

УДК 332.1

JEL: R1, O11, O33, O40

DOI: 10.18184/2079-4665.2021.12.1.23-33

Original article

## Modern Approaches to Arctic Development in View of Synergy Potential in the New Risks and Challenges Environment

Natalia N. Bondareva<sup>1</sup>

<sup>1</sup> Institute of Economic Forecasting, Moscow, Russian Federation  
47, Nakhimovsky prospect, Moscow, 117418

E-mail: [bonna2005@mail.ru](mailto:bonna2005@mail.ru)

---

### Abstract

**Purpose** of this article is to consider methodological and organizational approaches in managing the development of the Arctic zone of the Russian Federation as a complex system at various levels, from the project level to the global level, taking into account the synergy of the potential of the economic platform and the synergy of risks and threats.

**Methods:** the research presented in the article is based on the use of theoretical foundations of managing target processes for solving complex Arctic development problems, applying methods of system analysis, operations research and economic analysis of the development of complex systems from the view of synergy effects. Methods for analyzing the emergence of complex systems, the balance of dynamic integrity, evolutionary development and chaos management, and specific resistance activity were also used.

**Results:** consideration of the experience of the complex intensification of the Russian Arctic economic potential at different territorial levels through the system filling with better synergies management of the potential of private-state partnership is presented. It makes possible to identify both the results achieved and the current and future threats and challenges of the region. The author of the study disclosed the organizational and methodological problems of Arctic management, assessed the limitations for the full-scale launch of synergistic management models.

**Conclusions and Relevance:** the presented results of the analysis set the management vector for maximum synergistic activation of financial, logistical and intellectual resources to achieve sustainable, holistic and safe development of the Arctic. The proposed methodological approaches will minimize synergistic resistance of risks and threats to the current policy of the Russian Arctic competitiveness growth.

**Keywords:** synergy, "support" zones in the Arctic, anchor projects, negative, destructive synergy, targeted management, integrated approach, intelligent software, self-organization, self-development, large system, synergistic effect, ecology, ecosystem, social function of the state

**Conflict of Interest.** The Author declares that there is no Conflict of Interest.

**For citation:** Bondareva N. N. Modern Approaches to Arctic Development in View of Synergy Potential in the New Risks and Challenges Environment. *MIR (Modernizatsiia. Innovatsii. Razvitie) = MIR (Modernization. Innovation. Research)*. 2021; 12(1):23–33. (In Eng.)

<https://doi.org/10.18184/2079-4665.2021.12.1.23-33>

© Bondareva N. N., 2021



Контент доступен под лицензией Creative Commons Attribution 4.0 License.  
The content is available under Creative Commons Attribution 4.0 License.

Оригинальная статья

## Современные подходы к развитию Арктики с учетом потенциала синергии в условиях новых рисков и вызовов

Наталья Николаевна Бондарева<sup>1</sup>

<sup>1</sup> Институт народнохозяйственного прогнозирования Российской академии наук, Москва, Российская Федерация

117418, г. Москва, Нахимовский проспект, д. 47

E-mail: bonna2005@mail.ru

### Аннотация

**Цель.** Целью данной статьи является рассмотрение методологических и организационных подходов в управлении развитием Арктической зоны Российской Федерации как сложной системы на различных уровнях (от проектного уровня до глобального), с учетом синергии потенциала экономической платформы, с одной стороны, и синергии рисков и угроз, с другой.

**Методология проведения работы.** Представленное в статье исследование базируется на использовании теоретических основ управления целевыми процессами решения сложных проблем развития, применении методов системного анализа, исследования операций и экономического анализа развития сложных систем с точки зрения синергии эффектов. Также использованы методы анализа эмерджентности сложных систем, баланса динамической целостности, эволюционного развития и управления хаосом, специфической активности сопротивлений.

**Результаты работы.** Определение синергии рассматривается как результат консолидации и интеграции потенциалов, инструментов контроля качества и процессов. Вместе с тем, это явление трактуется как система методов организационного проектирования и взаимозависимой совместной деятельности нескольких факторов, объединенных в одно направление по созданию новой, измененной среды. Следует констатировать возрастающую роль и значение синергии в эффективном и инновационном управлении экономическим потенциалом Арктики. Выявлены относительно высокие риски международных конфликтов и конкуренции за перспективные доходы в ближайшие десять лет.

В настоящее время РФ обладает значительным потенциалом для достижения синергии при реализации арктических проектов на глобальном, национальном, региональном, отраслевом и корпоративном уровнях, на уровне «опорных арктических зон», а также на уровне якорных проектов и на микроуровне. В то же время следует иметь в виду, что новые условия негативной синергии могут появиться в любой момент при объединении угроз и рисков. Такие ситуации также могут создаваться и искусственным путем. Отсутствие избыточности предложения на рынке новых глобальных инноваций становится самым большим вызовом и угрозой для РФ в Арктике из-за санкционной геополитики некоторых стран.

**Выводы.** РФ обладает действительно необходимым синергетическим потенциалом – арктическим экономическим фундаментом, включающим в себя природные месторождения, национальные инновационные технологии, высококвалифицированный человеческий капитал, финансы и исторический опыт управления Арктикой. Эта база должна быть эффективно и оперативно вовлечена в разработку комплексной системы поддержки стандартизированных решений для арктических проектов. Необходимо рассматривать экологическую ответственность как неотъемлемую часть всех арктических национальных проектов. Кроме того, важно постоянно прогнозировать возможные угрозы как следствие недостаточного государственного контроля над деятельностью корпораций в Арктической зоне, а также угрозы природных и техногенных катастроф.

**Ключевые слова:** синергия, зоны «поддержки» в Арктике, якорные проекты, негативная синергия, деструктивная синергия, целевое управление, комплексный подход, интеллектуальное программное обеспечение, самоорганизация, саморазвитие, большая система, синергетический эффект, экология, экосистема, социальная функция государства

**Конфликт интересов.** Автор заявляет об отсутствии конфликта интересов.

**Для цитирования:** Бондарева Н. Н. Современные подходы к развитию Арктики с учетом потенциала синергии в условиях новых рисков и вызовов // МИР (Модернизация. Инновации. Развитие). 2021. Т. 12. № 1. С. 23–33

<https://doi.org/10.18184/2079-4665.2021.12.1.23-33>

© Бондарева Н. Н., 2021

### Introduction

The global threats and challenges increase the need for new management methods, projects with the synergistic potential in the Arctic. Arctic is a big and

relatively stable system facing the increase of unstable, unpredictable, and sometimes even uncontrolled internal and external factors of big changes. The consolidation of system effects of development and

degradation in different spheres can play very specific role depending on the system's nature, affordability and effectiveness of its management.

The consolidation of innovative activities of partners, the mutual integration of quality management, processes and resources tools create a new environment. It can support the open, sustainable development of the socio-economic system (hereinafter – the system) based on humanism and environment safety.

Consideration of synergy potential is important at all stages of the full life cycle (FLC). Threats and risks can be managed as a big environmental system too. In the unstable environment Arctic becomes a unique object of specific geopolitical competitive management. Being a complex dynamic system the Arctic produces the maximal effects due to its integrity and capability to acquire and join new elements, including human activity synergetic effects.

We suppose that the criteria of effectiveness of Russian Arctic management can be set and monitored within the state programs, global, national and regional programs' criteria, and also via corporative and public opinion investigations.

The Arctic economic potential is huge. According to the USA Geological Service up to 22% of world gas and oil deposits can be located under the Arctic Ocean. The total cost of all mineral deposits in Russian Arctic is above \$ 30 trillion of which only 5% is being mined. The length of the Northern Sea Route in Russia is 5.600 km. The huge potential of fishery and shelf mineral base gives advantages to the RF in gaining the leading position in the global economics. Above 2.5 million people live in the Russian Arctic region.

The RF national projects are aimed to speed up dramatically the Arctic development by 2030. New Arctic technologies, including ice-breaker fleet, underwater robots, and new materials in construction, new ecology-friendly mining technologies and drones become the effective part of the big Arctic system along with the natural resources, people and management. Currently this social and economic foundation system is quite stable in its evolution development. Nevertheless it faces definite threats and challenges, and must accumulate the potential to overcome possible future catastrophe. The reunion of the mentioned production driving forces meets face to face the reunion of new threats and risks, including climate change and regional geopolitical competition tension in Arctic. In such environment the Arctic resource base needs absolutely innovative management approaches and methods, including the best synergetic practice.

### Literature Review

The terms "synergy" was introduced by Hermann Haken, the synergetic science founder, in 1977. But long before that definition Karl Marx in his "Capital" wrote about "a new power" that appears from the emergence of many forces, powers into a united one. Later, in 1912 the Russian scientist A.A. Bogdanov developed the tectological classification of activities-resistance. Since that time many scientists (I. Prigozhin, E.J. Applewhite, R.B. Fuller, S.P. Kapitsa, S.P. Kurdyumov, V.I. Arnold, D.S. Chernavsky, Yu.A. Danilov, B.B. Kadomtsev, V.P. Milovanov and other scientists) explored synergy in physics and society. Thus, Ilya Prigozhin introduced such terms as global attractor, local attractor, super-choice and other issues. As to H. Haken, he believed that synergetic is the theory of self-organization in the systems of different nature. Via and due to synergy the system can produce a new characteristic, feature lacking by a separate element. The synergetic economy or reflective management theory describes crisis and knowledge – based economy from the point of new philosophy of nonlinear world. So, modern scientists understand synergetic as an interdisciplinary direction.

In this research the author analyses the contradictions, balance of order and chaos in Arctic as a big complex system, and the important source of satisfying a big part of human demands. The Arctic zone is also seen as a big global marketplace with its own laws, risks, restrictions, and future potential.

The purpose of this article is to consider methodological and organizational approaches in managing the development of the Arctic zone of the Russian Federation as a complex system at various levels, from the project level to the global level, taking into account the synergy of the potential of the economic platform and the synergy of risks and threats. The definition of synergy is considered as the result of potentials' consolidation and integration, quality control tools, processes. It is also treated as a system of organizational design methods, and the interdependent joint activity of several factors rolled into one and in the direction creating a new, changed environment. We should state the growing role and importance of synergy in effective and innovative Arctic governance of the economic potential. We reveal relatively high risks of international conflicts and competition for the future benefits in the next ten years.

Currently the RF has got most of potential for achieving synergy in the implementation of Arctic projects at the global, national, regional, sector,

corporate levels, at the level of the “Arctic support zones”, anchor projects and micro level. At the same time it should be kept in mind that new terms for negative synergy may appear at any time when threats and risks start working together. They can also be created artificially. Absence of excess to new global innovations becomes the biggest challenge and threat for RF in Arctic due to the sanction-based geopolitics of some countries.

Nevertheless, the RF has got really sufficient synergetic potential – Arctic economic foundation, including: natural deposits, national innovative technologies, highly qualified human capital, finance and historically approved Arctic management. This base must be wisely and quickly involved into the development of an integrated support system of standardized solutions for Arctic projects. We must always consider the ecological responsibility as an integrated part of all Arctic national projects. Moreover, threats of insufficient RF government control over the corporations’ activity in Arctic zone along with threats of natural and technological disasters should be forecasted on daily basis.

### Materials and Methods

The research presented in the article is based on the use of theoretical foundations of managing target processes for solving complex Arctic development problems, applying methods of system analysis, operations research and economic analysis of the development of complex systems from the view of synergy effects. Methods for analyzing the emergence of complex systems, the balance of dynamic integrity, evolutionary development and chaos management, and specific resistance activity were also used.

In the research we use open sources of information, governmental acts and corporate reports to get the full historical landscape of human impact and future plans in Arctic.

### Results

#### *The Importance and Role of Synergy in Arctic Governance*

In general, synergy is defined as a system of organizational design methods, as the interdependent effects of several factors acting jointly in one direction, as a set of mechanisms for self-organization and self-development of systems. Synergy in any spheres, including the Arctic Zone of the Russian Federation (hereinafter referred to as AZ RF) as a macro-region being a huge part of the Russian economy system, creates the vivid multiplier benefits, reduces most costs, increases direct and indirect profits, forms

multiple transit effects, and minimizes (distributes, shares) risks.

The integrity potential is composed of several elements, including resources, interconnections, people, technologies, mutual support and the agreed, integrated behavior of all system elements. So, the economic base can remain just a separate base without the effective management and organization.

The importance of synergy consists in creation of extra new additional (added) expected quality, including its new social, environmental, political and other characteristics. The Arctic development synergetic management role is the important public social function and driving force of the Arctic potential development, since the synergistic social effect is the main result of the economic development of the region.

Also, synergy in targeted management techniques comprehensively, multi-dimensionally enhances the potential of most management processes and methods, including the potential of “expert brainstorming”. It launches a unique mechanism of development through the self-preservation and self-development of the Arctic as a large system, including innovative decision making on the old and new processes, contradictions, correspondences, added sustainability and new quality of the system.

#### *Arctic Self-Development Potential*

It should be noted that the synergistic effect is achieved by the method of complete or partial interaction, integrity, interpenetration of such elements of the system as: organization, management, self-government and self-organization, self-development. There is no doubt that synergy unites and repeatedly strengthens different parts of the whole system. Simultaneously, synergy allows to get rid of redundant, inefficient and non-perspective elements along with the creation of a new synergistic quality. We can trace positive and negative effects of the Arctic development. Thus, the vicious cycle manufacture can recycle 5 million tons of scrap metal accumulated in Russian Arctic during dozens of years of polar exploration. Scrap metals as raw materials can be included into the technogenic turnover after building the scrap metal recycling plant.

We believe that the Arctic system is capable of self-organization during periods of evolutionary and revolutionary changes. An aggressive external environment (including climate change, territorial conflicts, oil spills) increases the threat of Arctic potential’s degradation or loss. And it requires new social approaches and honest and open international cooperation.

It is also reasonable to assess the total potential of Arctic self-development. The independently organized (reorganized) system, as can be proved by the Arctic region itself, continues to develop on its own regardless of human influence. And every time the Arctic system produces its own scenario to survive and reply on each anti-Arctic human action. In a whole, system's self-organization is a process in which the forecasted (planned) system changes are caused or produced (created) by the external, internal forces and system's self-development aims. The influence of the external environment makes its huge role too.

#### *Arctic System Evolution Stages*

It is reasonable to point the evolution stages of the system, including:

- a) a stage of the key elements' stability loss (which directly determine the system);
- b) a stage of the whole system stability loss;
- c) a stage of the system instability;
- d) a stage of transition from instability to evolution or revolution stage;
- e) the system stability recovery and restoration.

It is also important to understand which stages of evolution the Arctic is going through now, and what management tools are more effective on this stage, and which ones it is needed to develop in five or ten years horizon. Anyway the tools must be based on synergy principles as the consolidation of capacities, including AI, to achieve the maximum result that exceeds the sum of individual efforts.

To add more, the positive synergy of cooperation, including intellectual synergy, is not always able to withstand the synergy of combined and rolled into one risks and threats as a powerful destructive force with directly or indirectly built-in challenges. Geopolitical stage of competition for Arctic is often a hidden economic game, and it is masked under the economic alliances, international organizations and sanctions.

Along with geopolitical and environmental challenges, the economy of the Russian Arctic faces threats of population outflows. Out of 2.5 million people living in the Russian Arctic 200,000 people intend to leave it due to the harsh climate, low quality of life, and life-time under-consumption of all types of social benefits. This example demonstrates the third stage of system instability. Without people the Arctic system can't survive as the national economy basement and international resource center in some projects. Creating incentives to work in harsh conditions is the RF direct social and even political function.

#### *Achievement of Synergies at Different Levels of Potentials' Consolidation*

The conducted analysis of the Arctic projects realization confirms the importance of synergy at all levels: geopolitical, national, regional, sector, company and micro-levels.

#### *Synergy at the Geopolitical Level*

The synergy of geopolitical efforts to mitigate risks and mobilize potential is carried out within the framework of the Russian chairmanship in the Arctic Council in 2021-2023. The active partnership with countries and companies which are the leaders in the field of scientific research, shipping, Arctic technologies is highly demanded. The experience of international synergy in Norway in the use of eco-systems management in marine areas and the Canadian-American pilot program (the Beaufort Sea ecosystem, Arctic Council for the Protection of the Arctic Marine Environment) are interesting.

Positive synergistic effects are evident in existing global and interstate Arctic governance mechanisms. It is really important to underline the role of the Montreal Protocol on Substances that Deplete the Ozone Layer, the Stockholm Convention on Persistent Organic Compounds, the Arctic Monitoring and Assessment Program, the UN Framework Convention on Climate Change, the Northern Forum, WTO agreements, the International Arctic Scientific Committee (IASC), as well as the International Council of Scientific Unions, the International Association of Classification Societies, the International Council for Marine Research and other global, regional and field projects. All they are of humanitarian, social and ecological character.

#### *Synergy at the National Level*

It should be also noted that at the national level, the realization of the "Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period up to 2020 year" is expected during the three time stages: the first stage (2020-2024), the second stage (2025-2030), and the third stage (2031-2035). Implementation will be conducted through the national program "Socio-Economic Development of the Arctic Zone of the Russian Federation", the Northern Sea Route (NSR) Infrastructure Development Plan, regional, zonal and corporation programs.

It is appropriate to identify how strategic goals interact, interconnected, duplicate each other at all levels, what are contradictions among them. To analyze the mentioned above tasks and the current and future risks and challenges it is recommended to undertake the following actions:

1. To conduct audit of all strategic documents and activities at all levels;
2. To create a joint, consolidated register of programs and projects financed from budgets of all levels;
3. To carry out an environmental examination of the projects' results;
4. To make the unified register of capital construction facilities;
5. To compose a unified register of promising, perspective Arctic technologies (basic technologies) capable to become the technological transition drivers from the a stage "partial, point Arctic development" to a stage of "large-scale Arctic development";
6. To develop the integrated project management approach to the Arctic development with standard unified criteria for assessing the results and synergistic effects of Arctic programs.

It is believed that the proposed approach meets the tasks of the RF digitalization. Knowledge-intensiveness of Arctic development is really huge. Effective risk and challenge management will ensure Arctic safe and integrated development. It is highly needed to correct social imbalances, to increase the life expectancy and quality of life, to eliminate the old dwelling fund, to increase the number of population in Arctic up to 3 million people, to stimulate the social sphere and

infrastructure development (including budgeted air transportation), and to keep the safe environment. Today, Russian Arctic provides about 11% of the RF GDP, 82% of Russian gas production and above 12% of liquid hydrocarbons production. Despite the negative synergistic effect of risks, the value of the AZ is definitely growing at all levels. The national projects after revision include more really demanded activities including the total cleaning of Arctic from metal scrap and garbage by 2035.

*Synergy at the Territorial Level*

It should be noted that the principle of synergy is implemented into the new mechanism of territorial development, at the local level. It was introduced by the RF Ministry of Economic Development in 2016 (within the project of the so called "eight support zones"). Based on administrative – territorial division, the role of ports, the North Sea Route, and the resource base the Government expects to achieve the goal to convert oil and gas mining industry into a new intellectual breakthrough project able to intensify the popularity and affordability of the North Sea Route.

The format of the "support zones" is chosen to speed up the development of the Arctic macro region as a mega-project (large system) on the principle of mutual integration of competencies and resources at all levels and stages of planning, financing and realization, as well as analysis of synergistic effects in adjacent territories.

Table 1

**Eight Support Zones of Russian Arctic**

Таблица 1

**Восемь опорных зон Российской Арктики**

	Support Zone Name	Description of the Support Zone (Area)
1.	Arkhangelsk support zone	Advantageous geographical location, well-developed railway infrastructure and year-round port (from November to March operated only for ice class vessels or with icebreaking)
2.	Chukchi support zone	On its territory there is a number of system-forming transport infrastructure facilities in the eastern part of Russian Arctic.
3.	Kolskaya support area	Advantageous geographical location, non-freezing year-round ports, huge resources, relatively developed transport, energy, industrial, scientific and educational infrastructure characteristics of the support zone
4.	Nenets support zone	Potential for NSR development and mining
5.	North Yakut support zone in the Republic of Sakha (Yakutia)	The key object of the eastern part of the NSR is the strategic port of Tiksi.
6.	Taimyr-Turukhan support zone	It includes a mining and industrial complex in Krasnoyarsk region becoming a large agglomeration known as Norilsk industrial region.
7.	Vorkuta support zone	It includes the municipality of "Vorkuta" urban district in Komi Republic.
8.	Yamalo-Nenets support zone	It obtains high potential to provide stable cargo flow for the NSR ports.

Compiled by the author.

Составлено автором.

### *Synergy at the Corporate Level*

It is believed that synergy is effective in the conditions of competitive business projects with a high corporate production culture. In Arctic high-risk nature conditions, synergistic effects can be achieved when implementing step-by-step tasks of increasing and replacing Arctic raw material base (taking into account environmental safety and the development of harmless technologies):

- 1) exploration and study of areas of the new raw material base;
- 2) development of these areas;
- 3) involving new oil and gas reserves in the industrial turnover;
- 4) exploration, production and involvement of hard-to-mine oil and gas reserves;
- 5) development of alternative energy ("green energy");
- 6) reduction of hydrocarbon raw material usage.

It is still believed that "green energy" is not capable to fully satisfy the global needs in relatively cheap energy. Ecology – friendly engineering is the perspective trend for the next decade. In Arctic the atomic ice-breakers will remain the best option for the next ten years.

One of the positive examples of mutual beneficial synergetic effects at the industry and company level is the technological cooperation between "Gazpromneft-Yamal" (it made four horizontal shafts) and "Messoyakhaneftegaz" (with its unique "fishbone" technology in TAML-3). As a result, the intellectual synergy of two "GazpromNeft" assets in Yamal made it possible to find a high-tech solution for the project of hard-to-mine Arctic reserves.

So, high quality of production culture and management is an important condition for achieving synergy. Exchange of intellectual assets (selection of drilling equipment and methods, specialists drilling cross-training, joint expertise and partnership) is the basis of "Gazpromneft-Yamal" success. Internal synergy (inside the company-level) ensures the company's competitiveness to overcome most of complex risks. Thus, "Gazpromneft-Yamal" successfully drilled horizontal sections of more than 2,000 meters at the "Tazovskoye" field. Currently it is developing technological solutions for drilling deep oil deposits with a high coefficient of abnormal pressure.

To add more, the criteria for assessing the results of synergy must also include the new achieved level of safety, cost reduction, drilling speed increase,

and total profit. When copying somebody's proved success in the economy of scale, the effects will push up the new technology usage and force the whole market to grow. So Arctic is a highly growing technological market with its own laws.

The mentioned multiplicative corporate and sector synergistic effect in Arctic is not just a positive statistic fact, but also the proved successful methodology of the accelerated modernization of technologies that increases the national and global efficiency of Russian oil and gas production.

The specialists agree that the national projects are hard to realize solely on the private – state partnership base, without purely public (including municipality level) and military participation. Thus, only in 2020 the Russian Finance Monitoring Service (Rosfinmonitoring) disclosed and identified the violations in 6,000 national projects contractors at the amount of 500 billion Rubles. The total number of unscrupulous performers and contractors exceeds 20,000 projects. In Arctic conditions the cost of most contracts often exceeds the norms and standards due to lack of competition, proved management models standards and experience in some projects. Many pioneer projects are hard to implement and done for the first time in the history (for example, "Megafon" (Russia) and "Cinia" (Finland) communication project). So the cost of Arctic projects may dramatically vary due to their unique nature.

### *Synergy at the Project Level*

It should be pointed out that synergy at the national and sector level can also be achieved via "anchor" projects, increased financing, budget privileges and corporate goal financing. As a part of private-state partnership program (ALROSA, Lukoil, Russian Railways, NOVATEK, Gazprom, and Norilsk Nickel) a list of 145 current and future Arctic projects is compiled. It includes 17 most significant projects (Yamal LNG, the Northern latitudinal passage, Murmansk transport hub, seaport in the village of Sabetta, Prirazlomnoye, etc.).

#### Negative Synergistic Effect of Risks and Challenges

Understanding the complexity of developing the clear and definite criteria for assessing synergistic effects in Arctic risks environment, it is believed that only a comprehensive, humanistic, social, environmentally friendly approach is applicable in the Arctic market. The transfer of the Arctic national potential into the hands of two or three big companies is fraught with the loss of Government's direct revenues and synergy effects. We state that the public participation in the private companies' successes in Arctic is underestimated. Technological disasters (in Norilsk, 2020) were eliminated directly

and indirectly at the expense of the national budget and at a high cost for the future generations. The paid fine will never completely restore the regional landscape. Understanding this, Novatek became a member of International Economic Council in 2021. Gazpromneft and Novatek will create a new JSC for Arctic projects. The deeper Arctic ecology safe exploration by the private companies should be controlled by the Russian Government after a comprehensive examination of the compliance of their technologies with the RF tasks and national interests.

Understanding the mutual influence of two equilibrium systems - the Arctic region and the world - it is important to comprehensively develop synergistic partnerships at all levels (joint salvation in the Arctic, scientific research, etc.). The transformation of the resource market is inevitable - the largest natural gas reserves are located in the Russian Arctic, and there are the largest oil reserves in the state of Alaska (USA). We also believe that synergy of international potentials in the Arctic development should not be aimed at intensifying the extraction of resources (the potential of future generations), but at protecting this unique global region, preserving the Arctic culture, developing scientific researches, fisheries and tourism. Russia enlarges the number of current and future partners in Arctic exploration, including new projects with China, Norway and Finland.

Considering the highest cost of Arctic development, the risks and costs of business in Arctic projects (private companies are historically relatively young government's partners) are assessed disproportionately to similar business indicators in Russia's central regions. These costs and risks combines together have a sharply negative synergistic effect. Risks can rapidly transform into really big challenges from local to global level. For survival, business is often simultaneously forced to compete for markets in Arctic, in other Russian markets and even globally. This market situation also increases risks.

In addition to the said above, in order to keep actively growing permanent professional Arctic community new methodology is needed. It may sound unrealistic, but people expect at least 3-10 times wages increase, and a new stimulating system of benefits and preferences. It is impossible to realize the exploration programs and national projects without professional human capital. The geopolitical and social function of the Russian Government in the Arctic should be focused on the development of the NSR, the reconstruction of the White Sea-Baltic Channel, the creation of a

cargo fleet, sanitary aviation, transport and other breaking through infrastructure projects (including Internet). Currently the professional education for Arctic needs does not meet all the Arctic market needs. Social and economic bonuses can become the best way to set the problem of intellectual capital growth in the Arctic region. All the essential elements in the Arctic big system, firstly people, must be prioritized in the federal and municipal programs.

### Conclusion and Relevance

In conclusion, synergy in consolidating potential of science, management and business, social programs, public-private partnership is a unique joint methodological and philosophical mechanism to create a comprehensive support system of standardized solutions (technological, environmental, social). In being such it becomes the effective Arctic management instrument in the knowledge –based economy. Synergetic approach helps to conduct an audit of the Arctic raw materials base potential, risks of the external environment (dramatically hard climate), market needs and challenges, the interests of investors and beneficiaries of the Arctic. Levels of capacity consolidation include global, national, regional, business, project and other levels. So it is evident that synergy is achievable by smart synchronization, intellectual penetration and mutual reinforcement of potentials of different levels and at different levels in high cultural and philosophical environment. Synergy can be seen as an efficient civilization development instrument.

The mentioned above eight support zones are based on and focused on NSR seaports and filled with the first priority investment projects. The so called "Anchor Projects" will remain important and effective during the next decade. They will remain the zone support basic elements of the whole Arctic macro infrastructure system. All "linking" project potential instruments and common usage of Arctic infrastructures are forecasted to stay the effective mechanisms for achieving synergy in the Arctic. Project offices within those Arctic entities linked by a unified management system and infrastructure will be actively used as the effective tool of the integrated goal-based approach to the Arctic development as Russian macro-region and a unique large and dynamic system with macro-resources (NSR, hydrocarbons, etc.) of national importance.

We suppose that the "green energy" (wind plants) as highly ecological alternative energy, works perfectly in comfortable, non-emergency conditions. But traditional Arctic oil and gas will continue to save the

planet during the climate changes, freezing winters and transport collapses. Synergy of the interconnected global, national, regional and corporative risks will continue to grow in the next decade. To manage this process the synergy of global goodwill and responsible Arctic exploration can remain the most effective solution.

As to the synergy starting point, we suppose it must become a part of management philosophy and penetrate through the public and business mission in Arctic. It must motivate and fill up all current and future Arctic projects. We understand that the time expectations for synergetic effects vary depending on the complexity of projects and external forces. The effects can be achieved in 3 years (in case with new Arctic startups legislation which will increase the population due to new privileges), in 15 years (total cleaning up the Arctic using the imprisoned people) or in 30 years (after getting new geopolitical role as the owner and reliable operator of the Northern Sea Route). The legislative base and management system are the elements of the Arctic big system which can be transformed relatively quickly. The aim of Arctic legislation updating is to insure the synergetic effects birth after liquidation of governed part of risks, threats, and misunderstanding.

In conclusion, the Arctic system is dramatically different from the systems created by a man. The Arctic zone as a big system is quite stable. It is a self-complicated, self-renewed, self-growth organism, which accepts, emerges and integrates new elements (including negative synergetic effects of risks, threats as well as the positive synergetic effects of human management) in its existence and development model. People as a system's element can easily degrade in the harsh environment. Exploration of Arctic natural resources means consuming the Arctic. Cooperation, integrity, coexistence, restoration, protection aims must become the key criteria for all Arctic projects. People must learn the Arctic inner driving forces, its nature, rhythm, reactions, self-protection, self-survival, self-sorting forces and potential. They must understand how to survive in Arctic environment, which innovative technologies can become the philosophy between the Arctic and a man.

And finally, we should state that in the theory of dynamic chaos (a part of nonlinear sciences) there are the definite forecasting limits (forecasting horizons). The Arctic system is capable to evolution being far away from balance. Production of synergy effects from the effectively managed ensemble of optimal integrity of system elements remains the main goal of modern Arctic management.

## References

1. Arnold V.I. Theory of Catastrophs. 3rd edition. Moscow: Nauka, 1990. 128 p. (In Russ.)
2. Balayan G.G. Zharikova G.G. Komkov N.I. The Information and Logical Model is Unique. Moscow: Nauka, 1978. (In Russ.)
3. Bogdanov A.A. Essays on Organizational Science. Samara: State Publishing House, 1921. (In Russ.)
4. Chernavsky D.S. Synergetic and information. Dynamic Theory of Information. Ed. 5. (Series "Synergetics: from the past to the future", Issue 13). Moscow: URSS, 2017. 304 c. (In Russ.)
5. Hintsala H., Niemelä S., Tervonen P. Arctic potential – Could more structured view improve the understanding of Arctic business opportunities? *Polar Science*. 2016; 10(3):450-457. <https://doi.org/10.1016/j.polar.2016.07.001> (In Eng.)
6. Hintsala H., Niemelä S., Tervonen P. Is there an Arctic ecosystem emerging? Oulu region's perspective. *Int. J. Inf. Technol. Bus. Manag.* 2015; 15(1):21-27 (In Eng.)
7. Danilov Yu.A., Kadomtsev B.B. What is Synergy? Nonlinear Waves Self-Organization. Moscow: Nauka, 1983. (In Russ.)
8. Fuller R.B., Applewhite E.J. Synergetic. Explorations in the Geometry of Thinking. Macmillan Publishing Co. Inc., 1975, 1979. (In Eng.)
9. Haken H. Synergetik. Berlin, Heidelberg, New York: Springer-Verlag, 1982. (In Eng.)
10. Haken G. Advanced Synergetics: Instability Hierarchies of Self-Organizing Systems and Devices. New York: Springer-Verlag, 1993. (In Eng.)
11. History and Synergy: Research Methodology / ed. S.Yu. Malkov, A.V. Korotaev. Moscow: KomBook, 2005. 185 p. (In Russ.)
12. Kapitsa S.P., Kurdyumov S.P., Malinetsky G.G. Synergetic and Future Forecasts. Ed. 3. (Series "Synergetics: from the past to the future"). Moscow: URSS, 2003. 283 c. (In Russ.)
13. Dufva M., Ahlqvist T. Knowledge creation dynamics in foresight: A knowledge typology and exploratory method to analyse foresight workshops. *Technological Forecasting and Social Change*. 2015; 94:251-268. <https://doi.org/10.1016/j.techfore.2014.10.007> (In Eng.)
14. Kurdyumov S.P. New Trends in the Scientific Worldview. *Cosmic worldview – new thinking of the XXI century*. 2004; 1(1):82–91 (In Russ.)
15. Lipina S.A., Smirnova O.O. The Above Projects in the Arctic Zone are Key Aspects of Modern Geopolitical Partnership. *European Science*. 2016; 3(13): 54–57 (In Russ.)
16. Marx K. Capital. Classics of History and Culture. Moscow: AST, 2019. 352 p. (In Russ.)

17. Milovanov V.P. Synergetic and Self-Organization: Social Psychology. Moscow: LIBROKOM, 2012. 178 p. (In Russ.)
18. Prigozhin I., Stengers I. Time, Chaos, Quant: Synergies from Past to Future. Moscow: Progress, 1994. 265 p. (In Russ.)
19. Prigozhin A.I. Disorganization: Causes, Types, Overcoming. Moscow: Alpina Business Books, 2007. 400 p. (In Russ.)
20. Prigozhin A.I. Organizations: Systems and People. Moscow: URSS. 2021. 240 p. (In Russ.)
21. Scheller M. The position of Man in Space. Selected Works. Moscow: Gnosis Publishing House, 1994. 490 p. (In Russ.)
22. Smirnova O.O., Lipina S.A., Kudryashova E.V., Krejdenko T.F., Bogdanova Yu.N. Creation of development zones in the Arctic: methodology and practice. *Arctic and North*. 2016; (25):148–157. DOI: 10.17238/issn2221-2698.2016.25.148 (In Russ.)
23. Zhilin V.I. Synergistic Scientism: Critical Analysis of Philosophical and Methodological Foundations. Moscow: URSS: Krasand, 2010. 190 p. (In Russ.)
24. Komkov N.I., Tsukerman V.A., Goryachevskaya E.S. Analysis of the Main Factors of Innovative Development of the Arctic Regions of Russia. *Studies on Russian Economic Development*. 2019; 30(1):22–27. DOI: 10.1134/S107570071901009X (In Eng.)
25. Leksin V.N., Porfiriev B.N. The Russian Arctic: The Logic and Paradoxes of Change. *Studies on Russian Economic Development*. 2019; 30(6):594–605. DOI: 10.1134/S1075700719060108 (In Eng.)
26. Bukhvald E.M. National projects in the strategic planning system in the Russian Federation. *Theory and practice of social development*. 2019; 2(132):50–54. <https://doi.org/10.24158/tipor.2019.2.8> (In Russ.)
27. Ivanov O.B., Bucwald E.M. National Projects of Russia: Regional Dimension. *ETAP: Economic Theory, Analysis, and Practice*. 2019; (1):37–53. <https://doi.org/10.24411/2071-6435-2019-10067> (In Russ.)
28. Komkov N.I., Sutyagin V.V., Volodina N.N. The need for a targeted approach to the development of the Arctic. In: Arctic Horizons of the 21st century. St. Petersburg: Publishing and Printing Association of Higher Educational Institutions, 2018. P. 54–66 (In Russ.)
29. Heleniak T. The World in 2050: Four Forces Shaping Civilization's Northern Future by Laurence C. Smith. *Journal of Regional Science*. 2011; 51(4):856-857. [https://doi.org/10.1111/j.1467-9787.2011.00740\\_11.x](https://doi.org/10.1111/j.1467-9787.2011.00740_11.x)

Submitted 20.12.2020; revised 08.02.2021; published online 31.03.2021

*About the author:*

**Natalia N. Bondareva**, Junior Researcher, Institute of Economic Forecasting (47, Nakhimovsky prospect, Moscow, 117418), Moscow, Russian Federation, [bonna2005@mail.ru](mailto:bonna2005@mail.ru)

*The author read and approved the final version of the manuscript.*

### Список литературы

1. Арнольд В.И. Теория катастроф. 3-е издание. М.: Наука, 1990. 128 с.
2. Балаян Г.Г., Жарикова Г.Г., Комков Н.И. Информационно-логические модели. М.: Наука, 1978
3. Богданов А.А. Очерки организационной науки. Самара: Государственное издательство, 1921. URL: <http://www.uic.unn.ru:8103/pustyn/lib/bogdanov.ru.html>
4. Чернавский Д.С. Синергетика и информация. Динамическая теория информации. Изд. 5. (Серия «Синергетика: от прошлого к будущему», № 13). М.: URSS, 2017. 304 с.
5. Hintsala H., Niemelä S., Tervonen P. Arctic potential – Could more structured view improve the understanding of Arctic business opportunities? // *Polar Science*. 2016. Vol. 10. Iss. 3. P. 450-457. <https://doi.org/10.1016/j.polar.2016.07.001> (In Eng.)
6. Данилов Ю.А. Кадомцев Б.Б. Что такое синергетика? Нелинейные волны. Самоорганизация. М.: Наука, 1983.
7. Fuller R.B., Applewhite E.J. Synergetic. Explorations in the Geometry of Thinking. Macmillan Publishing Co. Inc., 1975, 1979.
8. Хакен Г. Синергетика: пер. с англ. В. И. Емельянова; под ред. Ю.Л. Климонтовича, С.М. Осовца. М.: Мир, 1980. 404 с. URL: <https://search.rsl.ru/ru/record/01001008799>
9. Хакен Г. Синергетика: иерархии неустойчивостей в самоорганизующихся системах и устройствах: пер. с англ. Ю.А. Данилова; под ред. Ю.Л. Климонтовича. М.: Мир, 1985. 419 с. URL: <https://search.rsl.ru/ru/record/01001269741>
10. История и синергетика: методология исследования / отв. ред. С.Ю. Малков, А.В. Коротаев. М.: КомКнига, 2005. 185 с.
11. Капица С.П., Курдюмов С.П., Малинецкий Г.Г. Синергетика и прогнозы будущего. 3 изд. (Серия «Синергетика: от прошлого к будущему»). М.: УРСС, 2003. 283 с. URL: <https://search.rsl.ru/ru/record/01002092647>

12. *Dufva M., Ahlqvist T.* Knowledge creation dynamics in foresight: A knowledge typology and exploratory method to analyse foresight workshops // *Technological Forecasting and Social Change*. 2015. № 94. P. 251–268. <https://doi.org/10.1016/j.techfore.2014.10.007> (In Eng.) DOI 10.17238/issn2221-2698.2016.25.148. URL: <https://www.elibrary.ru/item.asp?id=27300457>
13. *Курдюмов С.П.* Новые тенденции в научном мировоззрении // *Космическое мировоззрение – новое мышление XXI века*. 2004. Т. 1. № 1. С. 82–91. URL: <https://www.elibrary.ru/item.asp?id=19528451>
14. *Липина С.А., Смирнова О.О.* Проекты Арктической зоны – ключевые аспекты современного геополитического партнерства // *Европейская наука*. 2016. № 3(13). С. 54–57. URL: <https://www.elibrary.ru/item.asp?id=25690962>
15. *Маркс К.* Капитал. Классика истории и культуры. М.: АСТ, 2019. 352 с.
16. *Милованов В.П.* Синергетика и самоорганизация: социальная психология. М.: ЛИБРОКОМ, 2012. 178 с. URL: <https://search.rsl.ru/ru/record/01006527407>
17. *Пригожин И.Р., Стенгерс И.* Время, хаос, квант: к решению парадокса времени. М.: Прогресс, 1994. 265 с. URL: <https://search.rsl.ru/ru/record/01001697766>
18. *Пригожин А.И.* Дезорганизация: причины, виды, преодоление. М.: Альпина Бизнес Букс, 2007. 400 с. URL: <https://search.rsl.ru/ru/record/01003350312>
19. *Пригожин А.И.* Организации: системы и люди. М.: URSS. 2021. 240 с.
20. *Шеллер М.* Положение человека в космосе. Избранные работы. М.: изд-во «Гнозис», 1994. 490 с.
21. *Смирнова О.О., Липина С.А., Кудряшова Е.В., Крейденко Т.Ф., Богданова Ю.Н.* Формирование опорных зон в Арктике: методология и практика // *Арктика и Север*. 2016. № 25. С. 148–157.
22. *Жилин В.И.* Синергетический сциентизм: критический анализ философско-методологических оснований. М.: URSS: Красанд, 2010. 190 с. URL: <https://search.rsl.ru/ru/record/01004892761>
23. *Комков Н.И., Цукерман В.А., Горячевская Е.С.* Анализ основных факторов инновационного развития регионов Арктической зоны РФ // *Проблемы прогнозирования*. 2019. № 1(172). С. 33–40. URL: <https://elibrary.ru/item.asp?id=39215455>
24. *Лексин В.Н., Порфирьев Б.Н.* Российская Арктика: логика и парадоксы перемен // *Проблемы прогнозирования*. 2019. № 6(177). С. 4–21. URL: <https://elibrary.ru/item.asp?id=41362104>
25. *Бухвальд Е.М.* Национальные проекты в системе стратегического планирования в Российской Федерации // *Теория и практика общественного развития*. 2019. № 2(132). С. 50–54. DOI: <https://doi.org/10.24158/tipor.2019.2.8>
26. *Иванов О.В., Бухвальд Е.М.* Национальные проекты России: региональное измерение // *ЭТАП: Экономическая Теория, Анализ, Практика*. 2019. № 1. С. 37–53. DOI: <https://doi.org/10.24411/2071-6435-2019-10067>
27. *Комков Н.И., Сутягин В.В., Володина Н.Н.* Необходимость целевого подхода к освоению Арктики // В кн.: *Арктические горизонты 21 века*. Санкт-Петербург: Издательско-полиграфическая ассоциация высших учебных заведений, 2018. С. 54–66. URL: <https://elibrary.ru/item.asp?id=37258197&pff=1>
28. *Heleniak T.* The World in 2050: Four Forces Shaping Civilization's Northern Future by Laurence C. Smith // *Journal of Regional Science*. 2011. Vol. 51. Iss. 4. P. 856–857. [https://doi.org/10.1111/j.14679787.2011.00740\\_11.x](https://doi.org/10.1111/j.14679787.2011.00740_11.x)

Поступила в редакцию: 20.12.2020; одобрена: 08.02.2021; опубликована онлайн: 31.03.2021

Об авторе:

**Бондарева Наталья Николаевна**, научный сотрудник, Институт народнохозяйственного прогнозирования Российской академии наук (117418, г. Москва, Нахимовский проспект, д. 47), Москва, Российская Федерация, [bonna2005@mail.ru](mailto:bonna2005@mail.ru)

Автор прочитал одобрил окончательный вариант рукописи.