

Maritime Safety in European Concept of the Internalization of External Costs of Transport

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ABSTRACT: Efficient and effective transport system is the key element for the future development of European economy. Simultaneously, the process of transport development is connected also with the negative effects for environment and society. For that reason, the concept of internalization of all external costs of transport is developing in European Union. The concept characteristics and specificity in the maritime transport is the main issue of the following analysis. The special interest is focused on the maritime safety, one of the key external cost category.

1 CONCEPT OF THE TRANSPORT EXTERNAL COSTS INTERNALIZATION

1.1 *Definition and characteristic of the external costs of transport*

The transport sector have today a significant importance in global economy and development. Bring the people closer together, help in the production and service activity. Simultaneously, is itself the crucial part of economy. In Europe, is responsible for 10% of European gross domestic product and employs about 10 million people (2001. *White Paper. European transport Policy for 2010: time to decide*. European Commission). Despite the whole positive influence on the global economy and society, transport is also the source of unwelcome effects. Unfortunately, only the part of that negative influence is bore by the transport providers (private costs). Huge amount that effects, called 'external' is burdening of society, environment of national budgets. The current methodology of calculation is making possible a financial expression of these effects – external costs of transport. What is more, these costs are not borne by the transport users and hence not taken into account when they make a transport decision (2008. *Handbook on estimation of external costs In the transport sector*. Delft, Netherlands).

The most important categories of the external costs of transport are:

- transport congestion (infrastructure scarcity);
- accidents;
- air pollution;
- noise;

- impacts on climate change;
- nature and landscape;
- water and soil pollution;
- costs in sensitive areas;
- up- and downstream;
- urban effects;
- costs of energy dependency.

The costs of *congestion* could be reflected by: travel time increases, vehicle provision and operating costs, disamenities in crowded system, additional fuel costs reliability, scarcity of slots. In case of *accidents costs* the external part is connected with the part of costs are not covered by risk oriented insurance premiums, like: material damages, administrative costs, medical costs, production losses and the so called risk-value as a proxy to estimate pain, grief and suffering in monetary values. *Air pollution* is the next kind of costs, reflected mostly by health costs, building and material damages, crop losses in agriculture and impacts on the biosphere or impact on biodiversity and ecosystems. *Noise* is also important negative effect of transport activity. Its level could be estimated on the basis of costs of annoyance or health costs (hearing damages or nervous stress reaction). The key areas of *climate change* costs assessment are sea level rise (additional protection), energy use (heating), agriculture impacts (crops changes), water supply, health impact (heat or cold stress), ecosystems and biodiversity (extinction of vulnerable species). The following sorts of external costs are regarded as the less important and more difficult to estimate. *Nature and landscape* effects influencing on habitat loss, habitat fragmentation or habitat quality loss. The *water and soil pollution* are

connected with the repair costs or health costs for human beings. The indication of *sensitive areas* external costs is caused by higher environmental pressure in that places and taking into consideration the all kinds and types of costs. The *up- and downstream* costs are generated in the other areas of economy by there are caused by transport development (energy production, vehicle production, infrastructure construction). The next sort of external costs – *urban effects* are made by other participants of motorized traffic on the urban areas (pedestrians, cyclists, etc.). They are mostly regarded as time losses or scarcity problems. The last sort of external costs is the *energy dependency* resulted from the unequal distribution of energy sources. For that reason, the costs due to transfer of wealth, potential GDP losses or macroeconomic adjustments costs could be foreseen.

According to the estimation the EU financial losses connected with the environmental or congestion problems are indicated on the level of 1% of EU gross domestic product each (2006. *Keep Europe moving – Sustainable mobility for our continent*. European Commission). The important issue is also the modal and structure of the transport external costs category (Table 1).

Table 1. Total external costs (excluding congestion) by cost category and transport mode in 2000 (million Euro per year).

	Road	Rail	Air	In. navig.	Total
Accidents	155,588	262	590	0	156,439
Noise	40,410	2,136	3,098	0	45,644
Air pollution	164,282	4,447	4,235	1,652	174,617
Climate change	112,383	2,894	79,931	506	195,714
Nature & landscape	18,359	266	1,298	91	20,014
Up/Downstream	43,483	1,748	1,762	383	47,376
Urban effects	9,909	563	0	0	10,472
Total (EU 17)	544,415	12,315	90,914	2,632	650,275
%	83.7%	1.9%	14.0%	0.4%	100%

Source: 2004. *External costs of transport. Update study*. Summary. INFRAS, Zurich/Karlsruhe, October.

The most important sort of external costs, responsible for about 30% of total sum is climate changes. The following position are occupied by air pollution (27%) and accidents costs (24%). The next kinds of external costs have only about 7-5% of total share. Two third of total cost is connected with the passenger transport (private passenger cars). The modal comparing indicates on the leading role of road transport (83.7%). For that reason the road traffic is the best reconnoiter mode of transport in the aspect of external costs.

1.2 The concept of internalization of the external costs of transport

The internalization concept is based on the assumption, that, external effects should also be taken into consideration in the decision making process. It is connected with the rapid growth of global transport and increasing role of external, negative effects which are produced.

These initiative has been presented in the European Union documents for years (e.g. Green Book (1995), White Papers (1998, 2001, 2006)).

The aims of implementation of the external costs internalization are defined like, the following:

- Improvement of transport efficiency, both economical and environmental (use of infrastructure and rolling stock);
- Guarantee fairness between transport modes (fair price considering);
- Improve safety and reduce environmental nuisances of transport.

According to the European concept, the most efficient way of internalization is the proper regulation of the transport activity. The market - based instruments, like taxes, charges, emission trading should be used. In accordance with the theory assumption, the calculation should be based on the marginal costs.

The most important challenge is the detailed estimation of the regulation (financial burden) level. The two main approaches to the marginal external costs estimation are indicated in the literature: *bottom-up* or *top-down approach*. In first case, the calculation is based on the specific case studies. These approach could bring the detailed outcomes but it is costly and difficult to generate. On the other hand (*top-down approach*), the total value of external costs is divided between particular modes. The differentiation of traffic condition or stock categories make the method very imprecise (2008. M. Bąk, B. Pawłowska: *kalkulacja kosztów zewnętrznych transportu – krok naprzód w polityce Unii Europejskiej*. Materiały konferencyjne, EuroLog 2008, Warszawa).

Despite the advanced works on the methodology of external costs calculation, it is difficult to recapitulate that the ‘system’ is ready for implementation. It is still very complicated and difficult for the transport practice. What is more important, there no exist the proper ‘political climate’ for implementation. On the one hand, the transport companies and users will protest against the increasing burden of service activity (especially road haulers), on the other the financial crisis is additionally postponing the potential date of start. It is crucial, that there no exists reliable analysis of the influence of internaliza-

tion on the functioning of the European transport market.

2 THE EXTERNAL COSTS OF MARITIME TRANSPORT

2.1 *Crucial aspects of maritime transport external costs calculation*

The external costs of maritime transport are the most poorly recognized category among the transport modes. There exist several reasons of that situation.

First is the international character of maritime traffic, separated from the land areas. Thanks that, maritime traffic have limited influence on society and its activities (spatial separation). The next reason is restricted scope of maritime infrastructure problems and its relatively high capacity (observed only in case of particular seaports, straits or canals). The other incentive of low importance of maritime traffic in the internalization concept is the relatively low level of generated costs. The crucial aspect of the maritime traffic analysis is also discrepancy between infrastructure and shipping in the light of external costs characteristics.

Simultaneously, the essential problem in the analysis process is the limited access to the detailed and proper data concern the maritime traffic.

Despite the problems indicated above, all costs categories in maritime transport could be indicated and calculated. For the simplification of the analysis the scope of interest is limited to the accidents costs resulted from maritime shipping activity.

2.2 *Maritime accident external costs in the internalization process*

The estimation of the maritime accident costs needs the detailed indication of the most important categories of the effects. It is caused by the much more complicated nature of sea accidents than in other mode of transport. The main difference is the appearance of couple of cost categories caused by the occurrence. The following cost categories could be observed:

- Costs of damage to ships;
- Costs of damage to infrastructure;
- Costs resulting from human injury and death;
- Environmental damages (e.g. pollutions, nature and landscape costs);
- Operational damages (e.g. sunken vessels blocking the waterway);
- Administrative costs (2001. *UNITE*. P. van Donseelaar, H. Carmighelt. Workpackage 5/8/9., s. 40).

It is extremely difficult to present complete analysis of the external accidents cost of maritime traf-

fic. However, there is some data reflected this issue (Table 2).

Table 2. Accidents costs in maritime shipping in selected European countries in 1998 (million €).

	External accidents costs	Internal accidents costs
Finland	0.5	91
Greek	30	37
Italy	0.5	5
Sweden	6	75
Spain	15	236
Netherlands	1	4

Source: 2003. UNITE. Deliverable 8&12.

It could be stated that the part of about 10.6% is the external costs of maritime accidents. That is mean they are 'covered' by environment or society. The following part are the private one. The most important are human injury or death and of course environmental damages.

Table 3. Estimated values for casualties avoided in transport (thou. €2002)

Country	Fatality	Severe injury	Slight injury
Austria	1 760,0	240,3	19,0
Belgium	1 639,0	249,0	16,0
Cyprus	704,0	92,9	6,8
Czech republic	495,0	67,1	4,8
Denmark	2 200,0	272,3	21,3
Estonia	352,0	46,5	3,4
Finland	1 738,0	230,6	17,3
France	1 617,0	225,8	17,0
Germany	1 661,0	229,4	18,6
Greece	836,0	109,5	8,4
Hungary	440,0	59,0	4,3
Ireland	2 134,0	270,1	20,7
Italy	1 430,0	183,7	14,1
Latvia	275,0	36,7	2,7
Lithuania	275,0	38,0	2,7
Luxembourg	2 332,0	363,7	21,9
Malta	1 001,0	127,8	9,5
Netherlands	1 782,0	236,6	19,0
Norway	2 893,0	406,0	29,1
Poland	341,0	46,5	3,3
Portugal	803,0	107,4	7,4
Slovakia	308,0	42,1	3,0
Slovenia	759,0	99,0	7,3
Spain	1 122,0	138,9	10,5
Sweden	1 870,0	273,3	19,7
Switzerland	2 574,0	353,8	27,1
United Kingdom	1 815,0	235,1	18,6
Ave.	1 302,1	177,1	13,1

Source: 2008. Handbook on estimation of external costs In the transport sector. Delft, Netherlands.

The problem of the value of human health or life is one of the basic in the external costs concept. It is extremely difficult to express the life's value in financial category, therefore the theory call these kind of costs like 'value of casualties avoided'. The table 3 present the accessible outcomes of the studying issue.

The average value of fatality avoidance is counted on 1.3 m Euro, severe injury 177.1 thou. Euro and slight injury 13.1 thou. Euro.

The analysis of these costs structure indicates that the total premium paid by insurance companies amounts to 50% of the injury and death costs for victims (Calculation for inland navigation. 2001. UNITE. P. van Donselaar, H. Carmighelt. Workpackage 5/8/9., s. 42). Therefore, the half of the cost could be indicated like 'external'. Looking into maritime statistics, the average annual number of fatalities at sea accounts for 608 (based on the period 1989 – 2004) (2005. *Casualty statistics and investigations*. Annex 2. IMO, London 23 February). It could be resumed, that the annual external accidents cost referring to human life in the maritime transport is about 3.95 billion Euro.

The second type of external effects caused by maritime accidents are environmental damages. The various categories of costs could be indicated with correspondence to environment. There are: pollutions, nature and landscape costs, costs in sensitive area, etc. In maritime practice, the following kinds of costs are defined:

- Natural Resource Damage Costs (NRDA), which are based on estimated costs to restore equivalent resources and/or ecological services.
- Socioeconomic costs including damages to real and personal property, loss of use of natural resources (parks and recreation areas), and loss of income and expenses (fishing, tourism, recreation, shipping and other commerce).
- Response costs comprise appropriate spill response operations based on procedures outlined in local contingency plans and historical case studies for mechanical-recovery operations (Bickel P., Sieber N., Kummer U.. 2006. *Marginal environmental costs case studies for air and water transport*. GRACE, IER, University Stuttgart., s. 34).

Table 4. Selected major oil spills In Europe.

Name of ship	Year	Location	Oil lost (t)
Amoco Cadiz	1978	Off Brittany, France	223 000
Haven	1991	Genoa, Italy	144 000
Torrey Canyon	1967	Scilly Isles, UK	119 900
Irenes Serenade	1980	Navarino Bay, Greece	100 000
Urquiola	1976	La Coruna, Spain	100 000
Independienta	1979	Bosphorus, Turkey	95 000
Jakob Maersk	1975	Oporto, Portugal	88 000
Braer	1993	Shetland Islands, UK	85 000
Prestige	2002	Cape Finistere, Spain	77 000
Aegean Sea	1992	La Coruna, Spain	74 000
Sea Empress	1996	Milford Haven, UK	72 000
Erika	1999	Brittany, France	20 000

Source: 2007. *Panorama of Transport*. Edition 2007. European Commission.

The oil spills are the most important type of sea accident. They effects influence significantly the marine environment. Unfortunately, these kind of periodical occurrences has been noticed for years (Table 4).

In case of oil spills, the negative effect on the environment is unquestionable. The part of the effects could be limited by cleanup activity (table 5), constituting the private part of social costs.

Table 5. Oil spill cleanup costs in Euro

Continent	Euro 1999 /ton
North America	19,815
Latin America	3,056
Africa	3,164
Europe	10,808
South Pacific	5,699
Middle East	1,058
Asia	27,496
World Wide Average	8,073

Source: Bickel P., Sieber N., Kummer U.. 2006. *Marginal environmental costs case studies for air and water transport*.

GRACE, IER, University Stuttgart., s. 34.

The other losses connected with the accidents are 'covered' by the environment and citizens.

The presented elements of the maritime accidents external costs calculation do not fulfill the whole abundance of issue. Unfortunately, there no exists the exact and complete calculation of the external environmental costs of maritime accidents. Simultaneously, it is hard to define the proper way of the internalization of these negative effects.

3 CONCLUSIONS

The concept of internalization of external costs of transport is today the crucial element of European transport policy. So far, the theory and the methodological base for the concept implication have been done. Unfortunately, the financial and economic crisis on the global markets has limited the tempo of further steps.

Maritime transport is also regarded as the potential area of the internalization. Fortunately, the share of maritime transport in total sum of external costs is marginal. The crucial cost category of maritime externalities are costs of accidents. In case of these kind of disaster the majority of external costs are borne by environment.

The current EU action and regulation concerning maritime safety will, hopefully, limited the number of the maritime accidents. The packages Erika I, Erika II or the newest third package of measures should bring the gradual improvement of maritime safety (2006. *Maritime Transport Policy*. European

Commission). On the other hand, the internalization could be regarded as the positive action for maritime transport. The heavy increase of financial burden for road transport should enable the practical implementation of the old EU' challenge, expressed in form 'from road to sea', stimulating, at the same time, demand for maritime transport services.

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