international freight transport; East-West direction; broad-gauge railway

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PROSPECTS OF INTERNATIONAL FREIGHT TRANSPORT IN THE EAST-WEST DIRECTION

Summary. The article deals with the assets of building broad-gauge lines in Europe. The delivery time for international transport of goods affects international business in terms of the capital put into goods and subsequently affects its turnover rate. The current disproportion of different line gauges in Europe causes significant problems in the transport of goods especially in commodity streams in the East - West direction. Based on previous research of commodity streams in international trade and a comprehensive analysis of all performed studies for building broad gauge lines, the assets of building these lines included the development of employment, increasing the transport capacity and the building of transshipment stations in Slovakia. The current geopolitical developments have also a significant impact on international transport and important transport links, therefore diversifying these risks is a logical consideration to ensure the smooth delivery of goods and thus the development of international trade.

PERSPEKTYWY MIĘDZYNARODOWYCH PRZEWOZÓW TOWAROWYCH WSCHÓD-ZACHÓD

Streszczenie. Artykuł omawia koszty budowy kolei szerokotorowej w Europie. Czas dostawy w międzynarodowym transporcie towarów wpływa na prowadzenie międzynarodowej działalności gospodarczej, a także na obrót kapitałem. Występujące obecnie różnice w szerokości linii kolejowych w Europie powodują znaczne problemy podczas transportu towarów, zwłaszcza ze Wschodu na Zachód. Dotychczasowe badania przewozów towarowych w handlu międzynarodowym i kompleksowe analizy kosztów budowy szerokotorowych linii kolejowych wskazują na wzrost zdolności przewozowych, ale także na budowę nowych stacji przeładunkowych, a tym samym na zwiększenie się zatrudnienia na Słowacji. Bieżące wydarzenia geopolityczne mają istotny wpływ na połączenia w transporcie międzynarodowy, w związku z tym zróżnicowanie i analiza zagrożeń są ważne z punktu widzenia zapewnienia sprawnych dostaw towarów, a tym samym rozwoju handlu międzynarodowego.

1. INTRODUCTION

The Eurasian continent offers opportunities for the development of several types of transport between the two continents. These are not isolated continents, where the transport of goods can take place only by sea or air. Given the transport distances and transportation freight volumes, the road

transport is not used as the main type of transport. For a very small amount (and a high price) of a certain type of goods, air transport can be considered, too. However, concerning the price this type of transport is not suitable for transporting large volumes of goods, so that carriers at the end of the logistics chain accept the final product price, including transport costs. Therefore, the main types of long-distance transport in this direction are sea transport and lately rail transport also assumes an important role.

At the level of the EU and its Economic Commission for Europe there are several studies on how to improve, accelerate and efficiently perform transport of goods imported from Eastern Europe and Asia. The seaports in Western Europe are already overloaded in terms of capacity. However, the requirements for the import of goods continue to grow. In recent years, Asian countries have become trusted business partners, therefore besides a high transport volume of import of goods into these countries, the export of goods continues to grow.

For this reason, alternative transport routes could ultimately help meet this need of importing goods without burdening the already overloaded seaports.

2. THE ANALYSES OF INTERNATIONAL FREIGHT TRANSPORT IN THE EAST-WEST DIRECTION

According to expert forecasts, by 2015, 90% of the world economic growth will be generated outside of Europe, whereby a third will be generated by China. In the coming years, it is important to use the opportunity which is possible due to the increased level of growth abroad, especially in East and South Asia. It is likely that by 2030, third world and developing countries will produce almost 60% of world GDP. Currently, it is below 50% [1].

Table 1 shows the volumes of imported goods from China into the EU by water, air and rail transport in the years 2007 - 2013. This development is graphically illustrated in Graph No. 1 [2].

Table 1

The volume of goods imported from China into the EU according to the transport type

year type	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Water transport	68.329.206	59.399.709	39.255.828	47.819.986	50.107.167	43.488.210	43.027.655
Air transport	1.098.958	901.737	812.083	1.081.075	1.004.344	910.135	939.501
Rail transport	556.222	484.753	299.052	378.414	357.615	275.093	304.568
All transport types	77.495.258	67.494.469	45.359.474	54.039.149	57.317.263	49.272.707	48.906.366

Water transport is currently the most important type of transport of goods from China. This method is dominant due to the tradition, which is common in case of these distant transport links. Another reason is the very poor offer from the rail transport and measures that create barriers for rail transport.

Table 2 and Graph No. 2 show the volume of goods exported to China from EU countries. This volume is increasing steadily, which is caused by the growing Chinese economy and the need to purchase new technologies for further economic development. This increase was almost doubled during the monitored period 2007-2013. The global economic crisis had no effect on this export, since a significant growth of exports into this country was recorded in 2009. This increase could have partially been caused by a change in the business strategy of individual companies within the EU, when the EU countries stopped focusing on proven markets and started reaching out to these very rapidly growing economies of Asia. On the main axes there are the quantities of goods exported to China by water transport and other types of transport. The additional axis shows the export into China by air and rail transport [2].

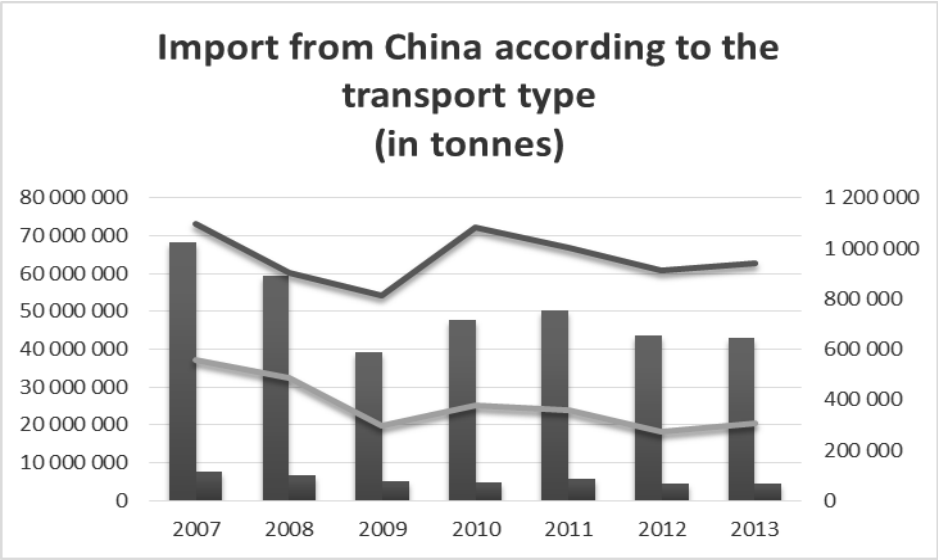

Fig. 1. The volume of goods imported from China into the EU according to the transport type
Rys. 1. Ilość dóbr importowanych z Chin do Unii Europejskiej w zależności od rodzaju transportu

Table 2

The volume of goods exported from the EU to China according to the transport type

year type	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Water transport	20.762.539	24.705.220	31.552.244	31.429.946	38.031.230	39.451.435	41.029.692
Air transport	318.824	338.885	341.096	568.710	608.951	531.468	551.973
Rail transport	191.434	134.596	261.999	194.754	122.468	83.215	134.675
All transport types	23.308.614	26.230.844	33.395.230	33.227.544	39.712.390	40.891.743	42.451.260

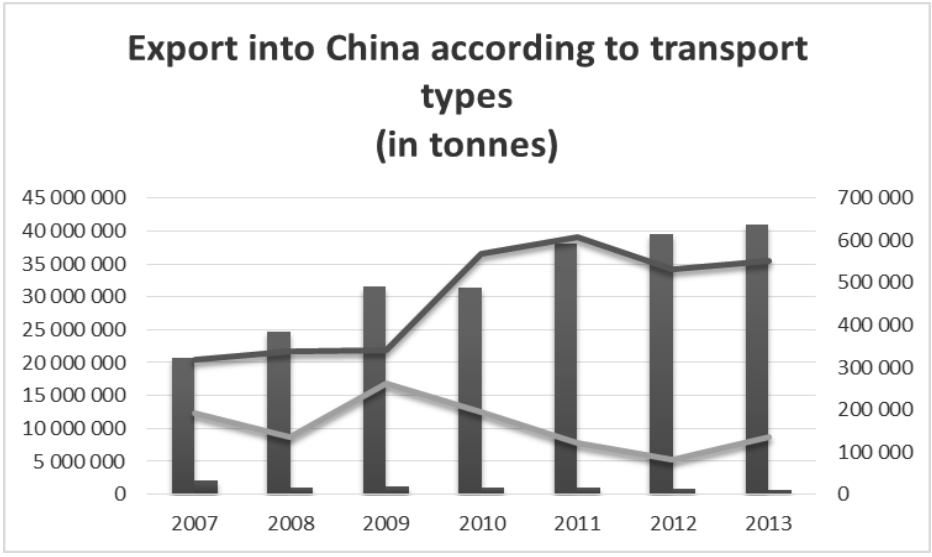

Fig. 2. The volume of goods exported from the EU into China according to the transport type
Rys. 2. Ilość dóbr eksportowanych z Unii Europejskiej do Chin w zależności od rodzaju transportu

In this case, we can state that almost all goods have been exported to China by water transport. Other transport types represent less than 4% of the transport market. This disproportion is caused by carriers' efforts to use freight ships, which transport goods from China into the EU to full capacity and their pricing policy for these transports.

Transport of goods from Asia to Europe, indeed, is dominated by sea transport. Huge distances between the two continents, in combination with a number of border crossings, political instability, lack of safety, delays at the border due to customs clearance of goods and other unpredictable discouraged carriers to use land transport. In addition, a simple comparison of sea and land transport through cost items often lead to a conclusion that the linking of countries by land transport is not financially competitive.

Rail transport can be competitive, in cases when the production facilities are located relatively far from ports, such as in China and India and the freight is again intended for countries of Southern and Eastern Europe, thus once again far away from international ports.

Volumes of intermodal transport, using rail or road transport in contrary to water transport between Asia and Europe, are currently very low. Rail transport is feasible mainly due the corridor of the Trans-Siberian Railway and the Baikal-Amur Railway, which is the southern connection to western and central China. These two rail corridors form the "backbone" network, and basically the only possible long distance rail link between China and the European part of Russia and the onward transportation of goods into the EU. Although this type of transportation of goods between Asia and Europe represents a minimum percentage (3-4% of the total volume of transport of goods), it has a significant potential in some relations.

The use of the Trans-Siberian Railways and all alternatives of waterways in the transport links from Asia (South Korea, Japan, China) to Finland in terms of transportation time is shown in Table 3 [3].

Table 3

Transport time of goods from Asia to Finland

	Busan (South Korea)	Kobe (Japan)	Shanghai (China)
Water transport	35 days	35 days	35 days
Trans-Sib. Railway	18-22 days	24 days	26 days

Finland as an EU member state uses the same gauge of lines as Russia, so in these transport links the need of transshipment of goods between broad-gauge (Russian) and standard gauge (European) is eliminated.

Sea transport is currently the dominant type of freight transport between Asia and Europe, and the rapid growth of intermodal traffic between Asia and Europe. Use of intermodal loading units in sea transport increased between 1997 and 2006 by 71% and the average loading capacity of ships increased by 55%. The total trade volume in intermodal loading units in 2002 on the route Asia-Europe reached 13.7 million TEU units and the association ASEM evaluates the annual volume growth at an average by 5.6% per annum [3].

One of the key features of international trade in intermodal transport units is a significant imbalance between the dispatching of full containers from Asia and full containers that are sent back to Asia. Carriers have recorded this imbalance since 1997 especially on the transport link to northern Europe. Current estimations of imbalanced loads reach the value of 25%, and according to prognoses this disproportion of the mutual trade of Asia and Europe there will grow and reach 34% in 2020. European countries expect an overall increase of the volume of import of goods from 7.6 million TEU to 16 million TEU, which is an increase of approximately 5.9% per year (till 2020), and in the opposite direction the estimated growth is a growth by 6.1 million TEU to 12 million TEU, i.e. an increase at an average by 5.4% per year [4-5].

The growth of trade of goods loaded in intermodal transport units between Europe and Asia has led to the production and use of larger and more efficient ships, where the average price of transport between Europe and Asia per TEU unit fell to 742 USD. At the same time, however, they gave rise to new concerns about the congestion of ports because of the low water route capacity. Ports in Asia, northern Europe and the Mediterranean, therefore, started a radical reconstruction, which enabled to serve these new ships with a larger draught (and hence the displacement). The water way capacity of

ports in China has increased from 19.4 million TEU units in 2000 to 118.3 million in 2009, equivalent to an average annual growth of 25.4%. The water way capacity in other countries of South and Southwest Asia in the same period almost tripled, which represents an average annual growth of 16%.

Logistics measures are indispensable for maintaining and increasing European competitiveness and prosperity in compliance with the renewed Lisbon agenda on the growth of job positions. Europe needs to "take a stand" to its tasks in the field of transport by integrating logistics thinking in its transport policy. The approach should focus on market needs, it should include social and environmental dimensions and should lead to a situation from which everyone involved should benefit. To achieve these objectives, the White Paper examines ways and means whether and where the EU could offer added value to enhance the development of freight transport logistics in Europe and the world.

The project of building a broad gauge railway in the conditions of the rail transport has a significant impact on the international transport network especially taking the fact into account that this line will form a direct connection of major European regions to a broad-gauge railway and thus reduces the time delays of time-consuming transshipment of goods between different gauges. Another indicator is the diversification of the transport risk of the transport of goods to Europe from Asia. The current conflict situation may also affect traffic and major transport links, thus diversifying these risks is only a logical reflection on ensuring the smooth delivery of goods.

3. THE PERFORMANCE OF THE TRANSPORT OF GOODS BY RAIL TRANSPORT FROM ASIA TO EUROPE

Many articles analyze the possibility of delivery on routes East - West. For example, article [7] analyzed shipping to the Baltic countries. Currently, there are several lines of freight transport from Asia to Europe. However, all these lines now have to undergo the mentioned need for transshipment of cargo from broad-gauge to standard gauge.

Some international organizations and private companies have already shown their readiness to implement these links. Block trains were dispatched as a demonstration of the ability to realize such shipments. These included a transport link from Nakhodka in Russian to Małaszewicze (in Poland). This transport link was 10 335 km long and lasted 12 days and 8 hours. The transport took place in July 2004. This situation is rather idealized because the transport did not take place in winter months when the temperature in the area of the Trans-Siberian Railway can cause significant complications. Another transport link that has been demonstrated in the past was the transport link from Beijing, China to Hamburg, Germany which was intended to demonstrate the potential of trains of intermodal transport. The transport link was 9780 km long and lasted 15 days [10-12].

3.1. Existing transport logistic trains at present

At present, there are links led which operate within the lines of the Euro-Asian corridors. These trains are regularly dispatched and they offer services for particular carriers [8].

Zhengzhou - Essen

The company DB Schenker has launched a rail connection from Essen to Zhengzhou in 2011. This link became the first major event, when the full use of capacity of a train of wagons of intermodal transport eastwards took place. The containers were loaded with industrial robots with the target destination in central China in the city of Zhengzhou. This link is dispatched once a week. The containers are loaded mainly with products for the electrotechnical and automotive industry.

The route from Essen to Zhengzhou through Poland, Belarus, Russia and Kazakhstan was 10 214 km long takes a total of 17 days, which is about 20 days faster than using sea transport. Time delays for the transshipment of containers in the station of Brest between standard and wide gauge are already counted in. This transport link transported more than 40 000 TEU units on the import from China to Europe in 2012.

Producers and shippers using rail transport may use two basic routes for tracing products. The first is sending shipments through Kazakhstan and the second is the well-known Trans-Siberian Railway. Producers in Central and Western China tend to use more the route through Kazakhstan, while producers from northeast China generally choose the other route. These routes can also be used by carriers from Japan and South Korea, where the goods will be supplied to the Chinese logistics centers and then the goods will be further dispatched by rail transport into Europe.

The effort of Chinese government officials is to reduce own production costs and industrialize not only coastal areas but also areas of central and western China. There is an increase of the interest in the transport of finished goods from China to Europe and the transport of goods in the opposite direction. Companies such as Hewlett-Packard, BMW, Audi, Volkswagen and Samsung have become permanent carriers of that rail link from China to Essen. At the same time the increased production in Tajikistan, Kazakhstan, Turkmenistan and Kyrgyzstan may cause the demand of railway links for the transport of goods to Europe, where particularly these countries can be a secondary market for Chinese shippers in addition to the core European market.

Despite this great potential the volume of transport on the Asia-Europe railway is declining. The extreme Siberian weather and consistently high indirect administrative burden during customs controls for these Euro-Asian countries are the reason for this decline [10-12].

Yiwu – Madrid

On November 18, 2014 another link of combined transport was opened, this time from the Chinese city of Yiwu to Madrid in Spain. This is a further confirmation of the importance of the rail link of Asia with Europe. Train route passes through seven countries. In Central Asia, it is passing through the Chinese region of Xinjiang and then through Kazakhstan, Russia, Belarus, Poland, Germany, France to the target destination in the Spanish Abroñigal terminal near Madrid. The total length of this route is 13 053 km. An interesting feature of this link is that it undergoes two gauge changes and the goods must therefore reloaded twice. The first change is a change from broad-gauge to standard gauge and then reloading from standard to broad-gauge (Spanish) lines. The whole transport link is shown in Fig. 3.

Fig. 3. Map of the transport Yiwu – Madrid
Rys. 3. Mapa transportu Yiwu – Madryt

The above-mentioned realized projects directly show the advantages that would result from building a broad-gauge railway.

3.2. Projects on building broad-gauge lines

The completion of a supplementary service infrastructure in the Slovak Republic will also have a major role in building broad-gauge lines. According to the assumed variants a new terminal near the city of Nové Zámky should be built. The choice of the location was not a coincidence. The actual location of the terminal has been researched for a long time from a number of analyses to determine an optimal position of the terminal.

The first criterion was an already existing infrastructure. An existing transport infrastructure near a transport junction is necessary for several reasons. It is necessary as a basis for the planned construction of broad-gauge lines. It is also necessary as a distribution network for all other transport types. The current transport corridors generally include logistics and an optimal planimetric connection of everything that is necessary to build broad-gauge lines in Europe.

The realization of prolonging the broad-gauge railways will bring investments and opportunities of acquiring new markets for companies that already operate in the area. Building a new terminal with links to standard gauge rail network and also to the water transport (Danube waterway) and road transport gives the potential for a large area of attracting new importers and exporters in the wide surrounding of all three countries. The priority of this new terminal is to attract customers in Central and Western Slovakia as well as the Northern and Western territory of Hungary. The alternative of building a second terminal in Pardnorf significantly reduces the potential for attracting customers of Eastern Austria [10-12].

The construction of this project, indeed, leads to strengthening Slovakia's position on the transport market in the East - West direction and vice versa. In connection with the financial and economic analysis of the study of feasibility of a broad-gauge railway, an increase of performances, which are listed in Table 4, are taken into consideration [9].

Table 4

Assumed commodity flows on a broad-gauge railway

Rail segment	East – West direction (million. tones/year)			West – East direction (million. tones/year)		
	2020	2025	2030	2020	2025	2030
Košice – Bratislava	13,3	15,5	18	3,7	4,9	5,7
Bratislava - Vienna	10,4	11,9	13,8	3,1	4,1	4,7

The table shows that in the segment Košice - Bratislava it will be an increase of the volume of transport of 0.5 million tones in 2020 and of 0.7 million tones in 2030, which could have a favorable effect on the calculations in the evaluation of the study of feasibility. On the contrary, in the segment Bratislava - Vienna it will be a reduction in the volume of the transport of 1.2 million tones in 2020 and of 1.8 million tones in 2030 [9].

These volumes of good flows in case of common commodities of transported goods represent about 14 pairs of trains per day (standard is 3000 tones/train), respectively in case of commodity containers about 28 pairs of trains per day (standard 1500 tones/train). To ensure transport of trains it is expected that 100 traction railway vehicles will be used on broad-gauge lines, of which 50 traction railway vehicles for the transport of trains and 50 traction railway vehicles for service and manipulation activities, while maintaining the volume of transport on the segment Maťovce - Haniska near Košice [9].

However, these data do not reflect the further possible potential of the development of regions adjacent to the area of the broad-gauge railway. When comparing time and financial terms of the delivery of goods, customers focus on the possibility of rail transport, which subsequently aggregates further transport requirements, and the consequent increase in the transport performances on broad-gauge line in relation to the already existing terminals of combined transport as well as those newly proposed.

When analyzing the EU's trade exchanges with Russia, China and India, detailed flows of goods on the side of import and export have been processed. By selection of commercial exchange of individual countries with the EU by water transport, the results are summarizes in Table 5 [2].

Table 5

Trading exchange of goods of the EU with selected countries in tones

		2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
China	export	20 762 539	24 705 220	31 552 244	31 429 946	38 031 230	39 451 435	41 029 692
	import	68 329 206	59 399 709	39 255 828	47 819 986	50 107 167	43 488 210	43 027 655
India	export	6 761 876	8 703 499	11 179 700	10 575 033	11 080 819	11 274 929	8 660 799
	import	15 400 980	14 058 800	10 438 653	16 003 352	16 710 593	14 766 103	14 791 141
Russia	export	6 178 379	7 544 875	5 142 232	8 066 102	10 419 707	9 175 054	8 502 336
	import	219 612 089	210 837 176	205 783 367	215 966 408	215 716 672	217 590 769	229 135 782
Total		337 045 069	325 249 279	303 352 024	329 860 827	342 066 188	335 746 500	345 147 405

In case the potential of a takeover of performances of the newly constructed broad-gauge railway would be as low as 5% of these performances, then another almost 17 million tons of goods, which could be transported by a broad-gauge rail, would be transferred on the new line.

CONCLUSIONS

In terms of creating new job positions, according to the study of feasibility it is estimated that the Project will generate 641 965 FTE (full-time equivalent in man-years), out of which 299 066 in the construction phase and 342 899 in the operational phase. The study of feasibility states that the operation of intermodal transport terminals and rail infrastructure will create an average of 3100 new jobs and at the operation of trains an average of 8400 new jobs is estimated. This estimation includes the entire logistics system of subsequent activities [9].

Constructing a new infrastructure is not the goal itself. Implementing efficient and sustainable logistics solutions can optimize the use of the existing transport infrastructure of the rail transport. If, however, the lack of suitable infrastructure and means of transport becomes a clear obstacle to the development of transport, this should be rectified. The EU has identified 30 priority projects to be completed by 2020, and that might be useful for the development of the common transport market.

If Europe is to maintain and improve its logistics position on the world market, closely linked to the solution of railways in the EU environment, high-quality solutions will be necessary. Being a center of efficient logistics, having appropriate measures and incentives is the way to maintain economic, social and environmental sustainability in Europe and to mitigate the adverse trends, such as relocation of business activities and possibilities outside Europe. The co-modality and high efficiency of the transport system is essential for Europe if Europe is to manage the increasing flows of goods that are transported every day on our transport infrastructures [10-12].

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