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Developing Russian Arctic Exports in a Changing Logistics Environment

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Abstract. Delivery of cargoes by water transport to the Far North and equated territories is one of the most important tasks of the national economy, as it unlocks the huge socio-economic potential of the Arctic region, improving the quality of life of people living there, which is of particular importance due to the demographic situation in the region. The purpose of the study is to determine economically justified changes in the Russian Arctic export development system for Arctic projects in the context of logistics changes. The subject of the study is the organizational and economic relations that arise during the delivery of goods. The following methods were used in the study: logical and structural-system analysis, content analysis, statistical and economic analytics, analogy method, various modeling options, etc. The most significant results of the study: the main factors determining the need to transform the cargo turnover management system in the conditions of uncertainty of logistics systems are identified, the priority ways of changing the logistics systems of development and management of transportation and delivery of various goods are identified, the conditions for effective functioning of carriers of the Russian Arctic are revealed and structured, the functionality of the Northern Supply Management Center is developed. The novelty of the scientific research is primarily the development of economic and organizational approaches, the development of methodological theses for changes in logistics management and increasing export transportation in the Russian Arctic in the framework of the uncertainty of logistics of Northern supplies and, consequently, the economic justification for the effective implementation of the proposed changes in the logistics management of Arctic cargo flows.

Keywords: *export development, Arctic project, water transport, Northern supplies, Arctic, risk, delivery management*

Introduction

Exporting Russian Arctic cargo for Arctic projects is one of the most important tasks of the national economy and the challenge of changing logistical conditions. The constant growth of cargo turnover by an average of 18.6% over the last five years and the tightening requirements defined in various programs for the development of the Arctic (“Infrastructure development plan for the Northern Sea Route up to 2035”, “Comprehensive plan for the modernization and expansion of the main infrastructure on period up to 2024”, the State Program of the Russian Federation “Socio-economic development of the Arctic zone of the Russian Federation”, etc.) indicate a constant increase in the transport and logistics potential of the NSR. The dynamics of the increase in cargo transportation along the Northern Sea Route also demonstrates the revival of this route,

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which is primarily associated with the strengthening of Russia's position in the world economic system, ensuring transport security, economic integration of the regions of the Arctic, gravitating towards the NSR [1, Osipova E. E., p. 6–21].

The main differences in the organization of the logistics management of cargo turnover when it is used in Arctic deliveries is the large number of participants used in the transportation process — these are forwarding operators; water port enterprises; water shipping companies, FSUE "Rosmorport", FSBI "Administration of the Northern Sea Route", State Corporation "Rosatom", etc.

Natural, climatic risks, geographical factors and a huge number of intermediate links involved in the logistics export of cargo flows to the Arctic predetermine an impressive level of quality requirements for logistics management. But the whole system of logistics management of cargo turnover in the Russian Arctic has many flaws and errors. This includes lack of reliable information for the effective functioning of logistics management, lack of interdepartmental relations, repeating of some functional tasks of logistics management, etc. All this leads to delays in delivery times, inefficient use of funds allocated to the budget, and the emergence of logistics errors.

Consequently, it is logical to change the structure of the methodological support for logistics management of export cargo. The identified problematic "points", their practical significance and the insufficient effect of the traffic of goods in the context of the export of Arctic supplies using sea and river transport, determined the relevance of the stated topic.

The problems of developing methods of logistics management, formation and development of the organization of cargo transportation, as well as the theoretical and methodological foundations of economics and management in the field of transport are presented in the works of Antipov E.O., Aronov A.M., Buyanova L.N., Kachenovskoy Z.S., Kirillova E.V., Komkova N.I., Lukina Yu.F., Mitko A.V., Moskvitina G.I., Municha D.O., Osipova E.E., Prokofieva T. Yu., Prokhorenkova A.M., Rodionova V.N., Chertkova A.A., Clegg S.R., Staun J., Zellen B.S.

The purpose of the study is to provide an economic justification for various changes in the system of logistics management of cargo exports to the Russian Arctic when using sea transport.

In accordance with the goal set by the authors

- analyzed the economic, social parameters of development of the Far North and equated territories;
- analyzed the process of logistics management of cargo turnover in the Arctic region by sea and river transport, identifying the main problems leading to inefficient logistics management;
- proposed methodological recommendations to improve the system of support for Russian Arctic exports for the implementation of Arctic projects under the conditions of changing logistics, and clarified the content of the resulting economic effect.

The scientific results of the study are as follows: development of economic and organizational approaches, elaboration of methodological proposals to change the logistics system of the Arctic export, as well as socio-economic substantiation of the effect of the proposed structural changes.

The results of the conducted scientific research allow:

- identify the priority factors affecting the change in the logistics management system of the Arctic supply freight turnover by sea and river transport, taking into account the economic and social elements of the development of the Russian Arctic;
- determine the key areas for transforming the export development system of the Russian Arctic for Arctic projects under the changing logistics of cargo flows to the Arctic based on the division of the logistics management process and conclusions on the current problems leading to inefficient logistics management;
- build a hierarchy of the main conditions for the effective functioning of carrier organizations (marine) with elements of their self-regulation in the Russian Arctic, namely, the procedure for dividing forwarding operators according to the levels of their technical and organizational potential;
- propose the creation of a single center responsible for Arctic supplies, and define the functions of the logistics management of the center, taking into account the grouping of basic information to support various logistics processes in the management of entities ensuring the implementation of Russian Arctic cargo exports for Arctic projects;
- determine the components of the economic effect of the transformation of the system of logistics management system of cargo flows to the Arctic.

Problems and methods of export development in the Russian Arctic

The theory and methodology of scientific research on the chosen topic formed the basis for fundamental research, while a large volume of analyzed scientific and practical works and developments of both domestic and foreign scientists in the field of economic management, theory of economics and social systems, logistics management made it possible to solve the set tasks.

The study of the conducted scientific research, the justification and argumentation of the theories provided the authors with the use of such scientific methods as analysis, mathematical and economic modeling, analytical research, statistics, didactics, interpretation, comparative analysis, questioning, etc.

The scientific research was based on the analysis of various works of both Russian and foreign scientists related to the theory of logistics and management theory, which made it possible to determine the general methodological approaches. These approaches are relevant as they are preferably used in logistics management for cargo turnover in Arctic supplies. The authors identified two main management approaches: process-functional and organizational.

In [2, Prokhorenko A. M., p. 103–114], cargo turnover management is considered from a technological point, but the basis is the method of systematization of logistics management during transshipment operations in river and sea ports. In [3, Chertkova A.A., p. 196–204], logistics management of cargo turnover is considered by the tangents of logistics systems, which involves the use of methods of optimization recurrence.

According to the authors, due to the lack of clear classification methods of logistics management, the division of methods into two groups — economic-social and organizational-economic — is justified. It should be noted that the second method of logistics management of cargo turnover can form the basis for the application of other grouping methods and techniques [4, Buyanova L.N., p. 102–116]. At the same time, social methods, which are components in the grouping of economic and social methods of logistics management, have an advantage when applied in personnel policy (application of socio-economic methods of logistics management of cargo flows to the Far North: percentage bonus to wages, article 317 of the Labor Code, regulation of tariffs for ports and transport and logistics enterprises, etc.) [5, Munich D.O., p. 30–32].

Organizational-economic methods of logistics management during cargo turnover can be divided into administrative and regulatory, used both for coordinating the actions of management elements (issuing orders, instructions and orders, directives, various resolutions), by which logistics management is performed.

The normative method, which is included in the organizational-economic group of methods of logistics management, refers to the organization of transport-technological elements of cargo turnover [6, Kirillova E.V., p. 44–54].

Based on the analytics of works [7, Komkov N.I., p. 4–11; 8, Zellen B.S.], the authors have developed their own classification of transport-logistics and logistics-technological systems of cargo turnover for Arctic projects. In this classification, the authors combined general timber cargoes, and cargoes in container ships according to the nomenclature into an independent group, which will allow the introduction of the transport-logistics and logistics-technological system of the Russian Arctic to detailed and single nomenclature cargoes, which are similar in terms of cargo turnover characteristics. Detailed elaboration forms the class of managerial decisions for development of export cargo turnover in Russian Arctic, taking into account nomenclature and specific features of transport-logistic systems of freight turnover within the region under consideration (Table 1).

Table 1

Distinctive features of transport and logistics systems of cargo turnover in Arctic regions¹

1 difference	Due to the lack of off-port infrastructure or its outdated legacy of strategically important facilities on archipelagos and islands (hydrometeorological stations, polar stations, airfields, military facilities, border checkpoints and branches of large resource-producing organizations), it is common to apply various types of unloading [9, Antipov E.O., p. 72–79].
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¹ Compiled by the authors.

2 difference	Transport and logistics technological systems of cargo flows connected with the conditions of transportation within the corresponding region (adjacent geographic-spatial and economic nature of the points of cargo turnover), which facilitates the delivery of different cargoes to several customers to a greater extent [10, Antipov E.O., p. 159–164].
3 difference	Specialization of transport and logistics facilities due to natural and technical and technological factors in the Arctic basin. Existing ships have specialized technical equipment for various types of offshore loading and unloading (unpacking and unloading directly onto ice or an existing ice berth, loading and unloading by helicopter), as well as for escorting ships in the ice of the Arctic: icebreakers are used, which are an integral part of the NSR in the form of the main rolling stock. Consequently, according to the authors, the existing number of icebreakers does not satisfy the demand for ice pilotage, which is described in detail [11, Moskvitin G.I., p. 338].
4 difference	The conditions of cargo flows within the region under consideration, the specifics of the logistics management of transport and logistics systems of the cargo flows of the Russian Arctic show the current absence and the need to create a single logistics management center for the effective management of the cargo flows of the Northern deliveries.

Thus, each method has its own direction of use, but the specifics of the region should always be taken into account.

Study of the logistics management problems and the impact of proposed changes in logistics on the development of exports of Arctic supplies

The authors' statistical analysis reveals that the volume of Arctic cargoes transported by sea in the period 2015–2020 increased annually by an average of 19.6%. At the same time, the volume of goods transported by inland water transport in the period under review changed insignificantly (annual growth was 0.8%). Taking into account the identified trends, as well as data from a number of state program documents in the field of strategic planning and development of water communications in the Arctic (Decree of the President of the Russian Federation dated October 26, 2020 No. 645 "On the strategy for the development of the Arctic Zone of the Russian Federation and ensuring national security for the period up to 2035, etc.), using the method of simple exponential smoothing (SES), the authors carried out forecast calculations for the transportation of goods to the Arctic by water transport for the period up to 2035, the results are shown in Figure 1.

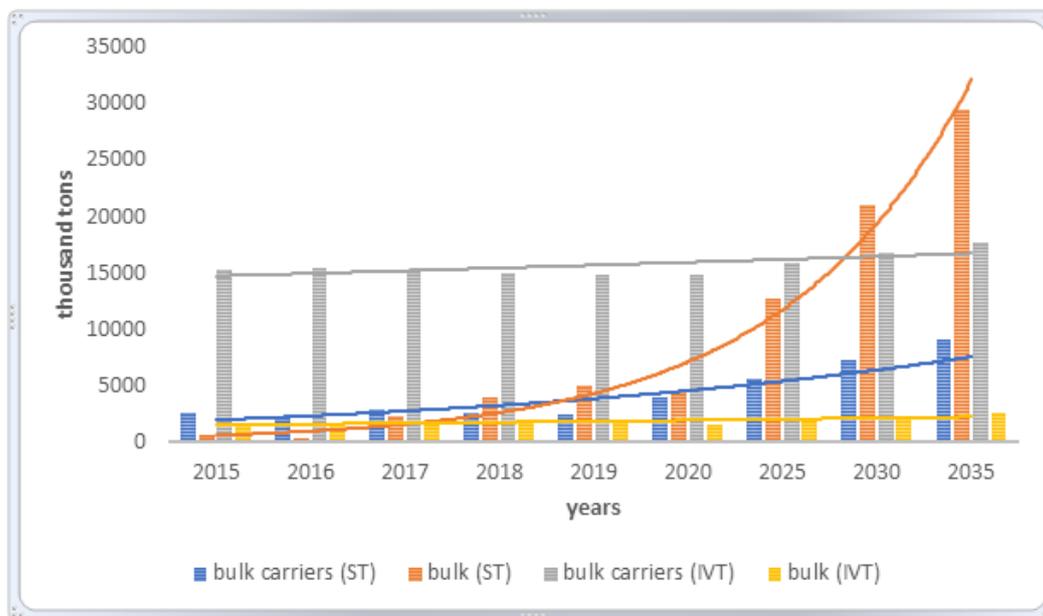


Fig. 1. Volumes of cargo exported by sea transport (ST) and inland water transport (IWT) in the Arctic region, and projected values under the conditions of changing logistics, thousand tons².

The analysis of the socio-economic characteristics of the region indicates that, despite the declining demographic indicators, the volume of investment in fixed capital of economic entities has been growing in the last twenty years by approximately 13.6% on average, and by 2020 it reached the level of 2.45 trillion rubles in real prices³.

The indicator of the gross regional product of economic entities of the Russian Arctic is similarly growing by approximately 13.5% on average and amounted to 6.66 trillion rubles for 2020⁴. This dynamics is achieved through the construction and commissioning of marine infrastructure facilities. Detailed information on the financing of cargo flows to the Arctic is not presented in sufficient volume, since the relevant activities are of a negative nature. Considering that in the State program “Socio-economic development of the Arctic zone of the Russian Federation for the period up to 2020”, the financial support of the Sea and River Transport subprogram in the total amount of allocated funding is 28.95 billion rubles; an important problem is that despite the increasing cargo flow to the Far North and equivalent territories, there is a constant outflow of the local population.

Based on the statistical and content analysis, the authors identified the following factors which determine the impact of changes in the logistics management of the cargo turnover of the Arctic deliveries by water transport:

- increased business activity of organizations, improving regional efficiency;
- certain conditions of cargo turnover due to the limited time of navigation;

² Compiled by the authors.

³ Rosstat. Ekonomicheskie i sotsial'nye pokazateli rayonov Kraynego Severa i priravnennykh k nim mestnostey v 2000–2018 godakh [Rosstat. Economic and social indicators of the regions of the Far North and areas equated to them in 2000–2018] // Federal'naya sluzhba gosudarstvennoy statistiki [Federal State Statistics Service]. URL: https://www.gks.ru/bgd/regl/b19_22/Main.htm (accessed 08 November 2022).

⁴ Ibid.

- state policy in the field of development of the Far North and territories equated to it (socio-economic development to reduce the outflow of residents from the Arctic regions);
- inadequate information support for the logistics management of cargo flows to the Russian Arctic, etc.

In order to assess the relevance of the problems of Russian Arctic developing exports for Arctic projects in the context of changing logistics in the implementation of Arctic supplies, the methods of applied sociology (questionnaires and processing of the results) were used in the work.

The main selection criteria for the respondents were experience and competencies in the implementation of Northern supplies. The respondents were the heads and specialists of the structural divisions of forwarding agents directly involved in the process of cargo transportation in the Arctic. The assessment of the significance of the identified problems was carried out by the ranking method.

The results obtained during the study of the process of logistics management of cargo flows indicate the different significance of the existing problems that impede the effective functioning of logistics management and the export of goods to the Arctic (Table 2).

Table 2

Ranking of urgent problems hindering reliable Arctic deliveries⁵

Problem	Average value	Rating
1. Decentralization of logistics management of Arctic supplies	0.18	1.6
2. Instability of payment for transportation services by customers	0.18	1.6
3. Low liability for cargo transportation in the Russian Arctic	0.16	4
4. Undeveloped new requirements for forwarding operators of Arctic supplies	0.15	5
5. Lack of coordination of transport and logistics operations performed by carriers	0.12	6
6. Incomplete level of logistics management of cargo turnover	0.1	7
7. Underdeveloped infrastructure for Arctic supplies	0.08	8
8. Inadequate cash distribution schemes between the participants of the cargo transportation process (disruption of logistical links)	0.05	9

Using the process approach, the authors carried out decomposition of the investigated logistics management process, which identified classes of managerial decisions and types of management actions. Thus, the results of the decomposition revealed the key problems of the economic and organizational mechanism:

- absence of a responsible body at forwarding operators, whose logistics management functions should include control and responsibility for cargo transportation to the AZRF areas, as well as regulation of pricing of transport and logistics organizations;

⁵ Compiled by the authors.

- inadequate quality of incoming information for making management decisions in the export cargo flows of Arctic supplies, which entails the need to organize information and analytical space;
- lack of a well-developed practical procedure for the competitive selection of forwarding operators, which leads to the failure to fulfill the logistics tasks of cargo flows and, as a result, to a low level of management and organization of routes along the NSR.

Based on the results obtained, the authors identified ways to change the logistics management of cargo deliveries to the Arctic and the content of methodological developments, which include:

- creation of a unified Arctic Supply Control Center with the following functionality: organization of information and analytical space providing export in the implementation of Arctic deliveries. This development is relevant in connection with the instruction of the President of the Russian Federation — “to develop and submit to the State Duma a special law on Northern delivery by March 2023”. This is stated in the list of instructions published on the Kremlin website after meeting on the development of the Arctic zone of the Russian Federation;
- maintaining the effective functioning of self-regulatory organizations of transport logistics include: availability of algorithm for development for developing initiatives of organizations; differentiation of forwarding agents-operators in accordance with the selected criterion; complete and timely information support of participants; providing participants with financial guarantees to improve the support system for Russian Arctic exports in the face of changing logistics;
- providing cargo participants in the Russian Arctic with up-to-date information in the form of generated information arrays used in decision-making in various areas of logistics management, such as pricing strategy for cargo transportation services; determination of subsidies for the renovation of means of transportation; development of proposals for improving the technical condition of ports and pre-port infrastructure in the Russian Arctic.

Up-to-date information received online will allow developing a concept for the transport and logistics development of the region based on real-time indicators, eliminating dumping prices when providing services of forwarding operators in collaboration with the Federal Antimonopoly Service and the Federal Tax Service, further clarifying the optimal loading of individual sections of the NSR, ports and approaches to them, which will ensure the rational operation of the port and pre-port infrastructure, as well as the operation of icebreaking fleets.

At the same time, it can be assumed that the Arctic Supply Control Center should be included in the Arctic Division formed by the State Atomic Energy Corporation Rosatom. Consequently, FSUE Atomflot, together with the Arctic Supply Control Center and FSUE Hydrographic Enterprise, will be in cooperation, having a common information and analytical space, which will give the economic effect of applying the changed logistics management.

The authors have also identified the components of the projected economic effect arising from the creation and implementation of the functions of the Arctic Supply Control Center. It has three levels of detail and two main areas: sectoral and regional (Fig. 2).

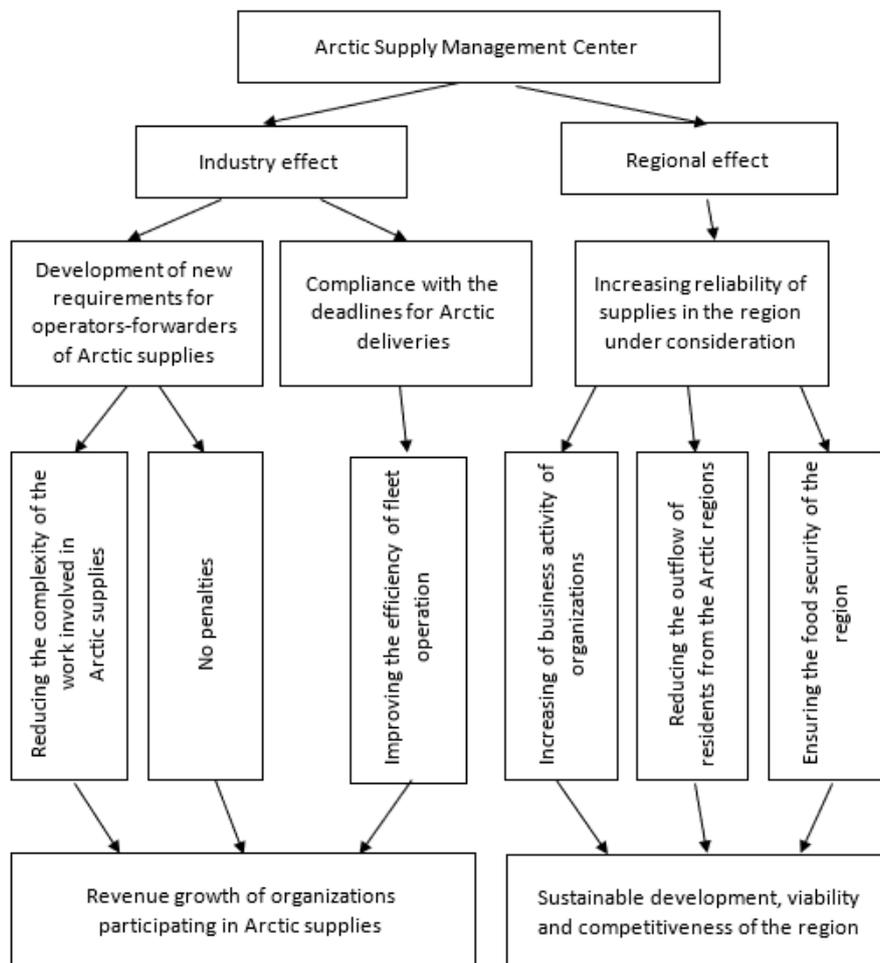


Fig. 2. Expected economic effect from the establishment and implementation of the functions of the Arctic Supply Control Center⁶.

As part of the study, the authors calculated the economic efficiency as a result of the proposed transformations of logistics management in the framework of the export transportation of Arctic supplies for the transport and logistics organization — CJSC “ACS” Arkhangelsk. The authors used the parameters of the existing schemes of cargo flow, which are compared with the parameters of the projected scheme, obtained in the proposal to create an Arctic Supply Control Center.

Two technological schemes of cargo delivery organization are also considered in detail: the current (actual) and the project scheme. Within the framework of these schemes, the following have been clarified: the initial conditions for export, the characteristics of technological and logistics schemes, the sequence of satisfying freight demand and finding a contractor, the terms for concluding a contract. The accompanying calculations of economic efficiency were made by the authors as part of their dissertation research. The effectiveness of the application of logistics management methods is

⁶ Compiled by the authors.

manifested in the competitiveness and economic efficiency of organizations, regions, and by saving delivery time, optimizing material resources and labor resources, etc., which can be implemented within the framework of the Arctic Supply Control Center, being created. The result of the economic efficiency of the implementation of the proposed transformations is presented in Table 3.

Table 3

*The result of economic efficiency of the implementation of the proposed transformations*⁷

Delivery options	Ship-day, actual costs	Occupied vessels, units	Total distance with cargo, NM	Costs for the delivery of goods, thousand rubles	Additional profitability, thousand rubles
Factual	60	5	14 148	24 000	-
Projected	45	3	10 775	18 000	6 000

In general, the realization of logistics management tasks as the creation and implementation of the functions of the Arctic Supply Control Center will lead to the expected results (Fig. 2, Table 3)

Any investment policy is of paramount importance to meet the needs of the state, region, business [12, Kornienko A.A., p. 94–101], and the developed ways make it possible to improve the standard of living of the population in the face of economic sanctions and falling incomes [13, Zheleznyakov S., p. 53–55]. In general, an example-calculation of economic efficiency as a result of changes in logistics management during the delivery of goods in the Arctic supplies, within the framework of this organization — CJSC “ACS” showed that the average decrease in turnaround time of material resources is 15 days; reduction of time intervals per voyage — 15 days; the number of free vessels — 2 units; economic efficiency from the proposed transformations is expressed in additional profitability — 6 million rubles.

The results of the assessment confirm the economic feasibility of the developed program for the transformation of the logistics management of the export of Arctic supplies.

It is necessary to continue the research work:

- in the field of a graphical model of the economic and organizational mechanism of the logistics management of Arctic supplies: this will justify the economic effect of the choice of logistics management methods;
- to identify problems that hinder the effective export of cargo flows in the Russian Arctic;
- on the development of methodological provisions for improving the logistics management of cargo flows of Arctic deliveries;
- on the application and use of the model for evaluating the effect and optimizing the logistics supply chain in coastal ports [14, Yi Y., p. 763–767];
- to provide the inhabitants of the Far North with food depending on consumption.

⁷ Compiled by the authors.

Conclusion

The significance of the research results in terms of application in practice is in the fact that they are scientifically substantiated and are given as recommended for improving the logistics management of export cargo flows to the Russian Arctic. The proposed methodological recommendations for the creation of an Arctic Supply Control Center and self-managed transport and logistics companies (sea and river carriers) in the Russian Arctic will solve the problems of concentrating the logistics management of cargo turnover and developing new transport and logistics schemes. Besides, when implementing the developed proposals, it will increase the rate of efficiency of industries and the region.

Conclusions from the results of the study:

1. The results of the analysis of socio-economic characteristics of the Arctic region development made it possible to identify the main prerequisites that determine the need to transform the export system of the Russian Arctic for the development of Arctic projects with a change in logistics (increase in business activity; special conditions of cargo delivery due to navigation conditions; poor information support of the logistics management of cargo flows; difficult demographic situation in the Far North).

2. The decomposition of the investigated process of logistics management and the ranking of the significance of problems that impede effective logistics management in cargo transportation identify the key areas of transformation in logistics management in the implementation of export cargo flows to the Arctic.

3. The conducted studies allowed the authors to prove the necessity of improving the process of self-regulation of cargo flows by organizations involved in the Arctic deliveries, since the absence of a self-regulatory management body for forwarding operators leads to a lack of control and responsibility for the delivery of goods to the regions of the Arctic zone of the Russian Federation. The economic and organizational conditions for the work of self-managed maritime transport and logistics companies in the Russian Arctic are proposed, the goal, objectives and basic principles of its activity are specified.

4. Identified problems were solved due to the following proposals: the functionality of the Arctic Supply Control Center was designed and proposed. The components of the projected economic effect resulting from the implementation of the functions of this center are determined. On the example of a transport organization, the calculation of the economic efficiency of changes in the logistics management of cargo flows by sea and river transport in the framework of Arctic deliveries was carried out.

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