

УДК 338.24:502.174

A. V. Neverov, I. V. Novikova, H. A. Bahedh
Belarusian State Technological University

TOOLKIT FOR ENVIRONMENTAL MOTIVATION OF A CIRCULAR ECONOMY BASED ON THE CONCEPT OF ENVIRONMENTAL RENT

The article considers actual aspects of ecological motivation of circular economy based on its essence and the main goal of development.

The problem of formation of circular economy of oil and gas complex and the place of ecological motivation in it are highlighted. Ecological and economic interests of circular economy development are structured. All this allowed us to consider the expediency of applying the theory of natural rent (with the separation of economic and ecological components in it) to develop the methodology of building ecological motivation of circular economy.

The article also presents natural accounting, which quantitatively reflects the importance of natural resources for the national economy and the possibilities of its growth in the system of national accounts (SNA). In the context of this article natural accounting performs a purely economic function and is considered from the position of the interests of natural capital, its increment as a factor of production.

In this study, the actualization of green growth problems assumes the separation of economic and environmental assets in the composition of natural capital.

We propose a toolkit of ecological motivation of circular economy based on the concept of ecological rent, organization of ecological accounting and ESG-criteria [1].

The purpose of this article is to determine the essence of ecologically-oriented rent relations, ecological motivation of circular economy and the institutional basis for its functioning, as well as an adequate mechanism of implementation as carriers of sustainable development values.

Keywords: environmental motivation, circular economy, concept of environmental rent, environmental motivation tools, sustainable development.

For citation: Neverov A. V., Novikova I. V., Bahedh H. A. Toolkit for environmental motivation of a circular economy based on the concept of environmental rent. *Proceedings of BSTU, issue 5, Economics and Management*, 2024, no. 1 (280), pp. 32–38.

DOI: 10.52065/2520-6877-2024-280-4.

А. В. Неверов, И. В. Новикова, Х. А. Бахед

Белорусский государственный технологический университет

ИНСТРУМЕНТАРИЙ ЭКОЛОГИЧЕСКОЙ МОТИВАЦИИ ЦИРКУЛЯРНОЙ ЭКОНОМИКИ НА ОСНОВЕ КОНЦЕПЦИИ ЭКОЛОГИЧЕСКОЙ РЕНТЫ

В статье рассматриваются актуальные аспекты экологической мотивации циркулярной экономики исходя из ее сущности и главной цели развития.

Выделена проблема формирования циркулярной экономики нефтегазового комплекса и место экологической мотивации в ней. Структурированы экологические и экономические интересы развития циркулярной экономики. Все это позволяет рассмотреть целесообразность применения теории природной ренты (с выделением в ней экономической и экологической составляющих) для разработки методологии построения экологической мотивации циркулярной экономики.

В статье представлен также природный учет, количественно отражающий значение природных ресурсов для национальной экономики и возможностей ее роста в системе национальных счетов (СНС). В контексте данной статьи природный учет выполняет чисто экономическую функцию и рассматривается с позиции интересов природного капитала, его приращения как фактора производства.

В проведенном исследовании актуализация проблем зеленого роста предполагает в составе природного капитала выделение экономического и экологического активов.

Предлагается инструментарий экологической мотивации циркулярной экономики на основе концепции экологической ренты, организации экологического учета и ESG-критериев [1].

Цель данной статьи – определить сущность эколого-ориентированных рентных отношений, экологической мотивации циркулярной экономики и институциональную основу функционирования ее, а также адекватный механизм реализации как носителей ценностей устойчивого развития, что позволяет сформировать мотивацию в циркулярной экономике на основе ренты I и ренты II.

Ключевые слова: экологическая мотивация, циркулярная экономика, концепция экологической ренты, инструментарий экологической мотивации, устойчивое развитие.

Для цитирования: Неверов А. В., Новикова И. В., Бахед Х. А. Инструментарий экологической мотивации циркулярной экономики на основе концепции экологической ренты // Труды БГТУ. Сер. 5, Экономика и управление. 2024. № 1 (280). С. 32–38 (На англ.).

DOI: 10.52065/2520-6877-2024-280-4.

Introduction. Currently, the development of a circular economy is an important issue throughout the world. To form an impartial concept of the circular economy, it is necessary to cite several of the most significant and relevant definitions of “circular economy”, currently given by various authors:

Considering the existing definitions of a circular economy and the concept of its construction, we can conclude that a circular economy can be defined as an economy of green growth based on the circularity of material flows, resource efficiency and environmental motivation for its development. The circular economy is considered as [2]:

- material flow management model;
- waste management model;
- a tool for eco-balanced development;
- a tool for regulating the carbon balance and the greenhouse effect.

The circular economy has long proven its environmental and economic feasibility, especially in the context world's natural resources depletion of the and degradation of the natural environment. According to global mining data (Global mining Review) [3]:

– 7 tons of mineral raw materials were mined in the bowels of the Earth per capita in 1900, in 1980 – 27, in 2000 – 48 tons.

– over the history of mankind, about 200 billion tons of coal, about 100 billion tons of oil, 50 billion iron ore, 2 billion tons of bauxite, 300 million tons of copper ore, more than 100 thousand tons of gold were removed from the Earth, and 50 – 85% of production, excluding gold, accounts for the last 30 years;

– however, only 10% of raw materials extracted from the depths of the planet are converted into finished products, the remaining 90% are waste that pollutes the biosphere.

Definitions of the category of “circular economy”

Definition	Sources
It involves the use of fundamentally new models of production and consumption to achieve the well-being of society with low material, energy and environmental costs.	https://disser.spbu.ru/files/phd_spsu/vetrova_disser.pdf
The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.	https://ec-europa-eu.libguides.com/circular_economy
Circular economy “model of production and consumption, including sharing (including leasing), reusing, improving, recycling, and disposing of existing materials and products for as long as possible”.	https://eaf.etu.ru/assets/files/eaf21/papers/255-258.pdf
The goals of the circular economy are reflected: 1. In the USA, the Strategic Plan proprograms on sustainable materials management (Sustainable Materials Management Program Strategic Plan). 2. In France, the concept of a circular economy is reflected in the national law “On the energy transition for a green Growth” and in the national strategy for sustainable development. 3. The Italian government has formulated strategic priorities for this model. 4. In Finland, the formation of a circular economy is stated as a goal of economic development. 5. In China, the circular economy development program was adopted in 2013. 6. In Russia, the existing model of the raw material export economy is unstable and linear, with high volatility of many economic indicators, which was clearly demonstrated by the global crisis of early 2020.	https://wne.fa.ru/jour/article/view/271/26 https://wne.fa.ru/jour/article/view/271/261 https://wne.fa.ru/jour/article/view/271/261

The influence of the anthropogenic factor on the ecology does not decrease over time.

Every year the amount of waste per person increases by about 1–4%. Efforts are being made in many countries to reduce them. The efficiency of using secondary resources, based on saving raw materials and energy in combination with improving the environment, is quite obvious.

The repeated cyclical use of resources idea has found its practical implementation in many developed countries of the world: the percentage of waste used as secondary material resources is more than 50%, and the degree of reuse of environmentally hazardous metals such as lead, copper, nickel, aluminum, and zinc has reached 60–85%.

Main part. The circular economy expresses the new essence of the economy, its environmental responsibility and environmental motivation for development. Her deepest interests determine environmental needs. The basis of any economy is interest, an incentive.

The main motives for the development of the circular economy as a new direction lie in the interests of the market economy, its new goals, sectors, and environmental instruments. At the same time, the motives of the circular economy are more fundamental and affect the interests of the security of existence of the person himself and his environment.

The main goal of the circular economy is to ensure the closure of the resource cycle. The motivation for closing the cycle is determined by the value of a natural resource as a carrier of economic (commercial) effect (result) and as a carrier of environmental effect (positive or negative). It's not enough to limit the value of natural resources to their operational value and not to take into account the cost of the environmental circulation factor in the cost of the reproduction cycle.

It's necessary to initially motivate the processes of resource efficiency and resource conservation based on the environmental and economic value of the natural resource and its cyclical reproduction.

Numerous examples indicate one thing: within the framework of a circular economy, the price of “output” products are “supplemented” by the “invisible” environmental gain of its production, which, under certain regulatory conditions, is transformed into environmental rent [4]. In a circular economy, its carrier is innovative products, the production and consumption of which ensures the preservation or improvement of environmental quality.

In this case, environmental rent is part of the price of innovative products, which expresses the cost of preserving (reproducing) environmental potential because of saving material resources and preventing waste from entering the environment. Environmental rent is born as excess profit of innovative products.

Excess profit expresses the organizational and technological advantages of circular production, which is born thanks to the general achievements of scientific and technological progress and a new technological structure.

The circular economy has its own rent motive for development, the basis of which is innovative products, based on which a unique system of rent relations is formed.

Rent, being a derivative of the final (innovative) product (according to the methodology for its calculation), determines the price of the initial resource not only as a source of raw materials and energy (differential rent), but also as a resource of environmental quality (ecological rent).

Rent is generated and paid by the entire society, and is not just the result of the activities of the owner. Even during the period of the emergence of capitalist rent relations, G. George proposed introducing a land tax that would completely withdraw the amount of rent in favor of the state [5]. Modern rental relations are characterized largely by social content rather than market content.

Since environmental rent expresses the interests of the entire society, it acts as a tax incentive tool for the production of innovative products, expanding the capabilities and scale of the circular economy. If classical political economy based value on socially necessary labor costs, and classical economics based marginal utility, then the concept of sustainable development requires the inclusion of a new factor.

The environmental motivation of the circular economy is especially relevant for addressing the climate agenda and reducing greenhouse effects in the production, use of carbon fuels.

From the perspective of a circular economy, the cost (value) of a natural energy resource that is not part of a complete resource cycle is determined by differential rent and environmental rent, indicating, respectively, the value of not only the consumed carbon fuel, but also on the value of an environmental resource that neutralizes greenhouse effects during its use.

The circular economy is distinguished by an active position in the formation of sustainable environmental circulation and an adequate energy price, which also takes into account the cost of the consumed vital environmental resource, ensuring the natural balance on the earth.

In principle, the countries of the energy union (OPEC, OPEC +) are called upon to determine the green vector of global energy development. The global process of energy supply development is fundamental and therefore must have appropriate political and socio-economic interpretation and responsibility.

We need an institutional environmental regulator of energy consumption, based on the normative

value of environmental rent as a tool of a circular economy that actually takes into account the consumed environmental resources value during the extraction and use of carbon fuel.

The balance of greenhouse gases and their absorption by ecosystems at all stages of production and consumption of energy from carbohydrates is a distinctive characteristic of the circular economy of the energy-carbon complex and the basis of its environmental motivation.

The formation of a circular economy in this direction must be approached carefully, given the key role of the oil and gas complex in providing the energy for human life on the planet. As before, in the structure of energy resources, oil leads with a share of 31.2%, followed by coal – 27.2%, gas in third place – 24.7%, followed by renewable energy sources (RES) – 5.7%, which overtook nuclear energy – 4.3% [6].

In mitigating the carbon impact of the oil and gas complex on the Earth's ecology, attention should be paid not only to the carbon intensity of the energy produced and consumed (as the final product), but also to the volumes of greenhouse gases (especially methane) during well drilling and hydrocarbon production. This provision is of fundamental importance for the formation and development of environmental motivation for a circular economy of this type.

Scientific research proves that methane has 25 times the greenhouse effect potential of CO₂. Therefore, to maintain ecological balance, it is necessary to avoid the release of methane into the atmosphere [7, 8].

Today, several technologies are known for using associated petroleum gas (APG), the main component of which is methane (processing in small-sized plants; chemical processing to produce a mixture of aromatic hydrocarbons; gas-chemical process (Fischer-Tropsch) to produce methanol; utilization for own needs, use as an agent for enhancing oil recovery.

To implement the necessary technologies for the effective use (recycling) of APG, significant investments are required.

Considering that data and similar technologies are aimed at preserving and improving the quality of the environment, an adequate system of government incentives and preferential taxation, which in its construction would be based on the concept of environmental rent, is important.

Environmental rent of innovative products serves as an instrument of preferential taxation, generating additional profit due to the preservation and improvement of environmental quality because of a closed resource cycle. The environmental rent of a circular economy is "tied" to the increase in recycled waste, including environmentally hazardous ones, as well as to the real savings of material and

energy resources (savings of natural matter) and is calculated per one conventional ton, taking into account the values of the relative aggressiveness of substances emitted into the atmosphere.

The value of environmental rent of innovative products in the circular economy should be presented in statistics as a separate line.

The process of carbon sequestration and neutralization of the greenhouse effect is the most important ecosystem service that ensures natural balance. This service is aimed at recycling CO₂ and other greenhouse gases generated when using carbon fuels.

In addition, if the environmental rent of innovative products is born in the depths of technological rent, then environmental rent as the cost of ecosystem services (due to the assimilation potential of nature) is a type of natural rent, expressing its environmental value.

Thus, within the framework of a circular economy, environmental rent manifests itself in two forms [9]:

- as a type of technological rent, the carrier of which is innovative products (environmental rent I);
- as a type of natural rent, the carrier of which is an ecosystem service based on the assimilation function of nature (ecological rent II).

Based on the different economic nature of environmental rent (as technological rent and as natural rent), it is important to determine its value expression, determined by the marginal and total utility of a natural (environmental) good.

The basis of environmental rent I is the marginal utility of innovative products of the circular economy. The basis of environmental rents II is the overall utility of ecosystem services, limited in time and space, renewable resources of nature – the basis of ecological balance.

Marginal utility determines the market price of products and its part – technological (including environmental) rent.

Total utility determines the normative (institutional) price of ecosystem services-normative environmental rent.

Based on the dominant position of environmental rent in the environmental motivation mechanism of the circular economy, the most important tool for its development is natural accounting and the separation of environmental accounting from its composition.

Natural accounting is traditionally presented in the System of National Accounts (SNA), quantifying the importance of natural resources for the national economy and its growth opportunities. Natural accounting performs a purely economic function and is considered from the perspective of the interests of natural capital, its increment as a factor of production.

Updating the problems of green growth involves separating economic and environmental assets from natural capital.

Depending on what emphasis dominates in the characteristics of natural capital, its content as an asset changes: economic or environmental, or both at the same time [10].

The belonging of natural capital to a specific asset fundamentally changes the content of the assessment: as an expression of future income (economic assets) or as an expression of environmental benefits (environmental assets).

Currently, in the system of national accounts, assets include only those that are used in economic activity and (or) are the object of property rights. Their defining feature is profitability. Environmental assets are not reflected in national wealth (in essence, environmental assets are close to intangible assets).

From a green growth perspective, an asset is not only something that generates income, but also something, that satisfies a need. An environmental asset as a natural asset of the life of society determines going beyond “profitable” interests and dictates a new approach to understanding and building assets. Along with economic assets, there should be equal assets of another kind that ensure the satisfaction of basic human needs, including the needs for a high-quality living environment [11].

The independent status of environmental accounting suggests that the mechanical division of accounting: within the framework of the SNA or outside the framework of the SNA is insufficient [12–15]. The independence of environmental accounting indicates a different methodology for its organization, which is determined by the need to satisfy a completely new class of needs – environmental, associated with the formation of a new environmentally oriented economy. The basis of environmental accounting is determined by ecosystem accounting. Its object is an ecological resource, a renewable natural resource with a pronounced function of environment formation and maintenance of ecological balance. This is a resource for the constant production of ecosystem services.

The independent direction of ecosystem accounting (outside the SNA based on economic assets) removes the problem of the “violence” of economic accounting over environmental accounting and frees us from the desire to reduce natural resources that are irreducible in their socio-economic significance and nature of use.

The environmental accounting system is a basic tool for environmental motivation of the circular economy, but it cannot fully express its interests, especially in terms of the socio-ecological-economic dynamics of sustainable development. Tools that are more active are needed.

Taking this circumstance into account, science and practice have recently developed and implemented new methods for regulating heterogeneous but interconnected processes, providing the desired

effect, which is measured not only in monetary units, but also in the degree of satisfaction of pressing needs (social, environmental, etc.).

In this aspect, the most popular are ESG-criteria (E) – ecology, S – social development, G – corporate governance [1].

ESG as a complex system expresses the strategic direction of development and transformation of economic activities (company, sectors) towards more fully taking into account the need to protect the environment, social development and improve corporate governance, excluding decision-making only based on economic criteria [5].

It's important to emphasize once again: the ESG system is designed to emphasize the higher value of strategic goals compared to current economic interests. This emphasis is especially important for the circular economy, the development of which is determined not only by the possibility of obtaining super-profits based on innovative technologies, but also by the need to recover waste, improve the environment and improve its quality, and ultimately create complete technologies and cycles.

Such a large-scale task is solved by taking into account many factors and the movement of social and environmental effects that are different in nature, and not just purely economic ones.

The environmental motivation of the circular economy can be filled with strategic content because of the use of ESG – systems for which the priority of achieving social and environmental goals is decisive.

Conclusion. The circular economy expresses the new essence of development. Its purpose is to ensure the closure of the resource cycle, taking into account all stages of the exchange of substances between nature and society, including the extraction of natural resources from nature, their involvement in economic circulation and the return of natural substances after its ecological transformation into the environment.

The motives for developing a circular economy are dictated not only by the interests of the economy. These motives are more fundamental and affect the interests of the very existence of humanity and its habitat. The deep essence of the circular economy is determined by the environmental needs of man (society).

The circular economy, as an economy of resource conservation and resource efficiency, determines the movement of the entire economy in an environmentally oriented direction. Its goal is to produce not only innovative rent, but also environmental rent. Saving natural raw materials, (energy) is equivalent to preserving environmental potential.

Taking into account that the rental value of a natural resource is determined based on the final product, including innovation rent; the motivation

for the full resource cycle is determined by environmental rent. In addition, if differential rent expresses the current interests of sustainable environmental management, and innovative rent expresses high profitability, then environmental rent is the long-term economic interest of maintaining environmental balance.

The basis of environmental motivation will be determined by environmental rent I and environmental rent II.

The carrier of environmental rent I is the marginal utility of innovative products, and the carrier of environmental rent II is the total utility of ecosystem services.

As the main tool for environmental motivation, an environmental accounting system is proposed, which is distinguished from natural accounting, as well as the ESG system, which expresses the strategic goals of green growth and circular economy

References

1. Belyaeva Yu., Danilova V. O. Novikova I. V. *Korporativnyye strategii i tekhnologii v usloviyakh ESG-transformatsii biznesa* [Corporate strategies and technologies in the context of ESG – business transformation]. Moscow, Knorus Publ., 2023. 332 p. (In Russian).
2. Batova N., Viets Kh., Derozhko S., Lobanov E., Sysoev S. Batova N., Viets Kh., Derozhko S., Lobanov E., Sysoev S., Tochitskaya I., Shershinovich E. *Tsirkulyarnaya ekonomika: kontseptual'nyye podkhody i instrument ikh realizatsii* [Circular economy: conceptual approaches and tools for their implementation]. Minsk, Medisont Publ., 2020. 212 p. (In Russian).
3. Global mining Review. Available at: <http://www.globalminingreview.com> (accessed 01.11.2023) (In Russian).
4. Neverov A. V., Bahedh H. A. Formation of the conceptual foundations for the construction of cost accounting of forest ecosystem services. *Vesti Natsyonal'nykh akademii nauk Belarusi* [Proceedings of the National Academy of Sciences of Belarus], series Humanitarian, 2022, no. 3, pp. 332–340 (In Russian).
5. George H. *Progress and poverty*. New York NY, Fond Shal'kenbakha Publ., 2006. 593 p.
6. Electric Power Council of the commonwealth of Independent states executive committee. Available at: <http://energo-cis.ru/news/dolya> (accessed 01.02.2024) (In Russian).
7. Yakovets Yu. V. *Renta, antirenta, kvazirenta v global'no-tsivilizovannom izmerenii* [Rent, anti-rent, quasi-rent in the global civilizational dimension]. Moscow, Akademkniga Publ., 2003. 240 p (In Russian).
8. Veklich O. Ecological Rent: Essence, Varieties, Forms. *Voprosy Ekonomiki* [Economic issues], 2006, no. 11, pp. 104–110 (In Russian).
9. Neverov A. V., Gervava A. I. *Ekologicheski sbalansirovannyi rost: politika, model', instrument regulirovaniya* [Eco-balanced growth: policy, model, regulatory tools]. Minsk, BGTU Publ., 2024. 209 p. (In Russian).
10. Neverov A. V., Bahedh H. A. Ecosystem services of forests in Belarus: physical and value measurement. *Belorusskiy ekonomicheskii zhurnal* [Belarusian Economic Journal], 2022, no. 2, pp. 107–121 (In Russian).
11. Bahedh H. A. *Ekosistemnyy uchet lesov Iraka kak instrument ustoychivogo prirodoopol'zovaniya. Avtoreferat dissertatsii kandidata ekonomicheskikh nauk* [Ecosystem accounting of Iraqi forests as a tool for sustainable environmental management. Abstract of thesis PhD (Economics)]. Minsk, 2022. 26 p. (In Russian).
12. Accounting for natural resources-land resources and subsoil resources – in the Australian Bureau of Statistics: materials of the conference. *European statisticians*, April 26–29. 2010, 21 p.
13. Central basis of the Natural Economic Accounting System, United Nations. Available at: https://unstats.un.org/unsd/envaccounting/seeaRev/CF_trans/SEEA_CF_Final_ru.pdf (accessed 02.10.2023) (In Russian).
14. Green Growth Indicators. Available at: <http://dx.doi.org/10.1787/9789264202030-4-en> (accessed 25.11.2023) (In Russian).
15. Harte M. J. Ecology sustainability and environment as capital. *Ekologicheskaya ekonomika* [Ecological Economics], 1995, no. 15, pp. 157–164 (In Russian).

Список литературы

1. Корпоративные стратегии и технологии в условиях ESG-трансформации бизнеса / И. Ю. Беляева [и др.]. М.: Кнорус, 2023. 332 с.
2. Циркулярная экономика: концептуальные подходы и инструменты их реализации / Н. Батова [и др.]. М.: Медисонт, 2020. 212 с.
3. Глобальный обзор горнодобывающей промышленности. URL: <http://www.globalminingreview.com> (дата обращения: 01.11.2023).
4. Неверов А. В., Бахед Х. А. Формирование концептуальных основ построения стоимостного учета экосистемных услуг лесов // Весці Нацыянальнай акадэміі навук Беларусі. Сер. гуманітарных навук. 2022. № 3. С. 332–340.
5. George H. *Progress and poverty*. New York NY, Fond Shal'kenbakha, 2006. 593 p.
6. Исполнительный комитет электроэнергетического Совета Содружества Независимых Государств. URL: http://energo-cis.ru/news/dolya_vozobnovlyaemykh (дата обращения: 01.02.2024).

7. Яковец Ю. В. Рента, антирента, квазирента в глобально-цивилизационном измерении. М.: Академкнига, 2003. 240 с.
8. Веклич О. Экологическая рента: сущность, разновидности, формы // Вопросы экономики. 2006. № 11. С. 104–110.
9. Неверов А. В., Геврасёва А. П. Экологически сбалансированный рост: политика, модель, инструменты регулирования. Минск: БГТУ, 2024. 209 с.
10. Неверов А. В., Бахед Х. А. Экосистемные услуги лесов Беларуси: физическое и стоимостное измерение // Белорусский экономический журнал. 2022. № 2. С. 107–121.
11. Бахед Х. А. Экосистемный учет лесов Ирака как инструмент устойчивого природопользования: автореф. дис. ... канд. экон. наук: 08.00.05. Минск, 2022. 26 с.
12. Accounting for natural resources-land resources and subsoil resources – in the Australian Bureau of Statistics: materials of the conference. *European statisticians*. April 26–29. 2010. 21 p.
13. Центральная основа системы природно-экономического учета. URL: https://unstats.un.org/unsd/envaccounting/seeaRev/CF_trans/SEEA_CF_Final_ru.pdf (дата обращения: 02.10.023).
14. Показатели зеленого роста. URL: <http://dx.doi.org/10.1787/9789264202030-en> (дата обращения: 25.11.2023).
15. Harte M. J. Ecology sustainability and environment as capital. *Ecological Economics*, 1995, no. 15. P. 157–164.

Information about the authors

Neverov Aleksandr Vasil'yevich – DSc (Economics), Professor, Professor, the Department of Management, Business Technologies and Sustainable Development. Belarusian State Technological University (13a, Sverdlova str., 220006, Minsk, Republic of Belarus). E-mail: Neverov@belstu.by

Novikova Irina Vasil'yevna – DSc (Economics), Professor, Head of the Department of Management, Business Technologies and Sustainable Development. Belarusian State Technological University (13a, Sverdlova str., 220006, Minsk, Republic of Belarus). E-mail: xenia2012@belstu.by

Bahedh Hayder Azeez Bahedh – PhD (Economic), Assistant, the Department of Management, Business Technologies and Sustainable Development. Belarusian State Technological University (13a, Sverdlova str., 220006, Minsk, Republic of Belarus). E-mail: bahtdh54@belstu.by

Информация об авторах

Неверов Александр Васильевич – доктор экономических наук, профессор, профессор кафедры менеджмента, технологий бизнеса и устойчивого развития. Белорусский государственный технологический университет (220006, Минск, ул. Свердлова, 13а, Республика Беларусь). E-mail: Neverov@belstu.by

Новикова Ирина Васильевна – доктор экономических наук, профессор, заведующий кафедрой менеджмента, технологий бизнеса и устойчивого развития. Белорусский государственный технологический университет (220006, г. Минск, ул. Свердлова, 13а, Республика Беларусь). E-mail: xenia2012@belstu.by

Бахед Хайдер Азиз Бахед – кандидат экономических наук, ассистент кафедры менеджмента, технологий бизнеса и устойчивого развития. Белорусский государственный технологический университет (220006, г. Минск, ул. Свердлова, 13а, Республика Беларусь). E-mail: bahtdh54@belstu.by

Received 05.02.2024