

THE IMPACT OF EXTERNAL COSTS IN TRANSPORT.CASE STUDY IN MARITIME TRANSPORT

¹CRISTEA VIORELA-GEORGIANA, ²DRAGAN CRISTIAN, ³BERESCU SERBAN

^{1,2,3}Constanta Maritime University, Romania

ABSTRACT

It is clear that transport costs are an important element which influence the final cost of a product, due to the fact that they represent a more complex area than in many other industries. Beside the internal costs (time and operation), representing costs incurred by individuals or operators for providing services required by the market, the external costs, which were seriously taken in consideration in the last few years, are considered to be a negative impact of transport. Thru this paper we tried to establish the important role of those costs, how they influence the transport activity, especially the maritime transport sector. This article contains a welfare economic analysis of transport's external effects regarding congestion, accidents, noise, air pollution and climate change.

Keywords: *Transport activity, external costs, negative impact.*

1. INTRODUCTION

Transport activity brings lots of benefits to the economy, due to the fact that it increases the production efficiency and it also links the producer and the customer from the logistics system (it also links regions, countries and continents).

Despite the benefits that transport activity brings (it contributes to economic growth and enables a global market), it also raises costs due to its environmental impacts, accidents and congestion, effects that aren't generally produced by the transport users¹. It needs to be noticed that the benefits of transport are higher than the costs.

The costs associated to these effects are usually denoted as "external costs" or "externalities" (Fridell E., Belhaj M., Wolf C., 2011). The freight transport network includes internal costs (that are considered to be time and operation) and external costs (like congestion, accidents, air pollution and CO₂ emissions) (Marquez L., Cantillo V., 2013).

The most common definition of the "external costs", consider them to be social costs imposed on others, but not paid for by the infrastructure user, like the "internal costs". All forms of transport give rise to bad side effects like: trains and aircrafts contribute to noise, ships to air pollution or road vehicles to congestion (see figure 1). For example accident costs are considered to be equal for all means of transport, while congestion costs are considered to be more significant for road transport (due to the transport in urban areas). According to many authors the road transport activities give rise to a wide range of external costs (Verhoef E., 1994).

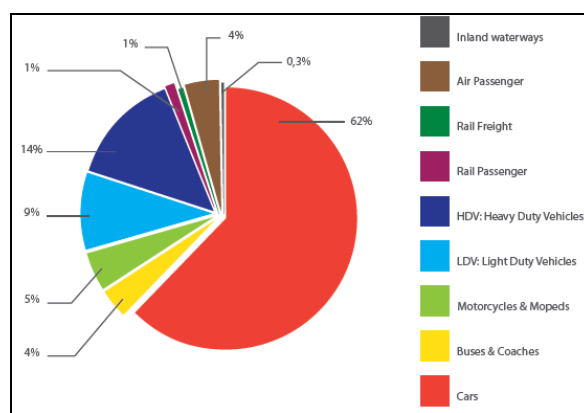


Figure 1 Total external costs of transport by transport mode

Source: International Union of Rails

There are many European studies (The Europe 2020 strategy, the Roadmap for moving to a competitive low carbon economy in 2050, the 2011 White Paper on Transport and the IMPACT study), which make clear that the transport sector faces huge challenges and they try to take into account all the elements that contribute to transport's "externalities", the development of the TEN-T, co-modality and modal shift².

One of the leading principles in EU transport policy is represented by the process of internalization of those external costs, an important issue for transport research and policy development for many years in Europe and worldwide. This process is very important because without it the external costs won't be taken into account by the transport users when making a transport decision. The traditional answer of economists to the problem of internalizing external costs of transport is "setting prices right" (Musso A., Rothengatter W., 2013). The internalization suggests that when transport users take a decision regarding the transport activity, the effects of

¹ According to the "Handbook on estimation of external costs in the transport sector- The IMPACT study", M. Maibach, H.P. van Essen, B.H. Boon, R. Smokers, C. Doll, B. Pawlowska, February, 2008.

² As said by the European Commission, "An inventory of measures for internalizing external costs in transport", Directorate-General for Mobility and Transport, Belgium, November 2012.

the external cost should take part of the decision making process.

An important study regarding transport's external costs is the IMPACT Handbook on estimation of external costs in the transport sector that covers all environmental, accidents and congestion costs. It tries to recommend a set of methods for estimating external costs, after providing first a comprehensive overview of approaches for this estimation.

Transport's externalities, for which many different methods have been developed and actually applied regarding the costs they cause, are: congestion, accidents, noise, air pollution and climate change³ (see figure 2).

- Congestion: those external costs are felt by transport users in travel times, operating costs and travel time unreliability;

- Accidents: when referring to this side of the external costs it represents a relatively large part of total external costs (especially for road transport), as a result of traffic accidents (such as cost for material damages, medical costs, production losses, administrative costs and immaterial costs- pain, sorrow);

- Noise: this side of external costs has two important elements: costs of annoyance (undesired social disturbances, resulting in social and economic costs like any restrictions on enjoyment of desired leisure activities, discomfort or inconvenience) and health damages (like hearing damage, the risk of cardiovascular diseases, the increase of blood pressure and hormonal changes) leading to many types of costs like medical costs, costs of productivity loss and the costs of increased mortality;

- Air pollution: this side of externalities leads to different types of external costs, referring to health (cardiovascular and respiratory diseases caused by air pollutants), the impact on ecosystems and biodiversity (the most important ones are considered to be nitrogen oxide (NO_x), sulphur dioxide (SO₂), volatile organic compounds (VOC) and Ozone (O₃) as an indirect pollutant);

- Climate change: according to the European Commission, in Europe, almost 20% of total greenhouse gas (GHG) emissions were caused by transport, emissions that have a significant effect on global warming (with health impacts, ecosystems and biodiversity impacts, an increase in extreme weather effects, agricultural impacts or regarding the rise of the sea level). There are considered to be three important greenhouse gases caused by transport: carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄). It is also important to notice that aircrafts emissions at high altitude also have an impact on global warming.

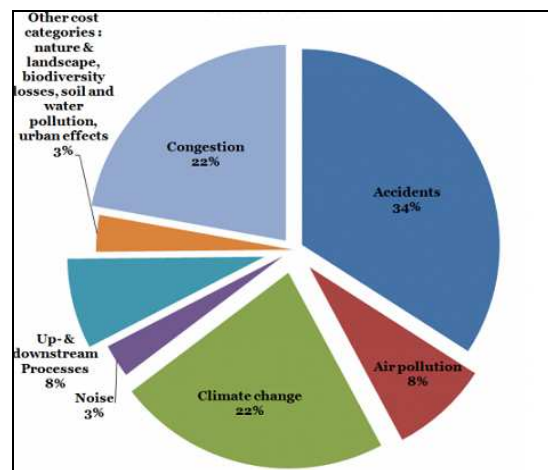


Figure 2 Total external costs per externality in EU 25+ 2 (Norway and Switzerland)

Source: International Union of Rails

2. METHODS FOR ESTIMATING EXTERNAL COSTS

From 1990 many projects and studies have been undertaken, European Union's project- UNITE (Nash, 2003), ExternE (Bickel & R., 2005), NEEDS or national research projects- INFRAS/IWW (Schreyer, 2004), CE Delft et al. (CE Delft; Infrast; Fraunhofer ISI, 2011), with the purpose of improving estimations of cost and the methodology used for estimations of external cost. There were also some studies that were conducted in order to estimate the external costs of the European transport sector.

The estimation of external costs is an important process that has to consider several uncertainties, but the best practice for this estimation is based on three elements: speed-flow relations, value of time and demand elasticity.

When referring to the external costs of transport, many authors consider that there are two ways of estimating them: top- down and bottom-up approaches. One of them starts at macro-level and the other one at micro-level. The easier method regarding the way of determination is the top-down approach, which suggests that the external costs of a country can be calculated by the national transport volume, so at macro-level (Bickel and Friedrich, 2005). On the other hand is the bottom-up approach, that is considered to be more precise due to the fact that first are specified in details the basic elements and then they are linked together to form a complete system, at micro-level (Friedrich and Bickel, 2001; Miola, Paccagnan and Turvani, 2008).

3. EXTERNALITIES OF MARITIME TRANSPORT

According to the European Commission ships transport almost 90% of the EU's World trade volume. Usually when trying to quantify the external cost of maritime transport, a bottom-up approach is used (the Impact Pathway), that has several steps like: the division of the fleet into ship categories, calculation of the environmental impact factors and monetary valuation of the external costs.

³ According to CE Delft, INFRAS, Fraunhofer ISI in "External Costs of Transport in Europe" from November 2011.

In the picture below (figure 3) are presented the main environmental impact factors of ships such as:

- greenhouse gases (CO₂- associated to the fossil fuel combustion process, as well as the HCFC-losses of refrigerant gases from air conditioning systems and on board freezers);
- atmospheric emissions;
- discharges into the sea (marine pollution-wastewater discharges from bilge separators, accidental oil spills due to operational activities, wastewater discharges from cargo tanks cleaning with seawater-based process, grey (laundries, kitchen, showers) and black (sewage) wastewater discharges, ballast water discharges).

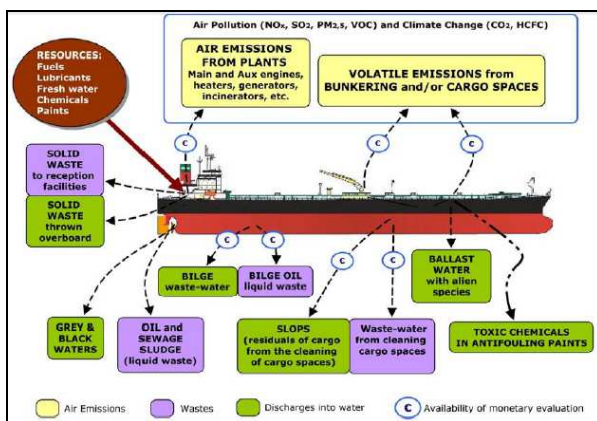


Figure 3 Ship's Resources Consumptions and Environmental Impact Factors

Source: European Parliament, External costs of maritime transport

Even if maritime transport activity is considered to be less harmful to the environment than any other type of transport, it has different environmental impacts during all activities that occur at ship (including the impacts that came from accidental events), in port or during ship construction/maintenance/dismantling. This is why the European Commission (thru Trans-European Transport Networks, TEN-T) tries to shift freight transports from trucks to ships, providing a more efficient, less polluting and more cost effective transport. It will also reduce road congestion on key bottlenecks across Europe and provide better, more reliable connections for peripheral regions.

4. CONCLUSIONS

External costs are an important element that affects both transport operators and transport users and their internalisation is a needful process due to the fact that it is a way to give transport users the right incentives. Those costs should be included in taxes because this will lead to a change in transport user's behaviour, resulting in changing vehicle type, vehicle utilisation, transport mode or even their overall transport volume. Studies have shown that from the total external cost of transport (that can be achieved by summing all types of

externalities) in Europe, about 77% of the costs are caused by passenger transport and 23% by freight⁴.

The European Commission also approaches this subject in the White Paper "Roadmap to a single European transport area- Towards a competitive and resource- efficient transport system" (COM (2011) which targets the development and deployment of new and sustainable fuels and propulsion systems and the promotion of a more sustainable behaviour.

It is also important to notice that the impacts of the external effects of transport can manifest in both short and long-term ways, so we need to take both of them in consideration if we don't want to face much larger costs in the future.

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