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Strategic Sustainability of Offshore Arctic Oil and Gas Projects: Definition, Principles, and Conceptual Framework

Diana Dmitrieva [1,*], Alina Cherepovitsyna [2], Gennady Stroykov [1] and Victoria Solovyova [1]

[1] Department of Economics, Organization and Management, Saint-Petersburg Mining University, 21St Line V.O. 2, 199106 St Petersburg, Russia; g.a.stroykov@mail.ru (G.S.); vikasolovyova9@gmail.com (V.S.)
[2] Luzin Institute for Economic Studies—Subdivision of the Federal Research Centre, Kola Science Centre of the Russian Academy of Sciences, 184209 Apatity, Russia; iljinovaaa@mail.ru
* Correspondence: diana-dmitrieva@mail.ru; Tel.: +7-8921-3024-523

Abstract: Exploitation of oil and gas resources in the Arctic offshore is one of Russia's key priorities in such areas as science, economy, and technology. Global trends, harsh climate conditions, fragile ecosystems, conditions of the pandemic and post-pandemic periods, price volatility, and the growing importance of the environmental factor require that the process of developing the Arctic's hydrocarbon resources should become strategically sustainable. The paper provides a deep literature review on sustainability issues, sustainable development, strategic sustainability, and project efficiency in the Arctic offshore oil and gas sector. The paper analyzes the trends and conditions that substantiate the need to transform the traditional sustainability concept to meet new challenges and comply with new policies. Based on the analysis, the authors propose a definition of and a conceptual framework for strategic sustainability of oil and gas offshore projects in the Arctic.

Keywords: strategic sustainability; oil and gas offshore projects; Arctic; energy markets

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1. Introduction

In today's global energy market, hydrocarbon resources are developed under the conditions characterized by a high degree of uncertainty. The global energy sector can be described as turbulent due to the impact of post-pandemic conditions, high price volatility, and the development of the green energy sector [1–3]. Obviously, the pandemic (COVID-19) and its consequences influenced the global energy market [4], making it more volatile and changing the trajectory of the global oil and gas sector.

According to the recent Short-Term Energy Outlook from the US Energy Information Administration (EIA), Brent crude oil prices will average USD 62.26 per barrel in 2021 and USD 60.74 per barrel in 2022 [5]. However, there is no unanimous agreement as to the future of oil prices. For example, EIA (Long-Term Brent Crude oil price projection) predicts a rapid growth in prices—to USD 120.47 per barrel [6]. Other post-pandemic forecasts are more "cautious" [7,8]. Figure 1 systemizes a number of current oil price forecasts provided by several global agencies. In the next few years, the most significant supply-side factors impacting pricing are expected to include US crude oil stocks, US shale oil production, and OPEC oil supply [6].

The crisis-induced slowdown in economic activity in 2020 caused the largest decline in oil demand ever—by 8.8%. In the gas industry, which had been growing fast, a decline in consumption by 1.9% was recorded as well [9]. Estimates of the prospects for energy demand vary considerably. Analysts at the Organization of the Petroleum Exporting Countries (OPEC) suggest that the historical peak in oil demand is likely to come in 2035–2040 [10]. Experts at the Rystad Energy consulting company expect the growth in demand to slow down after 2028 [11]. BP assumes that oil consumption will never reach pre-pandemic levels again [12].

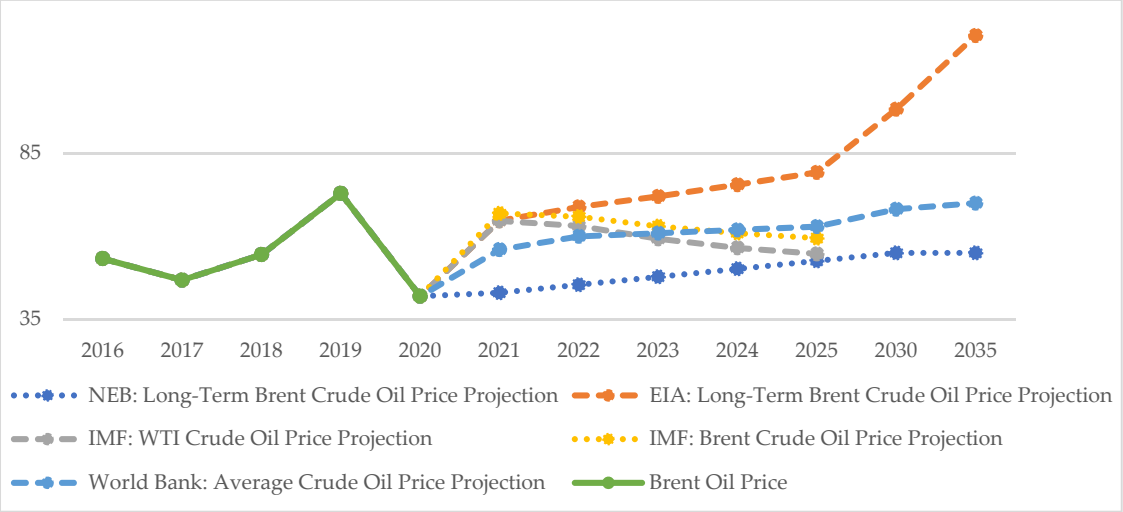

Figure 1. Brent crude price forecasts until 2035, USD per barrel. Source: made by the authors using [5–8].

The decline in the role of oil in the global energy mix is also caused by the growing importance of environmental protection and climate change issues. The development of carbon-neutral industries is fostered by a number of developed countries that intend to overcome the economic crisis by investing in environmentally friendly sectors [13,14]. Intensive development of the renewable energy sector is the focus of the Green New Deal. Despite the crisis, the demand for renewable energy increased by 3% in 2020 [9]. At the same time, natural gas, being the most environmentally friendly type of fossil fuels, is a promising resource within the energy transition framework and is expected to stay competitive in the energy mix of the future. OPEC forecasts an increase in natural gas demand by 1.2% by 2045 compared to the pre-pandemic times [10].

According to the DNV GL Energy transition outlook 2020, the share of oil and coal in the primary energy supply will gradually decline [15]. In 2018, the share of oil in the global energy supply was 28.7%, and coal accounted for another 26.9%. The situation is expected to change dramatically by 2040, with the share of oil projected at 20% and that of coal at only 15.5%. At the same time, the volumes of solar and wind energy will increase significantly. The pie charts below show the structure of primary energy supply by source: (A) year 2018, (B) year 2040 (forecasts) (Figure 2).

Moreover, BP's Statistical Review shows that the growth in the global energy consumption was accounted for only by alternative energy sources [16]. The Skolkovo Fund predicts a 45% reduction in the global investments in the oil and gas sector [4]. The reason for this is a shift to environmental friendliness. "More and more, oil and gas companies are focusing on renewable energy and electricity storage for their own operations, biofuels as a substitute for traditional feedstock, and also on being low-carbon" (Skolkovo) [17]. BP plans to cut funding for the majority of oil and gas projects by 40%.

The high turbulence of the global energy system increases the risks and uncertainty of oil and gas project implementation in Russia. Resilience of the oil and gas sector to the novel trends and tendencies (both positive and negative) determines one of the most important indicators—the national energy security. According to the current Russian policy, energy security should be based on the following principles: better energy efficiency, complying with environmental standards and requirements, reliability of power supply, etc. The fall in demand for hydrocarbons and the volatility of the pricing environment intensify competition for traditional and promising market outlets. New producers and production regions, geopolitical contradictions, the need for innovations and upgrades in the industry decrease the competitive potential of Russian oil and gas projects. Today, oil production in Russia is at the level of 2010. Over this period, oil production grew in such countries as the United States (by 113%), Brazil (by 50%), and Saudi Arabia (by 14%) (Figure 3). The

Arctic's offshore resources can be considered as an important asset that can ensure the future security of demand for Russia as the need for energy sources is expected to grow, regardless of the turbulence in the global energy market.

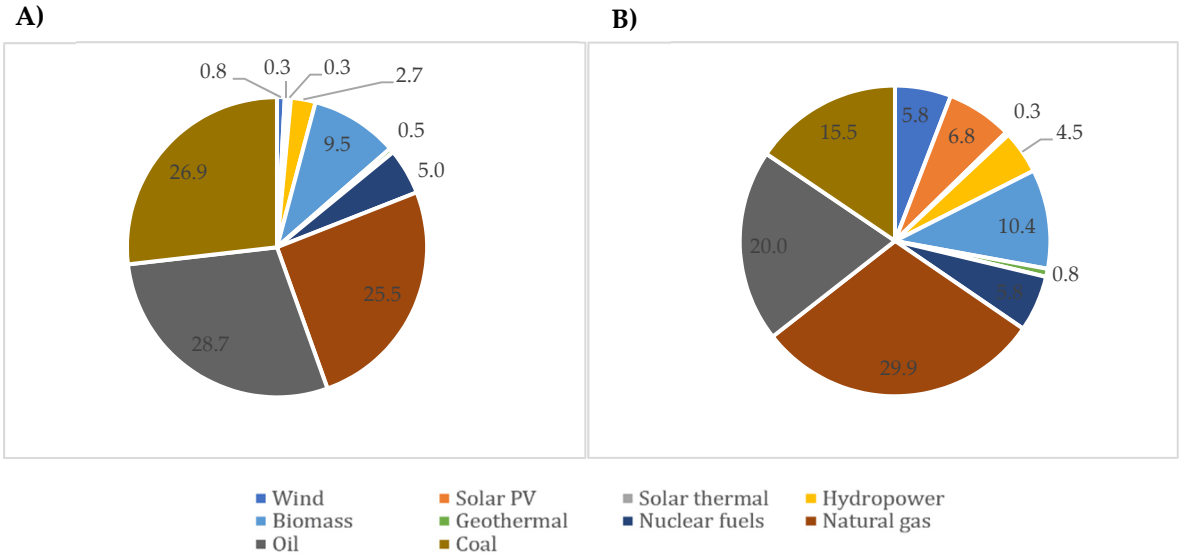

Figure 2. Primary energy supply by source: (**A**) in 2018, (**B**) in 2040, EJ/yr Source: made by the authors using [15].

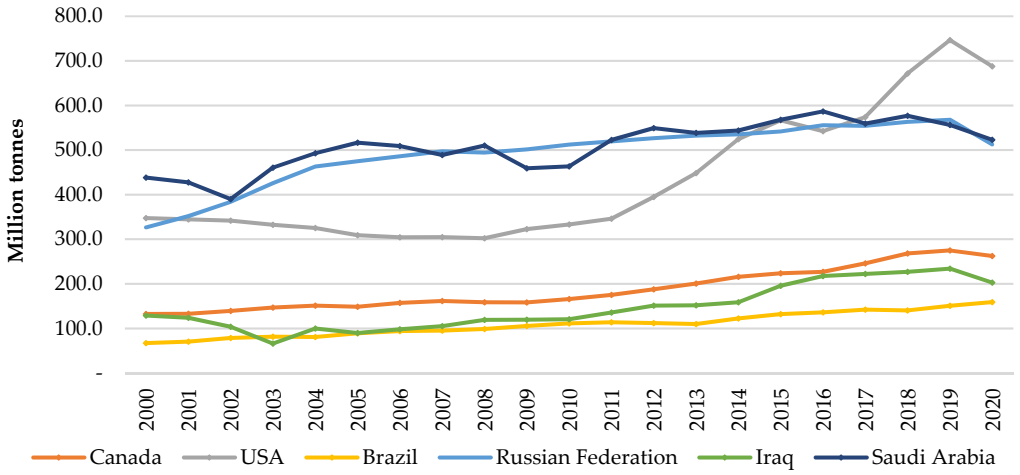

Figure 3. Oil production trends. Source: made by the authors using [12].

Nevertheless, despite the fact that the share of oil in the primary energy supply is supposed to decline, OECD predicts an increase in the global demand for oil (Figure 4).

Taking into consideration all the above mentioned and the ESG agenda, we can conclude that the long-term effective development of the Russian Arctic offshore oil and gas sector is the strategic task for the country and for the world (as gas is one of the most environmentally friendly types of fuel and Russia is one of the largest exporters of this product). According to Westwood Global Energy data, as of the end of 2020, Russia was recognized as the leader in the exploration of oil and gas fields, providing 70% of the increase in global gas reserves compared to 10–30% in 2017–2019 [19]. This is due to several large discoveries in the Arctic, especially on its shelf. The Russian sector contains about 41% of the world's Arctic oil reserves and 70% of gas reserves [20]. The exploitation of the unique resources of minerals and fossil fuels located in the polar territories is recognized as a foundation for the social and economic development of the Arctic, stable economic growth, and the national safety of Russia [21]. Arctic oil and gas resources will play a

key role in the country's energy mix, being a strategic reserve to replace the decline in production in traditional regions. Today, economic activity in this area provides 11% of the national income, 20% of the export [22], 17% of oil production, and 80% of natural gas production [23].

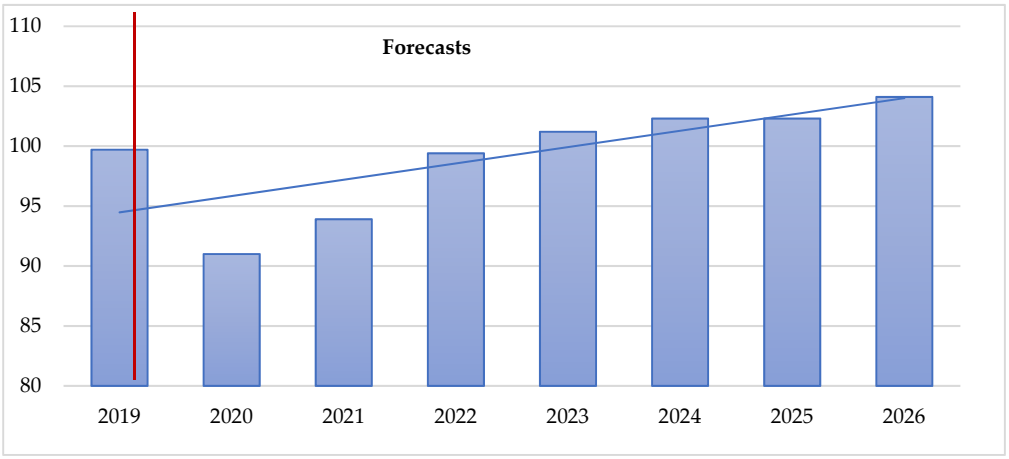

Figure 4. Global oil demand, mb/d (2018–2020—factual data, 2021–2026—forecasts). Source: made by the authors using [18].

The implementation of oil and gas projects in the offshore Arctic zone has been seen as a controversial issue by the scientific community, the government, and the public for many years [24–28]. Russia's share in the total volume of Arctic hydrocarbons is 52% with total reserves of 510 billion tons of n. e. s. The development of the unique resource potential of the Arctic is of strategic importance both for ensuring Russia's geopolitical and geo-economic positions in the world, and for its internal development [23,29,30]. However, the large-scale shocks suffered by the global energy market that were intensified in 2020 by the COVID-19 pandemic cast doubt on the prospects for Arctic hydrocarbons [4]. The climate agenda and the fast growth of the renewable energy sector reduced the demand for traditional fuels, primarily oil [31,32]. Experts noted that these factors are particularly critical for offshore fields, which have production and technological problems and significantly low economic efficiency of investments compared to their onshore counterparts [33,34].

In these conditions, further large-scale exploitation of Arctic oil and gas resources requires an assessment of not only projects' economic indicators [35] but also their multiplicative effect on the socio-economic development of the Arctic regions [29,36,37]. In this context, the geopolitical aspect is also relevant. Russia is not the only country with an access to the Arctic territories and the interests to exploit the resource base of the North, including offshore oil and gas reserves. The USA, Norway, England, and other countries holding slices of the so-called Arctic pie develop their strategies and plans as well as technological solutions and innovations in order to use the unique hydrocarbon resources. Each of them has its own geopolitical interests and intentions which are difficult to reconcile.

Researchers widely discuss the environmental risks of oil and gas projects [38,39] and emphasize the importance of ensuring the environmental safety of oil and gas production in the Arctic [40,41]. An important role is assigned to the innovative and technological renewal of the Russian oil and gas industry and the digitalization of management and production processes [42–45]. The sanctions from the USA and the European countries greatly influence the national energy sector. In such a situation, it is important to overcome the sector's dependence on foreign financing and technology.

Consideration of economic efficiency in conjunction with environmental, social and technological aspects will ensure a balanced exploitation of Arctic resources based on the principles of sustainable development (SD). In view of this fact, the challenge for Arctic offshore oil and gas projects is to reach strategic sustainability.

All of the above mentioned shapes the key goal of the research, which is to identify the concept of strategic sustainability and describe how it can be adapted to oil and gas offshore Arctic projects in a timely manner. This is possible by answering the following research questions:

RQ1: What is the nature and features of the strategic sustainability concept?
RQ2: What are the key prerequisites and principles of strategic sustainability of offshore Arctic projects?
RQ3: How can the strategic sustainability concept be adapted to offshore project implementation in the Arctic?

In order to achieve the goal and answer the RQs, we organize the paper as follows: firstly, we provide a deep literature review concerning sustainability and the SD concept and highlight the difference between the two. We then explore the strategic sustainability concept in both the global context and the context of Arctic projects. Then, we present the methodology of the research, which includes case studies, system-oriented analysis, the decomposition method, and comparative analysis, and give a detailed layout of the study. As a result, we outline the key principles, the definition, and the conceptual framework of the strategic sustainability of oil and gas offshore Arctic projects and substantiate the need to transform the traditional sustainability concept to meet new challenges.

2. Literature Review

To build an understanding of the theoretical and methodological aspects, we first studied the concepts of sustainability and sustainable development in order to highlight the difference between them. Then, we studied the existing approaches to the strategic sustainability concept, as well as its principles and interconnection with sustainability and SD. Additionally, we paid attention to sustainability of the Arctic offshore projects in order to create a common scientific vision of the sustainability concept applying to Arctic offshore projects. To develop the concept of project sustainability for Arctic offshore projects, we discuss and evaluate the existing practical approaches towards strategic sustainability in different spheres.

2.1. Sustainability and Sustainable Development

Currently, issues related to the SD concept are becoming particularly relevant within novel challenges and trends of the circular economy, the global energy transition, the principles of "green" economy, etc. [46–51]. According to the generally accepted definition, SD is a development model based on three key pillars: economic, environmental, and social [52,53]. To date, the concept of SD is being implemented both at the global level to meet worldwide challenges [54,55] and at the level of particular industries. As an example, a number of studies is devoted to sustainability in the mining industry as this industry has a great impact on the environment [24,56–59].

Notwithstanding the fact that the basics of SD are generally acknowledged, there are different approaches to what exactly SD means. In particular, there is no consensus in the modern scientific literature on whether the concepts of sustainability and sustainable development are synonyms or have crucially different meanings [60–63]. We present a brief outline of the points of view in Table 1.

Based on the approaches examined, we can identify three major views describing the link between sustainability and sustainable development: (1) these terms have the same meaning and are interchangeable; (2) sustainability is a general paradigm, whereas SD implies particular actions aimed at achieving it; (3) the concepts of sustainability and SD have no connection as they are fundamentally different (sustainability focuses only on environmental issues while SD focuses on achieving the SDGs).

Table 1. Sustainability vs. sustainable development (SD)—different points of view.

Sustainability vs. Sustainable Development (SD)—Points of View	Author/Source
Sustainability and SD are synonyms. These terms are perceived from the standpoint of environmental protection, social aspects, etc.	[64]
The concepts of sustainability and SD are strongly related to resolving social and ecological issues. Thus, they can be considered as unidirectional. A lack of integrated approaches to the terms applied is explained by the pluralism of opinions regarding SD issues in different sectors, companies, and projects.	[65,66]
SD is a process to achieve sustainability goals.	[60,67]
Sustainability is a general paradigm of the world's future and an order based on the trinity of economics, ecology, and society, while SD means concrete steps for its implementation.	[68]
Sustainability is a key concept of how to maintain the resource potential under the exhaustion of raw materials, and SD refers to particular actions.	[68–70]
The interconnectedness of the SD and sustainability concepts.	[71]
Sustainability is the ability to maintain and to achieve Sustainable Development Goals (SDG), and it can be both weak and strong. This idea shows that "development" in the meaning of "progress" and "positive change" is not applicable to all countries, companies, and projects.	[72,73]
The concept of SD is considered to be wider as it focuses on achieving the established global SDGs, such as the development of green infrastructure, formation of sustainable cities, tackling climate change, etc.	[74,75]

2.2. Strategic Sustainability

In academic literature, there is no uniform approach to defining and assessing strategic sustainability. Some authors consider strategic sustainability as an approach to "planning and implementation that allocates limited available resources with the greatest impact for sustainability" [76]. According to this opinion, the way to achieve strategic sustainability lies in comprehensive thinking about creating a plan and implementing it by identifying the main opportunities, stakeholders, and strategies needed to advance sustainability. This idea is supported further in the literature [77].

Kwon, Tang, and Kim used the concept of the strategic sustainability plan and established that developing a strategic sustainability plan provides cities with various benefits [78]. Additionally, the concept of strategic sustainability is based on strategic sustainability management (SSM) that reflects the sustainability integration process in the company's strategy [79,80]. SSM is analyzed in the context of the internal and external challenges of sustainability. The internal sustainability challenges include aspects of sustainability importance for the company, barriers for the sustainability implementation process, sustainability guidelines in the company's policy, etc. Internal challenges describe aspects of stakeholders' involvement in the sustainability implementation process.

The strategic sustainability concept is also viewed through the prism of the framework for strategic sustainable development (FSSD) [81,82]. The FSSD was transformed to the strategic sustainability procedures (SSP) concept [77]. While formulating this concept, the authors emphasize the difference between sustainability and SD and consider sustainability as "a vision for the socio-ecological system", while SD is described as "a tangible and actionable set of processes that occur within the operations of the business". At the same time, the authors highlight their congruence and their connection with the usual strategic management process. The authors suggest procedures that can provide strategy content for the business strategy planning process in a system focused on society and the environment.

According to Malenkov et al., strategic sustainability "is the ability of a system to recover from the external and internal impacts and changes, while stability is keeping a certain range of system parameters unchanged or allowing them to change within preset

limits" [83]. The authors suggest a model for strategic sustainability assessment, which is based on a set of digital components that influence the company's sustainability.

As for strategic sustainability assessments, Singh et al. suggest a detailed overview of sustainability assessment methodologies, which shows that many authors suggest using various sustainability indexes in order to measure SD [84].

The above mentioned can be done by using the strategic sustainability justification methodology (SSJM) introduced by Presley et al. SSJM requires distinct identification of the company's objectives, strategies, and processes [85]. The authors suggest three levels of assessment—strategic, tactical, and operational, and provide indicators for each aspect (economic, social, and environmental).

Furthermore, some authors describe sustainability indicators for renewable energy technologies, such as electricity prices, greenhouse gas emissions, availability of renewable sources, energy conversion efficiency, land requirements, water consumption, and social impacts [86].

Another methodology for strategic sustainability assessment described in the literature is strategic sustainability analysis (SSA) [87]. It is applied in the integrated long-term assessment of policies and programs, and requires a dynamic, quantitative, and consistent algorithm. We provide approaches to strategic sustainability in Figure 5.

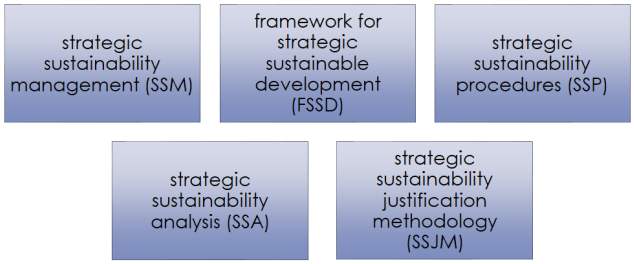

Figure 5. Approaches to strategic sustainability (compiled by the authors).

Nowadays, companies' and projects' management is faced with the necessity to strike a balance between operational effectiveness and strategic thinking on the sustainability issue [88]; in our opinion, this is the cornerstone for the achievement of strategic sustainability.

Despite a wide range of literature concerning strategic sustainability, there is no common definition or concept. Strategic sustainability in scientific literature is considered from different points of view. On the one hand, SS is considered as a strategic vision of sustainability, while on the other, it is closely connected with the sustainable development concept and it is also seen as the stability of the system itself (i.e., there is independence from the environment).

2.3. *Efficiency/Sustainability Assessment of Arctic Oil and Gas Projects*

Currently, the issues related to SD with regard to the development of Arctic territories are becoming particularly relevant. According to the Foundations of the Russian Federation State Policy in the Arctic for the Period up to 2035, one of the key strategic goals is to achieve sustainability of exploration in the Arctic [89].

The World Wildlife Fund (WWF) identifies the sustainability of Arctic oil and gas resource exploration as a key priority [90]. The reason for this is the irreversibility of the impact on the Arctic zone on a global scale. The Arctic Biodiversity Assessment report points out that resource exploration in the Arctic is a good opportunity to apply SD principles in practice [91].

Russian academic literature provides different approaches to defining sustainability in terms of developing the Arctic's resource potential. There are a number of studies which suggest that SD is closely related to the Climate Agenda, namely, to reducing climate risks, CO_2 emissions, etc. [92]. Several studies attempted to assess sustainability of resource exploration in the Arctic in terms of environmental aspects, such as the rational use of

mineral resources, ensuring a high level of energy and resource efficiency, reducing the environmental impact, and preserving fragile ecosystems [93]. Gassiy et al. concluded that the SD of the Arctic systems is determined by a balance between the interests of key stakeholders—the state, business, science, society, etc. [94]. An ambiguity in the approaches to the Arctic's SD leads to the uncertainty in the interpretation of SD when individual projects are implemented (in particular, Arctic oil and gas offshore projects).

The research "Foresight study of the development of the Arctic offshore industry until 2030" highlights factors that are contributing to the SD of the Arctic zone. They include natural resource parameters, transport trends (including infrastructure), and climate aspects [95].

Fadeev et al. discuss the sustainability of hydrocarbon projects through the prism of their potential impact on the development of the Arctic region. To assess the efficiency of these projects and to determine the level of their impact on the SD of the region, an integral indicator of the technical and economic potential of oil and gas fields is proposed. It was calculated based on technical, climate, and economic indicators [96]. The report "Challenges and opportunities of oil and gas investment in the Arctic" also considers the efficiency and investment attractiveness of offshore projects from the standpoint of their contribution to the sustainable socio-economic development of the northern region. However, there are no practical recommendations on how exactly this contribution should be assessed [97].

Recently, the interest of the global community in Arctic projects has increased despite the continuing discussions about the changing role of traditional energy resources. Stipo et al. argue that the level of sustainability of Arctic offshore projects influences environmental preservation [98]. Verhaag identifies two major driving forces of the SD of offshore resources. They include (1) ensuring the principles of the rational use of natural resources and (2) implementing a "precautionary approach" (concentration of efforts to prevent possible environmental consequences) [99]. It can be concluded that sustainability of Arctic projects in most cases is considered precisely in terms of environmental aspects [100,101].

Lee investigates the key problems of SD of the northern resource potential on the example of oil and gas projects in Alaska [102]. It is stressed out that oil and gas companies (and projects as well) have to focus on SD principles because of new global trends and tendencies. The factors influencing SD include more stringent state policies, restricting access to financial capital (a number of American banks have announced the termination of investment in Arctic projects), and the growing role of scientific and technological progress (new requirements for technological support of production processes in the exploitation of offshore fields).

At the same time, despite the relevance of the SD problem to Arctic offshore projects, there is no universal methodological approach to assessing the degree of sustainability (including strategic sustainability) taking into account the specifics of such projects and the Arctic territories as a whole. It is not clear which indicators should be used, how to calculate integral indicators for all parameters, how to compare different projects, and what this may ultimately affect.

As a rule, when analyzing the future opportunities for developing the offshore hydrocarbon potential, such an economic category as efficiency is used. In 2016, Gazprom Neft PJSC developed a special methodology for the economic assessment of offshore projects aimed at optimizing the implementation of the Prirazlomnoye field exploration and other large-scale projects planned to be implemented in the future [103]. Using this technique, it is possible to rank wells taking into consideration their efficiency based on the calculation of the allocation costs for field exploitation, as well as to carry out a comprehensive assessment of the associated environmental and geological risks. Nevertheless, social and environmental parameters are not taken into account when using this technique (it can be viewed as a disadvantage).

Gazeev et al. offer an approach to assessing the efficiency of Arctic offshore projects based on three pillars—economic, innovative (technological), and environmental [104].

The research does not use the term "sustainability". However, the very idea of moving away from focusing solely on financial and economic aspects corresponds to the concept of sustainability. A number of other Russian authors adhere to the same position [105,106].

Currently, the Arctic Council is implementing a project aimed at creating novel approaches to apply the global SDG in practice by organizing international project meetings, providing an inter-institutional gap framework analysis, developing online decision support tools, etc. [107]. Mineev et al. presented a methodology to assess a degree of commitment to SDGs. It includes five pillars—people, society, economics, environment, and partnerships, which correspond to certain indicators. Indicators are divided into three categories: green, yellow, and red, according to a degree of commitment to SDGs [108].

In the global report titled "Sustainable Development Action—the Nordic way", the sustainability of Arctic projects and industrial systems is proposed to be assessed by conducting a comprehensive analysis of stakeholders, taking into account the level of involvement of individual groups, their target priorities, and the possibility of ensuring a balance of their interests [109].

A holistic methodology for assessing the strategic sustainability of hydrocarbon offshore projects by applying the method of hierarchical analysis was proposed in a study by Cherepovitsyn et al. Its peculiarity lies in taking into account the specifics of conditions and key parameters for the implementation of Arctic offshore projects (investment, geological, economic, environmental, and social) [24]. At the same time, this study reflects the sustainability of projects only from the perspective of their implementation [110].

After a thorough analysis of scientific literature on the topic, we come to the conclusion that there are few studies devoted to sustainability of oil and gas Arctic projects. Therefore, our study is aimed at making the following contribution to scientific literature: developing a definition of the strategic sustainability concept for Arctic offshore projects, as well as its principles and conceptual framework that could be used by researchers in this sphere or adopted to others.

3. Methodology

The methodology of this study includes case studies, system-oriented analysis, the decomposition method, and comparative analysis. The study is based on an extensive list of references. We conduct a literature review in the following directions (Figure 6) to ensure a comprehensive approach to the topic discussed.

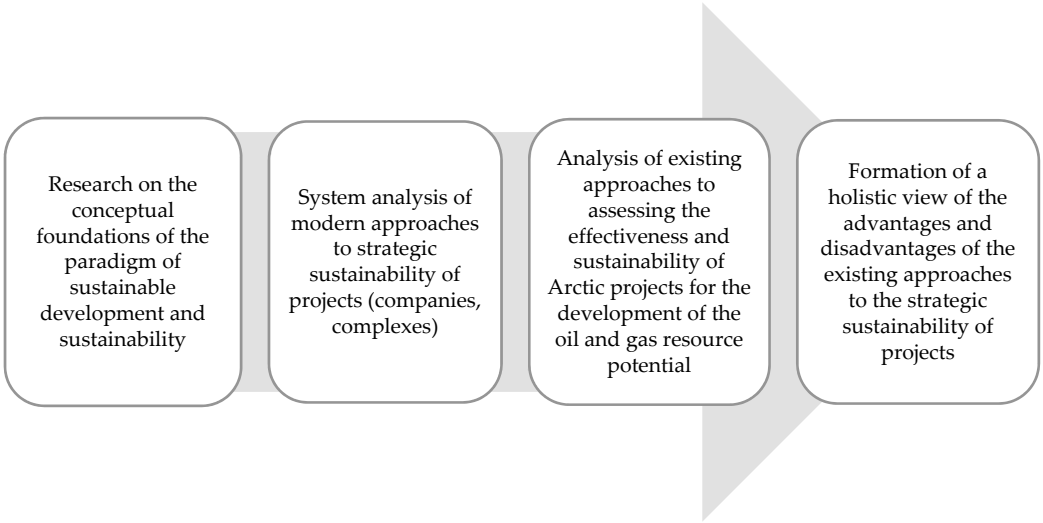

Figure 6. Theoretical basis of the research.

Economic, social, and environmental factors are important, but they are not the only variables for Arctic offshore projects to take into consideration. We argue that there is a

research gap between the existing approaches to project sustainability and current trends (including SDG, low-carbon development, etc.). Therefore, the existing methodological frameworks should be complemented to conform to modern trends and challenges taking into consideration not only the projects' specifics and the key SD parameters, but also the turbulence of the macroeconomic environment and the current requirements to the projects from stakeholders, investors, etc.

As it was noted above, strategic sustainability is focused not on operational decisions, but on long-term ones. To create a novel concept, it is important to understand the current trends and existing prerequisites for strategic sustainability of Arctic oil and gas offshore projects (Figure 7).

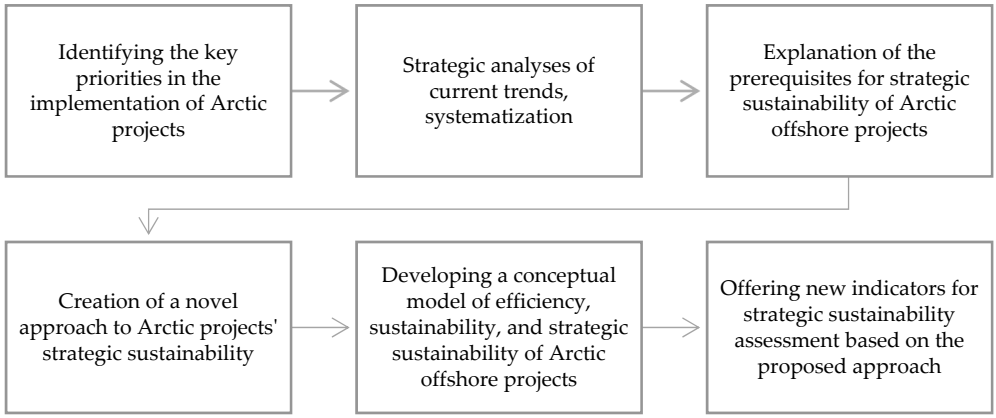

Figure 7. Strategic sustainability of Arctic offshore oil and gas projects.

To expand the vision of the tendencies on the global energy scale, we take modern concepts related to responsible and sustainable business and discuss them considering their potential influence on the future of the oil sector in general and that of hydrocarbon projects in particular.

We attempt to adopt ESG factors to oil and gas projects considering their specifics and possible contribution towards SDGs. Moreover, we try to understand how to ensure SD in the highly turbulent environment as investors' priorities are changing, the role of traditional resources is being transformed, and the concept of low-carbon development is gaining momentum. In the current conditions, Arctic oil and gas projects are sensitive not only to economic factors (price volatility, demand, etc.), but to global challenges as well. To implement them efficiently, we should follow new requirements, new standards, and the novel strategic sustainability concept.

4. Results

4.1. Modern Trends in the Oil and Gas Industry That Justify the Necessity of Strategic Sustainability of Arctic Offshore Oil and Gas Projects

Nowadays, economic efficiency is not the only indicator to determine if the project is attractive for investors or not. Environmental and social components are also particularly important, especially for the mining industry (as mining processes are supposed to be unsustainable by nature [111,112]). McKinsey and Company noted: "As oil and gas companies respond to the current economic discontinuities, they must choose where and how to compete as the world transitions to a low-carbon future" [113]. For example, Norway's priorities for the development of its Arctic region (according to the state policy) are closely related to the key directions of SD concepts and meet the global trends [114]:

- International cooperation (economic);
- Business development (economic);
- Knowledge development infrastructure (social);
- Environmental protection (environmental);
- Emergency preparedness (environmental).

As it was mentioned, some modern tendencies are intensifying and they can be perceived not only as threats, but as novel opportunities. For example, the growing technological complicity and the adaptation of new intelligent technologies in resource exploitation in the Arctic require significant capital investment. On the other hand, they become key factors to achieve safety in challenging natural and climatic conditions, to automate production processes, to reduce costs, and to maintain competitive positions on the global market. Thus, global trends and tendencies are the main prerequisites for adapting the strategic sustainability concept to oil and gas projects.

Table 2 presents global trends in the energy sector in the context of strategic sustainability. We tracked the influence of each of the modern global trends on the industry as a whole and on oil and gas Arctic projects in particular.

Table 2. Global trends in the energy sector as prerequisites for the strategic sustainability of Arctic offshore oil and gas projects.

Global Trends	Description—The Case of Arctic Offshore Projects	Prerequisites for Implementing the Strategic Sustainability Approach	Key Aspects
Strengthening competition in traditional hydrocarbon markets	The growing intensity of competition leads to searching for new opportunities to develop hydrocarbon resources. Therefore, Arctic offshore reserves are becoming important as prospective sources for meeting the global demand for energy resources [115].	A need to create novel competitive advantages to achieve and to maintain high positions on the global market; ensuring the investment attractiveness of offshore projects, taking into account current requirements and approaches to assess it (ESG indicators).	Economic/ Governance
Transition to low-carbon development [2,116]	For Arctic offshore projects, this challenge is particularly relevant. In 2020, multiple United States banks, including Wells Fargo & Company and Goldman Sachs, announced that they would not fund new offshore projects in the Arctic as these projects do not follow the established low-carbon directions [117]. Deloitte argues that investors request the long-term strategies of oil and gas companies to understand if they follow the climate and environment priorities or not [116]. Oil and gas companies should balance the investments needed to ensure sufficient supplies against the necessity of cutting emissions [18].	A need to transform current business models. According to Deloitte, oil and gas companies have only two options to remain viable during the transition (to be resilient and sustainable): (1) Diversifying into other forms of energy and enabling technologies (new competencies in renewables, novel technologies, focus on biofuels); (2) Turning emissions into a business opportunity (carbon capture technologies).	Ecological/ Economic
The growing role of innovation (technologies)	Arctic offshore projects require innovative technologies to exploit the resource base. Practice shows that there is a direct correlation between profitability of Arctic offshore projects and the current level of technological advances [118]. This fact was proven by Norwegian companies—the break-even rate of offshore projects reached USD 20 per barrel (Johan Castberg oil field) [119]. By contrast, a break-even point for Russian offshore projects is about USD 50–70 per barrel [118,120].	The need to develop innovative technologies and approaches, to minimize the level of import dependency on foreign equipment and technologies for offshore resources' exploitation (ice-resistant platforms, drilling rigs, etc.). Overall, the level of technological advances should become the key factor to resist the trends of high oil price volatility (maintain competitive positions on the global market against onshore oil projects). "Green" innovations might provide a contribution to environmental aspects.	Economic/ Ecological

Table 2. *Cont.*

Global Trends	Description—The Case of Arctic Offshore Projects	Prerequisites for Implementing the Strategic Sustainability Approach	Key Aspects
The growing role of digitalization	Transformation of management systems and production processes based on the implementation of fundamentally new systems for receiving and processing data, digital tools and management mechanisms, technologies (remote sensing platforms, intelligent and smart technologies) [121].	The need to develop and implement novel digital technologies. The effects can be discussed in different directions: social: to minimize labor; intensity, to reduce risks at work, to reduce the influence of the human factor; economic: to reduce production costs, to optimize production processes; ecological: to ensure effective operations without environment consequences, to enhance control systems (environmental factor).	Social/Economic/ Environmental
Social awareness	According to Norway's Arctic strategy, it is essential to balance opportunities and responsibility [114]. A responsible business practice implies respect for human rights and standards [122]. The term of corporate social responsibility (CSR) in case of the Arctic means to reconcile the priorities of key stakeholders and to have an open dialogue with the public (the Arctic Council as a platform for interaction).	The need to follow the current principles of corporate social responsibility, to integrate in the global system (the Arctic Council), to enhance tools and methods for interacting between the state, business, investors and society, to focus on open policy in the case of CSR.	Social
Environmental safety	Environmental aspects are of particular importance in offshore projects as the Arctic's environment is fragile and unstable. Specific risks associated with developing offshore hydrocarbon resources include oil spills, pollution, etc. The consequences of incidents might be not only dangerous but also irreversible. In severe weather conditions, it is impossible to react immediately to oil spills [123].	The need to minimize or even to eliminate possible environmental risks of offshore reserve exploration by implementing special technologies for preventing environmental incidents, and improving the control system quality. According to the SD concept, environmental impact is vital to consider when making long-term investment decisions.	Ecological/ Governance

Global trends in the energy sector create important conditions for implementing the strategic sustainability approach. The analysis shows that issues related to SD correspond to the category of project investment attractiveness. Taking into consideration the complexity and capital-intensity of Arctic oil and gas offshore projects, it can be concluded that investment attractiveness is essential. However, as we can see, foreign banks, companies, and investors are changing their priorities towards responsible business and sustainable projects. The more risky the project, the more efforts should be made to reconcile the key directions—economic, social, and environment. Strategic sustainability of Arctic offshore projects needs to be viewed through the SDG concept. According to previous research, the following SDGs are involved in developing the Arctic's oil and gas potential [44]: SDG 1, SDG 3, SDG 5, SDG 6, SDG 7, SDG 8, SDG 9, SDG 10, SDG 12, SDG 11, SDG 13, SDG 14, SDG 15, SDG 16, SDG 17. The most important SDGs for offshore projects can be systemized as follows:

SDG 3. Good health and well-being.
SDG 9. Industrialization, innovation and infrastructure.
SDG 11. Sustainable cities and towns.
SDG 12. Responsible consumption and production.

SDG 14. Conservation of marine ecosystems.
SDG 17. Partnership for sustainable development.

This concept can be applied not only to offshore oil and gas projects. The same list of SDGs, including SDG 8 (Decent work and economic growth), works for navigation projects. For alternative energy projects, such sustainable development goals as SDG 7 (Affordable and clean energy) and SDG 13 (Climate action) are particularly important.

The ESG concept is one of the important pillars as it complements the traditional SD model and reflects new requirements towards responsible investment and governmental regulation. Examples of ESG information include the environmental dimension (pollution, biodiversity loss, greenhouse gas emissions, waste management, renewable energy, energy efficiency [124]); the social dimension (quality of life, well-being, diversity, equality, employee relations, and human capital management), and the governance dimension (internal controls, regulations, board of directors, diversity, independence, information transparency, and risk management) [125–129].

ESG has been proposed as a strategic measure that allows companies to increase profits, the amount of attracted investment in company's projects, as well as an indicator of responsibility, corporate reputation, and consumer confidence [130,131]. Implementing sustainable practices helps companies gain competitive advantage over competitors in the industry, increasing productivity and intensity while reducing exposure to systematic risks.

In today's business environment, corporate governance, and financial transparency have an impact on corporate performance. These changes are important for understanding the widespread availability of relevant and reliable information related to financial and non-financial aspects of the company's operations. Environmental, social, and governance disclosure metrics have gained a reputation for playing a fundamental role in financial transparency. Research shows that environmental, social, and governance reporting is a means for a company to communicate with its stakeholders as part of its accountability and governance obligations, and at the same time, it is a tool for achieving transparency regarding the company's financial performance [127–129,132–134].

4.2. A Conceptual Framework for Strategic Sustainability in Arctic Oil and Gas Projects

Arctic offshore projects are known for their large scale. Thus, all the decisions made can be irreversible for the environment, local communities, etc. It is impossible to simply stop project implementation without any consequences. Therefore, all the steps should be thought out, and all the aspects (including environmental and social) should be taken into consideration. Moreover, as it was noted above, opportunities and responsibility have to be in balance.

Based on the tendencies and novel requirements discussed, we systemize the key principles of strategic sustainability regarding Arctic offshore projects. They include adaptability, taking into consideration stakeholders' interests, commitment to the global SDGs, etc. (Figure 8).

All the above mentioned substantiates the need to transform the traditional approach to sustainability (Figure 9). The projects' strategic sustainability is a way to implement investment projects in accordance with the key principles of the SD concept based on the adaptation to the current challenges and the novel opportunities through strengthening competitive advantages, transforming traditional approaches toward sustainability, and following technological advances. Strategic sustainability of Arctic oil and gas projects is primarily a complex dynamic system due to resource constraints and contradictions between the interests of various stakeholders. The priority objective in this case is not to ensure stable development but to be adoptive to a highly turbulent macroeconomic environment.

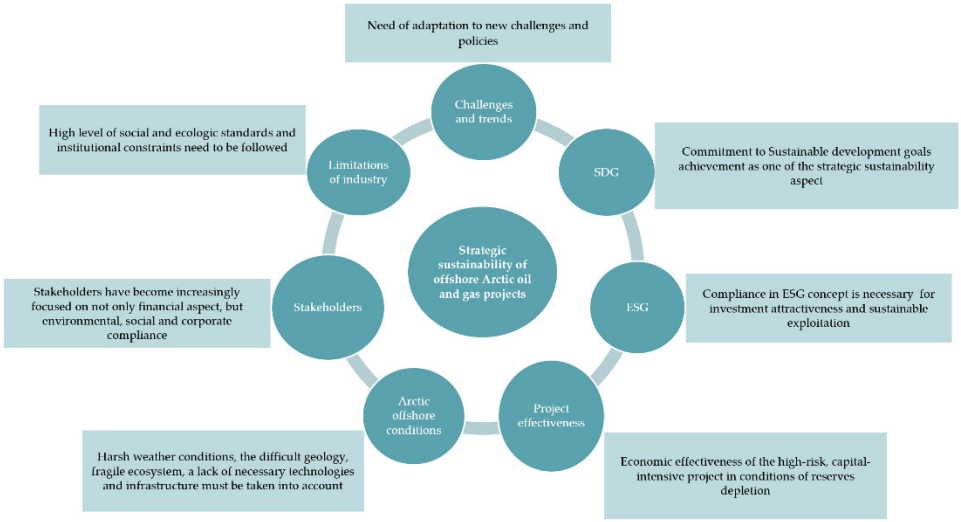

Figure 8. Principles of strategic sustainability regarding Arctic offshore projects.

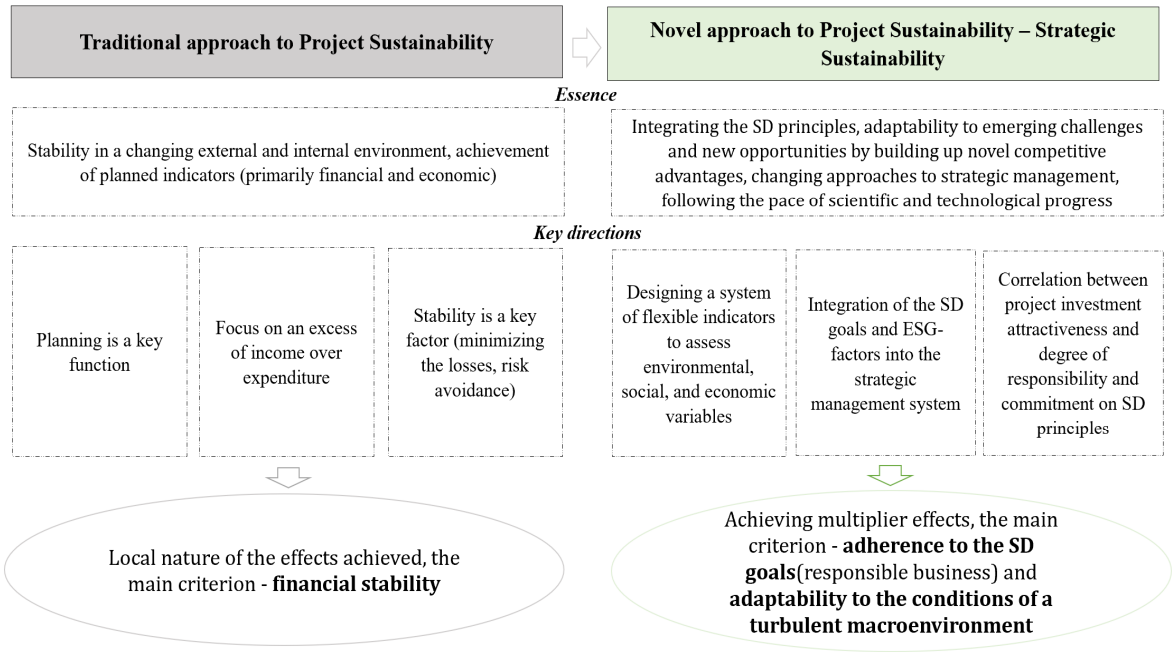

Figure 9. Transformation of the sustainability concept.

Thus, according to the concept offered, the strategic sustainability concept includes both the efficiency and the sustainability of investment projects. It covers not only economic aspects (economic and financial efficiency—microeconomic level), but also social and environmental pillars (SD foundation—macroeconomic level) and novel findings provided in this research—"Sensitivity to trends and volatility + Contribution to the achievement of the SDGs + Commitment to ESG factors". Figure 10 presents the conceptual approach we created to show the understating of the strategic sustainability concepts.

According to this novel approach towards strategic sustainability, the economic efficiency, social, and ecological pillars are important, but not enough to assess projects' positions. Table 3 presents the key indicators for assessing the efficiency, sustainability, and strategic sustainability of Arctic offshore projects. As it was mentioned before and shown in Figure 10, the strategic sustainability concept includes efficiency, sustainability, and extra factors such as sensitivity to trends and volatility, contribution to the achievement of the SDGs, and commitment to ESG factors.

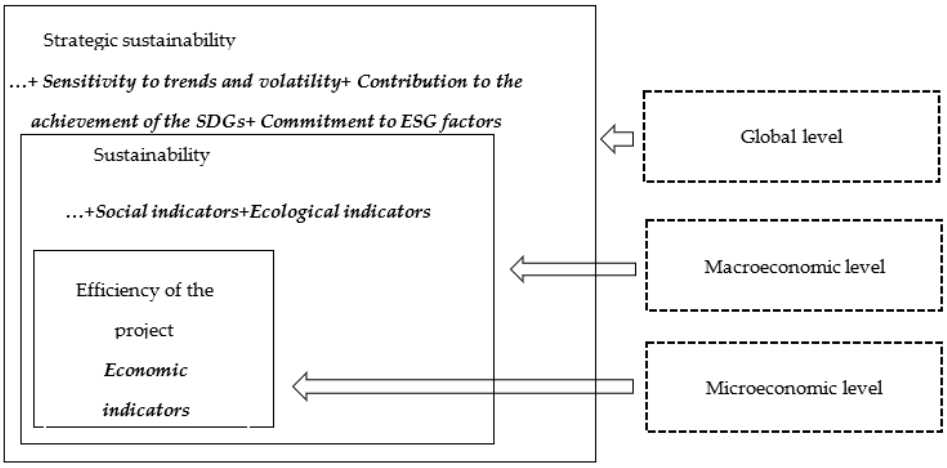

Figure 10. Conceptual framework for the strategic sustainability of Arctic offshore projects.

To determine the level of sensitivity of oil and gas projects towards new trends and volatility, we offer to apply an expert method. The tendencies discussed are different and multidirectional. Therefore, it is complicated to formalize them (see Appendix A).

Thus, the key findings of the research are the following:

- the unpredictability of the oil and gas market caused by high price volatility, post-pandemic consequences, as well as green energy trends, substantiates the need for a special approach to the exploitation of Arctic offshore resources;
- implementation of Arctic offshore projects nowadays requires not only economic justification, but also considering environmental, social, and governance aspects, which becomes possible if the strategic sustainability approach is used;
- the strategic sustainability approach in the case of Arctic offshore projects is a complex dynamic system that allows for implementing such projects in accordance with the key principles of the SD concept based on the adaptation to the current challenges and the novel opportunities through strengthening competitive advantages, transforming traditional approaches towards sustainability, and taking into consideration resource constraints and contradictions between the interests of various stakeholders;
- the strategic sustainability concept covers not only economics aspects (economic and financial efficiency—microeconomic level), but also social and environmental pillars (SD foundation—macroeconomic level) and novel findings provided in this research—"Sensitivity to trends and volatility + Contribution to the achievement of the SDGs + Commitment to ESG factors".

Table 3. Key indicators for assessing the strategic sustainability of Arctic offshore projects.

Approach		Indicators
Efficiency	Economic indicators [24]	Investments (including geological surveying costs, construction of infrastructure facilities, launch of production), mln rub
		Expected monetary value, mln rub
		Net present value, mln rub
		Budget efficiency, mln rub
		Return on investment
		Internal rate of return, %
		Payback period, years
		Unit total cost, mln rub

Table 3. *Cont.*

Approach		Indicators
Sustainability	Social indicators	The number of highly efficient jobs, units
		Contribution to the socio-economic development of the region
		Improving the living standards of the population
		Degree of public involvement in decision making
		New competencies
		Indicator of the average level of wages, rub
		Standard of living
		Implementation of programs aimed at improving the qualifications of personnel, units
	Environmental indicators	Energy intensity, %
		Resource efficiency, %
		Prevented damage: (rub/year) -water resources; -air; -land resources (soil and land degradation); -bioresources
		Resource intensity indicator, %
		Carbon content, %
		Waste capacity indicator, %
		Water capacity indicator, %
		Indicator of the degree of involvement of waste in production, %
		Indicator of the level of purification of emissions of pollutants into the atmosphere, %
		Indicator of innovative technologies, the level of technological support
		Accident rate (assessment of the likelihood of potential environmental threats)
		Creation of insurance funds to prevent possible environmental damage
Strategic sustainability	Sensitivity to trends and volatility	Strengthening competition in traditional hydrocarbon markets
		Transition to low-carbon development [2,116]
		Growing role of innovation (technologies)
		Increasing role of digitalization
		Social awareness
		Environmental safety
	Contribution to the achievement of the global SDGs	SDG 3. Good health and well-being
		SDG 9. Industrialization, innovation, and infrastructure
		SDG 11. Sustainable cities and towns
		SDG 12. Responsible consumption and production
		SDG 14. Conservation of marine ecosystems
		SDG 17. Partnership for sustainable development
	Commitment to ESG factors	Effectiveness of corporate governance
		Corporate and social responsibility
		Business reputation
		Cooperative ventures with the government
		Effectiveness of the risk management system

5. Discussion

It is well-known that exploration of the Arctic's resource potential remains a deliberative issue. There is an opinion that resource exploitation cannot be sustainable for the Arctic region, as any industrial activity influences the environment [135]. In view of the low-carbon development and green trends, offshore projects are often discussed as unsustainable. Obviously, the production processes influence the fragility of the Arctic's ecosystems. However, these reserves can be considered as strategically important not only for Russia, but for the whole world. Traditional energy sources are gradually being depleted. This leads to the necessity of searching for new resources—both conventional and unconventional.

We assume that in energy equivalent, the increase in alternative energy sources does not compensate for the growth in the global energy consumption. Therefore, Arctic hydrocarbon resources can be vital for meeting the future needs. The issue is that they are unique, making traditional technologies and approaches unfit. The interest in implementing Arctic offshore projects is increasing with growth in prices. However, consideration of these projects only from the economic point of view is fundamentally wrong. The high level of environmental risks, severe conditions, etc., must be taken into account. We argue that in the current conditions, Arctic offshore projects can only be effective if they comply with all novel standards and requirements. As we noted above, economic efficiency is an important pillar, but it is not the only one. In order to tackle new challenges, follow new trends, and be supported, Arctic projects have to be sustainable.

The analysis of scientific literature has shown a lot of different approaches towards project sustainability and strategic sustainability in particular. The paper does not contradict previous studies but complements them by revealing the nature of the strategic sustainability concept, its adaptation to oil and gas projects, and its key principles and features.

We have tried to build upon current approaches and principles, and to develop our own vision of how Arctic projects can be strategically sustainable in such trends as the focus on green economics, the global energy transition, the growing importance of social and environmental pillars, and novel investment standards. We have shown that the current approaches towards sustainability have to be transformed as they do not meet the existing challenges.

We have developed a list of indicators to determine Arctic projects' strategic sustainability taking into consideration their specifics. These indicators are different and include both qualitative and quantitative ones. In this research, we have tried to present a conceptual framework. Therefore, we do not attempt to assess particular projects, leaving this task for our further research.

6. Conclusions

Nowadays, the not yet explored potential of hydrocarbons in the Russian Arctic is 91% offshore and 53% onshore [136]. The low rates of exploitation of Arctic deposits are due to the features of development activities in the Arctic Circle. Challenging geological and weather conditions, poor infrastructure and logistics, and the vulnerable environment require special approaches to the technological systems and competencies used. Low prices for energy resources, as well as the lack of access to foreign technologies and financing, reduce the profitability and investment attractiveness of production activities [137,138]. In addition, the production and transportation of hydrocarbons in the Arctic, especially offshore, are associated with a negative impact on ecosystems and possible man-made disasters. Therefore, today, the implementation of high-risk capital-intensive oil and gas projects in the Arctic is a truly global challenge for both Russian oil and gas companies and the government in the context of the crisis in the global economy, structural changes in the energy mix, and the growing role of low-carbon development.

Given the transition to green energy on the one hand, and the continuing demand for oil and gas resources on the other, Russia has the opportunity to expand its capacity

through Arctic offshore projects. At the same time, their implementation requires a special approach, which should take into account the following issues:

- to develop long-term strategies including the ways and actions to meet key global challenges (related to low-carbon development in particular);
- to represent the contribution to the environmental and social aspects;
- to focus on the technological advances (to minimize possible environmental risks, to reduce production costs, to maintain a competitive position on the global market);
- to create new approaches to interact with the key stakeholders;
- to show commitment to the SDGs (not only in theory but also in practice).

The above mentioned will help to ensure the strategic sustainability of Arctic projects.

According to the background and the purpose of the research, we suggest a conceptual framework of strategic sustainability of Arctic offshore projects that requires a transformation of the existing approaches. It involves integrating SD principles, adaptability to emerging challenges, and new opportunities by building up novel competitive advantages, changing approaches to strategic management, and following the pace of scientific and technological progress. The following directions were determined:

- Designing a system of flexible indicators for assessing environmental, social, and economic variables;
- Integrating SDG and ESG factors into strategic management systems;
- Correlation between project investment attractiveness and the degree of responsibility and commitment on SD principles;
- The key goal is to achieve multiplier effects; the main criterion is adherence to the SDGs (responsible business practices) and adaptability to the conditions of a turbulent macroenvironment.

It has been determined that the analysis of the strategic sustainability of Arctic offshore projects should include performance indicators, stability parameters, as well as criteria for compliance with trends, ESG criteria, and criteria for contribution to the achievement of the SDGs.

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Appendix A

Table A1. Sensitivity towards trends and volatility.

Novel Trends and Challenges	Sensitivity towards Trends, Scores		
	0	**1**	**2**
Strengthening competition in traditional hydrocarbon markets	A company has significant competitive advantages, holds a stable position in the market	A company has significant competitive advantages, but its position in the global market is unstable	A company loses its competitive position and cannot compete with other market players

Table A1. *Cont.*

Novel Trends and Challenges	Sensitivity towards Trends, Scores		
	0	1	2
Transition to low-carbon development	The project priorities are fully aligned with the targets of the global energy transition	A company attempts to diversify its activities in favor of green assets and introduces advanced technologies for sequestration of CO_2	Project priorities completely contradict with the low-carbon development vision
Growing role of innovations (technologies)	Use of advanced technologies, high innovative activity	Partial implementation of innovative technologies at the level of individual production and production processes	Low innovation activity, outdated technologies, high depreciation of fixed assets
Growing role of digitalization	Widespread use of advantages of digitalization, full automation of production and technological processes ("smart field")	Partial use of digital solutions when performing certain operations, partial automation of production and technological processes	Lack of digital solutions in the organization of production and production processes
Social awareness	Practical implementation of socially responsible business concepts, use of progressive methods and tools for interaction with the public	Prerequisites for the implementation of socially responsible business concepts	Lack of effective interaction between the company and society
Environmental safety	Minimizing potential threats to environmental safety, continuous monitoring	Building an effective system for preventing environmental consequences	High level of environmental threats and risks, lack of effective oil spill prevention systems

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