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DEVELOPMENT OF MINING COMPANIES' LOGISTICS SCHEMES IN THE BALTIC SEA AREA

Summary. In the article an analysis of conditions affecting the development of logistic chains from mining enterprises to Baltic Sea ports is presented. It include: logistic chain sand channels review, comparison of rail road delivery conditions, distances, mineral raw materials transshipment costs. Additionally, historical comparison of relationships between producers and ports in changeable inner and external politics of transit countries so as producing countries is established.

Keywords: mineral raw materials, fertilizers, Baltic Sea logistics for mineral raw material sand fertilizers, rail road costs of raw materials transportation.

MODELE ROZWOJU LOGISTYKI PRZEDSIĘBIORSTW GÓRNICZYCH W OBSZARZE NADBAŁTYCKIM

Streszczenie. W artykule przedstawiono analizę warunków, które wpływają na rozwój systemów logistyki w przedsiębiorstwach górniczych. Analiza ta zawiera: opis łańcuchów logistycznych dostawy piasku, porównanie warunków dostawy kolejowej, odległości transportu oraz koszty dostawy surowców drogą morską. Ponadto w artykule znajduje się historyczne porównanie powiazań między producentami a portami w warunkach zmiennej polityki wewnętrznej i zewnętrznej krajów tranzytowych.

Słowa kluczowe: surowce, nadbałtycka logistyka w zakresie surowców, koszty transport kolejowego.

1. Introduction

In the latest three hundred years, mining industry has been one of the Russia's basics. Since Petr I, export volumes of mineral sand auxiliary goods have showed permanent and increasing growth. During the whole Empire period, followed by the Soviet period and FSU, the nomenclature of export cargoes was growing – from iron ore to modern complex fertilizers, rare metals, special chemical sand mixtures. Talking about creating logistic chains from mineral producers to consumers, one should always be aware of historical connections. According to this, industry and agriculture level of Western Europe has formed the main direction of trading. However, modern development and rapid growth of production in Asia, so as the crush of the Soviet logistics scheme and industrial basis, caused significant changes in logistics.

2. Review of existing traffic corridors

Russia's export structure nowadays shows that energy and minerals trade forms more than 70% of it. This group includes oil and petrochemicals, coal, metallic ores and fertilizers.

Significant demand for above-mentioned resources is shown in European countries so as in Japan and China. There cent level of Russian transport infrastructure together with its geographical location determines more close cooperation with Europe rather than with Far East. In most cases, delivery of minerals from producer to port of loading is made by rail. Considering the gauge difference, rail road delivery of goods from Russia and FSU countries to Europe is not efficient and has huge costs [1].

The logistical challenges of large mining companies of the Russian Federation, Belarus, Ukraine and the EU were analyzed in complex by such scientists: V.A. Tsvetkov, Deputy Director, IPE RAS, H.K. Zotov, member. cor. of Russian Academy of Sciences, A.A. Medkov. Speaking about foreign detailed study of mining companies logistics, they were conducted by such sectoral agencies as: Argus, ICIS and Integer. Serious attention should be paid for annual international conferences and articles published by these organizations.

The figure 1 clearly shows that the export of mineral raw materials along with fuel and energy resources is the major share in export of goods Russian Federation. There are six mane corridors which were formed historically for mineral and fuel resources transportation from the CIS to the world market [5]. These corridors are:

- Baltic corridor, including: mining companies of European part of CIS and Ural region, the transshipment points, rail, and ports of loading in the Baltic sea macro-region.

- North corridor, including: mining companies of the Kola Peninsula, Arkhangelsk region, Komi Republic and Yamalo-Nenets Autonomous Okrug, the points of transshipment and warehousing, rails, and ports of loading in the Arctic ocean.
- South corridor, formed by: mining companies of southern Russia, Ukraine, States of Caucasus and Central Asia, transport routes and transshipment facilities, and ports at the Black sea area.
- Western railway corridor: from mining companies and resources bases of minerals through railway system of Russia and Belarus to European Union and further to world market.
- Eastern railway corridor: from mining companies and resources bases of minerals raw materials in the Central Asian republics, Siberia and the Far East via the TRANS-Siberian railroad to China.
- East corridor: from ports in the Far East to the Asia-Pacific region.

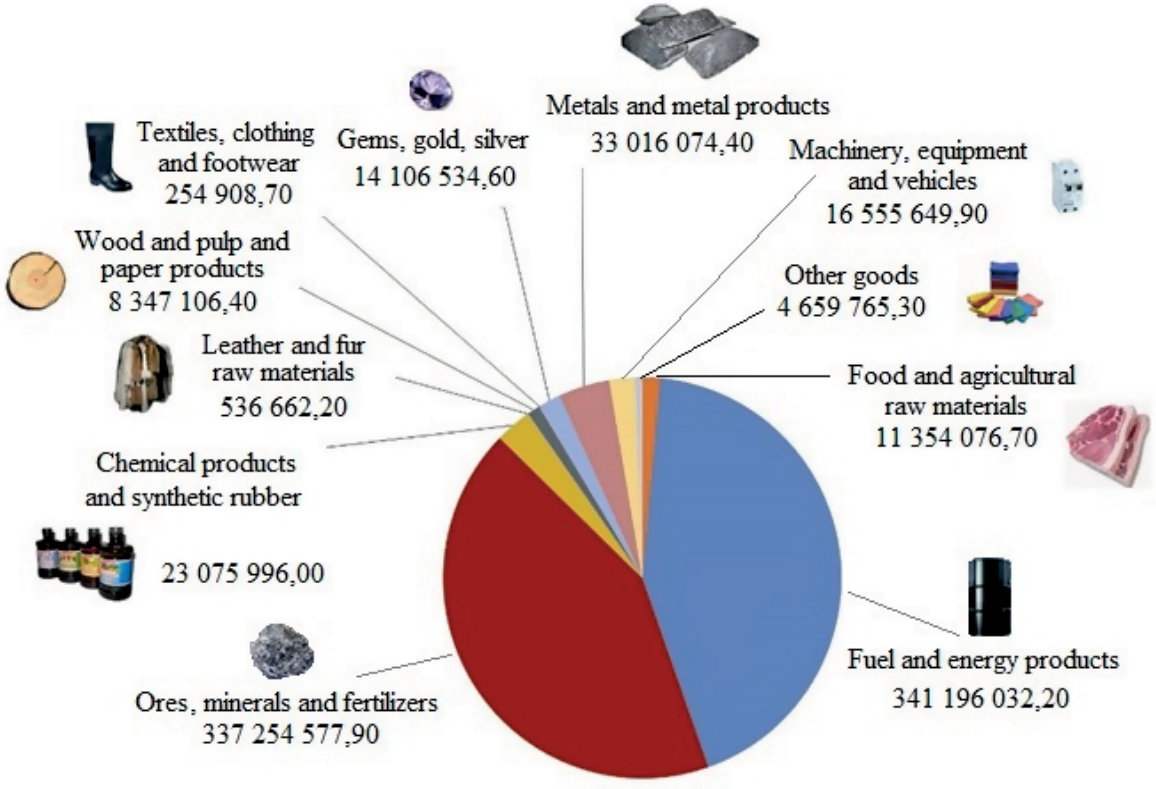

Fig. 1. Commodity structure of Russian exports in 2015 (in thousands of dollars) [5]
Rys. 1. Rosja. Struktura eksportu w 2015 r. [w tys. USD] [5]
Source: Own work.

Among all the presented transport corridors, let's consider the situation in Baltic region. Since 1991, most part of ports and transshipment points were owned to independent Baltic States. That leaded to significant changes of transshipment rates for raw materials and freight [1].

3. Analysis of the main directions of fertilizer delivery in Baltic Sea countries

Nowadays the main directions for minerals transshipment in Baltics are:

1. Northern way – ports of Ust-Luga and Saint-Petersburg.
2. Latvian way – ports of Ventspils and Riga.
3. Lithuanian way – port of Klaipeda.
4. Southern way – port of Kaliningrad.

In this part, one should review relative comparison of minerals transshipment so as freight rates in Baltic countries and Russia. In the beginning, Table 1 shows data for several main technical abilities of several ports.

The table shows significant difference in transshipping capacity between port of Klaipeda and others. Its four terminal scan provide up to 14.6 mln tones of mineral and ore cargoes transshipment annually. The deepest water area is situated in Ust-Luga – up to 15 m draught [3, 4].

Table 1

Technical characteristics of the Baltic ports for transshipment of mineral raw materials

Port	Annual capacity (million tonnes)	Maximum draught of vessels (meters)	The maximum deadweight (thousand tons)	The total capacity of the warehouses (thousand tons)	The speed of ship loading (t/h)
St. Petersburg	6,2	11	50	240	3000
UstLuga	4,5	15	70	145	2800
Riga	4,5	13	70	250	1100
Venstpils	7,5	14,1	75	140	6000
Klaipeda	14,6	13,4	80	515	3000
Kaliningrad	1,4	8	20	31	3000

Source: Own work.

Further, in order to provide the analysis of transport flows, one should make a common table for railroad delivery costs of minerals from different Russian regions, Ukraine and Belarus. It should be mentioned that the united railway system of the Former Soviet Union contains certain limitations for shipping large and bulk cargoes to foreign ports. This results in following: shipping from Belarus or Ukraine through ports of Lithuania and Latvia is more expedient rather than through Poland [1].

Main areas of mining and mineral ore processing for further railway transportation to Baltic Seaports are: the Ural Region (potassium salts, iron ore, polymetallic ores, copper ores), the Volga Region (crude oil and petrochemicals), North-Western and Central Regions

of Russia (phosphate rock, iron, manganese and nickel ores), Belarus (potassium salts, crude oil), Ukraine (coal).

Table 2

Comparative cost of rail fares in 2015 for the transportation of 1 ton of mineral raw materials from different regions to the port terminals (in dollars per ton)

	Central Russia	The Volgaregion	Ural	North-West region	Ukraine	Belorussia
St. Petersburg	17,5	23,3	35,5	12,2	38,5	16,2
UstLuga	17,5	23,0	35,0	12,1	38,5	15,5
Riga	25,3	35,5	38,6	28,9	69,2	14,5
Venstpils	27,2	39,8	38,66	30,1	69,0	12,5
Klaipeda	29,6	49,44	69,99	36,1	66,5	14,68
Kaliningrad	28,34	48,27	55,4	56,17	69,7	23,5

Source: Own work.

Overviewed main technical characteristics of Baltic States ports and also railway tariffs for transportation of mineral raw materials from different regions of the CIS to Baltic sea area, let's highlighting the share of mineral sector in the total volume of cargo transshipment in considered ports.

Analysing Klaipeda and Ust-Luga product structure, one shall see that the part of mineral cargoes (including crude oil) forms the largest piece – from 55 to 95%. The least volumes of such transshipping are common for Ventspils, Saint Petersburg and Kaliningrad (appx. 36-39% of the whole nomenclature). Described figures of railway costs show that Russian producers prefer Saint Petersburg and Ust-Luga as the most convenient and profitable routes. In some cases, Ventspils or Riga ports could be more convenient, but because of higher railway costs, they cannot be profitable for Russian companies (what, for example, leads to downtime of Ventspils' capacities) [3,4].

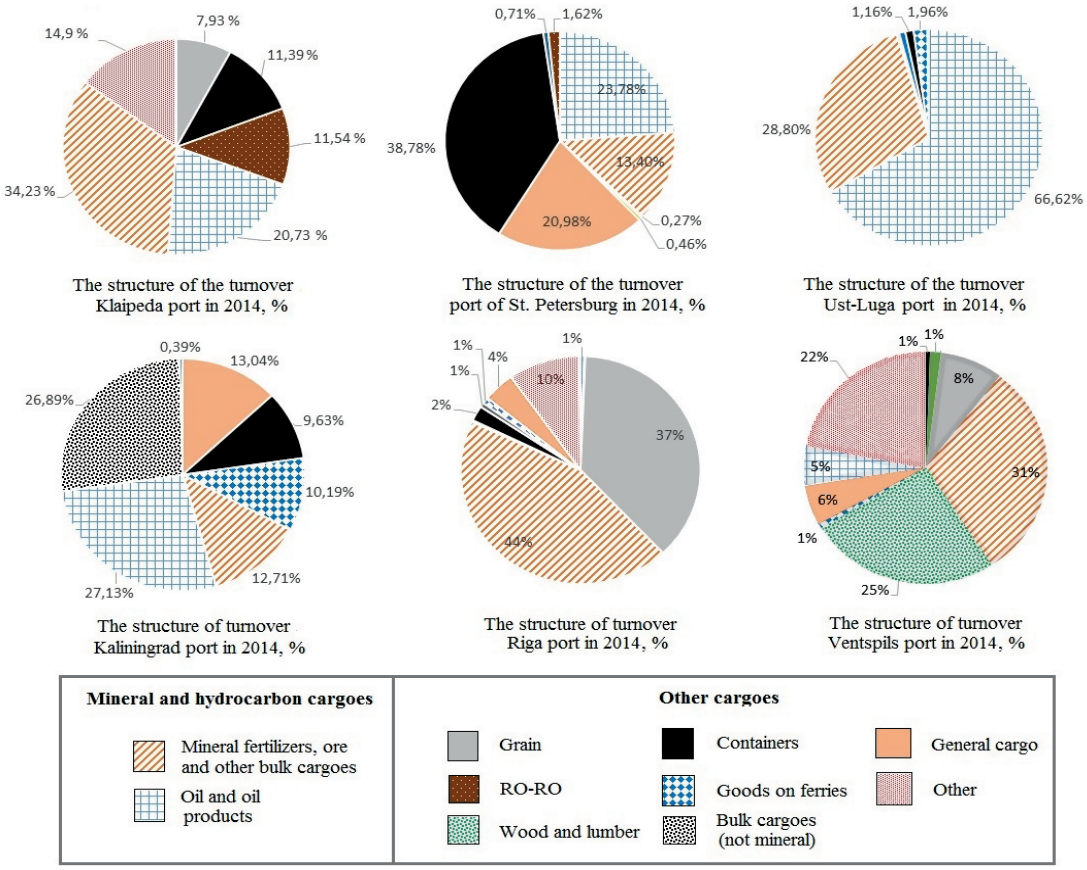

Fig. 2. Shares of the natural resources sector (fertilizers, ores and crude oil) in turnover of Baltic ports [1]
Rys. 2. Obrót portów bałtyckich w podziale na sektory surowcowe (nawozy, rudy metali i ropa naftowa)
Source: Own work.

Another case shows that use of Klaipeda capacities together with low railway costs makes Belorussian transshipment through this port extremely convenient and profitable. Comparing Klaipeda to other Baltic Sea ports one can highlight its close location to Europe, ability to load huge vessels and significant volumes of storage facilities.

Port of Saint Petersburg can be highlighted from other Russian ports, because it is used to transship minerals of Eurochem, Uralkali, SDS-Azot, Phosagro, etc. During 2013-2015 the volumes of transshipment increased by 20-25%, and the average minerals turnover turned to 5.4 mln. tones [2].

One significant advantage of Saint Petersburg – its close location to the main mineral producers of the Northwestern region (excluding Kolskiy peninsular and Kaliningrad). However, this port freezes in winter, so it's impossible to load huge vessel during winter period. In addition, freight rates in winter are usually higher by 10 USD per ton [3, 4].

Ust-Luga provides coal, fertilizers and Sulphur transshipment. Nowadays certain works for increasing the fertilizer warehouses capacities are being performed, so that the fertilizer transshipment capacities will additionally grow by 3-4 mln. tons. In addition, final electrification of the railway is being made, this will allow to change diesel locomotives to electric.

Fig. 3. Major ports and points of transshipment of mineral raw materials in the Baltic States [1]
Rys. 3. Główne porty i punkty przeładunkowe surowców mineralnych w państwach bałtyckich [1]
Source: Own work.

Port of Kaliningrad includes The Sea Trade Port and The Sea Fish Port. This port has lower max draught compared to other Baltic Sea ports that influences badly on its turnover. Kaliningrad port has facilities for dry, liquid and bulk cargoes transshipment. The capacities of both ports together provide ability for 2.7 mln tons of mineral cargoes transshipment annually. Navigation period in Kaliningrad is year-round. From the early January till the end of March Kaliningrad Sea channel is covered with ice, but ice-breaker vessels are used only in severe winters.

Talking about ports of Latvia, one should mention Riga, which holds fourth place in transshipping capacity between Baltic Sea ports with the whole turnover of 40 mln. tones., when Ventspils, which once was one of the leading ports in the region, providing potassium fertilizers transshipment from Belaruskali and BPC, suffers turnover decreasing because of strong competition with Saint Petersburg, Primorsk and Ust-Luga. Uralkali has transferred

most of its volumes to Saint Petersburg, due to its own terminal there and cheaper logistics. In the meantime Belaruskali has transferred its volumes to Klaipeda and it caused significant drop in fertilizer transshipment in Ventspils (for 8 months of 2015 it has formed only 142 thousand tons from 7.5 million possible [1].

Unlike Ventspils, Lithuanian Klaipeda with several terminals for fertilizers transshipping faced a significant growth of transshipment, first because of volumes from Belaruskali, that are handled here – approximately 10 million tones of KCL were loaded on vessels in Klaipeda during 2015. Assuming all above-mentioned capacities of the Baltic ports described, it is complicated to develop Kaliningrad port into an adequate competitor for its huge neighbors. Kaliningrad location cannot provide direct delivery of cargoes from the rest of Russia, and common logistic costs for transportation through foreign countries are higher, than costs for Ust-Luga or Saint Petersburg delivery. Important factor for Baltic countries success is the ability to provide lower railway costs for producers, if the port of loading is located in this country. In case of probable transit of the products through (for example) Lithuania to Kaliningrad, producers cannot rely on such privileges.

Active development of Kaliningrad as a large port should include the search for regions' inner reserves, that might allow to increase export volumes and provide a significant push for modernization of existing infrastructure in the way of minerals shipping so as for fertilizers export.

Kaliningrad region has huge potential in mining and selling mineral and energy raw materials outside the region. Carbohydrate reserves in the region are approximately 25-30 mln tones. Kaliningrad region has a good equipped base and vast experience in the oil fields development, also there is an existing oil terminal in Ijevskoe settlement. In addition, in the area remain undeveloped reserves of sodium and potassium salts, virtually untapped reserves of peat, sand and gravel. Active development of the mineral resource complex in the region is capable through several years to restart the Kaliningrad port facilities and increase seriously the handling and transportation of raw minerals probably for 3-4 million tons per year. Currently, this problem seems to be the priority, because new suppliers of sanctions products change the routes of goods import. The large part of new cargo not transports through Baltic region. Russia is rapidly developing ports on Black and Azov seas, which become in direct competition with Baltic basin ports. However, the export flows of Russian goods has left the terminals of the Baltic States and concentrated in Baltic ports - Ust-Luga, Primorsk, Saint Petersburg. As example, PhosAgro transferred all its volumes in Russia. Previously, this company used the ports of Riga, Muuga and Kotka [5].

But, even in such conditions, while companies are reorienting to Russian harbors, the port of Kaliningrad showed negative growth in 2015, and lose 8.6% of turnover. The latest figure says about 12.7 million tons of the annual turnovers.

4. Conclusions

Assuming the situation within the Baltic Sea area, it should be underlined that nowadays we are going into new period of cargo flow redirection, which unfolding in front of our eyes. Reorientation of the import and export of goods in connection with the sanctions regime, building of new facilities and construction of terminals, as well as changes in transport routes of mineral products supply - poses interesting complex problem of competitive struggle for the client that extends far beyond usual transshipment rates.

In these new conditions, different transshipment points should find some state support scheme in the field of tariff regulation; also, they should develop some new preferential treatments for the clients, as well as to conduct effective and coherent policy of receiving, registration and sending of cargoes to ensure the biggest advantages over competitors.

Dynamic situation in European mineral resources market requires constant monitoring and reassessment of efficiency of logistical routes in case of production and handling of mineral raw materials. Nowadays in some cases, there is a deviation from established, traditional schemes, involving both the political and economic factors. Constant monitoring and optimization is the most important points of logistics policy of any large mining company. In specific regions (such as the Kaliningrad region) an integrative approach for studying logistical characteristics of the region is required in order to change its current status. However, such research and development cannot take place in isolation from state programs of regional infrastructure development. Besides, it is interesting to study the process of logistic schemes of mining enterprises formation in current conditions from scratch, especially with example of Kaliningrad region. Scientific researches of optimal logistic schemes of mineral raw materials delivery in the Baltic States and Kaliningrad region will be continued according to implementation of projects and creation of new mining industry in described area.

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Omówienie

Dynamiczna sytuacja na rynku surowców mineralnych w Europie wymaga stałego monitorowania i powielania oceny efektywności kanałów logistycznych. Obecnie w niektórych przypadkach obserwuje się odchylenia od tradycyjnych schematów, spowodowane zarówno przyczynami ekonomicznymi, jak i politycznymi. Stałe monitorowanie i optymalizacja najważniejszych punktów polityki logistycznej jest kluczowym zadaniem przedsiębiorstw górniczych. W specyficznych regionach, takich jak kaliningradzki, jedynie zintegrowane podejście do analizy kanałów logistycznych może pozytywnie oddziaływać na pożądane zmiany.