

**Helena BÍNOVÁ<sup>1</sup>****ELBE RIVER WATERWAY – ECONOMIC AND SOCIAL BENEFITS****Abstract**

For a very long time the river Labe belongs to the transport ways with an unmistakable impact. Along the river Labe as well as along other inland water ways the commerce was spread and the towns lying on the river of Labe got the state of Hanza towns.. In the first half of the 19th century the railways transport in corridor Hamburg – Berlin – Dresden – Ústí nad Labem – Praha began competing with the water transport in this relation. So far the water cargo transport in this relation did not have competition. At present the water transport is on the edge of interest from the side of the government, investors and transporters. The reasons are clear. That is why that the infrastructure quality does not respond the transport requirements for the 21th century, the highway and railway networks are not finished, the trimodal reloading terminals absence. Usually that is why the inland water transport is not included into the logistic processes.

**Keywords**

Inland waterway, transport, rail, Elbe River.

**1 INTRODUCTION**

Today, road transport predominates over rail transport in the European area, and water transport represents only a small portion of the total volume of transported goods. Logistic services form a significant part of the total price of products, and price and speed were the primary criteria for choosing the transport mode. This trend has been moving further toward quality and safety. However, other influences and impacts of the choice of the transport mode must also be evaluated along with society-wide and economic criteria. As documented by the conclusions of the PLANCO study, 2007 [14] external costs per tonne-kilometre of road transport (noise, traffic accidents, emissions of greenhouse gases, CO<sub>2</sub> and air polluting substances) are almost twice as high for selected explored relations than for rail transport, and approximately six times higher than river transport. Water transport along inland waterways should therefore be explored given that it is environmentally-friendly and is associated with low energy demands. Disadvantages of this transport mode include the low speed of transport and the need to reload goods from another transport mode, whether road/water or rail/water reloading. However, water transport is irreplaceable for the transport of extremely heavy loads.

According Čábelka et al., 2004 [4] the water transport participates up to 0.5% the export of goods from the Czech Republic and on the import of goods into the Czech Republic water transport participates on max 0.1 %. Speaking about commodities transported using waterways for transport of goods from the Czech and to the Czech in total, the most important are agricultural products (oilseed rape, cereals, animal feed; 32% of imports and 45% of exports), fertilizers and chemical products (15%). Reduction of transport since 1999 is due to operational hydrological unreliability of the Elbe river with three to six-month cruise interruption at the border section for the reason of small water and thus needed transfer of transport to rail transport. The importance of waterways in the Czech

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Republic and their link to the European infrastructure network has been validated by the European Agreement on Inland Waterways of International Importance (AGN). In the future it is necessary to consider other functions of the Elbe waterway - tourism, recreation, or flood control measures.



Fig. 1: Evaluation of the Elbe waterway - the classification to the base of the network TEN-T (core network) *Source:EK, 2011*

The Elbe River waterway is the only link to the European network of waterways and major European seaports - Hamburg, Bremerhaven, Rotterdam, and Antwerp for the Czech Republic. Expected capacity of freight traffic on the Elbe is min. 8 mil. tons per year, which is approximately one fifth of commodity exchange of the Czech Republic with other countries, according to a study[1]. In the future, it is necessary to increase the capacity of waterway transport for goods; however it is necessary to consider the growth in the transportation segment of tourism. This is related to maintenance of watercourses, to cleaning of rivers' bed and shores and to maintenance of access roads. As for the Czech Republic, the motorway network is still incomplete; the same applies to rail corridors, and there is no year-round navigability ensured for the Elbe River waterway.

## 2 THE POSSIBILITY OF USING THE ELBE RIVER WATERWAY

Based on the European Commission White Paper, four pillars have been defined for transport:

- Mobility – utilization of all four transport modes – road, rail, air and water transport and their interconnection;
- Protection – of the environment itself, protection of inhabitants against extreme costs of transport, and the protection of traffic participants;
- Innovation – support of new, efficient and innovative solutions of problems in terms of energy, i.e. congestion and emissions related to transport, and improvement of logistics effectiveness;
- International dimension – uniform approach within Europe.

The White Paper also emphasizes the need to move transport flows from road to rail and water transport.

The vision of the European Commission aimed at competitive and sustainable transport means achieving a 60% reduction of emissions from transport by 2050.

The Trans European Networks (TEN-T) project, - European transport, telecommunication and energy network has the aim to support the uniform market and economic growth in the European Union [11].

The TEN-T network is composed of two levels – the core network (to be finished in 2030) and the comprehensive network (linked to the core network, to be finished in 2050). In October 2011, the present policy of the TEN-T project was updated, and ten corridors were designated, including at

least three types of transport, three member countries, and two cross-border segments. The methodology of choosing the corridors is based on three steps according to, [5] :

- Identification of major nodes – capitals, important economic centres, ports and airports;
- Inland waterways, roads (places with reduced passability or missing segments);
- Analysis of major transport flows – both personal and cargo transport.

In the list of ten corridors, corridor 4, “Hamburg – Rostock – Burgas/TR border – Piraeus – Lefkosia” is essential for the Czech Republic; the preference of the Elbe river waterway is envisaged by the European Commission in the Hamburg – Dresden – Praha/Pardubice segment. The building of the Děčín weir and lock system thus becomes crucial, as it will remove a problematic point at the Czech and German state border. However, water transport does not have an expected prominent position in the OP Transport for 2014-2020. In 2007-2013, a total of EUR 7.21 bil., i.e. EUR 14.5 per EU resident, was invested in transport infrastructure in Europe, specifically in 327 projects.

### 2.1 Inland water transport

There are 43.402 km of waterways of national importance in European Union countries and 17.621 km waterways of international importance. Waterways are used minimally. The European Commission wants to support competitive inland water transport and ensure its integration in logistic processes. The weir and lock system in Děčín and another one in Přelouč II need to be built to ensure year-round navigability of the Elbe River waterway.

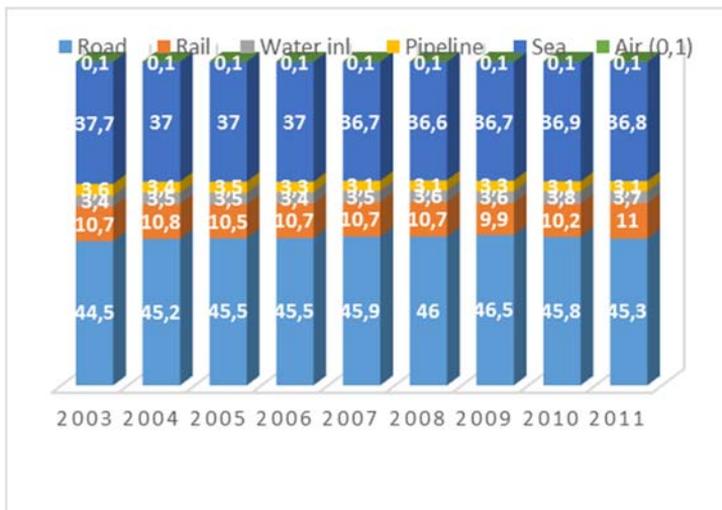


Fig. 2: Goods transport division according to transport modes in the EU-27, 2003 to 2011  
 Source: Author, based on EC data, “EU transport in figures. Statistical Pocket Book 2013“

Inland water transport provides a competitive and ecological alternative to road and rail transport, in the case of integration of waterway transport to supply chain management costs and environmental burdens can be reduced. Further, it shows a high level of safety and reliability. In 2006, the NAIDES – Navigation and Inland Waterway Action and Development in Europe action programme was initiated, which “includes recommendations of steps that should be taken by the European communities, Member States and other concerned parties in 2006-2013. They can be classified as legislative, coordination and support actions. They contains five strategic areas – business support in shipping the form of legislative, technological innovation of fleet, the definition of professional qualification requirements, public relations and infrastructure development. The European Commission on 1 October 2008 launched a project PLATINA to support the implementation of the Action Programme NAIDES into practice.

### 3 OUTLOOK FOR CONTAINER AND GOODS FLOW FROM/TO THE CZECH REPUBLIC UNTIL 2030

Hamburg is the most important export and import port for the Czech Republic. A total of 55% of Czech international trade passes through this port. The connection to the Elbe River corridor and linked canals is beneficial both economically and in terms of environmental protection.

In its study, the Hamburg Port Authority (HPA) expects 194 millions of tonnes of goods to be reloaded in 2025, of which about 25.3 mil. will be TEU containers; of this figure, 14 mil. TEU will be transported inland (an increase of 164%), according to the HAMBURG PORT AUTHORITY. As far as the transported containers are concerned, the share of rail transport will be increased from the current value of 36% to 41%, and the share of road transport will be reduced. A volume of 300,000 TEU/year is anticipated for container transport along the Elbe River waterway. Until 2025, maintenance of the river bed of the Elbe River waterway is planned in German territory (navigable depth of 1.6 m for 345 days a year). If the Elbe River waterway were navigable year-round and thus also usable in the territory of the Czech Republic, a system of HUBS, e.g. Mělník, Pardubice, according to [3], could be created along the waterway, with resulting savings due to advantageous and ecological transport. Cargo would be transported from these multimodal terminals further inland via rail transport or by road for distribution to nearby locations. Currently, road transport still has a dominant share in inland transport. According to EU transport in figures Statistical pocket book 2013 in 2011, the share of road transport was 45.3%, of the rail transport 11% and of the water transport 3.7%.

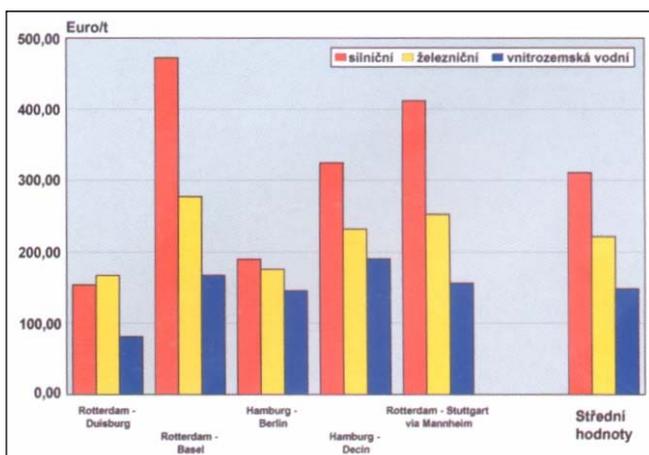


Fig. 3: Overview of cost of transportation of containers in EUR / TEU in selected sessions  
Source: Study PLANCO Consulting GmbH, study, 2007 [14]

The economic development of localities along waterways would be yet another benefit. There would be a trend toward moving manufacturing plants and operations directly to ports, creating so-called port industrial zones [12]. Economic activities are concentrated around ports in countries with developed inland water transport, contributing to regional development.

#### 4 TYPES OF TRANSPORT EXTERNALITIES (caused by means of transport)

##### 4.1 Accidents

External costs due to accidents – healthcare for the injured, or even the loss of human life, movement and occupation restrictions, loss of the carrier, damage to materials, etc. The accident rate associated with water transport is very low.

## 4.2 Polluted air

External costs caused by air pollution – the treatment of respiratory and cardiovascular diseases due to emissions, the removal of effects on agricultural crops, etc. Water transport shows no significant effect on air pollution, for example, based on the TREMOVE database, [13] .

## 4.3 Climate change

External costs due to climate change (approx. 20% of total greenhouse gas emissions in Europe) – removal of negative effects for the entire ecosystem, and thus also for human life. These can be determined based on the costs needed to remove damaged elements from the ecosystem or using costs needed to ensure protection against damage by such elements (prevention system).

## 4.4 Noise

External costs resulting from the high intensity of noise – physical and mental damage to the health of citizens. Noise occurs particularly in large cities and near transport corridors. Noise due to water transport is very low compared to other transport modes.

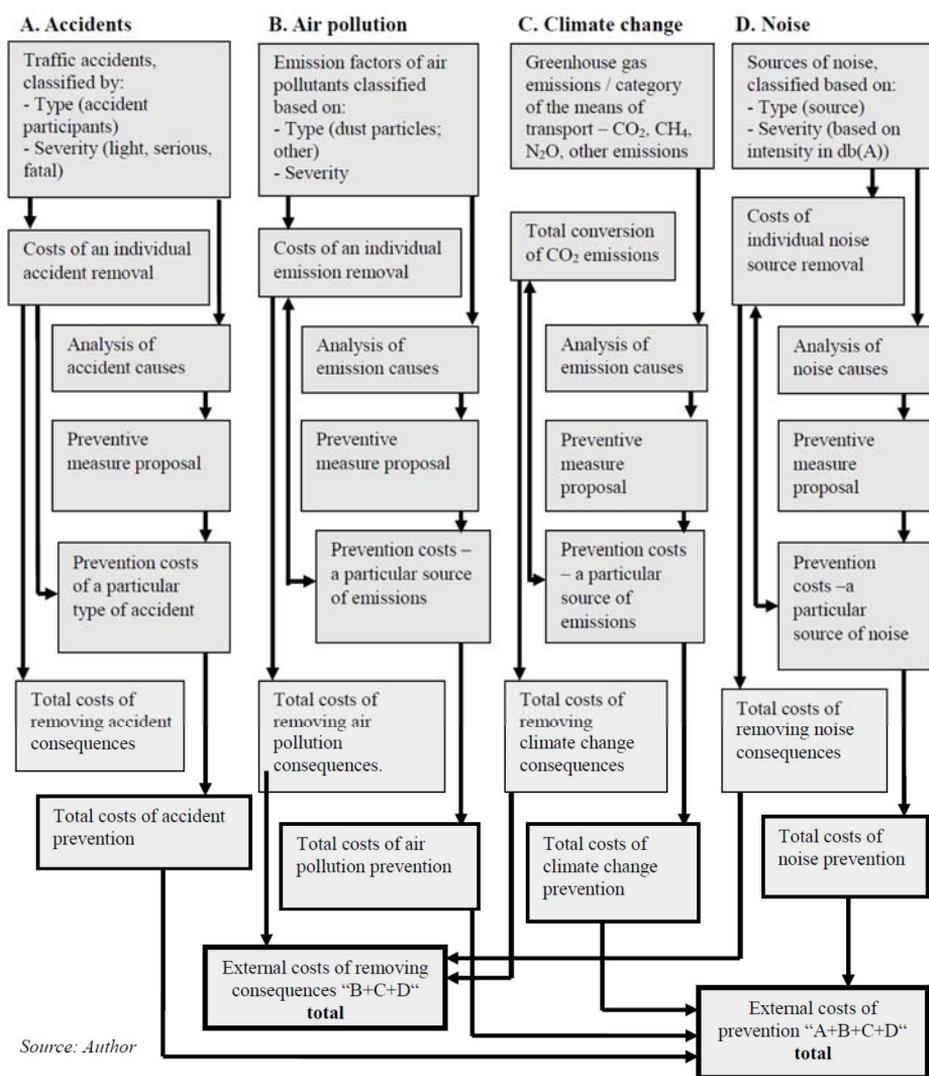


Fig. 4: Cost calculation model for selected types of transport externalities in the given segment

## 4.5 Congestion

Congestion (“mutual effects of transport participants that increase with insufficient free space along the transport route”) occurs with traffic accidents, when repairs are needed or they occur at peak traffic times – is associated with additional costs due to unforeseeable delays (prolonged travel time), the negative impact on the human nervous system, higher fuel consumption, etc. Congestion related to water transport is very low compared to other transport modes.

External costs due to congestion are included in the total external costs related to transport (these costs are not passed to anyone else – external costs are passed on to persons other than their originators).

## 5 POSSIBLE FUTURE CHARGES ON EXTERNALITIES AND THEIR CONSEQUENCES

External costs of transport are those that originate in connection with the substance of transport but are not paid for by its users. In the long-term time horizon, these costs should be included in charges for the use of a traffic product – transport to ensure the realistic function of the market. External traffic costs can be quantified for the Hamburg – Pardubice segment for three types of traffic: road, rail and water. Externality calculation is based on the External Costs of Transport in Europe study; values for the Hamburg – Pardubice relation have been used from the results [2], [6].

Tab. 1: Mean costs in the category of externalities in the EU based on the transport mode

Mean external costs	Cargo transport (€/1000 tkm)					
	Road over 3.5t	%	Rail	%	Water	%
Accidents	10.2	35	0.2	3	0.0	0
Air pollution	6.7	23	1.1	16	5.4	57
Climate change	5.8	20	0.6	9	2.1	22
Noise	1.8	6	1.0	15	0.0	0
Upstream/downstream processes	2.4	8	3.3	49	1.1	12
Impact on nature and landscape	0.7	2	0.0	0	0.4	4
Biodiversity loss	0.5	2	0.0	0	0.5	5
Soil and water contamination	0.8	3	0.4	6	0.0	0
Costs in urban areas	0.5	2	0.1	1	0.0	0
Total	29.4	100	6.7	100	9.5	100

Source: *External costs of Transport in Europe*

Tab. 2: Mean external costs in the Czech Republic and Germany based on the transport mode

Mean external costs	Cargo transport (€/1000 tkm)		
	Road over 3.5t	Rail	Water
Czech Republic	39.8	8.5	15.8
Germany	35.4	9.3	10.5

Source: *External costs of Transport in Europe*

As follows from the table above, road transport generates the most external costs, which is given predominantly by high accident rates on roads, air pollution, and production of CO<sub>2</sub> and noise. External costs of water transport are given predominantly by air pollution from combustion engines of ships and CO<sub>2</sub> production. External costs of rail transport are created particularly by obtaining and transporting energy needed to operate electric traction (so-called upstream and downstream processes).

Theoretical transport performances for the relation between a European port (for example, Hamburg) – Czech Republic can be calculated using the equation

$$t_{km} = Q \cdot l_n$$

where:

- $t_{km}$  – transport performance [tkm ],
- $Q$  – transport volume [t],
- $l_n$  – transport distance [km],

Values for individual transport modes can be obtained by adding the costs created by transport performances in the territory of the Czech Republic and Germany. Road transport, which creates the highest burden on the environment and on the areas surrounding infrastructure, has the highest transport volume and logically generates a considerable amount of external costs. On the contrary, rail transport, which shows very similar transport performances for the given relation, generates less than one fourth the external costs of road transport. The lowest value of external costs is shown by water transport, which is given by its low transport performances.

The Elbe River waterway could be used for goods for which there is no requirement for fast transportation. This segment of goods could be transferred from the road, eventually also from railways to waterways.

Compared to road and rail transport, water transport offers a low price due to its energy efficiency. The market thus could also be influenced by introducing an “ecological toll” based on the external costs of individual transport modes. However, the imposition of charges on externalities would have to be handled on the political level, including consideration of its consequences or potential increases in the price of some raw materials.

## 6 CONCLUSIONS

Several possibilities exist for the use of the Elbe River waterway all the way to the envisaged multimodal logistic centre in Pardubice; three examples are provided below [8], [9].:

- Transfer 10% of the transport volume from road to water – with the Elbe River being navigable for 345 days/year in the segment of Hamburg – Pardubice – the waterway can be used as an alternative and a natural regulator of prices for transport in this corridor. Ship transport could be operated in the form of regular (container) lines from north German ports to inland ports in the Czech Republic.
- Transfer 30% of transport volume from road to water – a 30% reduction in the volume of road transport, and an increase of water transport would require considerable support for inland navigation, which is also related to the planned implementation of VLC Pardubice [7].
- Transfer 30% of transport volume from road to water and 20% of transport from road to rail – in this case a 50% reduction in the volume of goods transported by road can be considered, which could be divided between rail (20%) and the waterway (30%). In this case, an artificial price increase of road transport as the highest producer of external costs could apparently be used as an impulse. However, the current capacity of the Prague – Děčín – Bad Schandau – Dresden rail route must be considered, as it is approaching peak capacity due to intensive passenger transportation [10].

## ACKNOWLEDGMENT

The author acknowledges support from the EU-US Atlantis Programme. Project Title: Transatlantic Dual Master's Degree Program in Transportation and Logistics Systems (ATL). This project and research is also co-funded by the European Commission's Directorate General for Education and Culture (DG EAC) under Agreement 2010-2843/001-001-CPT EU-US TD.

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