

## **DEVELOPMENT OF INTERMODAL CONNECTIONS IN NORTH –SOUTH CORRIDOR IN THE EASTERN EUROPE**

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### **Abstract**

The article results from outcomes of the SoNorA Project, dedicated to the need of improvement of the multimodal accessibility in Central Europe on the South-North axis. At the first stage arguments for opening new intermodal connections are given. The following analysis determines market potential for a new intermodal connection Scandinavia-Balkans. The potential cargoes leaning towards the projected intermodal block train in the 2020 perspective were researched. The criteria for determining the optimum route of the intermodal train were described. The study allows developing effective intermodal rail connections linking the ferry terminals with its hinterland.

**Keywords:** intermodal transport, market analysis, road-rail connection.

### **1. INTRODUCTION**

This analysis shows the one of the results of the SoNorA Project which is dedicated to the need of improvement of the multimodal accessibility in Central Europe on the South-North axis. This project is to elaborate schedules, recommendations and directives at a transnational level as well as to show ways of overcoming the deadlock in implementation of schemes of infrastructure development and transport services. In the scope of the project, recommendations for the Trans-European Transport Network–Transport (TEN-T) network are prepared.

The purpose of the analysis is to determine market potential for a new intermodal connection Scandinavia-Balkans. That means to determine the potential cargoes leaning towards the projected intermodal connection in the 2020 perspective. The assessment of the analysis is to develop intermodal rail connections linking the Polish ferry terminals with its hinterland. The launch of the new intermodal railway connection one will achieve a modal shift of goods from road to rail. The designed train route allows for elimination of the gap in transport and communication links between the old and new EU members in the Eastern Europe and the Balkans.

### **2. THE ARGUMENTS FOR THE DEVELOPMENT OF THE INTERMODAL CONNECTIONS IN THE EASTERN EUROPE**

The introduction and development of intermodal transport in Europe is due to the following conditions:

- 1) to offer the road transport users advantages provided by alternative modes of transport (larger mode enhances the efficiency of the transport system),
- 2) to reduce the burden of the transport system on the environment (environment unfriendly road transport is normally used as the shortest leg in the intermodal chain).

It can be assumed that the future development of the intermodal transport in Europe will be partly due to the growth in those sectors where the intermodal transport already constitutes a competitive alternative. Another major impact will come from new trends in production and logistics that will change the shape of the freight transport demand [1]. The market segment closest to the door-to-door intermodal transport is the road

transport. Thus, shifting cargo from the typical road transport towards intermodal chains is the most common aim of policy-makers and intermodal transport operators.

The cargo unitisation is the key factor, allowing transportation in intermodal transport units which are interoperable with other means of transport. This is accomplished by:

- 1) consolidation of less-than-truckload (LTL) and less-than-container (LCL) loads in larger intermodal transport units, e.g. full-truck-load (FTL) or full-container-load (FCL),
- 2) changing the size of shipment of some conventional goods, which traditionally are transported in incompatible to the ITU units, e.g. conventional general cargoes, loose or bulk cargoes or undividable project cargoes.

Very often unitisation, which determines usage of the intermodal transport, is consistent with the trend towards greater product differentiation, dedicated production and stock reductions. The unitisation enables to improve the efficiency and logistics chains through the introduction of just-in-time (JIT) and/or just-in-sequence (JIS) inventory and production strategies.

The intermodal transport in Europe includes three market segments which differ in structure of stockholders, customers, regulations, organisation and technologies. The segments are: container feeder traffic, continental sea-land connections and continental rail-road connections.

The most relevant for the sea port are the container feeder traffic and continental intermodal sea-land connections. The largest hinterland rail container flows are between the seaports of Hamburg, Bremen Rotterdam and Antwerp and the hinterland regions in Germany, Alpine countries and Northern Italy. More and more container trains are directed to the Central and Eastern Europe, the Balkans and Eastern Asia. The intermodal trading volumes from those countries are gradually increasing. The new EU countries: Poland, Czech Rep., Slovakia, Hungary, Romania and Bulgaria are the most developing markets. They offer chances for new viable intermodal connections and that potential has prompted transport operators to juggle for strategic position on transport networks in these countries.

Additional arguments for opening new intermodal road-railroad connections to and from the East European countries include:

- 1) the geographical coverage of railway networks with application of the intermodal transport is rather good;
- 2) the technical standard of the railway lines rapidly increases, mainly due to financial help of the EU programs, and more and more international lines comply with the requirements of the AGTC<sup>1</sup> agreement;
- 3) substantial investments in intermodal terminals, especially in industrial areas and urban agglomerations
- 4) the process of rail market liberalisation in the EU<sup>2</sup>, which makes former state monopolies rationalise and realign their service networks and makes room for new market entrants who often focus on the intermodal market.
- 5) EU common transport policy initiatives aimed at “turning intermodality and co-modality into reality”, including: promotion of “green corridors”, development of the Marco Polo II Programme specifically aimed at financing intermodal projects and the establishment of the Motorways of the Sea (MoS) initiative.

As regards continental intermodal sea-land connections, short sea shipping (SSS) has proved successful in corridors where there are few or only of poor quality overland alternatives. The EU concept of Motorways of the Sea (MoS), which aims to better integrate the sea transport into the overland transport system, bases on ferry connections on short distances, roughly up to 12 hours in sailing time. These ferry services can be considered as extensions of road network. At such short distances ferries carry a variety of accompanied

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<sup>1</sup> European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), of 1 February 1991, ECE/TRANS/88/Rev.6

<sup>2</sup> The adoption of the First Railway Packages (2001) and Second Railways Package (2004) have set the framework and liberalised the freight sector.

road vehicles and unaccompanied intermodal units (ro-ro or containers). In contrast to the container feeder connections, the SSS does not focus on larger seaports. Many operators prefer smaller ports because handling costs are lower and there is a lesser risk of congestion.

The sea-land corridors with currently the highest intermodal traffic criss-cross the North Sea area, the Baltic Sea Region and the Mediterranean. North-South connections in the south-western Baltic offer high quality ferry and ro-ro links between Germany and Poland on the one side and Denmark and Sweden on the other. The full overland alternative to sea-land intermodal connections is offered by the Oresund Bridge and the Sore Belt Bridge. Further investment plans to build a new bridge between Germany and Denmark are now under way. Taking it into consideration, the SSS connections from Polish ferry terminals to Sweden appear to have greater prospects for development as a part of attractive intermodal sea-land corridors.

### 3. MARKET POTENTIAL OF THE INTERMODAL CORRIDOR SCANDINAVIA-BALKANS

The analysis of differences in economic development between Scandinavian countries and the Central and Eastern Europe displays a big imbalance measured in the level of GDP per one citizen. It may mostly correspond with the differences in cargo structure of commercial exchange between countries. Generally speaking, the higher the level of a country's economic development the bigger number of intermodal cargo units that are involved in transport service to a given country.



**Fig. 1 PKB changes in the selected EU countries in the 2012 perspective [%]**

Source: Eurostat.

The official economy data show that the countries of the Eastern Europe and The Balkans develop faster than other European countries (fig. 1). The economy crisis that had begun in 2008 translated itself into slowing down or even recession of the economy in 2009. The best, positive PKB result that year belonged to Poland and the other countries, led by Romania and Hungary, experienced a few-percentage decrease in their PKB. In 2010 the countries of Eastern Europe and Scandinavia significantly improved their economic results. The crisis was greatly felt by Greece. The prognosis for 2012 shows the 2-4% increase of the analysed countries' PKB. Poland will remain the leader followed by Slovakia, Bulgaria and Romania. All countries, except for Greece, will develop faster than the average growth of the 27 European countries.

In order to determine the realistic cargo mass that might be serviced by intermodal train, there were chosen only four countries, which represent the most important target group of countries serviced by the train. Those are the countries of the Central-Eastern Europe and the Balkans: Slovakia, Hungary, Romania and

Bulgaria<sup>3</sup>. It has been assumed that those countries should generate enough cargos in their trade with Sweden and Norway to guarantee economic effectiveness of the new connection. Thus, the basic issues for the market prognosis are the determination whether the countries already do generate sufficient amounts of intermodal cargos and how the analysed international trade will change within the 10-year perspective.

**Tab. 1** Cargoes susceptible to containerisation in the Swedish and Norwegian trade with chosen countries in 2004-2009 [in tonnes]

	<b>Average trade 2007-2009</b>	<b>Cargoes susceptible to containerisation</b>
<b>IMPORT</b>		
Bulgaria	45 487	19 923
Hungary	143 081	94 935
Romania	50 480	36 188
Slovakia	173 052	118 742
<b>Total</b>	<b>412 100</b>	<b>269 788</b>
<b>EXPORT</b>		
Bulgaria	36 821	21 674
Hungary	663 406	345 452
Romania	107 720	64 550
Slovakia	131 027	73 940
<b>Total</b>	<b>938 974</b>	<b>505 616</b>

Source: own elaboration on the basis of the data from Statistiska centralbyrån (SCB) ([www.scb.se](http://www.scb.se)), Statistisk sentralbyrå (SSB) ([www.ssb.no](http://www.ssb.no)), [2], [3].

The conducted calculations have shown that within their trade with Scandinavian countries the four analysed countries transport in import and in export, respectively, 269 and 505 thou. tonnes of cargos susceptible to unitisation (tab. 1). Those amounts do not allow reaching the full profitability of the intermodal connection. Usually, such profitability is connected to operation of daily block trains connecting the two terminals. Daily intermodal connection means the carriage of 20000 TEU per year, i.e. about 220 thou. tonnes each way. With 2-3 trains a week each way the critical mass comes close to 6000-9000 TEU, i.e. about 60-100 thou. tonnes per year each way. One has to remember that those amounts refer to the actually transported cargo and always constitute a fraction of the potential market gravitating towards intermodal transport.

The above calculations show how difficult is the business enterprise consisting in the activation of a permanent intermodal connection. For connections which offer competitive to the road transport time of shipment a train moves along the shortest possible terminal-terminal route without stopping at any in-between terminals. This brings about a necessity of regular accumulation of a big number of intermodal cargo units at one land terminal of a train's departure. The units can be delivered to that terminal by other trains or heavy vehicles from the direct hinterland of the terminal. Performing the role of distribution notes by the terminals, undoubtedly is the success factor of the planned enterprise.

The long term Scandinavia-Balkans foreign trade prognosis has to be burdened with a great margin of uncertainty. While making the prognosis one has taken into account the starting point, which is present level of import and export of cargos susceptible to containerization. As factors having the most important influence on the future trend in foreign trade, one has adopted the following:

- 1) integration processes within the EU areas: the Baltic and the Danube [5],
- 2) accelerated economic development of the poorest EU countries: Bulgaria and Romania, thanks to utilisation of the Union's financial recourses,

<sup>3</sup> The choice is consistent with result of previous research in frameworks of LogVAS Project [4].

- 3) the processes of globalisation and creation of economic bonds between European metropolis and the so called development impulse,
- 4) economic and technological co-operation between highly developed Scandinavian countries and Fast developing Balkan countries,
- 5) the very strong South-Eastern direction of the European integration with the particular role of Istanbul and Turkey, described as “the growth locomotives”, for Europe.

**Tab. 2** The prognosis of the increase in cargos subject to containerisation in the trade between Sweden and Norway with the selected countries till 2020 [in thou. tons].

	<b>2009</b>	<b>2019 (pessimistic)</b>	<b>2019 (realistic)</b>	<b>2019 (optimistic)</b>
Bulgaria	20	40	46	52
Hungary	95	190	218	247
Romania	36	72	83	94
Slovakia	119	237	273	309
<b>Total</b>	<b>270</b>	<b>540</b>	<b>621</b>	<b>701</b>
Bulgaria	22	43	50	56
Hungary	345	691	795	898
Romania	65	129	148	168
Slovakia	74	148	170	192
<b>Total</b>	<b>506</b>	<b>1 011</b>	<b>1 163</b>	<b>1 315</b>

Source: own elaboration.

The prognosis has been made by analysing the trend line of the examined trade till 2020. The optimistic and the pessimistic variants have been assumed in order to provide for possible deflection from that line within +/-20% (tab. 2). The obtained figures show that the cargo mass gravitating towards intermodal transport will increase by about 200% in the pessimistic variant, by 230% in the realistic variant and by 260% in the optimistic variant. This means that the potential market to be serviced by the planned intermodal connection, in 2019, amounts up to from 1,5 to 2,0 mln tonnes of cargo, combined in the both directions. To achieve the economic effectiveness of the intermodal connection it is necessary to actually take over at least 10% of that market, which seems to be a rational figure.

#### 4. CONCLUSIONS

The analysis allowed determining the potential cargoes leaning towards the projected intermodal connection Scandinavia-Balkans in North-South corridors in the 2020 perspective. Therefore the investment in the new rail-road connections through Polish ferry terminals has basic economic justification. Then step is to set the basic technical parameters for the intermodal connection: route, railway infrastructure and rolling stock parameters, location of and potential of end and transit terminals. Additionally, the full feasibility study of the investment will allow adopting the most important exploitation assumptions in relation to frequency of operation, load capacity and integration with the ferry connection on Baltic Sea. What is the most important the study should contain the full financial analysis for economic effectiveness of the new intermodal connection.

The introduction of the intermodal rail-road connection linking the ferry terminal with its hinterland requires fulfilment of some essential conditions. The most important one is the presence of the market demand for this type of connection. In other words, the connection must have a cost-effective character so that fares charged to the shippers at least cover the real operational costs of the connection. Initially it is necessary to acquire the cargo mass in intermodal units, which will enable to secure one train a week. The target is the activation of a daily and permanently running block train to and from the terminal. At the first stage the connection may handle about 90TEU weekly in both directions, which means the transport of about 9000

TEU or about 100 thousand tons a year. At the targeted stage the connection may handle about 63000 TEU or about 750 thousand tons a year.

The analysis of the present and planned network of connections, TEN-T network in the North-South direction, which connects Sweden and Norway one side with Central and Eastern Europe, along with the Balkans, on the other, allows for marking out the optimum route of the intermodal train. The following criteria should be considered when choosing the route:

- 1) the position of the first terminal and the in-between ones near agglomerations and industrial centres allowing for a convenient access by car not farther than 100 km from the prospective receivers and dispatchers of intermodal units;
- 2) the position of the first terminal and the in-between ones at intermodal transport junctions so that it will be possible to communicate the train with other permanent rail-road or river-road connections;
- 3) the exploitation of the available rail infrastructure that offers the best technological and organizational parameters, that is in accordance with the requirements of the AGTC agreement and the European Rail Transport Management System ERTMS;

Undoubtedly, the location of the railway and the terminals in the corridor of the TEN-T transport network is a big convenience. The corridor that is the closest to the forecasted course of the intermodal train route is the Corridor IV connecting Central Europe with South East Europe. It runs as follows:

- 1) Berlin/Nurnberg→Prague→Budapest→Arad-Bucharest→Constanta, or
- 2) Berlin/Nurnberg→Prague→Budapest→Arad→Timisoara→Craiova→Vidin→Istanbul/Thessaloniki.

Additionally, the course of the Corridor VII, which is the Danube waterway corridor, should be considered. This corridor constitutes a huge potential for the development of intermodal river-road and river-rail-road connections.

## LITERATURE

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