is one of the concepts of sustainable development, which enables economic growth in accordance with the principle of decoupling and involves the socially responsible behavior of all participants in the production of food, feed, drugs, biofuels, and other products made from sustainable biomass and biotechnology.

The study of literature and expert opinion makes it possible to highlight the following features that can be the basis for identifying industries related to the bioeconomy: decoupling, the use of biotechnology, the use of sustainable biomass in production, and a high level of corporate social responsibility.

The bioeconomy is a complex system that has grown from some of the simplest and oldest human activities to the high-tech and complex sectors that underlie the most modern economic system. The representation of the bioeconomy as the sum of sectors is somewhat artificial, as these sectors are still institutionally separated from each other; the same applies to their statistical information [28].

It should be noted that the updated EU bioeconomy strategy for 2018 [30] focuses on trying to identify industries that are “part” of the bioeconomy. This is the main problem, the solution of which could allow us to operate with reliable statistics and on this basis to make management decisions and build economic forecasts for the development of the bioeconomy.

From the point of view of economic activities attributed to the bioeconomy, there is no clear answer. However, we need to work on this, because the identification of these industries will allow us to develop priorities for sustainable development and use effective governance mechanisms at the state and community level.

At the national level, it is necessary to determine the criteria for assigning economic entities to the bioeconomy based on reliable statistical information. For those industries (entities) that want to fit into the concept of the bioeconomy and work towards the sustain-
able achievement of SDGs, accounting should be conducted using methods that will allow this to be done. Quantifying the achievement of SDGs is a scientific challenge and will be the subject of our further research.

4. Conclusions

Based on a comprehensive study of scientific publications in Scopus on the methods and priorities of strategic bioeconomy development, as well as an analysis of strategic planning documents for the bioeconomy of OECD and EU countries, along with as countries with high innovation or raw material potential, we substantiate innovative scientific approaches to understanding the concept of bioeconomy. In our opinion, it is appropriate to interpret the bioeconomy as one of the concepts of sustainable development, which enables economic growth following the principle of decoupling, involving the socially responsible behavior of all participants in the production of food, feed, medicine, biofuels, and other products made from sustainable biomass using biotechnology.

The grouping of countries according to strategic priorities in the development of the bioeconomy has justified the system of features for identifying industries related to the bioeconomy. These features are decoupling, the use of biotechnology, the use of sustainable biomass in production, and a high level of corporate social responsibility.

Strengths and shortcomings in the process of implementation of different cycles of bioenergy development, in particular based on linear and circular bioeconomies, are substantiated. It is established that the goals of sustainable development can be achieved under the condition of a circular bioeconomy.

Based on the results of the study, a model for estimating the risks of conflict between SDG goals due to the development of the bioeconomy is proposed. We consider the bioeconomy as a tool for achieving SDGs; the most relevant being 2, 3, 7, 9, 12, and 13–15. However, the achievement of SDGs within the concept of bioeconomy can lead to conflict between SDGs in the implementation process, that is, in the practical dimension. Therefore, this aspect must be taken into account at the formation stage of bioeconomy development strategy and regulated in governance, to prevent conflicts between SDGs in the future and to involve citizens and key stakeholders in participating consciously in this process.

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