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ANALYSIS OF THE STATE AND DEVELOPMENT OF INTERMODAL TRANSPORT OF GOODS IN EUROPE

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***Abstract:** The paper reviews an analysis of the development and application of intermodal transport of goods in Europe and the modes of transport combined in it. The development in recent years is followed and the standardization of the cargo units, in particular the containers, is considered. The peculiarities and positive aspects of intermodal transport are presented. Statistical data on the movement of goods are presented and an analysis is made of the importance and change of the different types of transport in the transport of goods.*

***Keywords:** Efficiency, Intermodal transportation, Cargo*

INTRODUCTION

The Intermodal freight transport is generalizing concept of the use of different technologies of transportation based on a main principle: transportation of Intermodal Transport Units (ITU) on a long distance using rail or waterborne transport where the road transport is used only at the initial and/or end stage of the transport.

Intermodal solutions are suitable when the clients need transport to locations situated far away from the loading point. In such occasions the international carriage passes through several countries and depending on the possibilities, it is better to travel part of the route by land, and another part - by water. Then intermodal logistics services, whose routes are planned by the transport managers, are the optimal combinations, that meet the need for the cheapest and fastest transport solutions. Waterway freight, as the most cost-effective transport, takes main place in the intermodal logistics services. In addition to the combination of road and maritime carriage, combined solutions with the use of road and rail transport is also offered.

The analysis of the report highlights the advantages and efficiency of the intermodal transport and proves the necessity of Intermodal Terminal on the territory of Ruse. According to the statistics for 2016, through Ruse passed around 8 million vehicles, one third of which – freight. The availability of infrastructure for land, air and water transport is a great advantage.

EXPOSITION

Development of intermodal transport

Intermodalism originated in maritime transport with the invention and patenting of the first container by Malcolm McLean in 1956 in the US. The pallets and the forklifts lay the foundation for its development, but the emergence of intermodal transport systems is a result of several phases, including the application of key technologies, operational improvements and regulatory changes.

Figure 1 shows the main steps in the development of intermodal transport of goods.

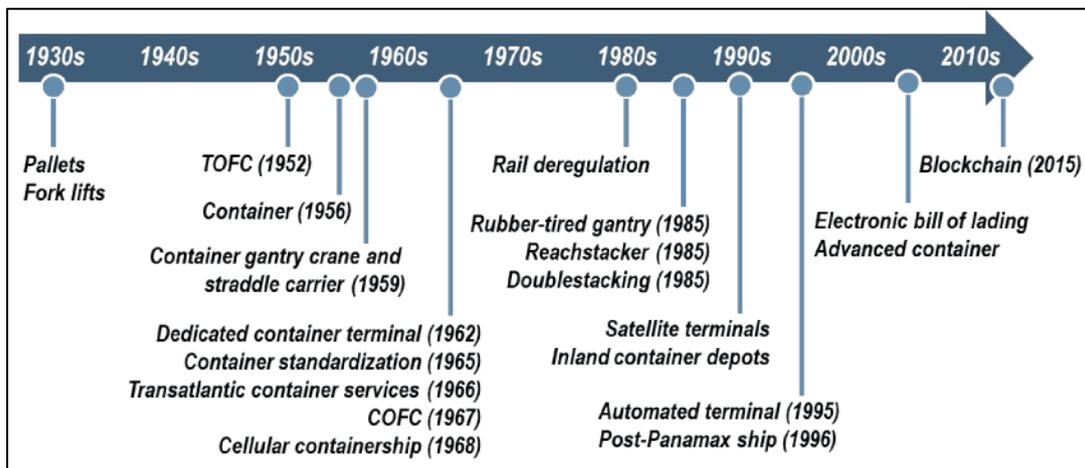


Fig. 1. Development of intermodal transport

The figure shows that for a period of three years after the invention of the container, the container crane began to function, and after another three years, the first container terminal opened. In the next ten years the containers' dimensions and locking systems are standardized and open freight wagons for container transport are constructed (so far only semi-trailers are transported on such). Container ships with a cellular structure are also being built, thanks to which the cargo space is being optimized (the use of the entire ship for stacking containers is possible), both on and under the deck.

The deregulation of rail transportation in the United States in 1980 paved the way for containerization. The transport of containers on top of each other by rail (double stacking) over long distances is evolving and the need for optimization leads to the creation of more efficient equipment.

As a result of the above mentioned factors, in the end of the 20th Century ninety percent of the world's freight is transported in containers.

Features of the intermodal transport.

The following can be pointed as advantages of the combined transport out:

- Disburdening the the road network from the flow of trucks, thus reducing depreciation. Noise and pollution reduction
- Low carbon emissions. Reduction of harmful emissions release into the atmosphere.
- Optimization of transport times (e.g: 1400 kilometres for 14 hours)
- Weak influence from the climatic zone, which the routes pass through, operation all year round - 24/7
- Storage capacity in the terminals
- 10% higher load capacity than road transport
- Reduction of transport costs – economic effect:
 - By achieving energy savings;
 - Use of unified tariff and and a single transport document;
 - Completing long transport routes in competitive travel times, as well as combination and harmonization of the interests of all participants in the combined freight transport;
- Use of a common information system by all participants in the combined transport – Transparency;
- Possibility to transport a wide range of goods in unified for different types of transport standard cargo units (ITU). (Unification/Connecting the different types of transport in one chain).

As disadvantages of the combined transport may be pointed out:

- Relatively higher cost of specialized rolling stock for the transport of Intermodal Transport Units (ITU);
- Relatively expensive construction and equipment of Intermodal terminals;

- Comparatively high infrastructure costs;
- Dependence on many different types of transport also determines the fragility of the chain. In case of interruption even in one connection, the whole process is affected – Low overall reliability;
- Necessity for additional measures to reduce the risk of damage when moving units;
- Specific conditions in the organisation of transport in accordance with the locations of the terminals. This in turn creates preconditions for delays and deviations from the shortest route.

Considering the modes of transport included in the intermodal chain at national level, the following features should be taken into account:

- Regarding rail transport – Malta, Iceland, Cyprus and Liechtenstein do not have railways;
- Inland waterways – only 13 member states have significant inland freight transport (geographically defined) and are obligated to provide data – Austria, Belgium, Bulgaria, Germany, Luxembourg, Poland, Romania, Slovakia, Hungary, France, the Netherlands, Croatia and the Czech Republic;
- Italy, Lithuania and Finland provide a normal set of data on a voluntary basis;
- The countries that do not have access to maritime transport due to their geographical definitions are: Luxembourg, the Czech Republic, Hungary, Austria, Slovakia, Liechtenstein and Switzerland.

State of the intermodal transport of goods in Europe.

Figure 2 shows the share of intermodal rail transport of goods (in green), compared to the total rail transport, structured by country in 2016 (billions of tonne-kilometres - tkms).

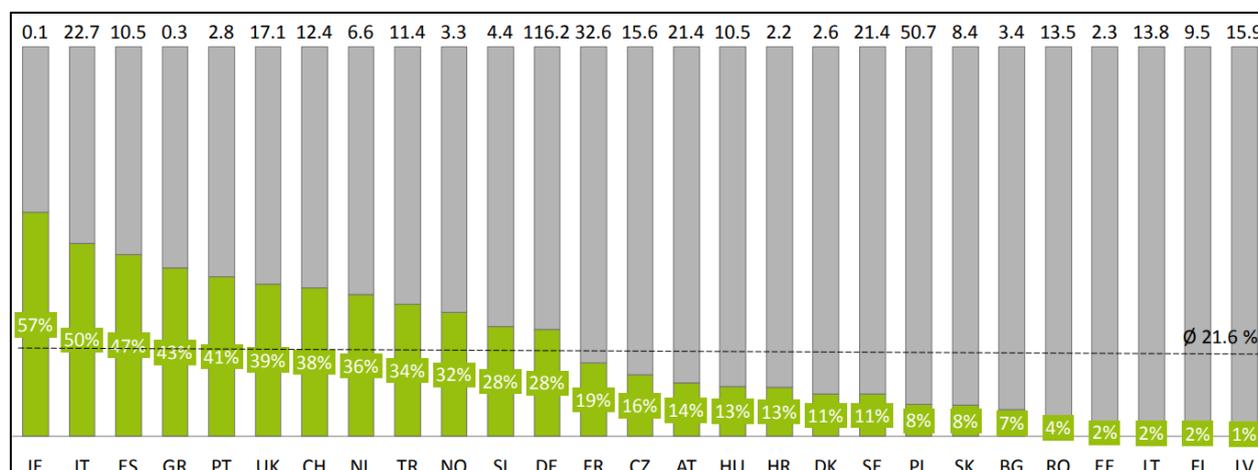


Fig. 2. Distribution of intermodal transport and rail transport in Europa (2016r.)

In 2016 about 400 billion tkms have been transported, of which 21.6% are intermodal.

For 2018 in Europe more than 430 billion tkms were transported by rail, which is 7.5% increase in 2 years.

The largest amount of cargo was transported by Germany – 116.2 billion tkms, of which 32.5 billion tkms (28%) through their 139 terminals, followed by Poland – 50.7 billion tkms, of which only 4 billion tkms (8%) through the 29 Intermodal terminals. After them are lined up respectively:

- France – 32.6 billion tkms, of which almost 6.2 billion tkms (19%) through the 23 terminals.
- Italy – 22.7 billion tkms, of which 50% are transported by rail as part of intermodal transport. Only Ireland has a higher percentage, but it is incomparable with the minimum quantities transported through the 4 terminals (about 100 million tkms).
- Austria – 21.4 billion tkms, of which almost 3 billion tkms through the 19 terminals.
- Sweden – 21.4 billion tkms, of which 2.3 billion tkms through their 16 terminals.

- 2% share respectively for Lithuania (5 terminals), Estonia (8), Finland (52), Romania has 4% through the 19 terminals and Bulgaria characterizes with 7%.

For Europe, the percentage of intermodal rail transport in relation to total freight rail by country varies between 1 and 57%. This is determined as well as by their geographical location, the number of terminals, their production capacity and the level of economic development, so of the available infrastructure and its development in general.

Figure 3 shows the distribution (percentage ratio) between the different modes of transport in the intermodal one for the period from 2013 to 2018 on average in Europe.



Fig. 3. Distribution between the different modes of transport in the intermodal

As it is noticeable for the period – the share of water transport decreases from 7.4% to 6% at the expense of land transport, and the share of rail transport varies between 18.7% to 18.3% , but remains relatively unchanged.

Table 1. Exported quantities of goods transported in intermodal units for the period 2010-2018

GEO/TIME	2010	2011	2012	2013	2014	2015	2016	2017	2018
Belgium	2,163	2,126	:	:	:	:	:	:	:
Bulgaria	309	295	241	219	123	149	236	214	271
Czechia	1,886	2,180	2,372	1,989	2,117	2,372	2,472	2,423	2,884
Denmark	535	530	393	370	364	302	283	926	875
Germany	31,126	32,377	32,504	34,471	32,657	32,187	31,989	30,594	32,364
Estonia	60	66	72	74	84	53	48	41	55
Ireland	43	51	47	52	53	51	58	59	49
Greece	46	48	41	29	55	149	110	217	297
Spain	3,065	3,563	4,192	4,101	4,881	5,045	4,927	5,276	5,721
France	5,749	6,395	7,162	7,504	8,007	7,590	6,128	5,262	5,550
Croatia	215	181	144	153	163	182	189	371	393
Italy	5,364	7,206	7,173	8,381	8,389	6,799	11,269	11,658	10,067
Latvia	357	413	400	356	356	235	185	176	226
Lithuania	307	408	404	411	333	266	254	360	530
Hungary	860	872	676	1,051	863	1,364	1,355	1,294	1,703
Netherlands	1,887	1,700	2,053	2,056	2,205	2,281	2,412	2,436	3,238
Austria	2,968	3,056	3,053	2,836	:	:	:	:	:
Poland	1,888	2,413	3,024	3,054	3,240	3,490	4,156	5,249	5,716
Portugal	420	647	686	583	0	807	1,135	1,251	1,521
Romania	657	919	830	733	813	561	605	818	969
Slovenia	853	951	889	926	1,048	1,166	1,229	1,379	1,524
Slovakia	213	186	:	142	122	513	672	692	686
Finland	178	144	104	102	98	103	143	168	246
Sweden	3,414	3,438	3,238	2,624	2,679	2,637	2,320	2,439	2,921

Table 1 shows the quantities of goods transported in intermodal units for the period 2010-2018.

The table shows that Greece has increased more than 5 times the amount of goods transported in containers through intermodal chains, and Slovakia, Portugal and Poland more than 3 times in the last 10 years. The countries Italy, Lithuania, Slovenia, the Netherlands, Croatia, Spain, the Czech Republic and Denmark have increased theirs about 2 times. In Bulgaria there is no increase, but there is even a decrease in cargo.

Germany sustains stable growth, achieving a maximum of 10% growth and maintaining a level of 4% compared to 2010.

Figure 4 clearly shows the volumes of transported goods in intermodal units by countries up to 1000 million tkms, in which group is Bulgaria. Germany is excluded from this analysis, as it is the undisputed leader in this type of carriage with more than the next 5 in the ranking combined.

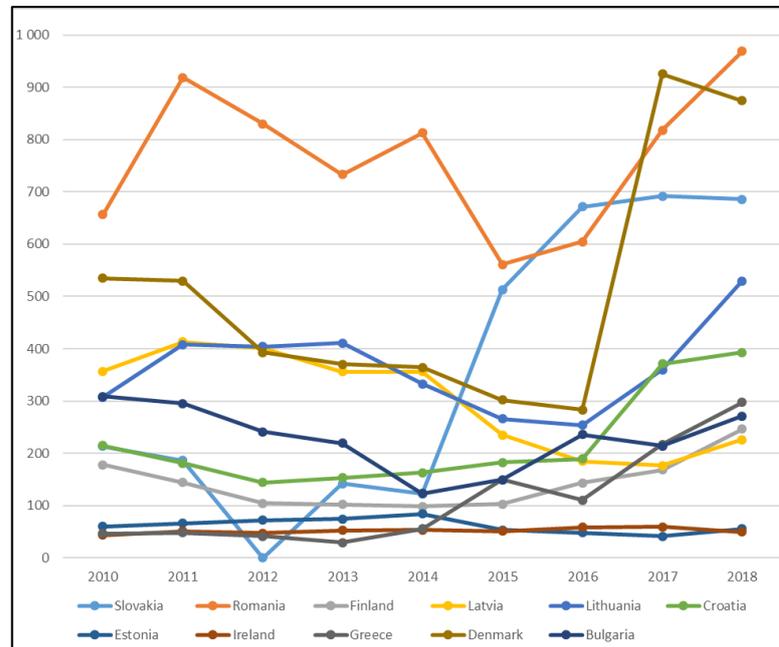


Fig. 4. Transported goods in intermodal units by country

From figure 4 it can be summarized that only two countries – Ireland and Estonia, maintain relatively the same quantities of freight transported in intermodal units for the whole period. With significant fluctuations up to maximum of 40% drop in 2014, Bulgaria scores only a 12% decline in 2018 compared to 2010, Latvia on the other hand recorded a 36% drop compared to the stability it maintained until 2014.

Gradual, but steady growth is recorded by Greece, Finland and Croatia. As a result, Lithuania, Denmark, Romania and Slovakia have significantly increased the quantities of goods transported in intermodal units in 2018, but with considerable fluctuations, both positive and negative compared to 2010.

It is clear from the statistics data that Norway and Sweden are reducing the quantities of freight transported in intermodal units by 2016, starting to increase again in 2017, but not reaching the initial high values of 2010. All other countries presented in the statistics data report stable growth and an increase in volumes almost every consecutive year.

CONCLUSION

Solutions that combine more than one mode of transport into an intermodal one may be the most efficient way to transport goods. Intermodality consists in the proper organisation, taking into account the strengths and weaknesses of different modes of transport, with aim to use the most appropriate one for the efficient transport of goods – with less energy consumption, less infrastructure requirements, less working time and lower emissions of greenhouse gases.

All this provides the possibility for highly automated and connected long-distance transport in order to improve the environment, safety and health for the benefit of society as a whole, as well as to improve the efficiency of the European freight market.

The terminals that function on the territory of Bulgaria are a few and are mainly located in the southern part. These are the intermodal terminals in Plovdiv and Stara Zagora, as well as the smaller capacities for transfer in Dimitrovgrad, Dolno Ezerovo (Burgas district) and the railway stations Yana and Voluyak. The analysis shows that the use of intermodal transport in Europe is growing, and Bulgaria lags behind other European countries. This determines the positioning and development of a new intermodal terminal on the territory of Ruse.

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