Sustainable Development of Mining Regions

Subjects: Economics

Contributor: Natalia Kirsanova , Marina Nevskaya , Semyon Raikhlin

The Arctic's specific conditions require increased attention to natural and human capital. Therefore, implementing the principles of the sustainable development concept, balancing economic, social, and environmental goals is of paramount importance. Mining is at the heart of the strategy for the socio-economic development of Russia's Arctic territories.

sustainable development | mining industry | rental income | AZRF | fiscal capacity | HHIoindustry index

1. Introduction

The sustainable development concept has long been the focus of academic and applied research. R.K. Singh and his colleagues [1] list 80 indices for assessing sustainability in different aspects of development. The number of interpretations and methods of sustainability assessment is growing along with the development of countries' socio-economic systems and new geopolitical and climatic challenges. Cultural differences between countries, large differentiation of countries by socio-economic development, demographic situation, industrial structure, and the position in the international division of labor result in various understandings of the sustainable development concept and different priorities in achievement of sustainable development goals (SDGs). Today, the humanization of ideology gives way to resources issues and the ability to access them. For example, in 2022, several coal-fired power stations resumed operation in Germany, the green energy "flagship", in order to replace Russian gas (https://www.bloomberg.com/news/articles/2022-12-22/germany-returns-to-coal-as-energy-security-trumps-climate-goals?srnd=premium-europe (accessed on 13 January 2024). Austria, France, Germany, Greece, Hungary, Italy, the Netherlands, Spain, and the UK have taken measures to extend the service life of coal-fired power plants, re-commission shutdown power plants, and increase power generation (https://inosmi.ru/20230114/ugol-259681827.html, https://ria.ru/20230412/ugol-1864635228.html (accessed on 18 September 2023). However, coal is considered a "dirty fuel", and its use is considered a sign of a brown economy.

Geopolitical events show that Russia's natural resource potential ensures not only socio-economic development of the country but also safeguarding national interests under the changes in the existing world order [2]. The mining industry gives a basis to develop relations with the existing and potential partner countries to facilitate global negotiations and conclude long-term agreements on a wide range of cooperation areas.

Thus, AZRF (the Arctic Zone of the Russian Federation) sustainable development becomes a priority area for Russia's state policy. The Arctic is a macro-region with the richest resource and military-strategic potential (https://www.interfax.ru/interview/722243, https://russtrat.ru/reports/20-dekabrya-2020-1614-2511, https://russiancouncil.ru/analytics-and-comments/analytics/voennye-aspekty-pozitsii-rossii-v-arktike/ (accessed on 10 September 2023)). Therefore, not only the Arctic states (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States (The list of Arctic states was approved at a meeting of ministers and plenipotentiaries in Ottawa, Canada, in 1996. It resulted in signing the Declaration on the establishment of the Arctic Council. The Arctic (circumpolar) countries are countries whose territories are crossed by the 66th parallel north: Canada, Denmark, Finland, Iceland, Norway, Russia, and the USA.)) focus on the Arctic but so do 13 observer states including China, India, and Japan [3][4][5].

The mining industry determines the core of the strategy for socio-economic development of the Arctic territories of the Russian Federation [6]. Moreover, the development of the mining industry has a multiplicative effect contributing to development of technologies, processing facilities, machine building, shipbuilding, logistics, and all types of infrastructure.

The differences in climate in the AZRF regions, level of their socio-economic development, resource potential, and structure of industrial production determine the guidelines of the state policy for sustainable development. The Arctic's specific conditions require increased attention to natural and human capital [7]. Therefore, implementing the provisions of the sustainable development concept and balancing economic, social, and environmental goals are of paramount importance.

2. Sustainable Development

The sustainable development concept is considered to have emerged in the 1970s and 1980s. However, the fundamentals of the sustainable development concept date back to the works of ancient philosophers. Since ancient times, mankind has been trying to understand and define the principles of human development, society, and justice. In the philosophy of Chinese Buddhism, the source of human "suffering" (dissatisfaction, fear) is the pursuit of pleasure; the way to get rid of it lies in the right action, right speech, and right way of life. Confucianism offers an ideal state system based on the moral qualities of a ruler-subordinate, father-son. The doctrine of Taoism assumes the unity of the world as a whole, of man, and of the cosmos. Many ancient philosophers like Democritus, Socrates, Plato, etc., put great emphasis on the interaction between nature and man, while cognition and knowledge was the way to safety. For the Cynics and Stoics, happiness can be reached through harmony with nature.

The emergence of the concept of sustainable development close to the modern interpretation is associated with the name of Thomas Robert Malthus (an English scientist and priest). In An Essay on the Principle of Population (1798), Thomas Robert Malthus considered the issue of population growth under conditions of limited resources, pointing out that the population grew in arithmetic progression, while the consumption of food and other resources increased in geometric progression [8]. The theory of overpopulation was developed in Marxist theory. In 1910, Karl

Kautsky, a representative of Marxist theory, noted that “as man’s dominance over nature increases, so does the tendency to upset its equilibrium” [9]. Later ideas of Thomas Robert Malthus were reflected in the Club of Rome’s (The Club of Rome is an informal international public organization founded at the initiative of Aurelio Peccei in 1968. The Club of Rome is engaged in research on models of human development. Aurelio Peccei was an Italian industrialist, economist, and social activist) report “The Limits to Growth” (1972) [10].

Works of V.I. Vernadsky are rightly considered to have made a significant contribution to the development of the theoretical foundations of the sustainable development concept and Russian cosmism. Vladimir Vernadsky outlined the concept of stability of life (1926). His theory of the biosphere, later the noosphere (The noosphere concept was introduced by Édouard Le Roy and Pierre Teilhard de Chardin in 1920s), claimed that humans were a “geological force” transforming the planet and, as a consequence, should be responsible for its development and preservation [11][12][13][14]. The noospheric approach was further developed in the works of V.G. Gorshkov, A.D. Ursul, N.N. Moiseev, K.S. Losev, and others [15][16][17][18][19][20][21][22].

Traditional economic science sees economic growth as the key to achieving general welfare, both in a particular country and in the world. The economic system plays the central role in the shift to global prosperity and is the source of environmental and social issues. Therefore, the quality of the economic system development determines the possibilities of their settlement [23][24]. GDP indicates the level of economic development, which is essentially the level of consumption in each country. According to the World Bank, since the 1970s, the rate of world gross product has been sharply increasing. In the last 50 years (from 1970 to 2022), the world GDP increased almost 34-fold [25].

Increased production, progress in science and technology, and the emergence of new industries have not led to universal prosperity, thus widening the discrepancy in quality of life both among and within countries (**Figure 1**) [26].

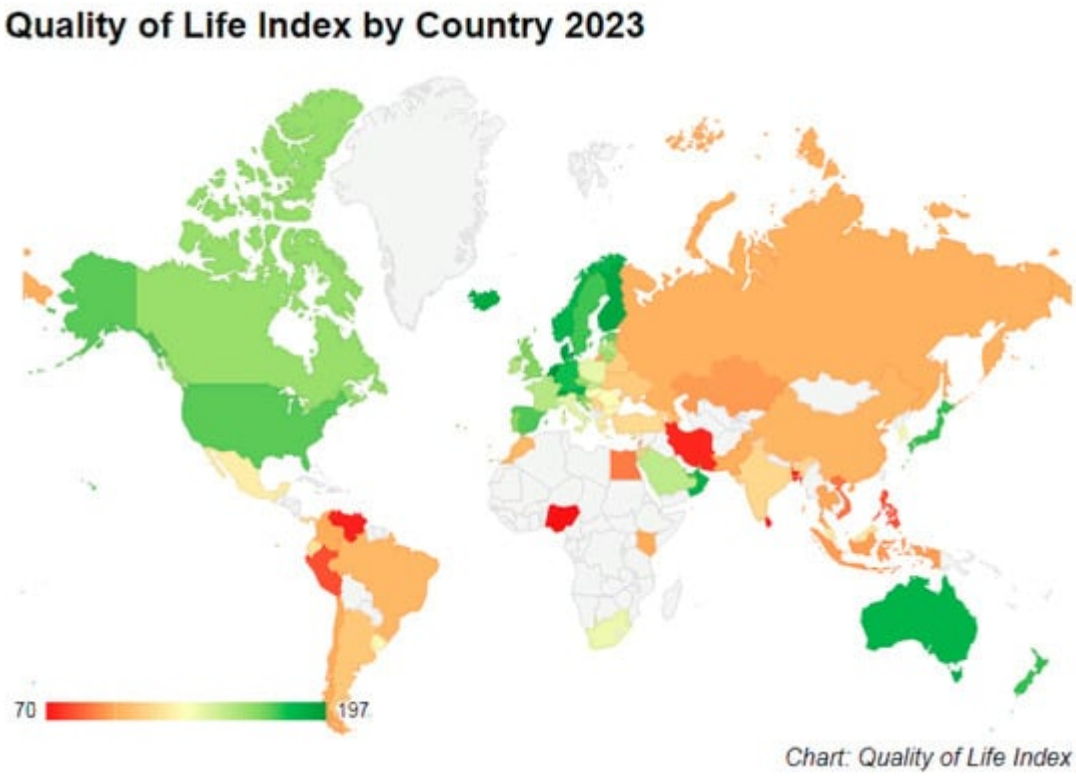

Figure 1. Quality of life index by country; 2023 [26].

High growth rates of the world economy required an ever greater consumption of natural resources, which resulted in an increase in the manmade impact and environmental concerns. According to NASA, human activity has increased atmospheric CO_2 concentrations by 48% over the past 170 years from pre-industrial values reached by 1850. This is more than what occurred naturally over a period of 20,000 years [27].

By the middle of the 20th century, the economic system development based on the biosphere degradation, the limited capacity of the biosphere and, as a consequence, possible environmental and demographic disasters, created the prerequisites to revise the traditional development model, the goal of which would be quantitative economic growth. In 2010, Joseph E. Stiglitz, Amartya Sen, and Jean-Paul Fitoussi published the report "Mismeasuring Our Lives: Why GDP Doesn't Add Up" of the Commission on the Measurement of Economic Performance and Social Progress (CMEPSP) and made a conclusion: "GDP is an inadequate metric to gauge well-being over time particularly in its economic, environmental, and social dimensions... Time has come to adapt our system of measurement of economic activity to better reflect the structural changes which have characterized the evolution of modern economies" [28].

At the first stage of its evolution, the concept of sustainable development was predominantly ***ecocentric***. The 1972 United Nations Conference on the Human Environment in Stockholm can be considered the beginning of the transition to the sustainable development concept. The adopted Declaration focused on settlement of environmental issues, recognizing that humanity was responsible for the state of the environment. The 26 principles of the Declaration proclaimed the ideas of equality, the fight against poverty, the need to manage

demographic processes, providing assistance to developing countries, and the preservation of natural resources. However, sustainable development of humanity had not yet been discussed [29].

An important stage in the evolution of the sustainable development concept was the publication of the report "Limits to Growth" in 1972 by Donella H. Meadows, Dennis L. Meadows, Jørgen Randers, and William W. Behrens III, commissioned by the Club of Rome. Based on the works of Jay Forrester, the American scientist and the author of the system dynamics theory, the authors of the Report proposed 12 scenarios of human development. The modeling results showed that humanity was threatened to face a global crisis as a result of overpopulation, increased production exceeding the capacity of the biosphere, and biosphere degradation. Donella Meadows and her colleagues noted that strict birth control was required in addition to technological breakthroughs and social changes for implementation of favorable development scenarios (Later, the authors adjusted the scenarios of the Limits to Growth report in their works: Model World3 1992, model World3 2004, and model World4 2012). The authors justified the need for "zero growth", a theory according to which it was necessary to restrain industrial production and consumption, this stabilizing the population while reducing the exploitation of natural resources [10].

The theory of the "golden billion" appeared. It stated that stability and decent living standards could be ensured if the world population did not exceed 1 billion people [30].

In 1974, Eduard Pestel and Mihajlo Mesarovic presented the report Mankind at the Turning Point at the Club of Rome [31]. They proposed the theory of "organic growth" instead of "zero growth". According to the new theory, each element of the world economic system, i.e., each country, should fulfill its organic function in a biological system. In fact, the theory consolidated the established architecture of the world division of labor, creating prerequisites for the development of neocolonialism implemented through transnational corporations [32].

Thus, the proponents of the ecocentric approach believed that natural capital (natural resources and environmental services) should be preserved/not diminished, and the limits of economic development were constrained by the biosphere capacity. Environmental sustainability could be reached through limiting consumption and, as a consequence, reducing or ceasing economic growth.

The ***anthropocentric approach*** was developed in response to environmental issues (increasing manmade impact, decreasing biodiversity, climate changes, etc.). Studies by the following scientists can be highlighted within the anthropocentric approach: N.D. Kondratyev [33], T. Page [34], D.W. Pearce, R.K. Turner [35][36][37], Robert Solow [38][39][40][41], Joseph E. Stiglitz [28][42], John M. Hartwick [43], and others. The anthropocentric paradigm was originally grounded in the philosophy of the consumer society, according to which: scientific and technological advancement was the core of economic growth and was the way to achieve sustainable development; and meeting the increasing demands of society was the first priority, regardless of the biosphere capacity and the need to preserve it for future generations. According to the representatives of the anthropocentric approach, non-renewable resources could be replaced with human and artificial capital and the reduction of one type of natural resource could be compensated with another, preserving the "critical value" of natural resources. N.D. Kondratyev's studies showed that the economic system developed cyclically, and each subsequent growth phase was preceded by

significant changes in the technosphere caused by innovation and scientific and technological advancements [33]. Robert Solow considered that technological changes were closely connected with the improvement of the quality of human capital by improving educational characteristics [38][39].

Environmental concerns, climate change, and the limited capacity of ecosystems remain global issues today. According to the Global Footprint Network (GFN), since the 1970s, the world economy has been using resources and producing waste in quantities that the planet cannot renew [44].

The present situation has resulted in awareness of the need to change the paradigm of humanity's development, predetermining the transition to the ***triad approach*** to solving global challenges of mankind. The triad concept of sustainable development implies a regulated balanced development where the social and economic spheres and the biosphere are not opposed to each other but develop in a balanced way and are not competing goals.

In 1987, Edward Barbier published his study The Concept of Sustainable Economic Development. In it, he recognized that "goals of environmental conservation and economic development are not conflicting and can be reinforcing each other" [45]. In the same year, the Brundtland Commission (formerly the United Nations World Commission on Environment and Development founded in 1983) published its report "Our Common Future", introduced the term "sustainable development" for the very first time, and gave the following definition: "sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs". In 1992, the term was institutionalized at the United Nations Conference on Environment and Development (UNCED), or Earth Summit, in Rio de Janeiro. This definition is the most quoted today. It was highlighted that the biosphere degradation was closely linked to the level of social and economic development of countries, emphasizing the responsibility to the future generations so as not to worsen their situation [46].

N. N. Moiseev wrote that "the future generations should have the same potential to use the planet's resources as the generations now living" [21].

In 2000, the UN General Assembly adopted the Millennium Declaration, which defined the MDGs (Millennium Development Goals). The MDGs primarily aimed at eliminating disparities in the quality of life and helping the world's poorest countries to eliminate hunger and poverty, ensure universal primary education and gender equality, reduce child mortality, fight diseases (AIDS, malaria, etc.), achieve environmental sustainability, and develop international cooperation in achieving the MDGs [47]. However, the MDGs "failed to consider the holistic nature of development as well as the root causes of global challenges such as poverty, gender inequality etc." [48].

In 2015, the UN complemented and expanded the MDGs. In 2015, the UN adopted the development agenda "Transforming our world: the 2030 Agenda for Sustainable Development" [49]. The document proposed 17 interconnected sustainable development goals (SDGs), which could be divided into four groups: social (1–5, 10), environmental (6, 13–15), economic (7–9, 12), and institutional (11, 16, 17).

Unlike the MDGs, the SDGs are universal for all countries, disregarding their level of socio-economic development, technosphere development, industrial structure, and environmental situation.

The ***present stage*** of development of the sustainable development concept is characterized by the following trends: numerous agreements and strategies on sustainable development, environmental protection; climate change issues have been adopted and are being adopted at the international and national levels, and social movements and non-profit organizations are emerging. A vast experience of international cooperation has been accumulated, and appropriate mechanisms and institutions have been established.

The number of published materials on sustainable development in the Arctic has increased. Analysis of publications in the Scopus database shows that as of 26 January 2024, 56% of works were published in the period from 2020 to present.

Leading Arctic research centers publish papers on a variety of issues connected with the region's development: the Federal Research Center "Kola Science Center of the Russian Academy of Sciences" (Russia), Luzin Institute for Economic Studies (Russia), Ohio State University (Columbus, OH, USA), David Taylor Research Center (Annapolis, MD, USA), University of Lapland (Rovaniemi, Finland), Norwegian Polar Institute (Tromsø, Norway), University of Stavanger (Stavanger, Norway), Center for Autonomous Marine Operations and Systems (Trondheim, Norway), The Center for Ships and Ocean Structures (Trondheim, Norway), Norwegian University of Science and Technology (NTNU, Trondheim, Norway), Acadia University (Wolfville, NS, Canada), University of Ottawa (Canada), etc.

Among the papers on issues of sustainable development of the Russian Arctic, it is worth highlighting the works by S. A. Dyatlov, Ye. G. Yefimova, V. P. Zhuravel, L. V. Ivanova, F. D. Larichikin, V. S. Selin, D. F. Skripnyuk, S. V. Fedoseyev, V. A. Zuckerman, V. I. Cherenkov, and A. Ye. Cherepovitsyn.

The efficient transition to sustainable development greatly depends on international cooperation and implementation of the concept of provisions by all countries. The provisions of the sustainable development concept, which constitute an ideology defining the goals and directions of human development, require further development and study [50][51][52][53][54][55].

References

1. Singh, R.K.; Murty, H.R.; Gupta, S.K.; Dikshit, A.K. An overview of sustainability assessment methodologies. Ecol. Indic. 2009, 9, 189–212.
2. Tsvetkova, A.; Katysheva, E. Present problems of mineral and raw materials resources replenishment in Russia. In Proceedings of the International Multidisciplinary Scientific Geo Conference Surveying Geology and Mining Ecology Management SGEM, Albena, Bulgaria, 28 June–7 July 2019; Volume 19, pp. 573–578.

3. Tysiachniouk, M.S. Disentangling Benefit-Sharing Complexities of Oil Extraction on the North Slope of Alaska. Sustainability 2020, 12, 5432.
4. Zhiltsov, S.S. The Arctic Vector of the Foreign Policy of the European Union. Sovrem. Evropa 2022, 3, 49–61.
5. Li, X.; Zhu, S.; Li, Y.; Chang, R. What is the asymmetric influence of natural resource rent and green innovation on the ecological sustainability of the ARCTIC region. Resour. Policy 2022, 79, 103051.
6. Russian Geological Research Institute (VSEGEI). The Report on the State and Prospects for the Use of Mineral Basis of the Arctic Zone of the Russian Federation. 15 March 2021. Available online: https://www.rosnedra.gov.ru/data/Fast/Files/202104/45bb8bcc7b844220954744c0149a86f4.pdf (accessed on 2 September 2023).
7. Kirsanova, N.Y.; Lenkovets, O.M. Assessment of Accountability in State Regulation of Arctic Zone of the Russian Federation in Current Institutional Environment. Sev. Rynok Form. Ekon. Porad. 2022, 75, 47–57.
8. Malthus, T.R.; Malthus, T.R. An Essay on the Principle of Population; Reproduced from the Edition: Malthus, T.R. “An Essay on the Principle of Population” St. Petersburg, 1868 ed.; Direct-Media Publishing: Moscow, Russia, 2008.
9. Kautsky, K. Propagation and Evolution in Nature and Society; Ryazanov, D., Ed.; State Publishing House of the RSFSR: St. Petersburg, Russia, 1919.
10. Meadows, D.H.; Meadows, D.L.; Rand, J.; Behrens, W.W., III. Limits to Growth; Moscow University Press: Moscow, Russia, 1991.
11. Vernadsky, V.I. Biosphere: Selected Works on Biogeochemistry; Mysl Publishing House: Moscow, Russia, 1967.
12. Vernadsky, V.I. Biosphere and Noosphere; Iris Press: Moscow, Russia, 2002.
13. Vernadsky, V.I. The Beginning and Eternity of Life; Sovremennaya Rossiya: Moscow, Russia, 1989.
14. Vernadsky, V.I. Chemical Structure of the Earth’s Biosphere and Its Surrounding; Nauka: Moscow, Russia, 1965.
15. Gorshkov, V.G. Limits to Biosphere Sustainability and the Environment; Leningrad Nuclear Physics Institute: Saint Petersburg, Russia, 1987.
16. Gorshkov, V.G.; Kondratyev, K.Y.; Danilov-Danilyan, V.I.; Losev, K.S. Environment: From New Technologies to New Thinking; Without a Publishing House: Moscow, Russia, 1994.

17. Gorshkov, V.G. Physical and Biological Bases of Life Stability; VINITI: Moscow, Russia, 1995.
18. Ursul, A.D. Conceptual Issues of Sustainable Development. Bull. Russ. Acad. Sciences. Use Prot. Nat. Resour. Russ. 2005, 1, 30–38.
19. Ursul, A.D.; Ursul, T.A. Vectors of Achieving Sustainable Future. Russ. J. Philos. Sci. 2017, 7, 139–149.
20. Moiseev, N.N. “Sustainable Development” or “Transition Strategy”. Ecology and Education. 1996. Available online: http://www.teacher-edu.ru/wmc/arts/1074784948 (accessed on 2 August 2023).
21. Moiseev, N.N. Time to Define National Goals; IIUEPS/MNEPU: Moscow, Russia, 1997.
22. Losev, K.S. Ecological Issues and Sustainable Development Perspectives of Russia at the XXI Century; Kosmosinform: Moscow, Russia, 2001.
23. Munasinghe, M.; Cruz, W. Economywide Policies and the Environment: Lessons from Experience. In World Bank Environment Paper; The International Bank for Reconstruction and Development/THE WORLD BANK: Washington, DC, USA, 1995.
24. Fedorenko, N.; Reimers, N.F. Ecology and Economics—The Evolution of Relationships. From “Saving Nature” to “Big” Ecology. Philos. Issues Glob. Ecol. 1983, 230–277.
25. The World Bank. GDP (Current US$). Available online: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD (accessed on 3 September 2023).
26. NUMBEO. Quality of Life Index by Country 2023. Available online: https://www.numbeo.com/quality-of-life/rankings_by_country.jsp?title=2023 (accessed on 4 January 2024).
27. NASA. Global Climate Change. Available online: https://climate.nasa.gov/ (accessed on 9 November 2023).
28. Stiglitz, J.E.; Sen, A.; Fitoussi, J.-P. Mismeasuring Our Lives: Why GDP Doesn’t Add Up. In Report of Commission on the Measurement of Economic Performance and Social Progress (CMEPSP); Drobyshevskaya, T., Ed.; The Gaidar Institute Publishing House: Moscow, Russia, 2016; p. 216.
29. Declaration of the 1972 United Nations Conference on the Human Environment. (n.d.). Available online: https://www.un.org/ru/documents/decl_conv/declarations/declarathenv.shtml (accessed on 2 September 2023).
30. Coleman, J. Conspirators’ Hierarchy: The Story of the Committee of 300; Vityaz: Moscow, Russia, 2005; Available online: https://karpovo.0o.ru/forum2/files/Comitee_300.pdf (accessed on 2 January 2024).

31. Mesarovic, M.; Pestel, E. Mankind at the Turning Point: The Second Report to the Club of Rome; E. P. Dutton and Co. Inc.: New York, NY, USA, 1974.
32. Krasnoshchekov, G.P.; Rozenberg, G.S. From Extraction of Oysters to Sustainable Development (Chronology of the Basic Events). Samar. Luka 2008, 17, 221–288. Available online: https://cyberleninka.ru/article/n/hronologiya-kalendar-sobytiy-svyazannyh-so-stanovleniem-predstavleniy-ob-ustoychivom-razvitii (accessed on 12 August 2023).
33. Kondratyev, N.D. Large Cycles of Conjuncture and the Theory of Foresight; Ekonomika: Moscow, Russia, 2002.
34. Page, T. Intergenerational equity and the social rate of discount. In Environmental Resources and Applied Welfare Economics; Smith, V.K., Ed.; Routledge: London, UK, 1988; pp. 71–89.
35. Pearce, D.W.; Turner, R.K. Economics of Natural Resources and the Environment; Dialog-MGU: Moscow, Russia, 1992.
36. Turner, R.K.; Kerry, R. Sustainability, Resource Conservation and Pollution Control: An Overview. In Sustainable Environmental Management; Belhaven Press: London, UK, 1988; 292p.
37. Turner, R.K. Sustainability: Principles and practice. In Sustainable Environmental Economics and Management: Principles and Practice; Belhaven Press: London, UK, 1993; pp. 3–36.
38. Solow, R. Technical Change and the Aggregate Production Function. Rev. Econ. Stat. 1957, 39, 312–320.
39. Solow, R. A Contribution to the Theory of Economic Growth. Q. J. Econ. 1956, 70, 65–94.
40. Solow, R.M. Intergenerational equity and exhaustible resources. Rev. Econ. Stud. 1974, 41, 29–45.
41. Solow, R.M. On the intergenerational allocation of natural resources. Scand. J. Econ. 1986, 88, 141–156.
42. Stiglitz, J.E. Growth with exhaustible natural resources: Efficient and optimal growth paths. Rev. Econ. Stud. 1974, 41, 123–137.
43. Hartwick, J.M. Intergenerational equity and the investing of rents from ex-haustible resources. Am. Econ. Rev. 1977, 67, 972–974.
44. Global Footprint Network. Global Footprint Network among Researchers Recognized with AASHE Sustainability Award. Available online: https://www.footprintnetwork.org/ (accessed on 3 October 2023).
45. Barbier, E. The Concept of Sustainable Economic Development. Environ. Conserv. 1987, 14, 101–110.

46. Our Common Future. Report of the United Nations World Commission on Environment and Development. 1987. Available online: https://www.un.org/ru/ga/pdf/brundtland.pdf (accessed on 8 September 2023).
47. United Nations Millennium Declaration. United Nations General Assembly (8 September 2000). Available online: https://www.ohchr.org/EN/ProfessionalInterest/Pages/Millennium.aspx (accessed on 2 October 2023).
48. Kruglov, A.Y. Emphasizing Transition: Sustainable Development Goals as Problem-Based Approach to Implementing Millennium Development Goals. In Sustainable Development: Challenges and Opportunities: Collection of Scientific Articles; Viktorova, Y.V., Ed.; SPbSUE Publishing House: St. Petersburg, Russia, 2020; pp. 156–162.
49. Sustainable Development Goals, UN. Transforming Our World: The 2030 Agenda for Sustainable Development. 2015. Available online: https://www.un.org/sustainabledevelopment/ru/about/development-agenda/ (accessed on 28 September 2023).
50. Ponomarenko, T.; Marinina, O.; Nevskaya, M.; Kuryakova, K. Developing Corporate Sustainability Assessment Methods for Oil and Gas Companies. Economies 2021, 9, 58.
51. Cherepovitsyn, A.; Tsvetkova, A.; Komendantova, N. Approaches to Assessing the Strategic Sustainability of High-Risk Offshore Oil and Gas Projects. J. Mar. Sci. Eng. 2020, 8, 995.
52. Marinina, O.; Nechitailo, A.; Stroykov, G.; Tsvetkova, A.; Reshneva, E.; Turovskaya, L. Technical and Economic Assessment of Energy Efficiency of Electrification of Hydrocarbon Production Facilities in Underdeveloped Areas. Sustainability 2023, 15, 9614.
53. Fadeev, A.; Komendantova, N.; Cherepovitsyn, A.; Tsvetkova, A.; Paramonov, I. Methods and priorities for human resource planning in oil and gas projects in Russia and OPEC. OPEC Energy Rev. 2021, 45, 365–389.
54. Pashkevich, M.A.; Danilova, A.S. Ecological Security and Sustainability. J. Min. Inst. 2023, 260, 153–154.
55. Litvinenko, V.S.; Petrov, E.I.; Vasilevskaya, D.V.; Yakovenko, A.V.; Naumov, I.A.; Ratnikov, M.A. Assessment of the Role of the State in the Management of Mineral Resources. J. Min. Inst. 2023, 259, 95–111.