

Ukraine in system of transport links

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ABSTRACT: The paper shows the possibilities and benefits of Ukraine joining the transcontinental system of transport links that is now on the eve of the global reshaping with development of alternative routes. This is a prerequisite for a phased increase in international cargo transportation in territories of Ukraine and partner countries. The paper presents some results of assessment of different transportation technologies capacity that enables decision-making on their use and development depending on traffic volumes.

Keywords: transit cargo; railway system; New Silk road; transport infrastructure; rolling stock; gauge change; combined transport; piggyback.

I. INTRODUCTION

The past two and a half decades were marked by many confirmations that Ukraine was a “great transit country”. Then how could it happen that transit cargo flows by rail decreased from year 2008 to 2016 almost five-fold? It is quite obvious that some important internal and external factors which impact transport flows were not taken in consideration. As to transit cargo flows, it was evident that they are dependent by 80 and more per cent on Ukraine’s economic relations with Russian Federation and the remaining 10 per cent on other CIS countries. But almost nothing was done to diversify the origins of international cargo flows, so after dramatic political events of late 2013 and 2014 that resulted in annexing the Crimea by Russia and warfare in Donbas, the Ukraine’s economic losses were inevitable, in that the above mentioned loss of transit cargo flows. Domestic and export freight rail traffic, of which almost 60% are loads of mining and steel industry, also have poor prospects. Because they depend on Ukraine’s position in the global steel market, but it has fallen out of the top ten world steel exporters. On the other hand, the European Union in last four years has become the main foreign trade partner of Ukraine with more than 40% of trade turnover and the second biggest trade partner of Ukraine is China with about 10%, while the share of Russia is steadily decreasing. Despite many difficulties, the Association agreement between EU and Ukraine [1] is working and it is aimed, inter alii, at cooperation between the Parties to facilitate the restructuring and modernization of Ukraine’s transport sector and gradual approximation towards operating standards and policies comparable to those in the EU. One of objectives in the Association agreement is the development of the multimodal transport network connected to the Trans European Transport Network (TEN-T) and improvement of infrastructure policy in order to better identify and evaluate infrastructure projects in the various modes of transport.

Another good chance for Ukraine is the Chinese initiative “One belt, one road” [2]. Of course, Ukraine must preserve and enhance all of its transport infrastructure capacities.

Ukraine’s experience and immediate prospects in international transport projects

In our opinion, Ukraine has sufficient experience to maintain and develop major international transport projects on many routes, among which are the following.

The existing route

- Odessa - Klaipeda (“Viking” train). Proper conditions must be created in Odessa and on the entire route to make it attractive for transit from Turkey and other countries. Tariff and legal regulation in favour of multimodal transportation, simpler and faster administrative procedures at sea ports and in railway companies may help to improve those conditions by joint efforts of State and businesses concerned.

The route, which needs to be revitalized

- Ukraine - Kyiv - Izov UZ (border)-Hrubieszów LHS – Slawków-Katowice (route of “Yaroslav” train). The most acute problems are also in tariff and legal regulation, but we see also insufficient supply of new transport

services for this broad-gauge line, which is traditionally used for bulk cargoes. For example, Ukrainian transport companies could propose to grain traders new container - based logistic chains and technologies to deliver cereals from Ukraine to EU countries via terminal in Slawków. Container technologies would be more effective with increased speed of trains that can be provided by means of better design and performance of new rolling stock. Indicator - one train daily in each direction.

Routes that should be created additionally

- Ukraine - Kyiv - Chop UZ (border)-Záhony MAV (Chierna-on-Tisza ZSR) – Italy (via Austria, Balkan countries). These routes should be developed starting with the organization of the up-to-date terminal in Chop, which would accumulate trucks that would need special permits to go to Italy by road. But road carriers would do without permits, if in this terminal the trucks are loaded onto special rail platforms of RoLa type to assemble regular contrailer trains, which transport trucks and piggybacks. Originally (before customs and other formalities are fixed) the trains will carry the whole truck with tractor, so a passenger car for drivers to travel should be provided in the train. Later on, trains will carry only piggybacks without tractor, so it will not be necessary to include an additional passenger car, thus the payload of the train increases. Timetables and fares (ticket prices) of the trains are to be agreed with the European network of combined transport routes. Indicator - one train daily in each direction. Possible links from routes of “Viking” and “Yaroslav” trains to “Rail Baltica” project.

II. ROUTES OF NEW GENERATION

These routes are to be created in the framework of the “National project of Ukraine’s high-speed railway of 1435 mm gauge (UHSR-1435)” on the Ukrainian part of the Black Sea-Caspian route of New Silk Road. The authors propose the idea of UHSR-1435 for further discussion.

1. The background of Ukraine’s participation in the New Silk road project

The idea of the New Silk road project is very attractive from many points of view. It gathers countries and cities around it [3] and it has much more supporters than opponents. Not only China and EU countries which are two main markets to be linked by the New Silk road, but many other countries are interested in the project and they may play in it both as partners and competitors. Thus, Baltic countries are actively looking for their place in maritime New Silk road [4, 5] that is connected to Trans-Siberian route via Russia and Belarus. The latter two countries are extremely interested in further development of this route [6], while Kazakhstan, being also a member of the Customs Union, looks forward for its own benefits on the New Silk road [7]. Afghanistan is currently not in the most favorable position, economically, politically and geographically, but it strives to join the New Silk road project and get some benefits for its economy [8]. We can notice that very often the project is considered as a new transport link between economic giants like China, Russia, Iran, India and West Europe, while Ukraine is not even mentioned as a player in the New Silk road project [9]. An impressive success on the New Silk road is the Beijing-London freight train launched by China in January 2017. In its 18-day journey, freight spans 7,456 miles of railways, crossing Kazakhstan, Russia, Belarus, Poland, Germany, Belgium, France and the UK [10]. Again, Ukraine is not involved in this route.

But Russia is not always regarded as a reliable transit country, Ukraine being not the only economy that suffers from its transit restrictions. “More recently, new trade routes across the region have opened to transport frozen chicken. In particular, this follows Russia’s imposition of trade restrictions on western agricultural produce. To bypass Russia, US suppliers of chicken to Kazakhstan have begun shipping via the Black Sea and onward through Georgia, Azerbaijan and across the Caspian Sea to Kazakhstan” [11].

Considering “land” options of New Silk road, one can find at least five possible routes that lead from China to West Europe [12]. The first of them, #1) Trans-Siberian route via Russia and Belarus is the most northern of them. The rest four routes (looking at map from north to south) have origin from different provinces of China via: #2) Kazakhstan to Aktau ferry on Caspian Sea; #3) Kyrgyzstan, Uzbekistan, Turkmenistan to Turkmenbashi ferry on Caspian Sea; #4) Tajikistan, Afghanistan to Iran; #5) Pakistan to Arabian sea coast. Two of these routes (#2 and #3) that use ferries on Asian coast of Caspian Sea will then lead to Baku ferry in Azerbaijan, on European coast of Caspian Sea. What can we see from this geographical overlook? Firstly, China strives to involve in the scope of the New Silk road as many countries as it is possible to earn maximum benefits. Secondly, Ukraine can have its own benefits as the largest transit country on the way to West Europe, if cargo flows from Baku ferry will be shipped via Azerbaijan to Georgian ferries Batumi or Poti, then across Black sea to Chornomorsk ferry in Ukraine. Despite of evident benefits that Ukraine can get from the New Silk road project, it has not yet gained appropriate attention in public opinion, and national business and politicians are not seriously focused on it. All we have is a rather wide range of opinions and assessments, from optimistic [13] to very pessimistic [14], the latter prevailing. It may seem strange (though encouraging), that the Chinese are more enthusiastic about the project than Ukrainians, for the Ambassador of China convinces them that the New Silk road is unthinkable without Ukraine [15].

This paper aims, among other, at better understanding of vital necessity of the New Silk road project for Ukraine and other participants in the project. Why should the New Silk road pass through Ukraine, when it is evident that this way is a much more complicated route in logistic and commercial aspects? Opponents are quite right saying that there is a well-tested and mastered technology of purely “land” Trans-Siberian route via Russia and Belarus, so why cross the two seas? First, there must be some alternatives that would allow cargo owners not to be subjected to restriction of any kind which may occur on the Trans-Siberian route. Second, the two of the New Silk road options that lead to Ukraine will be like “stringing beads” on this route with relatively small, but potentially rich countries – Kyrgyzstan, Uzbekistan, Turkmenistan, Azerbaijan and Georgia. These countries are rich not only in natural resources for UE and China’s economies, but also most of them have rapid population growth, so they will be capacious markets that are far from saturation (see Table 1). No doubt that construction and operation of the New Silk road routes via these countries will boost the development of these countries, so their contribution to goods exchanges and freight flows on these routes will be more tangible. These small countries are considered to be “poor”, by GDP per capita, compared to EU and other countries. But if we look at another angle of view, we will see another picture (see Table 1, column 7 and Fig.1).

Table 1. Some characteristics of transit countries on the routes of the New Silk road

Country	Population ^[1] , person	Area ^[2] , km ²	Population density, person/km ²	Population growth rate ^[3] , annual %	GDP per capita, PPP ^[4] , USD, year 2015	GDP per km ² area, PPP, USD, year 2015
Kazakhstan	17733198	2724902	6,51	1,5	25877	168403
Kyrgyzstan	6008600	199951	30,05	2,1	3427	102983
Uzbekistan	31807000	447400	71,09	1,7	5996	426274
Turkmenistan	5438670	491200	11,07	1,2	16499	182680
Azerbaijan	9730500	86600	112,36	1,2	17740	1993292
Georgia	3720400	69700	53,38	-1,3	9679	516639
Ukraine	42450370	603549	70,33	-0,4	7916	556769
Russia	146797031	17125191	8,57	0,2	24451	209594
Belarus	9498400	207600	45,75	0,3	17661	808050

[1], [2] <https://ru.wikipedia.org/wiki/>

[3] <http://data.worldbank.org/indicator/SP.POP.GROW>

[4] <http://databank.worldbank.org/data/reports.aspx?source=2&series=NY.GDP.PCAP.PP.CD>

The indicator “GDP per km² area” in Table 1 is derived by multiplying the indicators in columns 4 and 6. This indicator is not universally accepted, but it shows how much national wealth can generate per km² of its area.

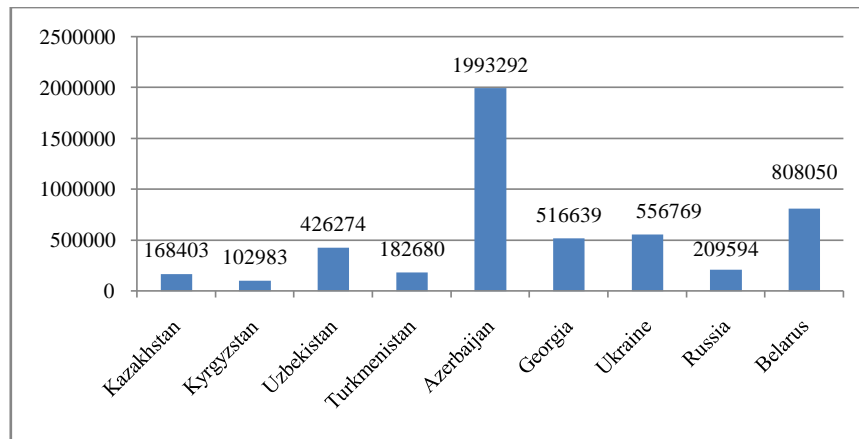


Fig.1. Countries by GDP per km², PPP, USD, year 2015

If we look at the Fig.1, we can see that, by analogy, that every 1 km of transport route via a country may give a certain return in GDP, contribution to global trade and cargo flows.

2. The Ukraine’s international transport routes – a contribution to the New Silk road project

The proposed National project of Ukraine’s high-speed railway of 1435 mm gauge (UHSR-1435) will be the Ukrainian part of the Black Sea-Caspian route of New Silk Road. The project will provide continuous railway normal-gauged tracks and completely interoperable rolling stock and other technological components in a single railway system with UE countries. In UHSR-1435 the rail and sea routes and terminals will be used for combined cargo and passenger traffic.

The project UHSR-1435 should be developed in stages:

Stage 1) Elimination of political, legal, administrative, commercial and technological barriers; creating most favorable conditions for transportation of containers and other goods from China to EU and back through Odessa - Kyiv - Lviv – Mostyska-II UZ (border)-Medyka PKP. Full-scale commercial use of ATGS technology(Automatic Transfer Gauge Systems) with track-mounted gauge changeover device at stations Mostyska-II UZ (border) and Medyka PKP. Perhaps construction of branch Lviv - Chop. Implementation and enforcement of ATGS technology at stations Chop UZ, Záhony MAV and Chierna-on-Tisza ZSR. Providing the feasibility study; design, construction and operation of new infrastructure and rolling stock on the route UHSR-1435.

Indicator - 1 express train a day in each direction.

Stage 2) Completion of construction and launch in regular operation of the entire infrastructure and rolling stock on the route UHSR-1435. Indicator - 2 express trains daily in each direction.

Stage 3) Full-scale commercial use of UHSR-1435 route. Indicator - 1 Express each hour in each direction.

Having in mind the current traffic by rail and combined transport between China and EU via Ukraine (practically at zero), these stages and indicators may appear to be non-realistic, even fantastic. But, first, there is nothing impossible with modern technologies in transport infrastructure construction and rolling stock building. Second, China strongly promotes the idea of the New Silk Road with several alternative routes, and it has adherents in Europe, as it is obvious to all participants of the project that it brings them future economic, social and political benefits. But, to help this future come sooner, consider all possible technologies that Ukraine can use to handle the growing volumes of traffic and to solve the problem of different track gauges at bordering railway systems with 1520 mm and 1435 mm tracks. These technologies are shown in the Table 2 and some results of technologies' capacity calculations are presented in Fig.2.

Table 2.Transportation technologies that can be used at border stations with different gauges

Technologies	Capacity*, trains per day	Locations and maximum possibilities of use
I. Transshipment of goods from wagon to wagon	2 – 3	Stations Chop, Batieve, Mukacheve, Vadul Siret, Mostyska-II and other (Lviv Railway), where there is an appropriate infrastructure for transshipment. The maximum volume of traffic up to 5 trains per day.
II. Wagon bogies change	3 – 4	Stations Chop (passenger) Yesen, Mostyska-II, Kovel (Lviv Railway). The maximum volume of traffic up to 12 trains per day.
III. ATGS system with gauge changeover device and adjustable wheel-sets	5 – 6	Station Mostyska-II. The maximum volume of traffic up to 24 trains per day.
IV. Using a single track gauge 1435 mm	24 – 28	Section stations Diakove – Helmeu (Lviv Railway). The maximum volume of traffic unlimited.

* The capacity of one production line, freight trains of 50 wagons per day

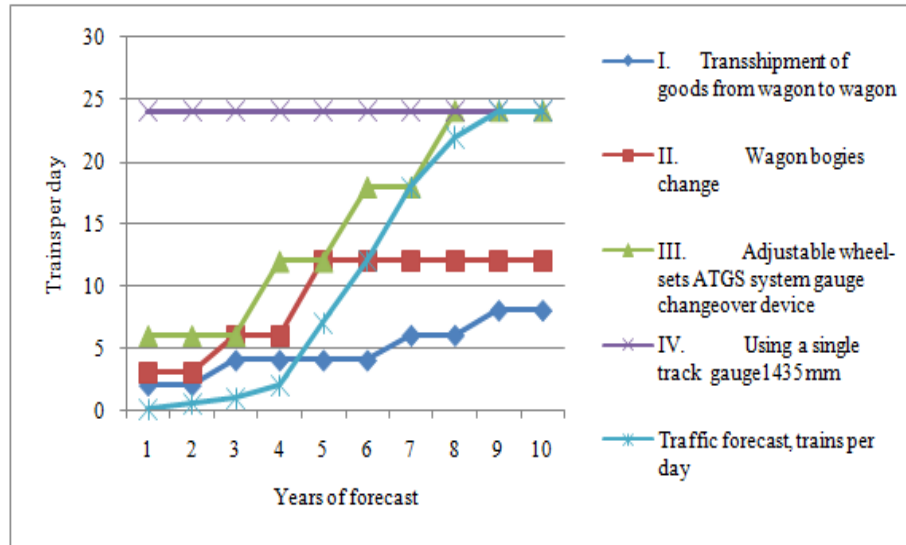


Fig.2. Forecast of traffic and possible capacity of stations with different technologies of border-crossing

An analysis of Table 2 and Fig.2 shows that the “Using a single track 1435 mm” technology has the best performance. To achieve the performance of this technology, 4 (four!) parallel production lines of ATGS system with gauge changeover device and adjustable wheel-sets should be built or seven points for wagon bogies change constructed, or eleven-fold increase in performance of overloading points should be reached. This increase in the number of parallel production lines will lead to a more than proportional complications and costs of infrastructure and technology of the border crossing stations, and the reliability of their work will only decrease. Fig. 1 is an example that shows the performance that is provided by different technology, when the number of production lines with each technology is increased. Note that under the operation conditions of existing border crossing points it is extremely difficult to develop their infrastructure.

However, the technology options “Using a single gauge of 1435 mm” and “ATGS system with gauge changeover device and adjustable wheel-sets” can be seen as competitive in performance (if it is possible to use four parallel lines of ATGS system). It should be noted, though investments saving in version of ATGS system are possible compared to single track 1435 mm, nevertheless ATGS system option is only a local infrastructure project, and can’t give global effects that will provide single track 1435 mm with high speed passenger and express freight train traffic.

III. CONCLUSIONS

1. At present time, Ukraine has lost about 70% of cargo transit by rail and other goods traffic that it had less than 10 years ago. Due to the fact that the restoration of transit flows in the future is almost impossible, it is necessary to use transit possibilities of the national transport system on existing directions (Black Sea – Baltic Sea, the broad line from Ukraine to Poland, LHS) by means of eliminating all obstacles to attracting new cargo flows of combined transport (export cereals, transit containers and/or piggy-backs etc.).
2. Existing technologies and technical solutions should be used to develop new directions of piggyback and container transportation from Ukraine to southern Europe, especially to Italy and expand the scope of ATGS systems with gauge changeover device and adjustable wheel-sets wherever its use is appropriate, including possible transport links to “Rail Baltica” project.
3. Ukraine’s joining the global New Silk road project is only a matter of time and a precondition of nation’s strategic development and prospects and should be carried out in stages, with the use and improvement of all existing technologies, and at the final stage the full-scale implementation of the project of Ukraine’s high-speed railway of 1435 mm gauge (UHRS-1435) which will be the Ukrainian section of the Black Sea-Caspian route of New Silk Road.

ACKNOWLEDGEMENTS

This paper is initiative work, but it becomes possible thanks to the support of Ukrainian League of Industrialists and Entrepreneurs.

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*Viktor Myronenko. “Ukraine in system of transport links.” *International Journal of Engineering Research and Development*, vol. 13, no. 09, 2017, pp. 01–06.