

THE SOCIAL COSTS IN INTERMODAL TRANSPORT BASED ON THE EXAMPLE OF THE EUROPEAN UNION

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ABSTRACT

Transportation depends on the mining industry, as it provides transport and traction stock, fuels and energy, human labour, machinery, equipment and materials used to build transport infrastructure. Taking into account that transport in the European Union is heavily dependent on fossil fuels, limiting their consumption will entail reducing the mobility of road transport, which consumes the most energy. Therefore, the priority of actions of the Member States of the EU is to transfer the burden of transportation from roads to multi-branch transport. It is dictated by the constant increase in the greenhouse effect, which is a consequence of the emission of toxic gases formed in the combustion of fossil fuels. In addition to the degradation of the environment, the negative effect of excessive use of road transport are its external costs, i.e. social costs, which are not directly born by transport companies, but by the entire society. These costs are directly related to the negative impact of transport activities on the environment and human life. The costs of environmental degradation, traffic accidents, traffic congestion, noise, human health, the infrastructure of the area and lost production as a result of human death have the largest share in the external costs of transport.

The main objective of the study is to present the competitiveness of intermodal transport in relation to road transport in the process of generating external transport costs resulting from the European Union's transport policy.

Keywords: social cost, intermodal transport, environment, competitiveness

INTRODUCTION

Contemporary transport connects people, cultures, cities, countries, and continents and is one of the main pillars of modern society and innovative economy. Therefore, creating interoperability of transport requires the European Union to take action to include transport into a common European policy, which undoubtedly contributes to reducing the difficulties in the trade of products around the world. However, the increase in the scale of global transport in addition to the obvious benefits associated with the mobility and economic growth of individual regions creates a very high external (social) cost that burdens the whole society. These costs are brought about by the negative impact transport-related activities

have on the environment and on human life, while not taken into account by any of the parties involved. This phenomenon occurs when the interested entities use resources that have unspecified property rights. The said costs result mainly from the assortment structure of the demand on transport and the increase of quality requirements in transport. The largest share in external costs of transport are those related to environmental degradation and pollution, which result mainly from soil, air and water contamination and the increase in the greenhouse effect. Additionally, there are also costs of traffic congestion, noise, human health deterioration, destruction of spatial economies of cities, the production losses resulting from human death or road accidents. It is worth mentioning that globally every day 140 thousand people are injured in road accidents. Of these, over 3 thousand die, and about 15 thousand never regain full health. [1] Furthermore, the noise of above 55 Db, caused by road traffic, is a problem of nearly 125 million people – one-fourth of all Europeans. [2] Hence, the European Union in its transport policy aims to reduce the volume of car transport, which to a large extent depends on fossil fuels and contributes to the creation of significant social costs, including excessive emissions of greenhouse gases. According to EU guidelines, by 2050, the transport sector must reduce its emissions by 60% [3] so that the overall percentage of greenhouse gas emissions in Europe is to be reduced by around 80%. With this fact in mind, the aim of the article is to attempt to present the issue of the competitiveness of intermodal transport with respect to road transport in the process of generating external transport costs resulting from the European Union's transport policy.

EXTERNAL COSTS OF INTERMODAL TRANSPORT

The external costs of transport, i.e. social costs, are all costs of consuming the means used to create a transport service, which are not born by the producer of the service, but by the general public. [4] These are the costs resulting from the transport of goods and persons who are not directly borne by transport companies but by the whole of society. The problem of social costs is an important issue in European transport policy. In its activities, the European Commission strives to internalize the external costs of transport. As early as the "Green Paper" published in 1995, the external transport costs were pointed as a threat to the European public and environment. Another signal to create a unified transport policy and an attempt to reduce external costs was the "White Paper" publication in 2011, on the future of the transport sector until 2050, entitled *"Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system"*. In this document, the European Commission described the situation of the transport sector in the transition phase between old and new challenges and referred to measures aiming at external costs reduction. By outlining 10 objectives in the 2011 "White Paper", the Commission sought to create a single European transport area by removing persistent barriers between modes of transport and national systems, supporting the integration process by facilitating the creation of international multimodal operators. [5] Contemporary EU transport policy seeks to eliminate difficulties and barriers affecting the development of European transport. The manifests itself in the creation of a single

European transport area, operating on the basis of fair competition between various forms of transport, such as road, rail, air and water transport. Undoubtedly, it is triggered by the fact that European road transport of goods grows at an average rate of 4.5% per year and, according to experts, this will not change. According to estimates of the European Commission, by 2050, the demand for passenger transport will increase by more than 50%, and for freight transport - by 80% compared to 2013. [6]

Taking into account the degree of use of various transport branches, it is estimated that in previous years, the volume of freight transport in the EU inland transport (including road, rail and inland waterways) stabilized at around 2300 billion tonne-kilometers, while the share of road transport is about 75% [7] (see Fig 1).

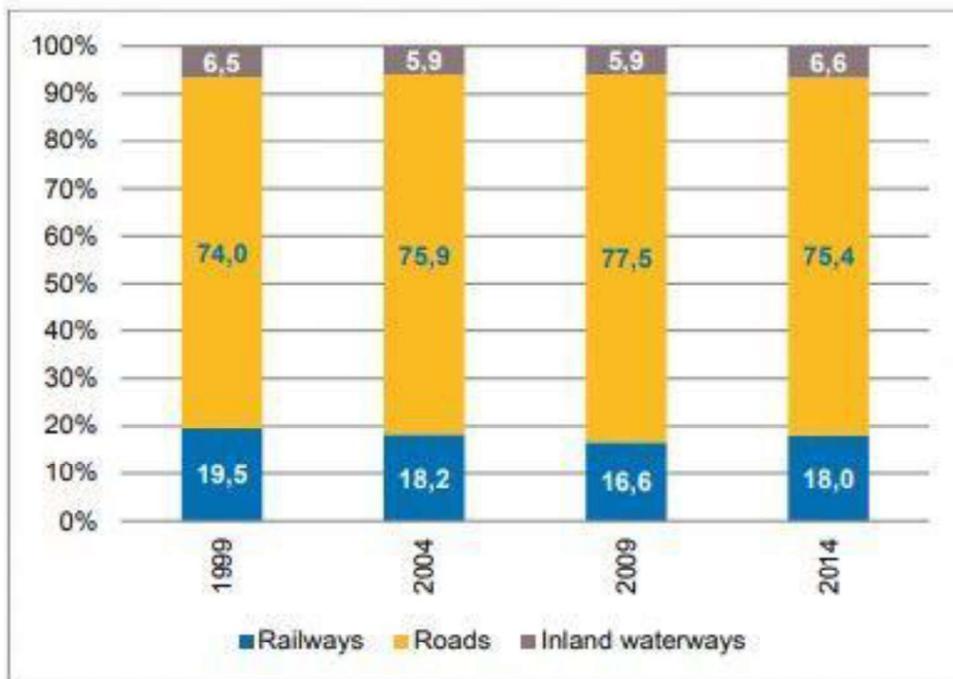


Fig 1. Freight land transport modal split [9]

In 2014 the share of rail freight in land transport was 18%, almost the same as 10 years ago. The share of road transport in generating all external costs is estimated at around 85% - 97% of the total costs. Out of all external transport costs of the European Union, 13% of them are generated by lorries which roughly amounts to approx. € 65bn. It is worth noting that the road congestion alone costs between € 146 and € 243 billion. Rail transport has a share of not more than 2% in these costs, whereas, importantly, freight transport is only 0.7%. [8]

In the case of intermodal transport, the costs incurred during the process are the sum of many elements occurring throughout the entire transport chain. These costs depend on the designed chain itself and on the activities related to transport. However, in intermodality, the essential transport of the cargo unit is carried out by railway, inland or sea routes. As a result, the road transport as such is very

limited, practically used only for the pick-up and drop-off operations. In rail transport, the length of railways in the European Union in 2014 was about 220,000 km. [9] In the same year, rail freight transports were at a level of 417.6 billion tonne-kilometers, showing an average annual growth rate of 3%. In total, more than half of freight transport was international, which shows the scale of the importance of this type of transport in relation to passenger traffic (see Fig. 2).

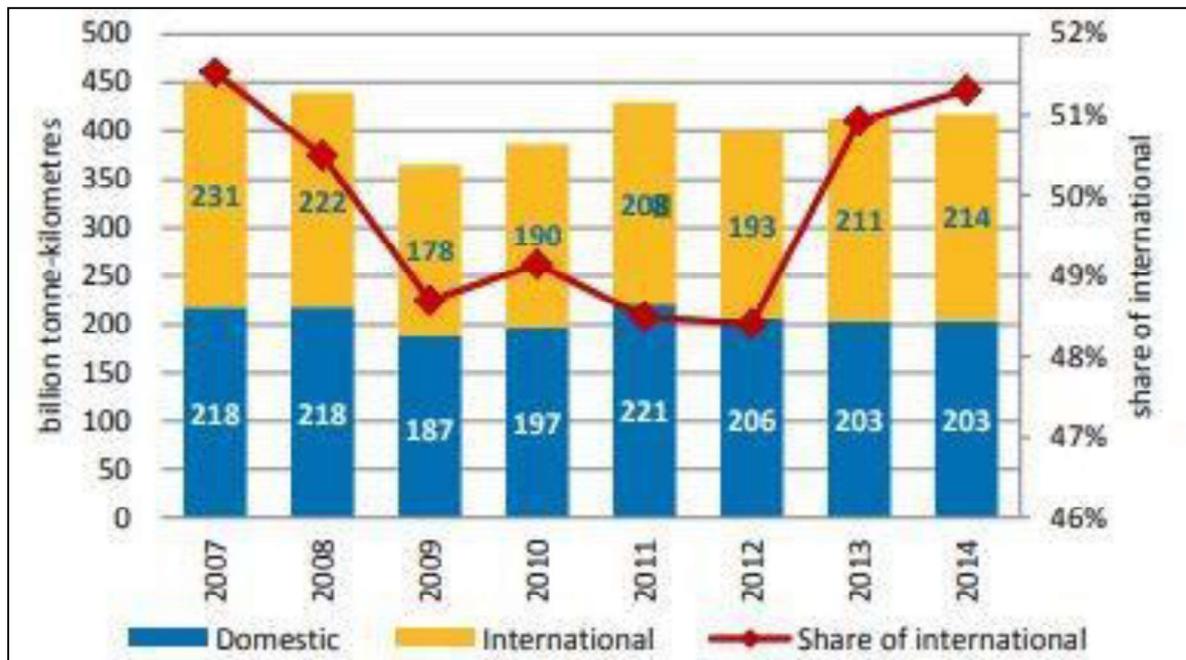


Fig. 2 Evolution of rail freight traffic [9]

This situation causes a rapid increase in the social costs of transport, reflected in the deterioration of the natural environment. Road transport is estimated to account for approximately 71% of carbon dioxide emissions from the entire transport sector. On the other hand, passenger cars account for two-thirds of the emissions from road transport. Other means of transport cause significantly less pollution. Sea and air transport is responsible for 14% and 13% of pollution respectively, and the share of emissions from inland waterway transport is only 2%. The least pollutants are caused by rail transport, which is a source of less than 1% of emissions. [10] The negative impact of rail transport on the environment is essentially limited to noise and vibration emissions, pollutants (from diesel locomotives) and occupancy (see Table 1). According to the data of the Ministry of Investment and Development, European rail transport emits about 13% of total pollutant emissions from transport. [11] According to the publication of the European Environment Agency, rail transport in the EU is responsible for 1.5% of total NOx and CO₂ emissions. [12]

Table 1. *External costs of transportation by branch*

Cost tkm	euro/1000	Road freight transport	Rail freight transport	Waterborne freight transport
Noise		1.8	1.0	0
Nature and landscape		0.7	0.0	0.4
Accidents		10.2	0.2	0.0
Air pollution		6.7	1.1	5.4
Climate change high		9.8	0.9	3.6
Soil and water pollution		0.8	0.4	0.0
Road congestion		0.4-7.0	0.1-0.5	0.0
Total		30.4-37	3.7-4.1	9.4

Source: Own study, based on CE Delft, Infras, Fraunhofer ISI, *External Costs of Transport in Europe – Update study for 2008*, CE Delft, 2011, p. 10

The average value of external costs for road transport is EUR 33.7 per 1000 tkm, while in rail transport it is only EUR 3.9 per 1000 tkm. Thus, the costs generated by road transport are more than 85% higher than the costs generated by rail transport and by over 70% higher than the costs generated by inland transport. This is mainly due to the fact that there is a much smaller number of railway accidents in rail transport, as well as lower emission of air pollution and noise levels.

Social accidents are another extremely important aspect of social costs borne by the whole society. In its directives, the European Union aims to improve road safety and introduces the highest safety standards for road traffic across Europe, which are to reduce the number of road fatalities by half by the end of 2020. However, as statistics show, the number of victims in the European Union has not only not decreased, but the number of injuries and deaths has increased. Only in 2015 there were 1090.3 thousand accidents, 3.3% more than in 2013, and the number of injured persons increased by 4.2%. 0.4% more people died on roads than in 2013. [13] (see Fig. 3). The low level of road safety in the European Union is the measurable social costs borne by citizens and economic costs burdening the economies of individual Member States. It is estimated that tens of thousands of fatalities and several million injured in road accidents significantly affect the reduction of national income, which undoubtedly leads to the impoverishment of individual countries. According to the European Union, only in 2015, social costs

related to rehabilitation, health care, material damage, etc. of injured people and road deaths fluctuated at least 100 billion euros. [14]

On the other hand, the number of accidents in intermodal transport is completely different. The number of railway accidents is constantly decreasing, which results in a decrease in the number of fatalities. In 2014, the total number of victims of railway accidents amounted to 1054 deaths, i.e. by 7% less than in 2013. In 2010-2014, the combined number of fatal rail accidents decreased by 17%, an average of 4% per year (see Fig. 3). [15] In total, the social costs of railway fatal accidents at EU-28 level are estimated at EUR 1.4 billion, including material damages is about EUR 103 million, and the total costs of delays amount to EUR 71 million. It is estimated that the environmental costs generated by accidents on the railways are about 71 million euros. Thus, the social costs related to the safety of cargo transportation by – respectively - road or rail transport are definitely in favour of the latter, when analyzing even security issues only. With regard to road transport, rail transport is much safer, which confirms the fact that almost 30 times less people are killed in road accidents than in road accidents, while in relation to the number of passenger-kilometers, rail transport is almost 3 times safer than the road one.

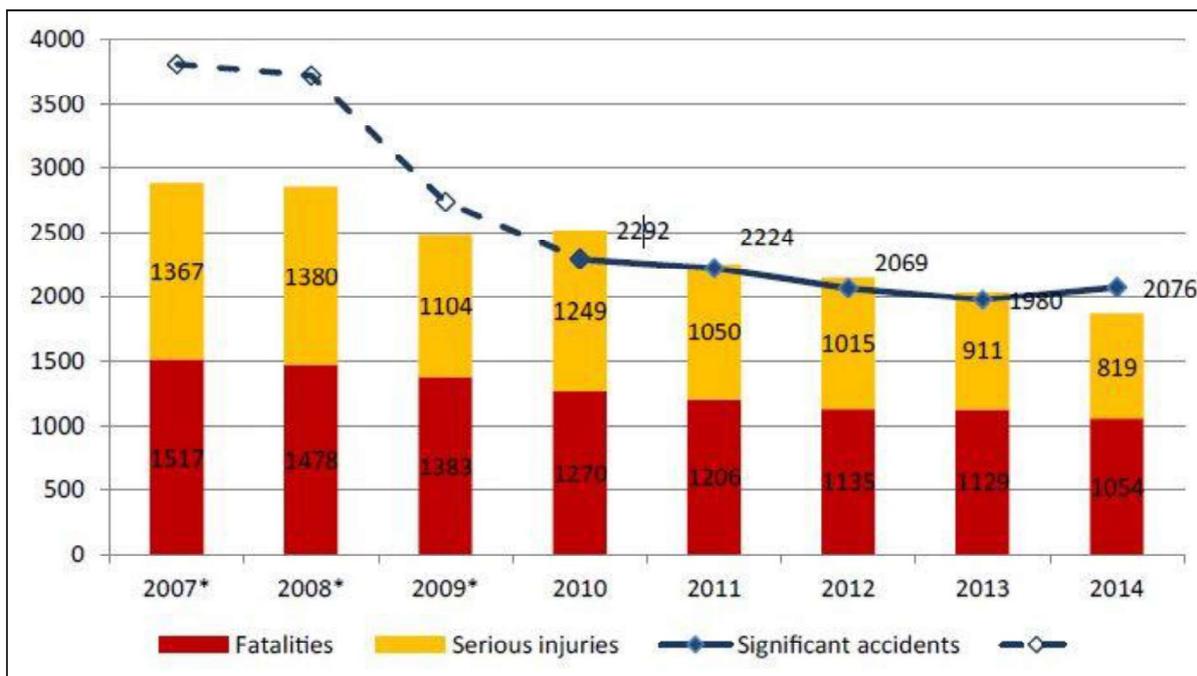


Fig. 3 Significant accidents and consequences for EU-28 countries (2007-2014) [15]

In 2014, there were reports of 2076 serious accidents in the European Union resulting in 1.054 people being killed and 819 being seriously injured. This means a 5% increase in the number of accidents, but a 7% drop in the number of victims compared to 2013. Gradually, from year to year, the number of casualties and injuries in railway accidents in 2007-2014 is decreasing. Taking into account all deadly railway accidents (excluding suicides) in the European Union, the risk of mortality per million kilometers traveled by train was 0.28. It follows that the social costs of accidents in rail transport are lower by over 95% in urban areas and

by over 90% in non-urban areas in relation to transport by road. Therefore, thanks to the use of intermodal transport as the main branch of freight transport, the total external costs of transport can be reduced by about 80-85% in relation to road transport.

CONCLUSION

Intermodal transport that is developing in the modern world combines not only different branches of transport of goods and services but main means for the movement of these goods. It provides the basis for an alternative solution to road transport. The development of the intermodal transport system requires not only a good knowledge of benefits and barriers, but above all a close integration of several transport branches, offering higher quality services and more cost-effective solutions than road transport does. This approach to intermodal transport is currently the main priority in the transport policy of the European Union and its countries. Due to the large environmental pollution and greenhouse gas emissions arising from the combustion of fossil fuels, the EU aims to shift the burden of freight transport from road to multi-branch transport. This is due to the fact the European Union has ordered all Member States to reduce greenhouse gas emissions by at least 60% by 2050 compared to 1990 levels. Currently, around 25% of total energy consumption in the EU-28 is associated with the transport sector, except for sea and pipeline transport, while road transportation amounts to the largest of energy usage in the sector, as much as 83%. The demand for oil in the transport sector accounts for 70% of all demand for oil in the EU, in 94% it depends on fossil fuels, while only 2% is supplied with electricity and 1% with biofuels. The total emissions in the transport sector are still growing, this sector was responsible for 1/4 of total greenhouse gas emissions (CO₂, CH₄, N₂O) in 2014 alone. Therefore, the European Union introduces instruments limiting the negative impact of road transport on the natural environment by financing infrastructure projects, among others: elimination of congestion of big cities and cargo ports, improving the competitiveness of rail transport (as a mode of transport generating lower CO₂ emissions than road transport), establishing rules for intermodal transport. According to the European Commission, these transport methods are considered to be one of the best solutions for environmental hazards generated by transport.

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