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SUSTAINABLE TRANSPORT AND EXTERNAL COSTS OF TRANSPORT

1. Introduction

Transport is considered one of the most important branches of the national economy. It stimulates economic activity, as well as economic growth and development. Transport enables the mobility of production factors, market expansion, the widening of product assortment, as well as having many other positive economic effects. The relation between the development of transport and the development of social and economic life is also of great importance. During the last few decades transport has developed rapidly in connection with the process of globalisation and economic integration. From one point of view it is a profitable trend accelerating the development of national economies, as well as the improvement of economic efficiency and competitiveness, especially since expenditure on transport leads to growth in other branches of the economy. On the other hand various negative aspects of the development of transport have been underlined. Their impact is becoming stronger and stronger. This is why the development of transport is nowadays often perceived as a threat, not as a positive trend. The reasons for this lie in the negative effects of transport, also known as external costs of transport. An external cost (externality) arises in situations where the social or economic activities of a person or a group of people have a negative impact on another person or group. This impact is neither fully intended nor compensated for by the causer(s). In the case of transport, the causers are both the producers of transport services and the users. However, the injured party is most often society as a whole.

Analysing the significance of external costs of transport, it should be explained in which form they most often occur, what kind of tools can be used in order to internalise them and what sorts of activities should be undertaken in order to achieve sustainable transport? In day-to-day life external costs of transport appear in varied forms. We all are subject to such external costs of transport as:

– noise and vibrations,
– air and water pollution,
– climate change,
– accidents,
– reduction in the area of unspoilt areas and changes in the landscape made in order to construct transport infrastructure.

Some types of these external costs are specified in Table 1, which also includes cost components, methods of internalisation, means of measurement and type of externalities. Only the costs of accidents are partially external costs of transport, due to individual insurance. The other costs are fully external, which means that society as a whole is affected by noise, air, water and ground pollution, as well as climate change.

Table 2 shows the total external costs of transport in 2000 according to category and mode of transport in EU-17. The largest costs may well arise as a result of climate change (30% in the worst case scenario), air pollution (27%) and accidents (24%). The negative influence of transport on nature and landscape, together with costs incurred in urban areas, is comparably the smallest (3 and 2%, respectively). The greatest externalities are caused by road transport (almost 84% of total external costs from transport). This is connected above all with increased gas emission, accidents and occupying terrain required to build the infrastructure. The best alternative in this case is rail transport, but it is continuously losing its importance in favour of road transport. Aviation, rail and waterborne transport have significantly smaller shares (14%, 1.9% and 0.4%, respectively). It is worth mentioning that passenger transport is responsible for 2/3 of the external costs of transport and freight transport – only for 1/3 of these costs [Ellwanger, 2005].

The external costs of transport in Central and Eastern European countries is presented in Table 3. According to the data shown, the country with the greatest externalities caused by transport is Poland (almost 32% of the total costs). The Czech Republic is in second position (almost 17%) and Ukraine, together with Hungary, in third (both 11.16%). The other countries are not significant sources of external costs from transport. The threat is becoming more and more significant, because in the 1995–2000 period the external costs of transport increased by 12.1% (in real value terms) [External Costs of Transport- Update Study, 2004, 9]. The main reason for this is the increase in freight and passenger transport, as well

Table 1. Overview of external costs

Type of cost	Cost components	Method of internalisation	Means of measurement	Type of externality
Accidents	Additional costs of – medical care – economic production losses – suffering and grief.	The value of human life is estimated by using studies on willingness to pay to reduce the risk of accidents.	National accident rates (mainly ECMT statistics)	Partially external (the part which is not covered by individual insurance)
Noise	Damage (opportunity costs) to land (value) and human health.	Willingness to pay for a noise reduction to 55 dB(A).	Population density in urban areas and exposure to noise.	Fully external.
Air pollution	Damage (opportunity costs) to – human health – material/buildings – biosphere/crop losses.	PM10 dose response functions are used as the basis for calculating the repair and damage costs.	Emission level per vehicle according to type (OECD).	Fully external.
Climate change	Damages (opportunity costs) caused by global warming.	Avoidance costs paid in order for a country to reach Kyoto targets.	CO_2 Emissions per vehicle according to type (OECD).	Fully external.
Nature and landscape, construction of transport infrastructure	Additional cost of repairing damage, compensation costs.	Costs based on the area of land affected and type of infrastructure	Length and width of transport infrastructure.	Fully external.

Source: *External Costs...*, 2003, 7.

Table 2. Total external costs of transport in 2000 in EU-17 according to category of cost and mode of transport

Cost category (million EURO/year)			Road		Rail		Aviation		Water-borne
	total	%	passenger	freight	passenger	freight	passenger	freight	freight
Accidents	156,439	24	136,394	19,194	262	0	590	0	0
Noise	45,644	7	21,533	18,877	1,354	782	2,903	195	0
Air pollution	174,617	27	55,444	108,838	2,351	2,096	3,875	360	1,652
Climate change (worst case scenario)	195,714	30	69,472	42,911	2,094	800	74,493	5,438	506
Climate change (best case scenario)	27,959	4	9,925	6,130	299	114	10,642	777	72
Nature and landscape	20,014	3	11,105	7,254	202	64	1,211	87	91
River pollution	47,376	7	21,240	22,243	1,140	608	1,592	170	383
Effects in Urban areas	10,472	2	6,112	3,797	426	137	0	0	0
Total EU-17[1]	650,275	100	321,301	223,114	7,828	4,487	84,664	6,250	2,632

[1] total costs estimated for worst case scenario.

Source: based on: *External costs...*, 2004, 72.

Table 3. Total external costs of transport in Central and Eastern European countries in 1995 by mode of transport

Country (million EURO/year)			Road		Rail		Aviation		Water-borne
	total	%	passenger	freight	passenger	freight	passenger	freight	freight
Albania	284	0.72	147	132	4	1	0	0	0
Belarus	1,645	4.14	958	289	138	248	12	0	0
Bos.-Herceg.	121	0.30	77	44	0	0	0	0	0
Bulgaria	1,440	3.63	856	421	63	84	12	2	2
Croatia	985	2.48	615	341	10	15	3	0	0
Czech Rep.	6,996	17.62	4,077	2,277	216	399	21	2	4
FYRO Maced.	267	0.67	157	100	5	3	2	0	0
Hungary	4,430	11.16	2,598	1,306	276	248	15	3	5
Moldova	255	0.64	107	117	4	5	1	0	0
Poland	12,609	31.76	7,320	4,394	265	602	23	2	3
Romania	3,134	7.89	1,615	885	300	311	13	1	10
Slovak Rep.	1,697	4.27	957	603	41	89	2	1	4
Slovenia	1,403	3.53	1,088	260	16	35	4	1	0
Ukraine	4,431	11.16	2,370	752	382	900	16	4	8
CEI 1995	39,697	0.72	22,942	11,919	1,720	2,940	124	15	37

Source: based on *External Costs...*, 2003.

as the increase in road transport compared to other forms of transport. In road transport accident costs, air pollution and climate change are the dominant costs. The last category of external costs are the greatest external costs from air transport.

The increase in the external costs of transport has forced policy-makers to take steps in order to attain sustainable transport, which is environmentally-friendly and safer for users and society. Sustainable transport means lower gas emissions and noise, minimising the number of accidents, a smaller influence on the climate etc. Sustainable transport is often described as such transport, which meets the needs of the present generation without compromising the ability of future generations to meet their own needs. Sustainable transport may be considered as an essential element of sustainable development and has to be consistent with its goals and assumptions.

Actions aimed at achieving greater sustainability in the field of transport have been undertaken at different levels – local, regional, national, as well as international. At the international level some of the most significant steps have been taken by the European Union. In 2001 the document "White paper – European Transport Policy for 2010: time to decide" was published. It is one of the most important documents written by the European Commission. It includes a vision of the development of European transport until 2010. Aware of the threats connected with the external costs of transport and the present trends in the development of transport, the authors of the White Paper presented the main activities which should be undertaken in order to internalise costs and minimise the externalities caused by transport. The crucial tasks are [White Paper – European Transport Policy for 2010: time to decide, 2001]:

- shifting the balance between the modes of transport,
  - reducing the share of road transport, improving its quality, revitalising railways, promotion of maritime transport and inland waterway transport, controlling the growth of air transport, improving the competitiveness of modes of transport;
  - improving connections between the different modes of transport in order to promote combined transport, which is considered as more sustainable;
- elimination of bottlenecks,
  - reducing of the share of road transport in favour of railway, maritime and inland waterway transport;
  - modern infrastructure projects, for example multi-modal corridors and trans-European transport networks;
- making transport more user-friendly,
  - improvement of transport safety,

- implementing intermodal transport for passengers, not only for freight transport,
- implementing transport pricing which internalises the external costs of transport (using the principles: "the user pays" and "the polluter pays"),
- new technologies in transport, for example new substitute fuels,
- rationalisation of urban transport, improvement of public transport and reducing individual motorisation;

These activities are only suggestions as to what we should practically do in order to make transport more sustainable. In the White Paper they are not described in more detail, but can and should be used as necessary and binding guidelines for EU member states.

A whole set of tools for internalising the external costs of transport was proposed in a report published by Karlsruhe University and INFRAS (a private and independent German Research and Consulting Company). All these instruments are presented in Table 4. It can be observed, that the most effective are economic, technical and "Command and Control" instruments.

Also, the Organisation for Economic Co-operation and Development (OECD) has been dealing with the issues of external costs of transport for the last few decades. The OECD's Environmentally Sustainable Transport (EST) project was undertaken to help address the challenge of maintaining and even enhancing the benefits from transport, while reducing its impact to sustainable levels. The OECD Environmental Policy Committee's Working Group on Transport initiated the EST project in 1994. The project's main purpose was to give some precision to the concept of EST by using criteria that have environmental significance and can be quantified, as well as by developing guidelines for the attainment of EST that could be of use to governments in OECD countries, as well as others [EST! Environmentally sustainable transport. Futures, strategies and best practices. Synthesis Report, 2000, 33]. A set of key guidelines for addressing the challenge of moving people and freight in an environmentally sustainable way was endorsed by the OECD conference on „Environmentally Sustainable Transport: Future, Strategies and Best Practices" held in Vienna on 4–6 October, 2000. OECD guidelines for environmentally sustainable transport are presented below:

The EST Guidelines [http://www.oecd.org, 1.04.2006]:

Guideline 1. *Develop a long-term vision of a desirable transport future* that is sustainable for the environment and health and provides the benefits of mobility and access.

Table 4. Overview of the most effective instruments for internalisation of the external costs of transport

	Type of instrument	Effectiveness	Cost-Effectivenessratio (ranking)*
Congestion			
Peak load pricing	Economic	High	1
Management of infrastructure operations, telematics	Technical	High	2
Accidents			
Education	Organisation/Institutional	Medium	1
Change of insurance/liability	Economic	High	2
Control of alcohol limits	Command and Control	High	3
Speed limits	Command and Control	Very high	4
Driving courses	Organisation/Institutional	High	5
Local measures	Infrastructure	Local high	6
Noise			
New railway braking systems	Technical	High	1
Restrictions on engine size for HDV	Technical	Low	2
Speed limits	Command and Control	Medium	3
Special road tyres	Technical	Low	4
Noise-proof walls/windows	Infrastructure	High	5
Air pollution			
Alternative engines for buses	Technical	Low	1
EURO IV + norms	Command and Control	High	2
Km-tax (emission dependent) Fuel tax	Economic	High	3
Urban parking policy	Economic/ Infrastructure	Medium	4
Urban road pricing	Economic	Medium	5
Urban traffic bans	Command and Control	High	6
Speed limits	Command and Control	Medium	7
Climate change			
Driving courses	Organisation/Institutional	Medium	1
Kyoto Mechanisms (Emission trading, mechanisms promoting clean development)	Economic	High	2
Fuel tax Kerosene tax	Economic	High	3
Renewable sources of energy for electricity production (rail)	Technical	High	4

Table 4. contd.

	Type of instrument	Effectiveness	Cost-Effectivenessratio (ranking)*
Alternative fuels (Bus/HDV)	Technical	High	5
Toll roads	Economic	Low	6
Fuel standards/alternative fuels	Command and Control	Medium	7
Speed limits	Command and Control	Medium	8

* 1 – an instrument with the highest cost-effectiveness ratio.
Source: *External costs...*, 2004, 113.

Guideline 2. *Assess long-term transport trends, considering all aspects of transport*, their impact on health and the environment, together with the economic and social implications of continuing with 'business as usual'.

Guideline 3. *Define objectives regarding health and environmental quality* based on health and environmental criteria, standards and the requirement of sustainability.

Guideline 4. *Set quantified, sector-specific targets* derived from the objectives on environmental and health quality. Also, define deadlines and milestones.

Guideline 5. *Identify strategies to achieve EST* and combinations of measures to ensure technological enhancement and changes in transport activity.

Guideline 6. *Assess the social and economic implications of this vision* and ensure they are consistent with social and economic sustainability.

Guideline 7. *Construct packages of measures and instruments* for reaching the milestones and targets of EST. Highlight 'win-win' strategies incorporating, in particular, promoting new technology, investment in infrastructure, pricing, controlling the demand for transport and traffic management, improving public transport, promoting walking and cycling, making use of synergies (*e.g.* those contributing to improved road safety) and avoid counteracting effects between instruments.

Guideline 8. *Develop an implementation plan* that involves the well-phased application of a package of instruments capable of achieving EST taking into account local, regional, and national circumstances. Set a clear timetable and assign responsibilities for implementation. Assess whether the proposed policies, plans, and programmes contribute to or counteract EST in transport and associated sectors using such tools as Strategic Environmental Assessment (SEA).

Guideline 9. *Set provisions for reporting and monitoring implementation of the EST strategy*; use consistent, well-defined indicators of sustainable transport to communicate the results; ensure follow-up action is taken to adapt the strategy according to inputs received and new scientific evidence.

Guideline 10. *Build broad support and public co-operation in implementing EST*; involve all concerned parties, ensure their active support and commitment and enable broad public participation; raise public awareness and provide education programmes. Ensure that all actions are consistent with global responsibility for sustainable development.

In order to effectively implement the EST guidelines, local and state governments have to take the particular geographic and socio-economic conditions of regions and countries into consideration. Assessments of economic and environmental impact play a very important role in the process of implementation. The EST Guidelines should be used in a dynamic fashion that takes into account the latest scientific, technological and economic developments. When starting to implement EST, all concerned parties – transport, environment, health and other sectors, government, industry, academia, and NGOs, as well as the public-at-large – should be involved to ensure widespread awareness, understanding, commitment, and acceptance [OECD towards Environmentally Sustainable Transport, 2002].

In its research on the external costs of transport, the OECD paid attention to the character of instruments internalising the external costs of transport, which should be:

– directed at the movement of people rather than freight,
– regulatory rather than fiscal in nature,
– directed towards increasing the share of non-motorised alternatives rather than towards numerous other objectives,
– designated as being the responsibility of national or regional governments and agencies rather than the responsibility of international agencies, on the one hand, or local governments or agencies, on the other hand (nevertheless, some key instruments require coordinated international action).

[EST! Environmentally sustainable transport. Futures, strategies and best practices. Synthesis Report, 2000, 42]

These features of internalisation tools are of essential importance, because they determine its effectiveness.

As we can see, the problem of the external costs of transport is becoming more and more complex and urgent. Steps aimed at reducing and internalising these costs are being taken both at international and national level. This article presented some instruments aimed at changing the present situation and creating sustainable transport. The problem is

that these instruments are often only found in documents. Some of them are either not implemented or not executed. Furthermore, it may happen that activities undertaken at international level are not reflected in the activities of national or local governments.

One crucial issue in the development of sustainable transport is awareness. Not only international organisations and national and local governments should be aware of the threat from unsustainable transport, but also people: society as a whole and particular individuals. Sets of internalisation instruments can be effective when organisations, governments and society work together. Otherwise, the results may well be similar to the present situation – a lot of documents, projects and conferences, but with very limited practical effects.

The conclusion is that the negative effects of the development of transport can be controlled only in a situation where society as a whole is aware of the need for sustainable transport and takes appropriate steps. In this case, instruments could be implemented which reduce the external costs of transport. Both of the following types of tools are important: those having a general impact and specialised tools influencing a specific element of the transport system. Such a set of internalisation instruments will be effective given that we all accept and understand their significance. Sustainable transport is necessary to keep our world healthy for following generations.

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