

Corporate carbon management system

© 2023. E. V. Karanina¹ ORCID: 0000-0002-5439-5912, N. N. Ilysheva² ORCID: 0000-0002-7876-9376,
E. V. Baldesku³ ORCID: 0000-0002-7876-9376, A. F. Toporkova⁴ ORCID: 0000-0002-7876-9377

¹Vyatka State University,

36, Moskovskaya St., Kirov, Russia, 610000,

²Ural Federal University named after the first President
of Russia B. N. Yeltsin,

19, Mira St., Yekaterinburg, Russia, 620002,

³JSC “VNIIneft named after Academician A. P. Krylov”,
10, Dmitrovsky Proezd, Moscow, Russia, 127422,

⁴JSC “Zarubezhneft”,

9, Armyansky Pereulok, Moscow, Russia, 101000,

e-mail: karanina@vyatsu.ru, elena.baldesku@yandex.ru

The basis of the company’s decarbonization is the effective management of greenhouse gas emissions. The article visualizes in graphic material the forecast values of the mass of greenhouse gas emissions in the fuel and energy sector of Russia until 2030 and determines the trends in their changes. Based on the results of the analysis, it was revealed that in order to achieve a low-carbon development path, it is necessary to introduce additional measures to reduce greenhouse gas emissions. The purpose of the scientific research is to develop a corporate carbon management system, which can become a guideline for the development of corporate systems by Russian oil and gas companies.

A reliable system for recording and monitoring greenhouse gas emissions serves as the basis for obtaining up-to-date, complete and reliable data. At the same time, for the quality control of the decarbonization process, a scheme of interaction within the company should be clearly built. The development and implementation of a carbon management system will allow the company to systematically reduce greenhouse gas emissions, which will create conditions for the transformation of climate risks associated with government regulation into the category of opportunities such as entering carbon markets, attracting investors, etc. The authors note that in most large Russian companies have already developed and introduced carbon management systems into production.

After analyzing the current greenhouse gas accounting system of JSC “Zarubezhneft”, the authors propose to create a carbon management system taking into account the specifics of the company, which consists in organizing activities on the territory of different countries (Cuba, Bosnia and Herzegovina, Egypt, Uzbekistan, Indonesia, Vietnam and Russia). It is proposed to adapt the methodological approaches for calculating greenhouse gas emissions to the requirements of the legislation in force in the territory where the production facilities of the JSC “Zarubezhneft” are located, and also to apply national coefficients in the calculation to ensure more accurate emission estimates.

The result of the study is the development of the concept of the carbon management system of JSC “Zarubezhneft”.

Keywords: emissions management, greenhouse gases, decarbonization, climate change, sustainable development.

УДК 502.3/.7

Корпоративная система углеродного менеджмента

2023. Е. В. Каранина¹, д. э. н., профессор, зав. кафедрой,
Н. Н. Ильшева², д. э. н., профессор,
Е. В. Балдеску³, к. э. н., гл. специалист НТЦ,
А. Ф. Топоркова⁴, руководитель центра компетенций ESG,

¹Вятский государственный университет,
610000, Россия, г. Киров, ул. Московская, д. 36,

²Уральский федеральный университет
им. первого Президента России Б. Н. Ельцина,
620002, Россия, г. Екатеринбург, ул. Мира, д. 19,

³АО «ВНИИнефть им. академика А.П. Крылова»,
127422, Россия, г. Москва, пр-д Дмитровский, д. 10,
⁴АО «Зарубежнефть»,
101000, Россия, г. Москва, Армянский пер., д. 9,
e-mail: karanina@vyatsu.ru, elena.baldesku@yandex.ru

Основой декарбонизации компании является эффективное управление выбросами парниковых газов. В статье визуализированы в графический материал прогнозные значения массы выбросов парниковых газов в топливно-энергетическом секторе России до 2030 г. и определены тенденции их изменений. По результатам анализа выявлено, что для достижения низкоуглеродного пути развития необходимо введение дополнительных мер по снижению выбросов парниковых газов. Цель научного исследования заключается в разработке корпоративной системы углеродного менеджмента АО «Зарубежнефть», которая может стать ориентиром для разработки корпоративных систем российскими нефтегазовыми компаниями.

Надёжная система учёта и мониторинга выбросов парниковых газов служит основой для получения актуальных, полных и достоверных данных. При этом для качественного контроля процесса декарбонизации должна быть чётко выстроена схема взаимодействия внутри компании. Разработка и внедрение системы углеродного менеджмента позволит компании планомерно сокращать выбросы парниковых газов, что создаст условия для трансформации климатических рисков, связанных с государственным регулированием, в категорию таких возможностей как выход на углеродные рынки, привлечение инвесторов и др. Авторы отмечают, что в большинстве крупных российских компаний уже разработаны и внедрены в производство системы углеродного менеджмента.

Проанализировав действующую систему учёта парниковых газов ГК «Зарубежнефть», авторами предлагается создать систему углеродного менеджмента с учётом специфики компании, заключающейся в организации деятельности на территории разных стран (Куба, Босния и Герцеговина, Египет, Узбекистан, Индонезия, Вьетнам и Россия). Предлагается адаптировать методические подходы по расчёту выбросов парниковых газов к требованиям законодательства, действующего на территории расположения производственных объектов ГК «Зарубежнефть», а также при расчёте применять национальные коэффициенты для обеспечения более точных оценок эмиссии.

Результатом исследования является разработка концепции системы углеродного менеджмента ГК «Зарубежнефть».

Ключевые слова: управление выбросами, парниковые газы, декарбонизация, изменение климата, устойчивое развитие.

Human activities create 18 gigatonnes of carbon emissions each year in the fast carbon cycle (biosphere, hydrosphere, atmosphere) that are not absorbed by the oceans and land cover, thereby upsetting the balance in the geochemical carbon cycle [1].

Global baseline emissions of greenhouse gases (GHG) are projected to be seven times the level needed to keep global warming below 1.5 C by 2050 [2]. At the same time, according to the results of a number of scientific studies, the oil and gas industry will account for up to 25% of the total emissions [3]. Today, shareholders, financial institutions and regulators are increasing pressure on enterprises that do not meet the requirements for reducing GHG emissions, including taking on obligations to reduce emissions, worsening financing conditions and excluding assets from investment portfolios [4].

Projected scenarios for GHG emissions from the fuel and energy complex of the Russian Federation, taking into account the implementation of decarbonization measures for the period up to 2030, are presented in Figure.

Total GHG emissions from the fuel and energy complex of the Russian Federation are grouped into two scenarios according to the

criteria “with measures” (regulatory legal acts and sectoral strategic planning documents provide for both market (tax and tariff) and administrative regulatory measures) and “with additional measures” (measures to absorb and reduce greenhouse gas emissions, such as increasing the absorptive capacity of managed ecosystems). The transition to a “low-carbon” path of development is possible only with the implementation of additional measures, i. e., according to the second scenario (Fig.).

Thus, in order to switch to the path of low-carbon development on a national scale, it is necessary to implement additional measures [7].

The main objective of the national policy in the field of climate change mitigation is the creation of effective carbon management systems that allow setting goals and achieving results in reducing greenhouse gas emissions [8].

Objects and methods of research

The object of the study is the integrated oil and gas company JSC “Zarubezhneft”. Based on the analysis of the historical stages of development of the current greenhouse gas emission accounting system and the company’s existing

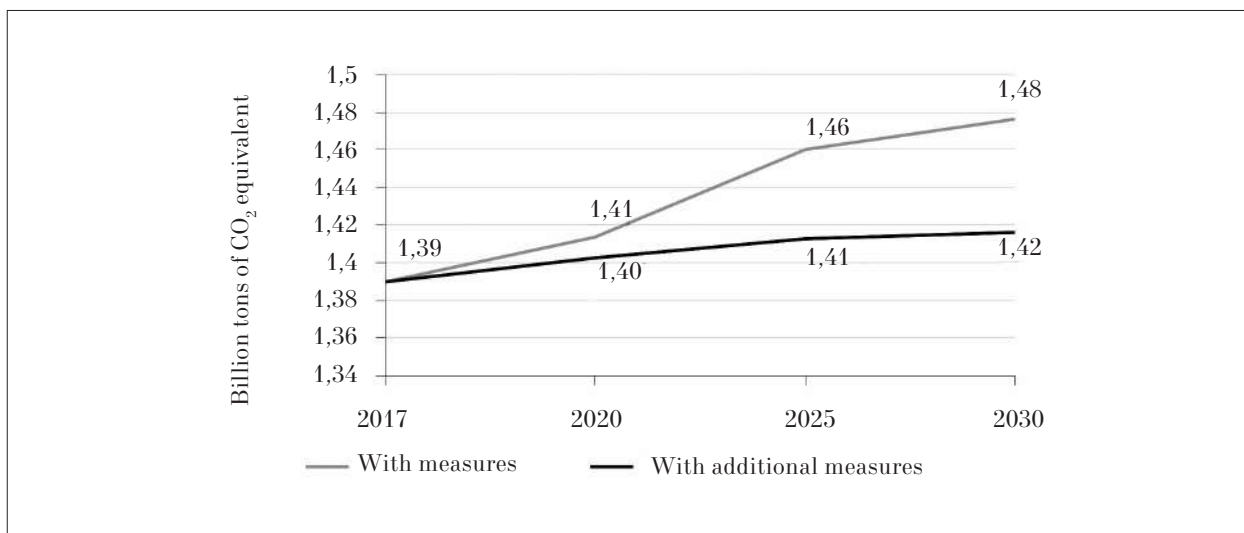


Fig. Greenhouse gases emissions in the fuel and energy complex of the Russian Federation (forecast values) [6]

experience in this area, priority areas for the development of a carbon management system in modern conditions were identified.

Using methods of the theoretical level (analysis, analogy, etc.), the concept of the corporate carbon management system of JSC “Zarubezhneft” was developed and recommendations were proposed for the development of corporate guidelines for the quantitative determination of greenhouse gas emissions, taking into account the specifics of the company, which consists in organizing activities on the territory of different countries.

Analysis of the stages of development of the current greenhouse gas emission accounting system of JSC “Zarubezhneft”

JSC “Zarubezhneft” shares the goals and objectives of the Strategy for the Social and Economic Development of the Russian Federation with Low Greenhouse Gas Emissions until 2050 and recognizes the importance of addressing climate change challenges in the context of sustainable and responsible business, taking into account the main trends in regulation in the field of GHG emissions and combating climate change in the regions of presence and in the main sales markets [9].

In connection with the development in the Russian Federation of a system for monitoring, reporting and verifying the volume of anthropogenic greenhouse gas emissions, JSC “Zarubezhneft” has been working since 2014 to develop a system for accounting for greenhouse gas emissions. Since 2014, the Instruction on the

procedure for preparing and submitting initial data for calculating greenhouse gas emissions has been put into effect. Since 2015, the calculation of the level of greenhouse gas emissions by the production assets of the Russian segment has been carried out.

In 2022, in order to develop and implement the decarbonization action plan, a centralized resource was created on the basis of the corporate center to coordinate efforts at all levels of the company, support work on the preparation of measures and their preliminary assessment. Work is underway to form a functional strategy for sustainable development and decarbonization of the company.

In the same year, work began on the development of a carbon management system. For all assets of the company, an inventory of greenhouse gas emissions was carried out, a base year was determined, and the carbon footprint of products was calculated. The assessment was made for three scopes: direct emissions (scope 1), indirect energy emissions (scope 2) and other indirect emissions (scope 3). The results obtained will be analyzed to set targets for achieving the company’s low-carbon development model.

In 2023, it is planned to develop a regulation and scheme for interaction between enterprises and divisions of JSC “Zarubezhneft” on carbon management and decarbonization of the company.

In the same year, it is planned to automate accounting for greenhouse gas emissions – as part of the development of the operational monitoring center system, a section on accounting for greenhouse gas emissions is being prepared for

launch. The data in the information system will be updated on a monthly basis.

JSC “Zarubezhneft” also implements measures and programs for the development and implementation of renewable energy sources in the regions of its presence.

In addition to the development of renewable energy sources, JSC “Zarubezhneft” is implementing a gas program for the rational use of associated petroleum gas. Its main goal is to reduce the negative impact on the environment by increasing the use of associated petroleum gas and reducing the volume burned at flares.

Another measure aimed at reducing greenhouse gas emissions is to increase the company’s energy efficiency. This program is based on the rational use of lighting, the use of energy-efficient electric motors, the use of emergency heating in administrative buildings, raising awareness of employees about the need to save electricity and fuel in the production process, etc.

Consistent and full-fledged implementation of these programs has become the basis for creating a common strategy in the field of sustainable development and decarbonization of the activities of individual assets and the company as a whole.

The concept of the carbon management system of JSC “Zarubezhneft”

A company’s carbon management system should include three main elements: inventory, strategy and monitoring [10]. At the same time, the inventory of greenhouse gas emissions is the central element of the system. Based on the base year inventory data, targets are set to reduce greenhouse gas emissions [11].

Inventory. During the inventory process, the company defines organizational boundaries. The purpose of this stage is to form a list of sources that are under the operational control of the company [12].

To determine the current level of greenhouse gas emissions, both the calculation method and the instrumental one can be used. Quantification methods should provide a minimum level of error. At the same time, countries approve their own emission factors at the national level. Taking into account the peculiarities of the organization of JSC “Zarubezhneft” activities in different countries, in order to minimize the error, it is proposed to adapt national methodological approaches to the calculation of greenhouse gas emissions of Russian and foreign assets. At the same time, in order to publish the consolidated results of

calculations of GHG emissions, a unified approach based on international methodological documents should be adopted [13].

Based on the results of the inventory, a register of greenhouse gas emissions is compiled, on the basis of which targets are set to reduce greenhouse gas emissions [14].

Carbon reporting is prepared in accordance with the requirements of the law and reflects the results achieved by the company in reducing greenhouse gas emissions [15].

Monitoring of GHG emissions is intended to update the emission register. Through monitoring, the status of implementation of measures to reduce greenhouse gas emissions is controlled and their effectiveness is assessed [16].

The collection, processing and storage of data are regulated by the relevant corporate documents. To automate the accounting of greenhouse gas emissions, an information system can be provided in the company. JSC “Zarubezhneft” plans to launch a section for monitoring greenhouse gas emissions as part of the development of the operational monitoring center system.

Data control and management procedures are designed to control the quality of the greenhouse gas register and should be integrated into the corporate governance system [17].

The strategy of sustainable development and decarbonization ensures that the goals and activities of the company are in line with the main directions of state policy in the field of reducing greenhouse gas emissions. To effectively manage emissions, the company defines a base year and sets targets based on the emissions forecast [18].

To achieve the goals of the strategy, an action plan is developed and implemented to reduce greenhouse gas emissions [19], which may include measures aimed at introducing renewable energy sources and increasing energy efficiency, implementation of forest climate projects [20].

The concept of the carbon management system of JSC “Zarubezhneft” is shown in Figure 2.

The carbon management system allows, under changing conditions, to evaluate options for managing greenhouse gas emissions and make the most effective decision to achieve the goals [21].

Development of corporate guidelines for the quantitative determination of greenhouse gas emissions

One of the important tasks in the development of corporate guidelines for the quantifica-

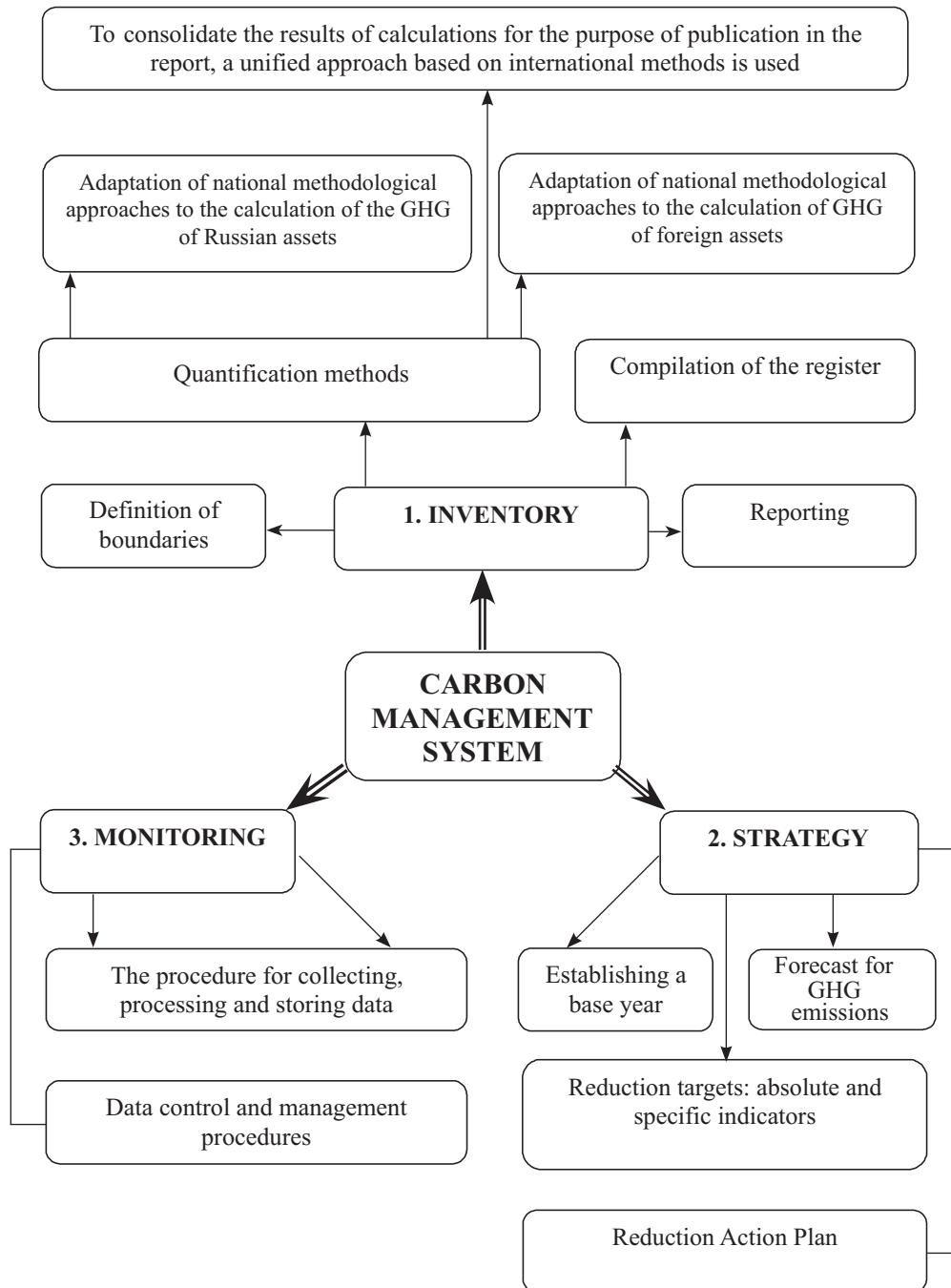


Fig. 2. The concept of the carbon management system of JSC “Zarubezhneft”

tion of GHG emissions for a company with a presence in different countries is to ensure the compatibility of guidelines with national inventory methodologies [22].

The purpose of developing corporate guidelines is to adapt national methodologies for calculating GHG emissions to the operating conditions of subsidiaries located both in the Russian Federation and in foreign countries [23].

When developing corporate guidelines, Russian methodological documents (Order of the Ministry of Natural Resources of the Russian Federation of May 27, 2022 No. 371, Order of the Ministry of Natural Resources of the Russian Federation of June 29, 2017 No. 330) and international methodological documents (IPCC Guidelines, GHG Protocol), since these documents describe in detail the calculations of GHG emissions by the main categories of the

inventory, as well as national methodological documents that are in force in the territories of the countries where the company operates [24]. Methodological guidelines should take into account the calculations of all types of GHGs, regulated by national regulations in the countries where the company operates [25].

For the storage and operational use of data, the guidelines should provide for forms and periods of reporting with the appointment of responsible persons. Reporting forms should be designed with internal use in mind, and should also include reporting at the state level [26].

Due to the all-Russian trend towards digitalization and import substitution of foreign software, guidelines should include not only a detailed description of the quantitative calculation procedures with indication of regulatory documents, but also a description of business processes for further correct integration into the already existing model for monitoring oil and gas production processes [27]. The purpose of this model is the online monitoring mode. Greenhouse gases emissions in this system are an integral part of the overall process [28].

To adapt the developed corporate guidelines to the national conditions of the countries where the company operates, as well as for ease of use, they may additionally include: 1) available national energy coefficients; 2) IPCC default coefficients; 3) GHG types regulated for calculation by national regulatory documents; 4) nationally accepted global warming potentials; 5) rules and procedures for internal audits (including reconciliation of information from documents with data from metering devices).

Guidelines should be systematized, set out as simply and clearly as possible. Recommended methods should be substantiated by references to a regulatory and prescriptive document.

Conclusion

Commitment to the goals of low-carbon development and presentation of the results of its activities in terms of the scale of the impact on the climate and the reduction of greenhouse gas emissions are the most important tasks for achieving carbon neutrality.

The introduction of a carbon management system will allow the company to apply a unified approach to managing greenhouse gas emissions, monitor the effectiveness of measures to reduce emissions, including the use of both internal reserves (energy efficiency measures, implementation of climate projects, carbon cap-

ture utilization and storage projects – CCUS) and external opportunities (entry into carbon markets, work with suppliers), adapt to climate change and build effective interaction with government agencies and stakeholders.

Based on the results of the analysis of the current greenhouse gas emission accounting system, the concept of the carbon management system of JSC “Zarubezhneft” was proposed, taking into account the specifics of the company, which consists in organizing activities on the territory of different countries

The article was prepared with the support of the grant of the President of the Russian Federation NSh-5187.2022.2 for state support of young Russian scientists and state support for leading scientific schools of the Russian Federation within the framework of the research topic “Development and justification of the concept, an integrated model of resilience – diagnosing risks and threats to the security of regional ecosystems and technology of its application based on the digital twin”.

References

- Hill L.B., Li X.C., Wei N. CO₂-EOR in China: A comparative review // International Journal of Greenhouse Gas Control [Internet resource] <https://www.sciencedirect.com/science/article/pii/S1750583620305983> (Accessed: 28.02.2023). doi: 10.1016/j.ijggc.2020.103179
- Cooney G., Littlefield J., Marriott J., Skone T. Evaluating the climate benefits of CO₂-Enhanced oil recovery using life cycle analysis // Environ. Sci. Technol. [Internet resource] <http://acs.est.5b00700> (Accessed: 03.01.2023). doi: 10.1021/acs.est.5b00700
- CNPC Oil Provinces Summary [Internet resource] <http://www.cnpc.com.cn/en/operatediol/201405/2a55baf2e8a9420187880810fe91728f.shtml> (Accessed: 28.02.2023).
- Corporate development strategy of JSC “Zarubezhneft” 2021–2030. Moskva: Izdatelstvo VES MIR, 2020. P. 33–39 (in Russian).
- Zagirova S.V., Mikhailov O.A. Seasonal changes in the concentration and net exchange of CO₂ in the ecosystem of the spruce forest of the middle taiga subzone // Theoretical and Applied Ecology. 2022. No. 3. P. 226–234 (in Russian). doi: 10.25750/1995-4301-2022-3-226-234
- Fourth Biennial Report of the Russian Federation submitted in accordance with Decision 1/CP.16 of the Conference of the Parties to the UNFCCC [Internet resource] https://unfccc.int/sites/default/files/resource/10469275_Russian%20Federation-BR4-1-4BR_RUS.pdf (Accessed: 02.11.2022).

7. Mayorova T.V., Belik I.S. Efficiency of environmental management in the context of the development of a low-carbon economy // *Economics and Entrepreneurship*. 2015. No. 12–2 (65). P. 1147–1152 (in Russian).
8. Mayorova T.V. The possibility of evaluating the effectiveness of environmental management by elements of non-financial reporting // *Economics and Entrepreneurship*. 2015. No. 11–1 (64). P. 646–650 (in Russian).
9. Annual report “Competencies of Success” for 2019 of JSC “Zarubezhneft” [Internet resource] https://www.zarubezhneft.ru/ru/ustoichivoe_razvitie/ (Accessed: 01.02.2023).
10. Belik I.S., Maiorova T.V. Indicators of environmental performance and energy efficiency of businesses under the low-carbon economy development // *Advances in Computer Science Research*. 2016. V. 51. P. 426–430.
11. Pakhomova N., Endres A., Richter K. Environmental management. Sankt-Peterburg: Peter, 2003. 544 p. (in Russian).
12. Saldaeva E.Yu., Fedyukov V.I. Fundamentals of the audit of the quality management system. Yoshkar-Ola: Volga State Technological University, 2022. 102 p. (in Russian).
13. Global Carbon Atlas [Internet resource] <http://www.globalcarbonatlas.org/en/CO2-emissions> (Accessed: 01.03.2023).
14. Strukova M.N., Strukova L.V. Ecological management and audit. Yekaterinburg: Ural Federal University, 2016. 80 p. (in Russian).
15. Peters G.P. From production-based to consumption based national emission inventories // *Ecological Economics*. 2008. V. 65. No. 1. P. 13–23. doi: 10.1016/j.ecolecon.2007.10.014
16. Decarbonization in the oil and gas industry: international experience and Russian priorities / Eds. T. Mitrova, I. Gaida. Moskva: Energy Center of the Moscow School of Management Skolkovo, 2021. 158 p. (in Russian).
17. Soils and global change in the carbon cycle over geological time // Eds. H.D. Holland, K.K. Turekian. Oxford, 2004. 605 p.
18. Ayres U., Kneese A. Production, consumption and externalities // *American Economic Review*. 1969. No. 59. P. 282–297.
19. Wiedmann T. Editorial: carbon footprint and input-output analysis // *Economic Systems Research*. 2009. V. 21. No. 3. P. 175–186. doi: 10.1080/09535310903541256.
20. Gordeeva E.M., Vedernikova I.E. Forest climate projects in Russia: current legal support // *Theoretical and Applied Ecology*. 2022. No. 2. P. 209–215. doi: 10.25750/1995-4301-2022-2-209-215
21. Sosnina E.N., Masleeva O.V., Pachurin G.V. Comparative evaluation of options for solving the problem of greenhouse gases in the energy sector // *Sovremennye problemy nauki i obrazovaniya*. 2013. No. 3. P. 161–165 (in Russian).
22. Ilysheva N.N., Karanina E.V., Baldesku E.V., Zakirov U.Sh. Detection of the interdependence of economic development and environmental performance at the industry level // *Montenegrin Journal of Economy*. 2017. No. 4. P. 19–29. doi: 10.14254/1800-5845/2017.13-4-2
23. Ilysheva N.N., Karanina E.V., Baldesku E.V. Assessment of the applicability of methodological guidelines and guidelines for the quantitative determination of greenhouse gas emissions // *Earth and Environmental Science (EES)* [Internet resource] <http://esgmt2021.ru/index.php/ru/> (Accessed: 15.02.2023).
24. Ilysheva N.N., Karanina E.V., Baldesku E.V. Analysis of the factors of sustainable development of ecosystems in the territories of the North // *E3S Web of Conferences* [Internet resource] <https://doi.org/10.1051/e3sconf/202020808020> (Accessed: 23.02.2023).
25. Ilysheva N.N., Karanina E.V., Ledkov G.P., Baldesku E.V. The relationship of the components of sustainable development for the indigenous peoples of the North // *Economics and Management: Problems, Solutions*. 2020. No. 2 (8). P. 101–110 (in Russian). doi: 10.34684/ek.up.p.r.2020.08.02.014
26. EIA Atlas of Energy [Internet resource] <http://energyatlas.iea.org/#!/tellmap/1378539487> (Accessed: 01.03.2023).
27. Earth System Science [Internet resource] <http://www.earth-syst-sci-data.net/8/605/2016/> (Accessed: 20.12.2022).
28. Pystina N.B., Sharikhina L.V., Kosolapova E.V. Implementation of the roadmap for the greenhouse gas emission management system in Gazprom Group companies for the period up to 2030 // *Ecological safety in the gas industry (ESGI-2021): Sbornik materialov VII mezhdunarodnoy nauchno-practicheskoy konferentsii*. Moskva: Publishing house LLC “Research Institute of natural gases and gas technologies”, Gazprom VNIIGAZ, 2021. P. 43–44 (in Russian).