

## Terminological Framework for the Study of Circular Bioeconomy

*Maryna I. Yareмова\**

*Polissia National University  
10008, 7 Staryi Blvd., Zhytomyr, Ukraine*

**Abstract.** In the context of increasing global environmental challenges associated with anthropogenic destructive impact on the environment, the bioeconomic direction of sustainable development in combination with a closed production cycle becomes relevant, the development of which would help to overcome the imbalance of the ecological and economic system and minimise the burden on the environment. Therefore, the purpose of this study is to comprehensively consider the prerequisites for the establishment of a framework of categories for combining green concepts of sustainable development, in particular, to substantiate the theoretical and methodological foundations for interpreting the fundamental features of circular bioeconomy to form a specific vision of the issue. The methodological basis of the study is general scientific and special theoretical and empirical methods, in particular inductive and deductive, heuristic method, graphic, analysis and synthesis, etc. At the empirical level, descriptive, comparative, and observational approaches are used. The theoretical level covers the historical, abstract-logical, hypothetical, formalisation method as a manifestation of logical thinking and theoretical generalisation for formulating the results of the study. This study systematises the ideas of leading scientists on the positioning of circular economy and bioeconomy, highlights similarities and differences in the process of combining concepts, identifies fundamental generic and specific features, establishes complementary relationships to generate the author's position and formulate a fundamental vision of the problems of circular bioeconomy. The practical significance of the study is conditioned by scientific substantiation of the terminological platform of the problems of circular bioeconomy. Further research is aimed at developing criteria for regulating the bioeconomic system with subsequent evaluation of results

**Keywords:** concept, circular economy, bioeconomic model, convergent similarity, divergent difference, fundamental features

Received: 10.02.2021, Revised: 12.05.2021, Accepted: 16.06.2021

**Suggested Citation:** Yareмова, M.I. (2021). Terminological framework for the study of circular bioeconomy. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 8(2), 108-116.

\*Corresponding author

## Introduction

The increasing global environmental problems associated with pollution and sudden climate change necessitate the search for rational ways to minimise the anthropogenic destructive impact on the environment and overcome the imbalance in the ecological and economic system. In this context, the latest biotechnological achievements have become attractive for the economy and environmental protection, which gave an impetus to the development of bioeconomic science, whose teachings are focused on promoting the idea of producing food and non-food products based on renewable biological resources with an emphasis on their circular manifestation. Therefore, the key tasks of scientific research are the need to systematise the opinions of leading scientists on the positioning of circular economy and bioeconomy, identify similarities and differences in the combination of these concepts, identify fundamental generic and specific features and establish their complementary relationships to establish the author's position on the problem and formulate the definition of circular bioeconomy.

Over the past decade, there has been an active increase in scientific publications devoted to the establishment of a bioeconomic model both in the Ukrainian and international educational space. Gradual popularisation is explained by the accelerated scientific and technological development and the constant increase in environmental challenges in society. The growth of scientific papers since 2015 is more than 50% annually [1]. An active scientist whose research is related to bioeconomy is a doctor of environmental sciences S.V. Mohan [2], who has more than 25 publications in the field of innovative Biotechnologies on the international platforms Web of Science and Scopus, which allowed the Indian engineer, according to Stanford University's calculations, to take the 29<sup>th</sup> place in the ranking of the world's best scientists. Distinguished scientist of the Indian Institute J.L. Pandey [3], is the author of over 1200 publications in the field of bioeconomy, the author considers the implementation of theoretical concepts in practice. The papers by D. D'amato, associate professor of the Department of Forest Sciences of the Helsinki Institute [4], played a major role in the establishment of public consciousness about the need to produce and consume products on a biological basis. The papers by L. Kelleher, M. Henchion, E. O'Neill [5], R. Meyer [6] and other scientists deserve no less attention, since they cover an in-depth analysis of the updated concept and consider the trends of its development in different directions. Among the Ukrainian scientists, the papers by V.V. Baidala [7], O.G. Vdovichenko [8], M.V. Dobrivska [9] V. Krutyakova, T. Babynets, V. Targoni, O. Bondarenko [10], S.M. Fedina, B.L. Kovalyov, B.M. Ignatchenko [11] and others.

The activation of scientists and practitioners contributed to the implementation of innovative bioeconomic developments in the practice of economic activity. The importance of the applied value of the bioeconomy is determined by the rapid pace of its development, mainly in the developed countries of the world, in particular Finland,

Italy, France, Germany, Denmark, Norway, the USA, the Netherlands, etc. Achieving bioeconomic principles of management allows the state to maintain a high level of food security through the production of safe industrial and food products, efficiently consume natural capital and minimise dependence on fossil raw materials, overcome energy dependence, increase employment and intellectual activity, improve the quality of life and well-being of the population as a whole. At the same time, the development of innovative, resource-efficient and low-carbon bioeconomy is possible if the principle of circularity is observed, since basic natural biological resources are constantly depleted, which determines the need for efficient and economical use in compliance with the maximum waste-free production based on the implementation of closed-cycle technologies and provided that the product's service life can be extended. This problem requires increased attention, because it plays a crucial role in this study, the *purpose* of which is to substantiate the theoretical, methodological and applied foundations for the establishment of the author's understanding of circular bioeconomy. It is based on the systematisation of the opinions of leading scientists on the composition of the concepts of circular economy and bioeconomy, highlighting their convergent similarity and divergent differences on the way to their combination, establishing fundamental features with the allocation of generic and specific characteristics for their own interpretation of the inclusive concept of "circular bioeconomy", which is viewed through the plane of economic activity with the dominance of the biological and circular aspect.

## Materials and Methods

The scientific hypothesis of the study is the assumption that the combination of fundamental features of circular and bioeconomy would allow forming an integrating concept, which is based on economic activity with the development of the biological and circular aspect. Achieving its practical implementation necessitates the application of a clear research methodology. Therefore, the establishment of scientific truth is carried out with such scientific approaches as a systematic, aimed at a comprehensive study of socio-economic phenomena and processes associated with a closed system of management on bioeconomic principles; the dialectical approach provides knowledge of the subject of study on the laws of unity and struggle for the possibility of combining concepts, the transition of quantitative changes to qualitative, which is used if necessary to scale concepts, negation of objections – to explicate convergent similarity and divergent difference of circular and bioeconomy; the synergetic approach is considered from the standpoint of the effectiveness of integrating concepts.

In the course of the study, empirical and theoretical approaches were used, in particular historical, which describes the evolutionary perspective of scientific views understanding of circular and bioeconomy; abstract-logical, which allows one to establish complementary relationships

between concepts, identify fundamental basic features based on identified similarities and differences between circular economy and bioeconomy, formulate conclusions; the hypothetical method is used for argumentation of results; formalisation as a manifestation of logical thinking, is reflected in the construction of complementary relationships of fundamental features of circular bioeconomy; theoretical generalisation contributes to the interpretation of the definition based on the results of the study. At the empirical level, a descriptive method is used to explicate the graphical representation of the closed-loop bioeconomic model and detail the characteristic characteristics of circular bioeconomy; the comparative method allows one to determine the convergent similarity and divergent difference between the analysed concepts; observation involves studying the prerequisites for forming the author's position.

General scientific and special methods of scientific knowledge, which are characterised by theoretical and empirical character, are used in research to systematise bioeconomic and circular content in order to demonstrate theoretical generalisations (inductive and deductive methods of scientific knowledge); generating creative ideas allows one to implement a heuristic method aimed at solving scientific problems, in particular, visualisation of research using the Euler circle, the argumentation of the relationships of circular bioeconomy through the Euler-Venn diagram, interpretation of the circular manifestation of the bioeconomic model; the graphic method is aimed at visual reproduction of the obtained scientific results, namely, the schematic representation of concepts, graphic representation of circular bioeconomy by generic and specific features, and so on.

The advantage of this study is the author's approach to the search for a terminological platform for interpreting the definition of "circular bioeconomy", which consists in configuring the scientific views of leading scientists, system-

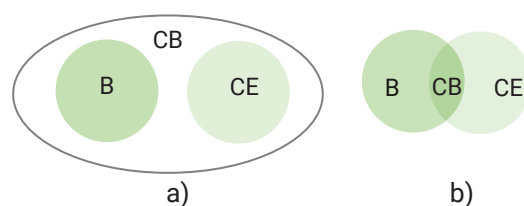
atising the similarities and differences of concepts to outline an integrated paradigm and identify basic fundamental features, which allowed forming the author's own vision of the problem of understanding circular bioeconomy. Further research is aimed at developing a methodological model based on the introduction of criteria characteristics for regulating the bioeconomic system.

## Results and Discussion

The study of the conceptual foundations of the establishment of circular economy and bioeconomy [12] gives grounds to assert that scientists understand the essence of definitions in different ways, giving a certain degree of their own internal diversity. Many foreign researchers suggest interpreting the content of concepts as interrelated, since it is believed that they are united by a common economic, environmental, and social goal [4], for which the green economy is a comprehensive umbrella [13]. Modern European researchers L. Hetemäki, M. Hanewinkel, B. Muys, M. Ollikainen, M. Palahí, A. Trasobares [14] prove that the basic features of circular and bioeconomy have a synergistic effect, which is manifested in the establishment of an integrative concept of circular bioeconomy.

Michael Carus, director of the private German *Nova-Institute* [15], has a slightly different view, arguing that the circular and bioeconomy have similar goals that intersect closely, but are not a complete part of the other. From his standpoint, the concept of bioeconomy goes beyond the circular and covers many more aspects. Hence, M. Carus suggests that "waste from agriculture, forestry, fisheries and other organic process residues can only be integrated into the circular economy through a bioeconomic strategy".

Quite a thorough study of scientific opinions on the exposition of the concepts of circular and bioeconomy is presented in the papers by P. Stegmann, M. Londo, M. Junginger [16] (Fig. 1).



**Figure 1.** Explication of complementary concepts of circular economy and bioeconomy

**Source:** compiled by the authors based on studies [14-17]

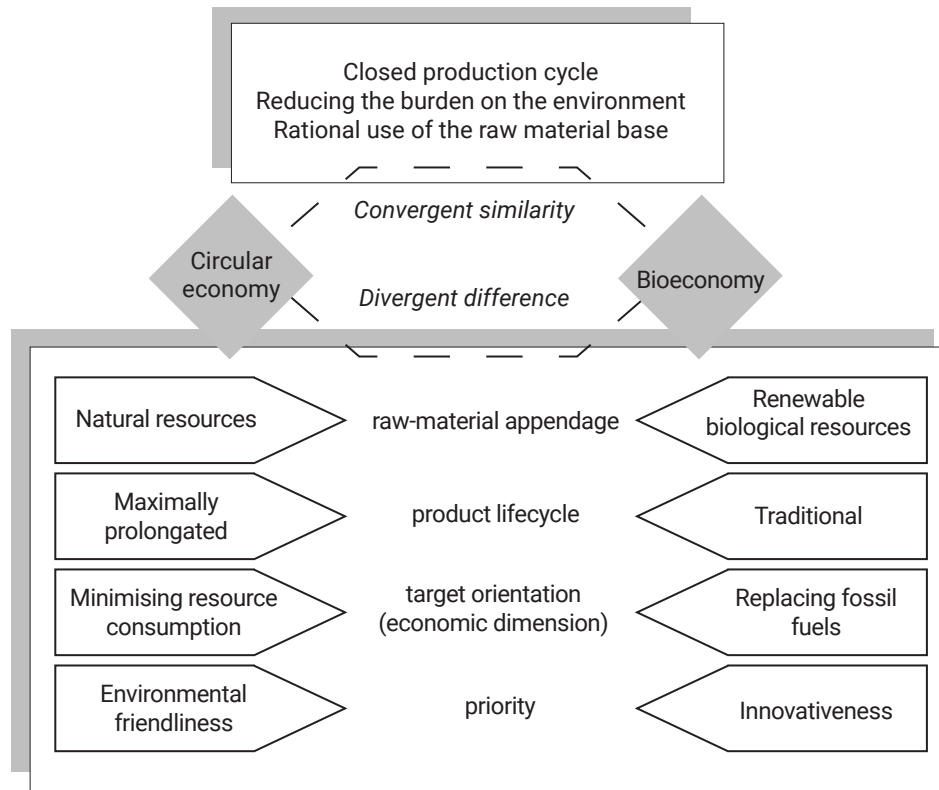
According to Euler circle theory, a visual illustration reflects the relationship between interrelated concepts. Thus, figure a) visualises the position of D. D'Amato [4], L. Hetemäki [14] et al. on the interpretation of circular bioeconomy. Accordingly, the subordination of circular economy and bioeconomy is depicted, which are disjointed, but depend on the integrating concept. Figure b) shows the compatibility of concepts at a partial intersection, where feature characteristics form a circular bioeconomy. At the same time, opposite individuals remain behind separate ideas of circular and bioeconomy. Well-known proponents of the theory are the aforementioned German researcher

M. Carus [15] and doctor of environmental sciences of the Indian university V. Mohan [17], whose papers are devoted to the study of the problems of bioeconomic science.

The controversy among scientists and the divergence of their opinions on the positioning of the concepts of circular and bioeconomy made it advisable to conduct the study. The establishment of the author's vision of the terminology requires identifying convergent similarities and divergent differences in the interpretation of circular economy and bioeconomy on the way to the development of an integrating concept. According to the academic explanatory dictionary, convergence is interpreted as "the

coincidence of features, properties in phenomena that are not related to each other and independent" [18, p. 256]. At the same time, the opposite in its meaning is divergence,

denoted as "divergence of features and properties" [19, p. 270]. The relative similarities and differences between the concepts of circular and bioeconomy are shown in Figure 2.



**Figure 2.** Convergence and divergence in the study of circular economy and bioeconomy

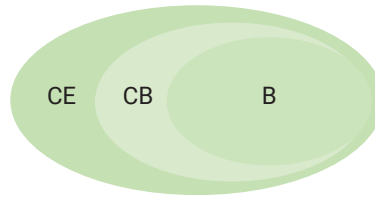
**Source:** compiled by the author

Taking into account the fact that circular economy and bioeconomy are concepts of sustainable development that promote green growth in the economic, environmental and social dimensions, their relative similarity is considered primarily in matters of efficient consumption of raw materials, in particular, the increase in the use of recycled materials. An important vector of development of modern society, which lies in the plane of the concepts of circular and bioeconomy, is a closed production cycle, which will minimise the amount of accumulated waste, reduce the consumption of fossil resources and reduce the burden on the environment.

The divergent difference is identified in four main areas, namely: raw-material appendage, product life cycle, target orientation (economic orientation) and priority. For example, renewable biological resources in the interpretation of bioeconomy are objects of labour [20], while circular economics considers the entire range of natural resources in closed cyclic production. From the standpoint of life cycle analysis, products and materials should maintain the longest possible service life, which can be achieved through repeated use of goods, their repair, overproduction with partial changes in functions or design. Bioeconomic production is determined by the introduction of innovative

biotechnological developments in the production process, but the dominant characteristic of the circular economy is environmental sustainability and preservation of environment, which should be considered at the stage of designing industrial chains and consumption models. The goal of the bioeconomy is to replace fossil fuels and reduce greenhouse gas emissions, but the value of a circular economy is considered to be minimising the use of raw materials.

The key goal of the circular economy is the rational management of household and industrial waste of organic and inorganic origin for the sake of economical consumption of natural resources and reducing pressure on the environment. At the same time, the bioeconomy is developing in rural areas with an emphasis on the economic effect of introducing innovative biotechnological developments for the search for renewable energy sources. This suggests that the concept of a circular economy is global in relation to the bioeconomy, which covers the organic segment. Therefore, the author's position according to the above-mentioned theory is reduced to the recognition of circular bioeconomy as an integral part of circular economics. At the same time, it is worth noting that the starting point on the way to circular bioeconomy is the paradigm of bioeconomic science (Fig. 3).

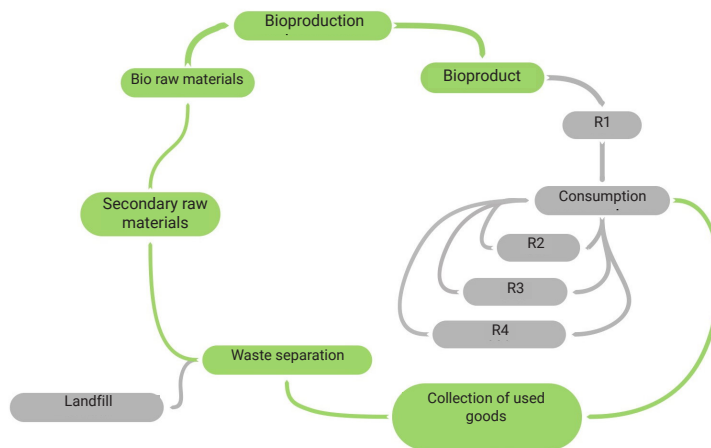


**Figure 3.** Methodological exposition of the concept of circular bioeconomy

**Source:** compiled by the author

The need to combine concepts is conditioned by the fact that the development of innovative, resource-efficient and low-carbon bioeconomy is possible if the principle of circularity is observed, since basic natural biological resources

are constantly depleted. Efficient and economical use causes the need for a closed cycle with the most waste-free production and an extended service life of the product (Fig. 4).



**Figure 4.** Circular manifestation of the bioeconomic model

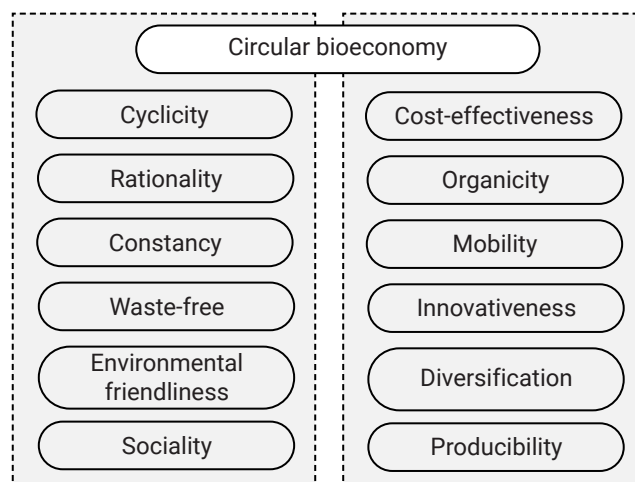
**Notes:** R1 – reduced in needs; R2 – repeated consumption; R3 – recycling; R4 – recovery.

**Source:** compiled by the author using the Coggle web application

The closed production cycle allows producing products from bio-raw materials, which after consumption can be easily transformed into secondary ones for reuse in the next production process. An important aspect is to redefine the need to purchase goods in order to reduce unnecessary needs (R1). Life cycle prolongation occurs through reuse (R2), recovery after repair (R4), or recycling (R3), which characterises the circular manifestation. Consequently, the

implementation of the closed-loop bioeconomic model allows completely disposing and recycling of all materials, minimise waste and effectively use available natural resources.

The conducted study gives grounds to assert that the establishment of the terminology of circular bioeconomy should be reduced to a combination of fundamental features of the concepts of circular economy and bioeconomy, which are the basis of the integrating concept (Fig. 5).



**Figure 5.** Fundamental features of circular bioeconomy

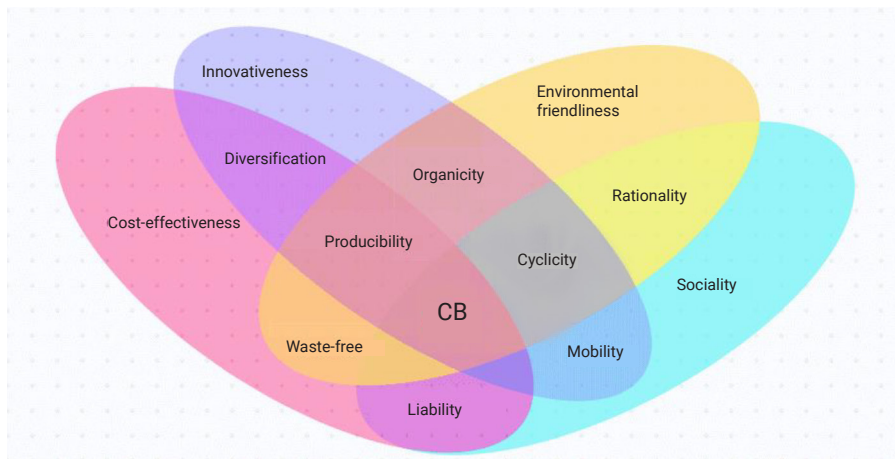
**Source:** compiled by the author

Translated from Latin, “principles” (principium) is denoted as “the beginning, basis, that is, the starting point of any scientific system, theory, ideology” [21]. At the same time, the “attribute” reflects “features, properties, features of someone or something” [22]. Taking into account the above, it is proposed to identify the fundamental characteristics of the functioning of the bioeconomic model, which is characterised by an economic character, which indicates effective management of residues of organic and inorganic origin [23, p. 22] with an approach to waste-free production. The principle of environmental friendliness is expressed through the preservation of resources and the multiplication of natural capital. Cyclical manifestation is caused by the prolongation of the value of goods during the life period [24] and the rethinking of the need to consume a significant amount of resources and reserves, which is seen through the plane of the principle of rationality.

The general list of fundamental features includes those that are highlighted in the scientific paper of R.Z. Lyubachivska, in particular, manufacturability, which is conditioned by the rapid pace of technological change in accordance with the production process and environmental requirements; sectoral diversification, which indicates the

penetration of biotechnology in all areas of production; mobility as an opportunity to search for modern projects through the scientific and information space and the social principle of conscious attitude to the environment [25]. In addition to the above, it is worth highlighting innovativeness as a requirement for the introduction of biotechnological innovations in production turnover and organicity, which indicates the consumption of resources of the plant and animal world that have the ability to reproduce themselves. The principle of sustainability is designed to ensure production from renewable biological resources in a balanced economic and ecological growth with a responsible attitude to the environment.

Taking into account the above-mentioned fundamental features of circular bioeconomy, it is proposed to clearly illustrate the similarities and differences in the relationships between them using the Euler-Venn diagram. According to the conducted research, the basic principles define economy (Ec), environmental friendliness (Ef), sociality (S), and innovativeness (I), which are reflected in the form of four circles, the intersection of which shows their interdependence. All planes coincide at a key point in circular bioeconomy (Fig. 6).



**Figure 6.** Complementary relationships between the fundamental features of circular bioeconomy (CB)

**Source:** compiled by the author

Next, the results of this study are substantiated using mathematical operations [26], where the intersection of planes is denoted as  $\cap$ . Therefore, the diagram can be decoded as follows:

$$I \cap Ec = \text{Diversification},$$

which indicates the development of the principle of diversification at the intersection of the planes of innovation and economy.

$$I \cap Ef = \text{Organicity},$$

$$Ef \cap S = \text{Rationality},$$

$$I \cap S = \text{Mobility},$$

$$Ef \cap Ec = \text{Waste-free},$$

$$Ec \cap S = \text{Responsibility}.$$

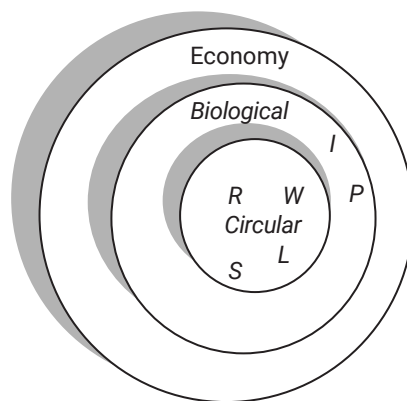
The union of planes designated as  $\cup$  reflects the following identity:

$$(I \cap Ef) \cup (I \cap Ec) \cup (Ef \cap Ec) = \text{Producibility},$$

$$(I \cap Ef) \cup (I \cap S) \cup (Ef \cap S) = \text{Cyclicity}.$$

Thus, the interrelation between the fundamental features indicates the need to take them into account in the process of scientific interpretation of circular bioeconomy, since the “concept” is interpreted as “a way of reflecting reality, in which the subject is revealed through a set of essential features” [27, p. 137]. In addition, it is worth paying attention to the identification of basic fundamental features, in particular, economy, innovativeness, environmental friendliness and sociality, which underlie the definition, which is formed as “an integral set of thoughts expressed with the help of certain general and essential features of the object” [28, p. 6].

According to the method of identifying generic and specific features, it is worth highlighting economy among the above-mentioned, which is a generic characteristic and the basis of the concept of circular bioeconomy (Fig. 7).



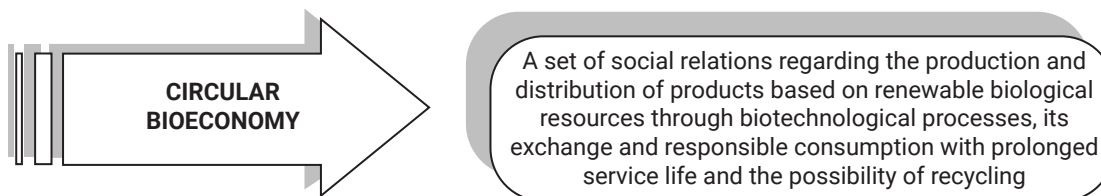
**Figure 7.** Visualisation of the definition of “circular bioeconomy” by generic and specific features

**Note:** O – organicity, M – mobility, D – diversification, I – innovativeness, P – producibility, R – rationality, W – waste-free, E – environmental friendliness, C – sociality, L – liability

**Source:** compiled by the author

Economics as a generic feature of circular bioeconomy subordinates biological as specific, and an order of magnitude lower – circular. Consequently, the author's

position of the interpretation of circular bioeconomy at the initial stage reduces to an economic science that has specific features of biological and circular (Fig. 8).



**Figure 8.** Scientific interpretation of the concept of “circular bioeconomy”

**Source:** compiled by the author

The author's interpretation consists in defining circular bioeconomy as a set of social relations regarding the production and distribution (economic feature) of products based on renewable biological resources using biotechnological processes (biological feature), its exchange and responsible consumption with prolonged service life and the possibility of recycling (circular feature).

### Conclusions

Thus, the polemic of scientists on the problem of positioning the concepts of circular economy and bioeconomy on the way to the development of an integrating concept has become a prerequisite for the study of convergent similarity and divergent difference to argue the author's vision of the framework of categories. The substantiation of the need to combine concepts within which it is possible to achieve maximum processing of organic materials, minimise

production waste and use available natural resources economically allowed identifying the basic features of circular bioeconomy and establishing complementary relationships between them. Among the available characteristics, it is worth highlighting the basic ones, in particular, economy, environmental friendliness, innovativeness, and sociality, which formed the basis of generic (economic) and general (biological and circular) characteristics. This fact allowed the author of this study to form the scientific interpretation of the concept of “circular bioeconomy”, the basis of which is economic activity with an emphasis on the biological and circular aspect, which, unlike the previous definitions, is interpreted as a set of social relations regarding the production and distribution of products based on renewable biological resources through biotechnological processes, its exchange and responsible consumption with an extended service life and the possibility of recycling.

### References

- [1] Yaremova, M., Tarasovych, L., Kravchuk, N., & Kilnitska O. (2021). The evolution of Circular Bioeconomy: A bibliometric review. *E3S Web of Conferences*, 255, article number 01051.
- [2] Mohan, S.V., & Katakojwala, R. (2021). The circular chemistry conceptual framework: A way forward to sustainability in Industry 4.0. *Current Opinion in Green and Sustainable Chemistry*, 28, article number 100434.
- [3] Pandey, J.L. (2020). Policy for Bioeconomic Growth. *BioScience*, 70(6), 459-460.
- [4] D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., Leskinen, P., Matthies, B.D., & Toppinen, A. (2017). Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of Cleaner Production*, 168, 716-734.
- [5] Kelleher, L., Henchion, M., & O'Neill, E. (2019). Policy coherence and the transition to a bioeconomy: The case of Ireland. *Sustainability*, 11, article number 7247.

- [6] Meyer, R. (2017). Bioeconomy strategies: Contexts, visions, guiding implementation principles and resulting debates. *Sustainability*, 9, article number 1031.
- [7] Baidala, V.V. (2017). *Macroeconomic factors of bioeconomy development* (Doctoral thesis, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine).
- [8] Vdovichena, O.H. (2017). Bioeconomic vector of the world economic system development. *World Economy and International Economic Relations*, 4(68), 8-19.
- [9] Dobrivska, M.V. (2018). *Development of bioeconomy in the conditions of transformation of agricultural sector* (Doctoral thesis, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine).
- [10] Fedyna, S.M., Kovalov, B.L., & Ihnatchenko, V.M. (2019). Bioeconomics: The essence of the concept, strategy, state and prospects of business forms in Ukraine. *Mechanism of Economic Regulation*, 3, 16-24.
- [11] Krutiakova, V., Babynets, T., Tarhonia, V., & Bondarenko, O. (2019). Bioeconomics of the biotechnological alternatives use in agricultural production. *The Latest Technologies in Agriculture: Research and Management*, 25(39), 132-140.
- [12] Yaremova, M.I. (2020). Theoretical conceptualization of the problems of understanding bioeconomics. *Scientific Horizons*, 23(10), 78-87.
- [13] Loiseau, E., Saikku, L., Antikainen, R., Droste, N., Hansjürgens, B., Pitkänen, K., Leskinen, P., Kuikman, P., & Thomsen, M. (2016). Green economy and related concepts: An overview. *Journal of Clean Production*, 139, 361-371.
- [14] Hetemäki, L., Hanewinkel, M., Muys, B., Ollikainen, M., Palahí, M., & Trasobares, A. (2017). *Leading the way to a European circular bioeconomy strategy*. Joensuu: European Forest Institute.
- [15] Carus, M. (2017). *The bioeconomy is much more than a circular economy*. Retrieved from <https://www.brain-biotech.com/blickwinkel/circular/the-bioeconomy-is-much-more-than-a-circular-economy/>.
- [16] Stegmann, P., Londo, M., & Junginger, M. (2020). The circular bioeconomy: Its elements and role in European bioeconomy clusters. *Resources, Conservation & Recycling: X*, 6, article number 100029.
- [17] Mohan, S.V., Butti, S.K., Amulya, K., Dahiya, S., & Modestra, J.A. (2016). Waste biorefinery: A new paradigm for a sustainable bioelectro economy. *Trends in Biotechnology*, 34(11), 852-855.
- [18] Bilodid, I.K., Dotsenko, P.P., & Buriachok, A.A. (Eds). (1973). *Dictionary of the Ukrainian language* (Vol. 4). Kyiv: Naukova Dumka.
- [19] Bilodid, I.K., Dotsenko, P.P., & Yurchuk, L.A. (Eds). (1971). *Dictionary of the Ukrainian language* (Vol. 2). Kyiv: Naukova Dumka.
- [20] Lainez, M., González, J.M., Aguilar, A., & Vela, C. (2018). Spanish strategy on bioeconomy: Towards a knowledge based sustainable innovation. *New Biotechnology*, 40(A), 87-95.
- [21] Dictionary of foreign words. Principles. (n.d.). Retrieved from <https://www.jnsm.com.ua/cgi-bin/u/book/sis.pl?Qry=%EF%F0%E8%ED%F6%E8%EF>.
- [22] Explanatory dictionary of the Ukrainian language. Sign. (n.d.). Retrieved from <https://slovnyk.ua/index.php?swrd=%D0%BE%D0%B7%D0%BD%D0%B0%D0%BA%D0%B0>.
- [23] MacArthur, E. (2013). *Towards the circular economy: Opportunities for the consumer goods sector*. Retrieved from [https://www.ellenmacarthurfoundation.org/assets/downloads/publications/TCE\\_Report-2013.pdf](https://www.ellenmacarthurfoundation.org/assets/downloads/publications/TCE_Report-2013.pdf).
- [23] Schoenmakere, M.D., Hoogeveen, Y., Gillabel, J., & Manshoven, S. (2018). *The circular economy and the bioeconomy*. Luxembourg: Publications Office of the European Union.
- [24] Liubachivska, R.Z. (2018). The stages of bioeconomy evolution in the European Union. *Scientific Notes of "KROK" University*, 49, 93-100.
- [25] Orel, L.O. (2019). Proving set equality: Methodical techniques to prevent mistakes. *Physical and Mathematical Education*, 1(19), 154-159.
- [27] Konverskyi, A.Ye. (2017). *Logic* (2nd ed.). Kyiv: Ukrainian Orthodox Church "Kyiv University".
- [28] Sokolova, O., & Diachenko, S. (2021). Consolidation of Public Finances as a Tool for Minimising Disparities in the Sectoral Structure of the National Economy. *Scientific Horizons*, 24(5), 121-130. doi: 10.48077/scihor.24(5).2021.121-130

## Термінологічна платформа дослідження циркулярної біоекономіки

**Марина Іванівна Яремова**

Поліський національний університет  
10008, б-р Старий, 7, м. Житомир, Україна

**Анотація.** В умовах посилення глобальних екологічних викликів, пов'язаних з антропогенним деструктивним впливом на навколишнє природне середовище, актуальності набуває біоекономічний напрям сталого розвитку в поєднанні із замкнутим циклом виробництва, розвиток якого дасть змогу подолати дисбаланс еколого-економічної системи та мінімізувати навантаження на довкілля. Тому метою наукового дослідження є комплексний розгляд передумов становлення категоріального апарату щодо поєднання зелених концепцій сталого розвитку, зокрема обґрунтування теоретико-методологічних засад інтерпретації принципових ознак циркулярної біоекономіки задля формування власного бачення проблематики. Методологічною основою дослідження є загальнонаукові та спеціальні методи теоретико-емпіричного характеру, зокрема індуктивний і дедуктивний, евристичний метод, графічний, аналізу і синтезу тощо. На емпіричному рівні наукового дослідження використовується описовий, порівняльний та метод спостереження. Теоретичний рівень наукового дослідження охоплює історичний, абстрактно-логічний, гіпотетичний, метод формалізації як прояв логічного мислення та теоретичне узагальнення для сформулювання підсумків проведеного дослідження. У статті систематизовано думки провідних науковців щодо позиціонування циркулярної та біоекономіки, виокремлено схожості та відмінності в процесі поєднання концепцій, ідентифіковано принципові родові та видові їх ознаки, встановлено комплементарні взаємозв'язки задля генерування авторської позиції та формулювання власного бачення проблематики циркулярної біоекономіки. Практична цінність проведеного дослідження полягає у науковому обґрунтуванні термінологічної платформи проблематики циркулярної біоекономіки. Подальші дослідження націлені на розробку критеріальних характеристик регулювання біоекономічної системи з подальшою апробацією результатів

**Ключові слова:** концепція, циркулярна економіка, біоекономічна модель, конвергентна схожість, дивергентна відмінність, принципові ознаки