External Costs of Transport in Central and Eastern Europe
Forewords

Transport issues loom high in the agendas of our Member States of Central and Eastern Europe. Governments are quite right in assigning priority to question of transport infrastructure as a prerequisite for further economic development.

Yet, at the same time they need to be fully aware of the external costs with their decisions to implement transport systems entail.

They can, of course, facilitate their work by paying close attention to the experience of more advanced countries and try to avoid moving into directions that will put avoidable strain on the environment.

I am, indeed, very pleased that the CEI Task Force on Environment and Transport has prepared this pilot study which might be of assistance to planners and decision makers in our Member States and lead to a stronger involvement of this Task Force into the elaboration of concrete policies striking the proper balance between the costs, including the external ones, and the benefits of projects coming up for implementation.

Ambassador Dr. Harald Kreid
Director General
CEI – Executive Secretariat

Current and projected transport trends in Central and Eastern Europe are not sustainable and cause severe environmental and health damage. Transport-related accidents, air pollution, noise, climate change impacts, etc. generate large social costs. These costs are usually not covered by the users, but have to be borne by the whole society. Consequently, ignoring these externalities results in market inefficiencies that favour more harmful transport modes.

Knowing these external costs is a prerequisite to develop strategies for their internalisation, and thus for making progress towards sustainable transport - a key issue on the transport policy agenda. External costs of transport have not been assessed for Central and Eastern Europe, and thus an important element of policy-making was missing.

Following the CEI Ministerial Declaration “Towards Sustainable Transport in the CEI Countries” and the OECD/UNEP Initiative on Environmentally Sustainable Transport in the CEI region, the OECD Environment Directorate, supported by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, launched this pilot study on “External Costs of Transport in the CEI” under the auspices of the CEI Working Group on Environment and its Task Force on Environment and Transport. This initiative aims to facilitate sustainable transport policies by providing – for the first time detailed data on external costs of different transport modes in the Central and Eastern European countries.

This brochure summarises the main results of the study including current and projected future external costs as well as conclusions and recommendations for policy. It also provides an overview of the activities of the CEI Working Group on Environment and its Task Force on Environment and Transport. We hope these information tools will serve as a basis for improving the assessment of externalities and developing strategies towards their internalisation, thus contributing to environmentally sustainable transport in the CEI region.

Peter Wiederkehr
Administrator, Sustainable Transport Programme

Robert Thaler
Chair of the Working Group Environment and its Task Force Environment and Transport
Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, Vienna.
Editorial

This brochure “est goes east! – External Costs of Transport in the CEE Countries” was prepared on behalf of the Organisation for Economic Cooperation and Development (OECD) and the Austrian Ministry of Agriculture, Forestry, Environment and Water Management in cooperation with the Central European Initiative (CEI). The brochure summarises the main findings of the basic study on External Costs of Transport in Central and Eastern Europe was commissioned by OECD and the Austrian Ministry of Agriculture, Forestry, Environment and Water Management, elaborated by INFRAS Consult, Zürich and HERRY Consult, Vienna under the auspices of the CEI Working Group Environment and its Task Force Environment and Transport as Steering Committee.

The study was commissioned before the access of the State Union of Serbia and Montenegro and could therefore not take into account the external costs of transport in this country due to data and time restriction. This will be done in the frame of a possible follow up.

Conception, Project Management and Editorial:

OECD Environment Directorate
Dr. Peter Wiederkehr
Austrian Ministry of Agriculture, Forestry, Environment and Water Management
Division for Transport, Mobility, Human Settlement and Noise
Robert Thaler, Renate Nagy

Both brochures are available at the following contact address:

Federal Ministry of Agriculture, Forestry, Environment and Water Management
Division V / 5
Ms. Renate Nagy
Stabenhalle 5, A-1010 Wien
e-mail: Renate.Nagy@bml.fuw.gv.at
Fax: 00431-51522-7208

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**Introduction and Background**

**Transport trends and future options**
**In the CEI Countries**

Present mobility patterns of passenger and freight transport in Western as well as in Central and Eastern Europe do not correspond to the objectives of sustainable development. Road freight and car traffic have increased tremendously. In contrast, non-motorised modes, public transport and rail freight transport experienced a substantial decrease. Some facts on transport trends in the CEI countries:

- Since 1989, rail has lost more than 46% of its passenger transport volume.
- In most of the CEI countries, the number of cars per 1,000 inhabitants grew fast in the last years. In the mid-1990s the road vehicle fleet in the CEI countries varied from 18 passenger cars per thousand inhabitants in Albania to 327 passenger cars per thousand inhabitants in Slovenia.

Furthermore, the long term outlook for the next decades projects further considerable growth in road transport and aviation and thus decreasing shares of the other modes, like rail, inland waterways (see Figure 1);

- Car traffic will almost double and freight transport will more than double by 2010.
- On the other hand, public transport will be only slightly higher than in the mid-1990s, but below the 1989 level.

- Technological progress, especially for road vehicles, will result in a reduction of emissions of volatile organic compounds and particulate matter. However, NOx emissions will be higher than in 1995 and CO2 emissions from transport in 2010 will increase by 50%.

**Figure 1: Growth of road traffic – projected trends versus EST scenarios (1995-2010)**

In the 1997 “Declaration Towards Sustainable Transport in the CEI Countries”, ministers recognised the strategic position of the region as the “traffic junction of Europe” with a high potential for increases in transport volumes, particularly road transport, and related environmental impacts. Therefore, there is an urgent need for developing sustainable transport policies that meet environmental, social and economic objectives at equal levels. To this end, a new target-oriented approach will be needed that places environmental and health issues high on the transport policy agenda to ensure full integration of environmental concerns into the transport sector.

To help address these problems and explore future transport options compatible with the requirements of sustainable development, the pilot study “Environmentally Sustainable Transport in the CEI Countries in Transition” was initiated by the United Nations Environment Programme (UNEP), the Environment Directorate of the Organisation for Economic Co-operation and Development (OECD), and the Austrian Federal Ministry for the Environment, Youth and Family, Division for Transport, Mobility, Regional Planning and Noise Protection.

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**Definition of Environmentally Sustainable Transport (EST)**

A sustainable transport system is one that (i) provides for safe, economically viable and socially acceptable access to people, places, goods and services; (ii) meets generally accepted objectives for health and environmental quality (e.g. those set forward by the World Health Organization for air pollutants and noise); (iii) protects ecosystems by avoiding exceedence of critical loads and levels for ecosystem integrity (e.g. those defined by the UNECE for acidification, eutrophication, and ground-level ozone; and (iv) does not aggravate adverse global phenomena such as climate change and stratospheric ozone depletion and the spread of persistent organic pollutants.

Therefore, an EST system is one where transportation does not endanger public health or ecosystems and meets needs for access consistent with (a) use of renewable resources below their rates of regeneration, and (b) use of non-renewable resources below the rates of development of renewable substitutes.
Environmentally sustainable transport (EST) does not mean less transport than we have today, but it does mean different transport from what it would be under projected trends (see Figure 2).

EST would require for passenger transport a substantial increase of public transport, including innovative mobility services combining public transport and car sharing and more than doubling of rail passenger transport. Due to significant technological progress and today’s rather low share of car traffic in most of the CEI countries compared to Western Europe, the use of passenger cars could increase considerably in the CEI region.

Achieving EST would require that freight transport volumes by rail and inland shipping would have to be nearly doubled. Achieving EST will also require a return to the modal splits for passenger and freight transport of the mid-1990s. Half of the efforts towards achieving EST would come from technological advancements in cars and lorries, fuels and infrastructure; the other half from making transport “smarter” through mobility management and modal shift to improved public transport, innovative mobility services and improved rail and intermodal freight logistics.

**Health and environmental impacts of transport and related external costs**

Transport in Central and Eastern Europe is experiencing great changes. Growth of the economy between 5.0% to 5.0% p.a. which has led and still leads to high growth rates in traffic volumes, especially road transport (see Figure 2).

Due to change of modal share towards road transport, projected trends of future volumes of rail transport will not increase as much as road traffic or aviation. In the EST scenario however, the future volumes of rail traffic will increase as much as aviation and more than road transport due to the change of modal share in favour of public transport.

The high growth rates of traffic volumes induce increased infrastructure demand, might generate unwanted side effects such as accidents and environmental problems (noise, air pollution, climate change) and related costs.

These costs of environmental and health impacts caused by different modes (cars, trucks, airplanes, ships and trains) not covered by the users should be evaluated in monetary terms.

These so called external costs of transport are important indicators revealing market inefficiencies in the transport sector. They represent costs not paid by users, leading to suboptimal prices and inefficiently high traffic volumes.

External cost evaluations supplement national transport data and are an important (quantitative) basis for policy decisions. The level of external costs strongly suggests the need for internalisation strategies, i.e. setting investment priorities and efficient pricing in the transport sector.

A recent study commissioned by the International Railway Union (UIUC) estimated accident, environmental and congestion costs for Western Europe. Total external costs (accidents and environmental costs) amounted to 530 billion € in 1995, or 7.8% of the total GDP in the EUR 17 region (EU countries, Norway, Switzerland).

Accidents are the most important single cost category with 29% of total costs. Air pollution and climate change costs
amounted to 48%. The costs for nature, landscape and urban effects are also significant. Costs generated by upstream processes (i.e. energy, fuel productivity distribution, vehicle manufacturing, etc.) are significant too (11%). They are strongly related to air pollution and climate change effects. Two thirds of the costs are caused by passenger transport and one third by freight transport. The highest share of external costs comes from road transport, causing 92% of total costs. Air transport causes 6% of total external costs, while railways and waterways cause much lower external costs, 2% and 0.5% respectively.

Definitions

- **Social costs**: Social costs of transport comprise all costs, which transport generates and which are borne by society. They consist of internal and external costs.

- **Internal costs**: Internal costs, or private costs, are those borne directly by the individual user of transport services. For example, for road transport, these costs include car purchase, fuel, maintenance, taxes, charges and the cost of travelling time.

- **External costs**: External costs are part of social costs not borne by those generating them, but by the society at large. Typical examples are noise and air pollution, which adversely affect the public and are not (or only partly) compensated for by transport users.

Background and objectives

For Central and Eastern European countries external costs of transport had not been assessed bill now. Thus, an important element for policy-making was missing. For this reason, the OECD, Environment Directorate and the Austrian Ministry of Agriculture, Forestry, Environment and Water Management have launched the study “External Costs of Transport in Central and Eastern Europe” under the auspices of the CEI Working Group on Environment and its Task Force on Environment and Transport. The study takes into account the latest expertise as regards external cost calculations and provides first estimates of comparable and quantitative figures for Central and Eastern Europe [INFRAS/HERRY 2002].

This study was part of the joint OECD/UNEP initiative on environmentally sustainable transport (EST) for CEI countries. It is a first attempt to provide estimates of total and average external costs of accidents and environmental impacts on a country-by-country basis and for individual modes of transport with a view to developing a quantitative monetary basis for internalisation strategies.

This study on transport externalities is a contribution to the implementation of the CEI Ministerial Declaration Towards EST in the CEI Countries, where Ministers highlighted the need of assessing externalities and developing internalisation strategies for fair and efficient pricing to make transport pay its full costs.

Methodology

For reasons of comparison, the cost estimates are based on the actual state-of-the-art methodology in Western Europe. It uses the most recent available transport data on the status and trends for different transport modes [OECD, ECMT; other sources].

This study uses the methodology developed for the UIC study mentioned above [INFRAS/IWWW 2000] and provides first estimates of accidents and environmental costs for different transport modes and individual countries.

In addition, it uses the OECD data on transport and environment and the quantitative figures provided in the respective study [OECD/UNEP 1999]. Based on this approach it is also possible to compare the results between Western and Eastern Europe. Table 1 gives an overview of the cost components considered and the method used.
### Table 1: Overview of external cost categories

<table>
<thead>
<tr>
<th>Type of effect</th>
<th>Cost components</th>
<th>Method</th>
<th>Data base</th>
<th>Type of externality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents</td>
<td>Additional costs of:</td>
<td>The value of human life is estimated by using studies on willingness to pay to reduce accident risks.</td>
<td>Accident rates per country (ECMT statistics).</td>
<td>Partly external (part which is not covered by individual insurance).</td>
</tr>
<tr>
<td></td>
<td>- medical care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- economic production losses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- suffer and grief.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air pollution</td>
<td>Damage (opportunity costs) to:</td>
<td>PM$_{10}$ dose response functions are the basis for estimating the repair and damage costs.</td>
<td>Emission levels per transport mode (OECD data).</td>
<td>Fully external.</td>
</tr>
<tr>
<td></td>
<td>- human health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- material/buildings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- biosphere/crop losses.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Climate change</td>
<td>Damage (opportunity costs) due to global warming.</td>
<td>Avoidance costs to reach the Kyoto targets for each country.</td>
<td>CO$_2$ emissions per transport mode (OECD data).</td>
<td>Fully external.</td>
</tr>
</tbody>
</table>

### Table 2: Socio-economic data of the CEI countries in 1995

#### Basic Socio-economic Data

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP (billion US$)</th>
<th>Population (million)</th>
<th>GDP per Capita (US$/capita)</th>
<th>GDP per Capita PPP (US$/capita)</th>
<th>Surface area (km$^2$)</th>
<th>Population density (Pers./km$^2$)</th>
<th>Total external costs (million Euro/year)</th>
<th>External costs compared to GDP (% of GDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albania</td>
<td>2.50</td>
<td>3,248,836</td>
<td>770</td>
<td>2,853</td>
<td>113.0</td>
<td>28,748</td>
<td>283,9</td>
<td>15%</td>
</tr>
<tr>
<td>Belarus</td>
<td>10,34</td>
<td>10,280,805</td>
<td>1,006</td>
<td>4,398</td>
<td>207,595</td>
<td>49,5</td>
<td>1,664,7</td>
<td>21%</td>
</tr>
<tr>
<td>Bosnia-Herzegovina</td>
<td>1.90</td>
<td>3,400,000</td>
<td>559</td>
<td>1,433</td>
<td>51,129</td>
<td>66,5</td>
<td>120,8</td>
<td>8%</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>13,10</td>
<td>8,406,100</td>
<td>1,558</td>
<td>4,604</td>
<td>110,994</td>
<td>75,7</td>
<td>1,440,2</td>
<td>14%</td>
</tr>
<tr>
<td>Croatia</td>
<td>19,24</td>
<td>4,776,000</td>
<td>4,029</td>
<td>3,972</td>
<td>56,538</td>
<td>84,5</td>
<td>984,9</td>
<td>7%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>52,04</td>
<td>10,330,800</td>
<td>5,037</td>
<td>12,366</td>
<td>78,864</td>
<td>131,0</td>
<td>6,996,1</td>
<td>18%</td>
</tr>
<tr>
<td>FYR Macedonia</td>
<td>3,11</td>
<td>1,966,033</td>
<td>1,583</td>
<td>4,058</td>
<td>25,713</td>
<td>76,5</td>
<td>266,9</td>
<td>11%</td>
</tr>
<tr>
<td>Hungary</td>
<td>44,47</td>
<td>10,229,000</td>
<td>4,307</td>
<td>9,064</td>
<td>93,030</td>
<td>110,0</td>
<td>4,451,0</td>
<td>13%</td>
</tr>
<tr>
<td>Moldova</td>
<td>1.70</td>
<td>4,338,799</td>
<td>392</td>
<td>1,547</td>
<td>33,700</td>
<td>128,7</td>
<td>234,6</td>
<td>18%</td>
</tr>
<tr>
<td>Poland</td>
<td>127,30</td>
<td>38,587,600</td>
<td>3,299</td>
<td>7,004</td>
<td>312,685</td>
<td>123,4</td>
<td>12,608,7</td>
<td>13%</td>
</tr>
<tr>
<td>Romania</td>
<td>31,90</td>
<td>22,681,000</td>
<td>1,406</td>
<td>4,431</td>
<td>238,391</td>
<td>95,1</td>
<td>3,134,7</td>
<td>13%</td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>17,38</td>
<td>5,363,676</td>
<td>3,240</td>
<td>7,400</td>
<td>49,036</td>
<td>109,4</td>
<td>1,696,5</td>
<td>13%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>18,70</td>
<td>1,983,012</td>
<td>9,431</td>
<td>12,500</td>
<td>20,255</td>
<td>97,9</td>
<td>1,403,4</td>
<td>10%</td>
</tr>
<tr>
<td>Ukraine</td>
<td>25,33</td>
<td>51,276,556</td>
<td>494</td>
<td>2,361</td>
<td>603,700</td>
<td>84,9</td>
<td>4,431,1</td>
<td>23%</td>
</tr>
<tr>
<td>Total CEI</td>
<td>369,21</td>
<td>176,868,197</td>
<td>2,087</td>
<td>5,137</td>
<td>1,910,378</td>
<td>92,6</td>
<td>39,697,6</td>
<td>14%</td>
</tr>
</tbody>
</table>

**Sources:**
1. *European health for all database, WHO Regional Office for Europe, Copenhagen, Denmark.*
2. [World Bank](https://data.worldbank.org/)
3. OECD 1999 (area data).
4. *Statistisches Bundesamt, Statistisches Monatsheft 1/2008, p. 72 (Deutschland, Landkreis Hamburg).*

**Remarks:**
2. *GDP data for Albania, Bosnia-Herzegovina, Bulgaria, and Romania taken from [World Bank](https://data.worldbank.org/).*
3. *GDP PPP per capita for Bosnia-Herzegovina estimated based on GDP/GDP PPP ratio of FYROM.*

**Definitions:**
- **GDP (PPP):** Gross domestic product in US$. The total output of goods and services for final use produced by an economy, by both residents and non-residents, regardless of the allocation in domestic and foreign accounts. Use of export prices and some export values not included in the value of the products. It is calculated without making adjustments for depreciation of fabricated assets and depletion and degradation of natural resources. Data are in current US$ dollars. Dollar figures for GDP are measured from domestic accounts using single year official exchange rates (US$ = 0.6447 EUR in 1993). Source: WorldBank.

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Cost estimates are based on a value transfer method using results from the study for Western Europe [INFRAS/1WW 2000]. In order to transfer unit values estimated for Western European to CEI countries, a specific value adjustment procedure, based on GDP per capita and Purchasing Power Parity adjustment was applied.

The assumption was made that income elasticity of the willingness to pay approach is close to one.

For accident unit costs for example, the unit risk value was calculated for CEI countries using GDP/capita value in each CEI-Country and adjusting them according to purchasing power parities (PPP).

Results for 1995

The cost estimates for the CEI regions for the base year 1995 show that there are significant externalities due to accident fatalities and due to environmental impacts of the transport sector.

Total external costs amounted to approx. 40 billion Euro in 1995, being almost 14% of total GDP in CEI countries. Two cost categories are predominant:

- about half of the total of 40 billion Euro are due to external accident costs,
- more than 40% are costs caused by air pollution.

Figure 4: Total external costs in 1995 by cost category and transport mode

Figure 5 illustrates the relative share of total external costs by transport mode and cost category. The contribution of road transport differs among the various cost categories from 75% (air pollution) to almost 100% (accidents).

Climate change costs are estimated to be relatively low, mainly due to the assumption, that avoidance costs of the CEI countries to reduce CO₂ emissions to meet Kyoto targets are rather low.

Passenger cars are responsible for around 40% of total costs, road freight transport (light and heavy duty vehicles) for some 30%.

Road transport is the predominant mode and accounts for 87% of total costs. While accidents costs are predominant for passenger cars, the PM₁₀ emissions of diesel engines of trucks are mainly responsible for the high share of air pollution costs in road freight transport.
External costs of rail transport are very low. However, air pollution health costs are important in the rail sector due to the high share of diesel locomotives and the fossil fuel based production of electricity that causes pollutant emissions. The costs from aviation are much lower than road transport but quite significant for air cargo. Costs have been estimated by taking into account only the LTO-cycle (Landing – Take-off cycle) while cruising altitudes were not considered where significant climate effects occur.

The cost ratio between road and rail clearly indicates the lower costs incurred by railways. Also in the CEI countries, the railways perform significantly better, if one compares average costs of passenger and freight transport. It is worth noting however, that the environmental performance of railways has to be improved substantially to reduce today’s high diesel shares and fossil fuel based electricity production.

External costs of road freight are 5.6 times higher than for rail freight. Those for road passenger transport are 3 times higher than passenger transport by rail.

In passenger transport, motorcycles have the highest average cost value with 166 € per 1,000 pkm. Average costs of passenger cars amounted to 33.3 € per 1,000 pkm. Rail transport generates approximately one third of the passenger car value (12 € per 1,000 pkm). In road transport accident costs are the predominant cost factor, followed by air pollution. In freight transport, external costs of road freight transport are significantly higher than all other means of transport. The external costs for road freight transport amounted to 44 € per 1,000 t·km, which is 5.6 times higher than the average external costs.

Figure 6: Average external costs of passenger transport in 1995 by cost category and mode

Road transport has the highest level of average external costs per passenger km.

Figure 7: Average external costs of freight transport in 1995 by cost category and mode

Air pollution costs are predominant in freight transport.
The levels of external costs vary from country to country, depending on GDP levels, population densities and traffic volumes in urban areas, and diesel share in the rail sector (see Figure 8).

Figure 8 presents total external costs of individual countries in the CEI region. The highest contribution with regard to GDP occurs for Poland (32%), followed by the Czech Republic (18%), Hungary (11%) and the Ukraine (11%).

Total costs per capita show quite a broad range among the countries. The most important driving factor is economic performance and population density. Therefore, the costs for the Czech Republic, Hungary, Poland, the Slovak Republic and Slovenia are up to three times higher than the CEI average.
The following Figure 9 and Figure 10 show the results for average external costs for road and rail transport, differentiated for passenger and freight.

In all countries, average road freight costs are much higher than the average costs for road passenger transport.

Figure 9: Average external costs of road transport in 1995 by country

The share of diesel traction on the one hand and the electricity mix on the other hand are the most important factors explaining the differences of average external costs of rail transport in CEI countries.

For rail transport the results show that rail passenger average external costs are higher than for rail freight in all countries. This result is contrary to road and is mainly due to higher efficiency of rail freight transport.
Outlook 2010

A forecast of external costs for 2010 was developed in order to get a first picture of future trends and their impacts in the CEI region. Two scenarios were developed:

- A trend projection with likely changes in technologies and environmental requirements (Business-As-Usual scenario).
- A scenario for Environmentally Sustainable Transport (EST) according to the OECD EST project considering high economic growth, best available technology, mobility management and modal split changes in favour of rail and public transport i.e. a combination of improved technology and modal shift.

The outlook for the year 2010 used the cost factors developed for the base year 1995 and the projections of traffic volume and emission for both scenarios for the CEI region.

Trend scenario 2010

A rough trend outlook for 2010 indicates that external costs will rise significantly due to economic growth (which is predominant for the increase of damage valuations) and traffic growth, especially in road transport and aviation. Total external costs will increase by 38% between 1995 and 2010 amounting to 60 billion Euros. A major factor is the increase of transport volume and GDP per capita. The highest growth rates are estimated for road transport (cars +57%, trucks +107%) and in aviation (+68%). The costs for rail passenger transport will increase much less (+19%). For rail freight transport, they even will decline due to the reduction of PM10 emissions. All impact cost categories will increase (between 45% and 70%). Most dominant is the increase of climate change and noise costs, since no significant technological progress can be expected to be implemented within the period considered. Average costs however decrease (mainly in the freight sector), due to the reduction of PM10 emissions from diesel engines.

EST scenario 2010

Under EST conditions the total external costs are likely to be stabilised at 1995 level and may only slightly increase by 7% between 1995 and 2010 to 42 billion Euro. As for the trend development, a major factor for this increase is the growth of total transport volume and GDP per capita. Technical progress however would outweigh the increased traffic volumes. The mode specific changes differ quite significantly. Road transport costs might increase by 12% compared to 1995. Rail transport costs however would decrease.

Average costs of EST in 2010 would decrease significantly compared to 1995 and 2010 trend levels. Most important is technical progress in the field of air pollution.

Reduce external costs under EST

Realising EST would lead to considerably lower health and environmental costs of transport compared to the BAU trends (see Figure 11). Health and environmental externalities (i.e., unpaid costs of transport users) in the CEI countries represent approximately 14 per cent of total GDP in 1995 and in 2010 under the BAU scenario, but less than 10 per cent under the EST scenario, assuming a 60 per cent growth in GDP during period 1995 to 2010.

Figure 11: External costs of transport in the CEI region for BAU and EST
Conclusions from the outlook 2010

The outlook for 2010 based on the two scenarios (i.e. the BAU trend and the environmentally sustainable transport - EST) suggests the following:

- External costs will increase, although there are technical improvements. The main reasons are increasing transport demand and with economic growth. The latter does not affect the share of external costs to GDP since it is assumed that economic growth leads to higher willingness to pay for safety and environmental improvements.

- A policy path implementing best available technology and improving modal share towards rail as well as public transport is a promising approach to reduce external costs of transport.

- The EST scenarios are focusing on environmental impacts, but implicitly address energy and safety issue due to a more balanced modal split towards rail as well as public transport. A significant reduction of the external costs (esp. for road transport) however has to target accidents costs, being the predominant cost category. Thus, the EST scenarios could address more specifically possible safety improvements.

To summarize: a shift from the projected trends towards an EST scenario must be based on strong investments priorities towards rail and public transport in particular regarding infrastructure and rolling stock. Furthermore stringent measures to enforce technical improvements and pricing measures to finance this structural changes and modal shift will be necessary.

Comparison with Western Europe

Since the methodology for the CEI countries is strongly based on the methodology developed in the UIC study for Western Europe [INFRA'S/IIW 2000], it is possible to compare the results with Western Europe. The following observations are interesting:

- External costs per GDP are higher in the CEI countries (14% of GDP) than in Western Europe (8% of GDP). This indicates a relatively higher economic importance of accidents and environmental problems in the CEI countries relative to other economic activities.

- Accident costs are much higher in the CEI countries than in Western Europe. This is an indication of the differences of the safety performance, primarily of road transport.

- The share of road freight transport costs is much higher than in Western Europe. This is due to high emission levels of diesel engines and related particle emissions in CEI Countries.

- The cost ratios of road to rail in the CEI countries are similar to those in Western Europe. Also in the CEI countries, the railways perform significantly better than road transport, if one compares average external costs of passengers and of freight transport. The external costs for road freight transport are 3.6 times higher than for rail freight transport. Those for road passenger transport are 3 times higher than for passenger transport by rail. It is worth noting however, that the environmental performance of the railways is worse than in Western Europe, due to high diesel shares and the fossil fuel based electricity production.

- The external costs of the aviation sector in Eastern Europe is smaller than in Western Europe. The reason for this is primarily the assumption of lower population density around airports and the lower unit costs for climate change emissions, since the CEI countries might have lower avoidance costs to reach the Kyoto targets.

- The relative growth rate of external costs in the trend scenario in Eastern Europe (+58%) is higher than in Western Europe (+42%), due to higher economic and transport growth. The technical potential for improving environmental performance is more significant in Eastern Europe (esp. with regard to PM10 emissions); thus, the performance of the EST scenario shows significantly reduced average costs.

Range of uncertainty

It is important to note that the figures presented should be used with caution and are to be considered as first estimates for Central and Eastern Europe. The sensitivity analysis has shown that the range of uncertainty is very high, especially if one would like to compare different countries and different cost elements of different transport modes. It is therefore recommended to use the results primarily at the aggregate level for the entire region. The uncertainty range per cost category varies between -30% up to +100% of the values shown.
Conclusions

Today’s externalisation of environmental and health costs in transport lead to market distortions and inefficiencies in the transport sector and favour unsustainable transport modes and modal patterns. Therefore, it is strongly recommended to undertake estimations of external costs and to incorporate them into decision-making, mainly for setting investment priorities and for pricing decisions. In particular external costs should be included when evaluating transport investments, i.e., infrastructure investments for different modes.

Monetary evaluation of impacts and investment priorities

Based on the general cost structure of the externalities, the following recommendations can be made to reduce external costs:

- **Specific safety programmes** (improving road infrastructure) and **improvements of the existing insurance system** will improve the traffic safety situation, as accidents are the pre-dominant cost category of road transport. From a pricing point of view, the increase of liability amounts and the differentiation of insurance premium according to individual risk performance of car drivers might be one of the most effective measures.

- **A fast introduction and implementation of European emission standards** and retrofitting existing diesel engines would reduce road transport air pollution and related costs. Such a policy could be strengthened by the differentiation of existing taxes according to their environmental performance to give incentives for the use of environmentally friendly cars.

- **A programme for the revitalisation of railways** through targeted investments is essential in order to increase the share of railways and to benefit from the higher environmental performance (i.e., the lower average costs). Such a programme should improve the quality of road and railway transport (infrastructure and operation) and the environmental performance as well. The electrification of diesel trains and the retrofitting of existing diesel locomotives (for example using particle filters and low sulphur fuels) are important strategies.

Cost-benefit analysis

Cost-benefit analysis can be an economic tool for supporting decisions on larger infrastructure investment projects from a public policy point of view. In order to apply comprehensive cost-benefit analysis appraisals, the external costs (accidents, environmental and health unit costs) should be considered as well. This study provides a first basis for including them by using the figures for each mode and each country of the CEE region.

Pricing of transport

For pricing purposes, one should include other cost elements (such as congestion costs, infrastructure costs and related revenues) as well. Nevertheless, the figures presented for accidents and for environmental costs can be used as proxies for an externality price which is able to internalise these cost elements. For road transport for example, appropriate average charges would be:

- 3.3 Eurocents per passenger and kilometre for passenger cars, and
- 4.4 Eurocents per tonne and kilometre for trucks and light duty vehicles. Expressed in costs per vehicle kilometres, there is a range from 3.2 Eurocents (for light duty vehicles) to more than 6.6 Eurocents (for heavy trucks). Expressed in tonne kilometres, light duty vehicles cause higher unit costs (due to low loading factors) than heavy trucks; they range from 1.0 Eurocent to 9.7 Eurocents.

External benefits of transport?

Economic theory suggests that the transport sector also generates numerous economic benefits which are very relevant for the functioning of the economy, and especially for trade. This is however not an argument or justification to subsidise transport or ignoring externalities (see for example ECMT 2000). External benefits are therefore not relevant for efficient pricing solutions.

Further research

This study is a first attempt to provide a quantitative basis for the monetary valuation of safety and environmental issues in the transport sector of the CEE countries. Due to lack of data, gaps in available statistics and missing valuation studies for the CEE countries, the study had to be based on a number of assumptions and apply a value transfer procedure from basic studies for Western Europe.

In order to improve this quantitative basis for assessing externalities in Central and Eastern Europe, further work is recommended:

- Specific studies on unit values and external costs in CEE countries (i.e., willingness to pay studies for risk reduction with respect to road safety and air pollution related health risks or noise).
- Improvement of the quantitative transport data and statistics (traffic volumes, load factors, emission data, etc.).
- Estimation of marginal costs for accidents, congestion, environment and infrastructure, based on the results of UNITE project of the European Union and application of these figures for corridor analyses.
- Estimation of total subsidies and congestion costs in CEE countries.
- Development of internalisation strategies and implementation plans for the CEE countries.
Footnotes

1 Source: OECD, UNEP, Austrian Ministry for Agriculture and Forestry, Environment and Water Management: Towards Sustainable Transport in the CEI Countries, Vienna, 1999

2 CEI countries: Albania, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, FYRO Macedonia, Hungary, Moldova, Poland, Romania, Slovak Republic, Slovenia, Ukraine. These countries were covered in the previous OECD reports and represent the CEI countries. Yugoslavia is not treated in this study, although it has also joined the CEI-Initiative in the mean time. This is due to lack of comparable transport and environmental data.

3 A summary of the pilot study “Environmentally Sustainable Transport in CEI Countries” including the definition of environmentally sustainable transport is contained in the brochure “est goes east” – Investments and partnership opportunities for EST (Vienna 2002). The synthesis report of the overall OECD EST project including good practice examples is also available as brochure.

4 External Costs of Transport: Accident, Environmental and Congestion Costs in Western Europe [INFRAS/IWW 2000]


6 Not considered were: congestion costs and other indirect effects.

7 Purchasing power parities (PPPs) are the rates of currency conversion that eliminate the differences in price levels between countries. Per capita volume indices based on PPP converted data reflect only differences in the volume of goods and services produced. Comparative price levels are defined as the ratios of PPPs to exchange rates. They provide measures of the differences in price levels between countries.

8 OECD, UNEP, Austrian Ministry for Agriculture and Forestry, Environment and Water Management: Towards Sustainable Transport in the CEI Countries, Vienna, May 1999

9 UNITE: Unification of accounts and marginal costs for Transport Efficiency

References


• ECMT: Efficient Transport for Europe, Paris 1998

• INFRAS/HERRY: External Costs of Transport in Central and Eastern Europe, Zurich/Vienna, December 2002

• INFRAS/IWW: External Costs of Transport – Accident, Environmental and Congestion Costs in Western Europe, Zurich/Karlsruhe, March 2000

• Neithorpe et al.: UNITE: Unification of Accounts and Marginal Costs for Transport Efficiency, funded by 5th Framework RTD Programme. ITS, University of Leeds, Leeds, April 2001

• OECD, UNEP, Austrian Ministry for Agriculture, Forestry, Environment and Water Management: Towards Sustainable Transport in the CEI Countries, Vienna, May 1999

CEI Ministeral Declaration Towards Sustainable Transport in the CEI Countries

CEI Declaration and EST Principles

The “Declaration Towards Sustainable Transport in the CEI-countries” has been elaborated by the CEI Subgroup “Environment and Transport” and was signed by the Ministers for environment of the CEI-countries (except Italy) on June 25th, 1997 in New York.

The Declaration includes the “Vancouver Principles for Sustainable Transport” (which have been recommended by the OECD Conference Towards Sustainable Transport in Vancouver 1996) and a definition of “Environmentally Sustainable Transport”.

The CEI Declaration recommends the following strategies and measures:

- Integration of the principles of sustainable development into transport policies and establishment of common guidelines for the attainment of a sustainable transport system.

- Development and adoption of environmental goals and standards for the transport system.

- Development, promotion and implementation of strategies and measures towards sustainable passenger and freight transport including assessments of the environmental, social and economic impacts of transport and infrastructure programs; strategies should distinguish between reducing the demand for motorised transport, inducing modal shifts towards less polluting transport modes, and finally, applying the best available technology.

- Development, promotion and implementation of strategies and measures by making transport pay its full costs by implementing of fair and efficient road pricing, internalising the transport related external costs and supporting the use of economic instruments.

- Special focus on solutions for particular sensitive areas, urban areas, transit corridors and post war areas.

- Co-operation and joint activities in particular for promoting environmental sound transport development within the CEI countries in order to achieve sustainable transport solutions.
CEI Working Group Environment and its Task Force on Environment and Transport

On 26/27 September 1996 the Environment Ministers of the CEI Countries decided at the CEI-Meeting of Environment Ministers in Graz, Austria, to found the CEI Sub-Group „Environment and Transport“. The Sub-Group on Environment and Transport was upgraded within the new CEI structure into the Task Force on Environment and Transport within the Working Group Environment in the year 2002. The Working Group Environment will focus on key environmental topics in its further cooperation activities, proposed by the CEI Member States, e.g.:

- Noise, Tourism, Water, Renewable Energy, Safety, Spatial Planning, Sustainable Consumption

The main activities of the Task Force on Environment and Transport focus on:

- Follow up the CEI-Ministerial Declaration „Towards Sustainable Transport in the CEI Countries” and the Joint Project „Environmentally Sustainable Transport (EST) in the CEI Countries in Transition“, supported by OECD, UNEP and Austria.
- „Study on External Costs of Transport in the CEI Countries“, supported by OECD and Austria and the CEI Group as a Steering Committee.
- OECD/UNEP/CEI Initiative “EST goes EAST“, designed to promote the implementation of the OECD Guidelines and Strategies across the CEI Region. The Task Force acts as Steering Group for this initiative.

A number of project proposals, e.g. Development of the Strategic Evaluation of the Environmental Impacts of Transport and Transport Infrastructure; Strategic Environmental Assessment of the Adriatic-Ionian Corridor; Strategic Environmental Assessment for the Danube Corridor; Concept for North Adriatic Sustainable Transport; Czech Pilot Study of Sensitive Boarder Areas; Guidelines for Implementation of alternatively-fuelled Buses in Hungary; Non-Motorised Passenger Intermodality; have been elaborated and applied for funding.

- Development of an EST information clearing house and network.
- Coordination and cooperation in other initiatives in the fields of transport and environment with the EC and EEA, UNECE and WHO (Transport, Health, Environment Pan European Programme THE PEP), OECD, UNEP

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Overview of recent publications in the field of transport, environment and health published by the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management.

The following brochures can be ordered at:

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