KALININGRAD STATE SEA FISHING PORT: CURRENT PROBLEMS AND ENHANCING ITS EFFECTIVENESS BY ACTIVITY DIVERSIFICATION

[1]MEYLER LEONID, [2]MOISEENKO SERGEY

[1,2]*Baltic Fishing Fleet State Academy, Kaliningrad, Russian Federation*

ABSTRACT

An analysis of the Kaliningrad State Sea Fishing Port (KSSFP) activity makes it possible to define the actual problem: the choice of a rational strategy for the development of productive economic activity of the port and improving economic efficiency in conditions of a limited capacity to increase the volume of cargo flows and uncertainty of demand for port services. Currently, the transit potential of the port is not used efficiently. The analysis of trends in domestic and transit cargo flows does not give a base to expect a significant increase in transshipment port complex in the near future. However, it is possible to reveal potential opportunities to improve the efficiency of port operations at existing volumes and to attract cargo flows. To solve the problem two basic strategies for development and improving the port activity were identified: strategy of the port diversification and strategy of integrations and renewal. The paper suggests a way to increase effectiveness of the port operation by means of the local Transport-Production Logistical Centre (TPLC) development. The important object of TLPC could be specialized floating fish processing factory.

Keywords: *Sea fishing port, Strategy of development, Diversification of activity, Logistics, Effectiveness.*

1. INTRODUCTION

Development of transport-logistic complexes and their integration in intercontinental transport systems is considered as the priority field of the Russian economy and, in particular, for the Kaliningrad region [1]. Taking into account its unique geopolitical features, transport complex is an important part of the industrial infrastructure and service trade of the region. After the Soviet Union disintegration, the Kaliningrad region of Russian Federation has become a half-exclave region separated from the main territory of the country and surrounded by Poland on the South and Lithuania on the East and the North and having an outlet to the Baltic Sea. Branches of two Trans-European transport corridors: №1A (Riga-Kaliningrad-Gdansk) of the route № 1 "Via-Baltica" (Helsinki – Tallinn – Riga – Kaunas – Warsaw) and № 9D (Kaunas-Kaliningrad) of the route №9 (Kiev – Minsk – Vilnius – Kaunas – Klaipeda) cross the Kaliningrad region [5]. It gives an opportunity to attract freights between Europe and Russia and also on the Trans-Siberian Railway from countries of Asia to Europe. It is possible to say that the Kaliningrad region is integrated in a European transport system taking into consideration some transport-technological aspects. As it is shown in Figure 1, specific features of the economic-geographical situation of the Kaliningrad region are: geographic isolation from the mainland of Russia; neighbourhood with European countries-members of EU and the 'Schengen Agreement'; special economic zone (SEZ) regime. The regional transport strategy covers construction of a new deep-water port, modernization of existing ports and terminals, setting-up of information-logistic centres and infrastructure objects because of innovative technologies application [7], [8].

The "Transport Strategy of Russia for the period up to 2030" [13], the conceptual document defining the main directions of the state transport policy, has identified several categories of ports with the possibility of improving their competitiveness, specialization and the prospects for further development. The first category includes the ports that provide the main volumes of foreign trade and transit goods reshipment competitive with the ports of bordering countries.

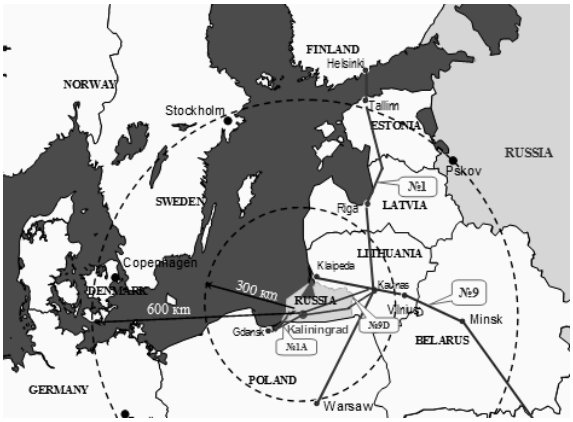

Figure 1 Geographical location of the Kaliningrad region and branches of international transport corridors

The port of Kaliningrad is among the ports of this category. The whole range of existing and prospective regional ports and terminals is implied by that name.

2. THE PORT OF KALININGRAD

The port is connected with the sea by the Kaliningrad's canal, having a length of 43.0 km. The canal depth is 10.5 m, the width is 80 – 180 m on the halfway from the entrance in Baltiysk; the rest part of the canal has the depth of 9.0 m, the width of 50 m. Vessels with the length up to 170.0 m and the draft up to 8.0 m., tonnage up to 20.0 thousand tons can pass along the canal. The port of Kaliningrad provides services on accumulation and storage of different types of cargo, including storage capacities for oil, oil-products and liquid fertilizers. Construction of the cargo passenger

automobile-railway ferry complex is completed in the out-port Baltiysk; construction of the new transfer terminals in the Kaliningrad sea canal water area is on-going. There are ferry connections between Baltiysk and St-Petersburg, ports of Germany, Sweden and Lithuania. The port Kaliningrad is connected by container lines with ports of Germany, Netherlands, Denmark, Belgium and Baltic states.

There are several main stevedoring companies at the port of Kaliningrad, such as: the Joint-Stock Company "Sea Commercial Port of Kaliningrad" which provides overloading and storage of general, dry bulk, liquid bulk cargoes and containers; the State Enterprise "The Kaliningrad State Sea Fishing Port" which has specialization: overloading and storage of perishable cargoes, liquid and bulk fertilizers; the Joint-Stock Company "Lukoil-Kaliningradmorneft" - is specialized in overloading of oil and petroleum; the Joint-Stock Company "Sodruzhestvo-Soya" handles grain, soya beans and food oil, etc. The scheme of the port of Kaliningrad cargo terminals is shown in Figure 2.

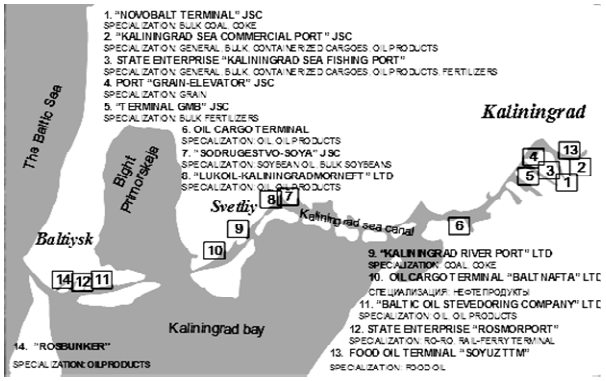

Figure 2 Map of the port of Kaliningrad cargo terminals

The main cargo nomenclature handled in the port complex of the region includes: oil and oil-products, coal, coke, timber cargos and timber processing cargos, ferrous materials, ferroalloys, mineral fertilizers, reefer cargos, grain, cargos in containers and wheeled technics. Since 2000 volumes of cargoes handled in the regional port complex had been steadily growing, while its transit potential considerably exceeds the real demand for cargo transhipment. But, at the end of 2008 the global financial and economic crisis negatively influenced the activity data of ports and terminals. The real annual throughput of all cargo terminals is up to 33 mln tons. The dynamics of the annual cargo turnovers of the Kaliningrad port in total and the Kaliningrad State Sea Fishing Port (KSSFP) since 2007 are shown in Figure 3. It is possible to see that both the total turnover of the port and KSSFP turnover have been decreasing since 2010 [7].

The analysis of the processes of functioning and development of Kaliningrad ports shows that essential factors determining low level of the use of transit potential of the region are: geopolitical factors, economic factors and, as a consequence, low growth dynamics of cargo flows volumes. Problems of efficiency and development of the region maritime transport complex mostly depend on its isolation from the mainland of Russia. High discriminating tariffs for cargo transportation by rail from Russia and transit countries are making the port complex of the Kaliningrad region uncompetitive with respect to other Baltic ports like ports of Klaipeda, Gdansk and Gdynia.

In this regard actual problems of the regional maritime transport complex are its activity diversification, development of competitive directions and provision of services sector oriented on attraction of transit cargo flows, development of the inner and external logistics.

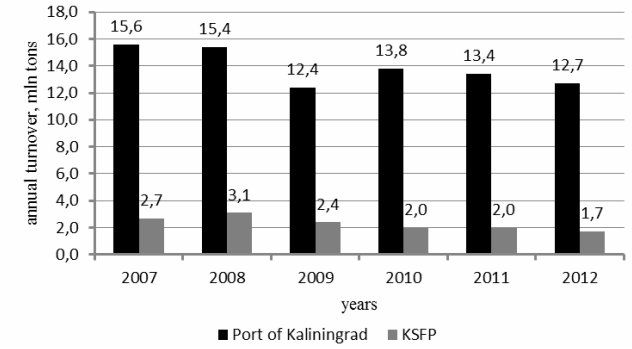

Figure 3 Kaliningrad port in total and KSSFP cargo turnovers

3. ENHANCING EFFECTIVENESS OF KSSFP ACTIVITY

Therefore, at present it is necessary to pay more attention to activity of KSSFP which is one of the important objects of the regional port facilities. KSSFP specialization is transshipment and storage of the frozen imported fish, meet and other reefer cargos, as well as export of the mineral bulk and liquid fertilizers. It should be noted that KSSFP activity effectiveness was on the low level even in the pre-crisis period. Hereby some of the reasons for it are presented:

– a dramatic drop (in comparison with the «Soviet» period) of fish products cargo flows;
– relatively high tariffs for a ton of cargo processing in comparison with the ports of neighboring countries;
– a dramatic drop of demand for the related service concerned with vessels preparation for the voyages;
– instability of general and bulk cargo flows due to «discriminatory» tariffs for the transit through Lithuanian territory;
– moral and physical obsolescence of fixed capital assets (port berths and port facilities stand idle; part of the equipment is technically out of date and requires modernization);
– low-level management.

Nowadays KSSFP uses only half of its capacities. However, KSSFP is a powerful transport hub, where necessary infrastructure exists already. The analysis of the KSSFP possibilities gives prospects of this enterprise to be modified into the multifunctional logistics complex of the regional level [10]. It allows increasing transit cargo flows and quality of the cargo service.

Generally, regional logistic centers represent large infrastructure complex objects, within the framework of which complete logistic support of the transport process

is realized, including the choice of transport-customs procedure with the formation of logistic parameters, choice of the assurance company, shipment of the forwarding, providing of the reshipment at the border, etc. Considering such a KSSFP object it is possible to draw conclusion about its correspondence to such logistic center in many positions.

The analysis of the key factors of KSSFP activity and reasons preventing the growth of demand for services on the cargo flows handling allows determining the following contradiction. On the one hand, the port has rather high transit potential and technological possibilities for services sector development which could find the demand on the regional market as well as on the export market. But, on the other hand the port's strategic interests remain within the framework of traditional activities development: handling «traditional» cargoes.

The mentioned contradiction allows to state the problem: the choice of the rational strategy of the port's production and commercial activities development, economic effectiveness enhancing under conditions of limited capacities on the traditional cargo flows' volumes increase and ambiguity of the demand for the services [11].

3.1 Aims and main directions of KSSFP activity diversification

It is necessary to define the general aim and development strategy of the port, based on the situation analysis in the past and in the present, taking into account predicted future conditions for solving the problem of KSSFP activity effectiveness enhancing. Decomposition of the general goal usually allows to determine the main objects-demands and directions of the activities [3]. The main goal of KSSFP is to provide effective activity of the port and proportional development of its infrastructure as the industrial-economic and transport-logistic system.

The main goals-demands are:

- to improve effectiveness of transport and production potential usage;
- to improve effective use of fixed capital assets or to renew them (berths, refrigerators, warehouses, handling equipment etc.);
- to improve effectiveness of labour and financial resources usage;
- to expand a range of services in the sphere of transport management, additional cargo handling (additional cost creating), production and information activity;
- to develop partnership with foreign companies and potential investors, within the framework of private-public partnership;
- «to incubate» innovative ideas;
- to increase the port staff professionalism level.

Main directions of the port activity should be oriented on the aims-demands realization. In particular, it is necessary to attract cargo flows for improvement of the port's transport and production potential usage effectiveness [6]. It is a complex problem in the present situation. But, if to expand the range of services on creation of the additional cost, this goal of cargo attraction will be partly achieved. In a case of production creation (for example, fish processing), it will be necessary to have enough raw material. This means additional cargo flows (the raw material import and the end products export). Therefore, two basic strategies of KSSFP activity effectiveness enhancing and development may be considered, namely:

- a strategy of the diversification of the port activity;
- a strategy of integration.

The second strategy means interaction with foreign partners on the first stage and renewals (technologies renewal, capital funds, innovative technologies and information technologies implementation).

First of all, it is necessary to develop handling refrigerated containers that will require construction a new terminal. Proposed modernization will not change the initial function of the port and will keep it as an important object of such a city-forming branch as fisheries industry. Capacity building on the handling of containers corresponds to the Concept for Fisheries Industry Development of the Russian Federation for the period until 2020, according to which the infrastructure development of marine terminals is planned to be oriented on complex services for fishing fleet vessels, as well as creation of state fisheries corporations on its basis.

Secondly, KSSFP has a sufficiently large refrigerating warehouse for storage of frozen fish and meat. It is possible to create a modern refrigeration complex on a basis of this equipment. There are such important infrastructure objects as railroad and automobile driveways, open cargo areas, warehouses for different cargo storage which can be used for KSSFP perspective development. Furthermore there are some free areas for construction of industrial and infrastructure facilities in the port and on the adjacent territories. These offers show opportunities for the port's activity diversification, i.e. other types of activity development which will not contradict to the port's core operations: handling of vessels and cargo transhipment. The demand and supply analysis on the food market in Russia and Belarus [1] shows the stable demand in fish products. According to this analysis the following conclusion can be made:

- one of the port activity diversification trends may be more thorough processing of frozen fish products with the purpose of additional cost creation and therefore getting additional income;
- the second trend is connected with the organization of own fish production which considers construction or obtaining of own fish factory;
- the third trend is connected with reefer containers handling and its multimodal transport to places of destination;
- the forth trend is connected with freight-forwarding activity, in particular with raw material (frozen fish and meat) delivery to the fish and meat factories of the region and delivery of the fish production from the factories for the reefer containers forming with following shipment to the buyer;

– the fifth trend is connected with cargo attraction for further shipment by linear ships and cargoes transit organization;
– the sixth trend is creation of an information-analytical centre providing full range of services (from submission of the information on various activities trends and designing of the transport-logistic systems of cargo delivery to organization of researches in marketing, logistics and strategy planning).

Having defined the KSSFP essential trends and activity diversification types it has become possible to determine the real possibilities for their realization.

3.2 Perspective structure of the KSSFP transport-production logistics complex

Thus, an analysis of KSSFP possibilities shows perspectives of this enterprise to be transformed into a multifunctional transport-production logistics complex (TPLC) at the regional level. TPLC of KSSFP may be presented as a complex of logistic objects:
– specialized berths;
– a fish processing factory;
– technological lines on the bulk cargoes packing (for example, fertilizers);
– a container terminal;
– a refrigerating warehouse for cargo distribution and refrigerating warehouse for long-term cargo storage;
– warehouses and open areas for cargo storage/accumulation;
– technical, technological and other infrastructure services/objects;
– information - analytical centre which includes a multifunctional freight forwarding company;

3.2.1 Fish processing factory features

This paper pays main attention to the fish processing factory because of the basic KSSFP specialization. Having the purpose to enhance the port effectiveness in the post-crisis period (maybe as a temporary variant) it is suggested to organize the factory on the basis of a reefer type fish super-trawler made fast to the berth. Such a floating fish processing factory has to be equipped with:
– canned fish food line having a productivity rate of 100,000 cans per day;
– fish-dressing line (28 tons of fillet per day);
– fish-dressing line (headless fish - 50 tons per day);
– preserves line (12000 cans each 1.3 kg per day);
– retail package line (16 tons per day);
– fish meal plant (150 tons per day – according to the raw material).

The canned fish food line is intended for canned fish production of a rather wide assortment out of various fish species which affords an opportunity of choice of the market oriented on the most rational assortment range. There are two holds for frozen fish production storage: a hold for the preserves and a hold for the fish meal on the vessel. The vessel is equipped with the cargo handling gears for the load handling execution, as well as internal transport arrangements system (conveyors, lifts) for the finished product delivery directly from the technological lines to the holds. The fish processing factory may operate on a three labour shift basis. The raw material for processing is delivered both from the port refrigerating warehouses and fishing or transport vessels calling the port for unloading. Raw material stocks are stored in the holds.

3.2.2 Fish processing factory optimization

Let consider the problem of optimization of this fish processing factory. It is suggested that the factory can produce different range of products from various kinds of the raw material (fish). There are also main technical and economic characteristics of the production technological lines and the wholesale price for a unit of a commercial output, as well as resource constraints. Then the optimal working scheme for fish products can be developed using methods of linear programming with an objective function for a maximum of commercial output in value terms [3], [4]. In general, the mathematical model of optimal planning for fish products is as follows:

the objective function:

$$\sum_i \sum_j C_{ij} X_{ij} = \max \quad (1)$$

with limitations:

$$\sum_i \sum_j K_{ij} X_{ijk} \le \sum_i \sum_j Q_{ij} \quad (2)$$

$$\sum_i \sum_j X_{ij} \le \sum_i \sum_j \Pi_{ij} \quad (3)$$

$$\sum_i \sum_j N_{ij} X_{ij} \le T_p \quad (4)$$

$$X_{ij} \ge 0; i = 1,2,...I; j = 1,2,...J \quad (5)$$

where X_{ij} - value of fish products of i assortment made from j kind of fish; K_{ij} – coefficient of j kind of raw materials consumption for fish products of i assortment; Π_{ij} - capacity of a technological processing line for fish products of i assortment made from j kind of fish; N_{ij} - time rate for fish products of i assortment made from j kind of fish; C_{ij} - wholesale price of a ton of commercial fish products of i assortment made from j kind of fish; T_p – labor resources of the factory, man-hour.

An important task of manufacturing is maintaining a reasonable stock of production resources or component parts to ensure continuity of the productive process. Traditionally, the stock is regarded as inevitable costs [9]. It leads to costly shutdowns of production when the stock level is too low and to "necrosis" of capital when it is too high. The problem of stocks management is to determine the level that balances the two mentioned extreme cases. An important factor [12] in determining the formulation and solution of the stocks management problem is that the demand for stored reserves (per unit time) can be either deterministic (fairly well-known), or the probabilistic one (described by a probability distribution). In case of fish products the demand and constant supplies of raw materials consumed uniformly, because production capacity is constant. Thus, the

deterministic static model of stocks management will be used, that is each next order is made at regular intervals time. Also it is important for interaction with the fleet in the fishery, because it is necessary to synchronize the supply of goods to the coastal fishing complex with an optimal plan of storage and release of fish products. Since the fish products manufactured by KSSFP fish-processing factory (the vessel) in large volume will be realized onto the domestic market of the region, the storage (holds) of the vessel can be considered as a distribution warehouse. To best meet the consumer demand there is need for some stocks of fish products that provides the satisfaction of the demand at any time, even under the conditions of "failures" of production and "bursts" of the demand.

The simplest model of optimization [2] of the current stock of raw materials is considered here. It allows to improve the efficiency of the fish processing complex and commercial enterprises selling fish products. The model is designed in the following situation: fish processing complex has a plan to realize a certain product assortment range in a fixed period of time that will require a certain kind of raw materials in certain values. It is necessary to simulate the complex production activity in order to obtain the minimal total costs of the raw material storage. This model uses the following initial conditions:

- one product or one product group stocks are planned only;
- stocks level is reduced uniformly according to the manufacturing of products in accordance with the plan;
- the demand in the planning period is fully defined in advance;
- costs of stocks management consist of the costs of delivery and storage only.

Total costs will be assumed to depend on the size of a delivery q. Thus, the optimal stocks management reduces to finding the optimum size of one delivery q_0. Then other parameters of the model, namely: the number of deliveries n_0, the optimal time interval t_{so} between two consecutive deliveries, minimal (theoretical) total cost Q_0 can be calculated. The following designations for the predetermined model parameters are introduced: T - full time period for which the model is designed; R - the whole volume (the total demand) of raw materials for time T; C_1 - storage cost of one unit of raw materials per unit of time; C_s - costs of a raw materials lot delivery. The total cost of stocks is denoted as Q that is the objective function. The task of modeling consists in plotting the objective function $Q = Q(q)$. The total cost will consist of the costs of delivery and storage of goods. Total costs of the storage of the current stock will be equal to $C_1 T q/2$ - cost for storage per goods unit - the "average" current stock product. As stated above, the stock level is reduced uniformly by uniformly produced sales, i.e. if at the initial moment of the stock it is equal to q, then at the end of the period of time t_s, it was equal to 0. Total costs for the delivery of the goods will be equal to: $C_s R/q$, that is a product cost of one lot of goods delivery to the number of deliveries $n = R/q$.

Then the total cost of current stocks management will be:

$$Q = Q_1 + Q_s = \frac{C_1 T q}{2} + \frac{C_s R}{q} \to min \tag{6}$$

i.e. the objective function Q is a nonlinear function of q, changing in the range from 0 to R and trends to minimize. The solution of the task proceeds by well-known scheme. It is calculated the derivative $Q'(q)$ and equate it to zero:

$$Q'(q) = 0;\ q_0 = \sqrt{\frac{2C_s R}{TC_1}} \tag{7}$$

$$Q''(q) = \frac{2C_s R}{q^3};\ Q''(q_0) > 0 \tag{8}$$

Thus, the optimal size of one delivery:

$$q_0 = \sqrt{\frac{2C_s R}{C_1 T}} \tag{9}$$

The optimal average current stock:

$$\frac{q_0}{2} = \sqrt{\frac{C_s R}{2C_1 T}} \tag{10}$$

The optimal number of deliveries:

$$n_0 = \frac{R}{q_0} = \sqrt{\frac{C_1 RT}{2C_s}} \tag{11}$$

The optimal interval between two deliveries:

$$t_{s0} = \frac{T}{n_0} = \sqrt{\frac{2C_s T}{C_1 R}} \tag{12}$$

Optimal (theoretical) costs are:

$$\mathrm{Q}_0 = \frac{C_1 T q}{2} + \frac{C_s R}{q} = \sqrt{2C_1 C_s RT} \tag{13}$$

Let it be assumed that the fish processing factory plans to deliver and to process fish with the total value R = 50,000 tons per a year (T = 12 months). The cost of one raw materials lot delivery C_s = 650,000 USD, and the storage of one ton of fish costs C_1 = 320 USD per a year. The value of Q can be calculated according to the above formulae. Thus, the optimal size of a delivery $q \approx$ 4500 t; the optimal number of deliveries $n_0 \approx 11$; the optimal interval between two deliveries $t_{s0} \approx 33$ days; minimal total costs $Q_0 \approx 4560700$ USD.

It should be noted that the conditions of this problem are mainly the idealized ones. In practice it is not always possible to adhere to the theoretical parameters of the stocks management model. For example, in the considered problem, it is found that the optimal size of delivery is about 4,500 tons. But it may be that the total required amount of raw material is not

satisfied in the case of a failed fish catching. It means that the optimal size of delivery has to be changed. Therefore it is important to define such limits of a change that does not lead to a significant increase in total costs.

Taking into account that the estimated cost of the floating fish processing factory with additional equipment can be about USD 12 mln and using the "pessimistic" values of the main indicators of the annual work plan, it can be concluded that the cost of such project will be repaid over a maximum of 3-4 years. Meanwhile, the variant to build the factory at the port area can be considered. Such a variant would probably be more productive, but its implementation involves organizational, technical and environmental problems.

Also a refrigerating complex for 20,000 tons of simultaneous storage of cargo turnover at 150-200 thousand tons per year and a new container terminal with the estimated capacity of 75,000 TEUs per year are designed for KSSFP.

4. CONCLUSIONS

The federal government of Russia and local authorities pay great attention to the Kaliningrad region economic growth, considering it as the Russian fore post in Europe. Such position applies fully to the transport, and in particular, to the maritime complex of the region. Transit opportunities in the region and ports are the basis for the effective operation of international transport corridors passing through the territory of the Kaliningrad region. With creation of a logistics center in the Kaliningrad region, the Russian part of the transport corridor East - West will be closed. It has a great importance for the transportation of goods from countries in South-East Asia.

The problem of the Kaliningrad State Sea Fishing Port arising due to global economic crisis and the geo-political situation of the region is closely connected to mentioned transborder transport links. The paper suggests a way to increase effectiveness of the port operation by means of the local Transport-Production Logistical Centre (TPLC) development. The important object of TLPC could be specialized floating fish processing factory.

As it was preliminary calculated, the estimated total capital investment for the proposed TPLC project need around USD 120 mln, and the payback period is three years for fish processing factory and container terminals, and five years for refrigerating complex. Such conditions should be admitted as effective project for investments.

Creating TPLC will allow to solve the following problems for KSSFP:

- to attract the additional volume of cargo flows and lowering its cost;
- to optimize interaction processes of transport modes;
- to increase production and logistic services volume which will allow to create additional working places and more effectively solve social problems.

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