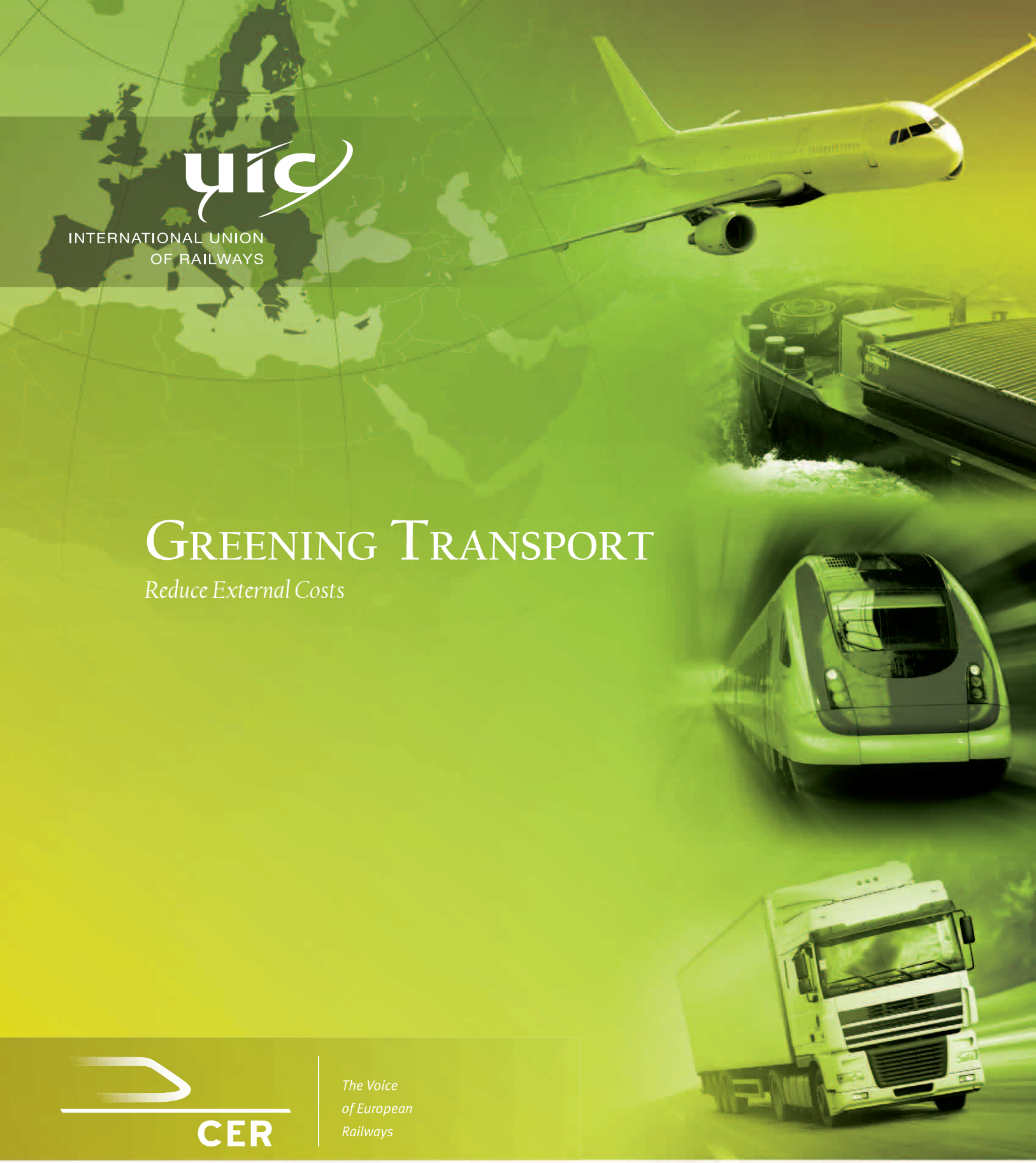


Greening Transport

Reduce External Costs

CER

The Voice of European Railways

June 2012

Purpose of this brochure

External costs are the subject of intense policy and political discussion and academic research. This brochure presents the rail sector's contribution to this debate, and reflects the latest thinking on the issue.

The brochure is in two parts. Firstly, it summarises the main results of a new study conducted by a team of established consultants (CE Delft, INFRAS and ISI) that quantifies these external costs of transport in the EU[1]. Secondly, it goes on to describe the ways in which European institutions and national governments are attempting to apply the concept of external costs to the transport sector. It concludes with proposals on how to further internalise external costs, as part of a move towards a more sustainable transport system.

1. **CE Delft, INFRAS, Fraunhofer ISI: 'External costs of Transport in Europe: Update study 2008'**. November 2011.
The study is available at: http://uic.org/IMG/pdf/external_costs_of_transport_in_europe-update_study_for_2008.pdf

The real price of transport for sustainable mobility and fair competition

Understanding the concept

We all know that many people die in road accidents every day. We are all subjected to the smell of exhaust fumes from vehicles. We have all observed congestion or been stuck in traffic jams. We regularly witness extreme weather events that experts say are being increased in their severity and frequency by the effects of climate change. We understand the dangers and downsides of transport. But when we take our car, we typically do not consider the resulting pollution, traffic congestion or the risks we subject ourselves and others to. These effects are external to the transport system because they are created by transport users but not paid by them.

For example, an individual travelling from A to B will consider the price of using public transport or his or her private car, and the convenience of the service provided (plus an array of other parameters such as speed, frequent/regular service, quality, flexibility, etc), before making their choice of transport mode. However, the crucial price element does not include the negative external costs such as accidents, air pollution, climate change or congestion. These costs are not supported and paid for by individual users but are borne by society as a whole. This means that the price of the private car is lower than it should be, distorting completion between modes, and incentivising the growth of road traffic.

What are external costs?

The new study took into account the following 10 external cost components, in order of importance (see total costs below). The study didn't take into account many other external costs such as electromagnetic effects or obstacle of infrastructures to water flows.

1 **Accidents costs** linked to traffic accidents including costs for material damages, administrative and medical costs, production losses and immaterial costs like lifetime shortening, suffering, pain and sorrow. The calculation of external accident costs is focused on the value of human life, production losses and other cost elements not covered by insurance, such as medical and administrative costs. Fatalities, slight and severe injuries are also considered. Material and immaterial costs together constitute the total social accident costs.

2 **Congestion** affects transport activity by increasing travel times, reducing reliability and raising operating costs.

3 The transportation sector's emissions of greenhouse gases such as carbon dioxide (CO2) or nitrous oxide (N2O) are second only to the energy sector in terms of total volume, and transport is the only sector which has seen an increase since 1990. These emissions contribute to global warming and **climate change** effects like rising sea levels, disruption to food production, increasing health problems, and biodiversity loss.

4 **Air pollution** generated by transport increases cardiovascular and respiratory diseases. It also has an effect on buildings and brings material damage, and crop losses. The most important air pollutants are particulate matter (PM10 and PM2.5), nitrogen dioxide (NOX), sulphur dioxide (SO2), volatile organic compounds (VOC) and ozone (O3).

5 Transport activities also cause indirect negative effects by means of **up- and downstream processes** such as emissions due to the production and distribution of fuel and electricity ('well-to-tank'), and the production, maintenance and disposal of both vehicles and infrastructure.

6 Transport **noise** causes physical and psychological harm to humans and leads to health impacts such as hearing damage for levels above 85dB(A), increased risk of cardiovascular diseases (heart and blood circulation), and could result in nervous stress for levels above 60dB(A), increased blood pressure, hormonal changes, and disrupt sleep quality.

7 **Additional effects in urban areas** are observed on non-motorised traffic participants such as pedestrians and cyclists. Time loss for pedestrians due to separation effects caused by rail/road infrastructure and scarcity problems such as the loss of space availability for bicycles due to high levels of vehicle use are examples of this.

8 Effects on **nature and landscape** include ecosystem loss due to 'sealed' areas of transport infrastructure, drastic change of landscape appearance, and loss of the ecological functions of soil such as absorption of rainfall, production of biomass, and storage of CO2.

9 Transport is the cause of **soil and water pollution** through emissions of heavy metals and polycyclic aromatic hydrocarbons and can for instance decrease soil fertility, pollute drinking water and damages wildlife habitat.

10 **Biodiversity losses** as a result of transport activities are also increasingly significant.

Assessing the external effects of transport

It is crucial to evaluate the negative external effects of transport. Whatever can be measured can be handled by measurable actions and consequently, can be improved. Indeed, many external effects are already well understood. For example, in the EU 27:

- In 2008, the transport sector emitted a total of 1 271 M tonnes of Greenhouse Gases (GHGs), which was 24.2% of total EU GHG emissions[2]
- Around 34 500 people were killed in road accidents in 2010[3]

The challenge for external costs analysis is to find a way to compare very different costs, in order to help decision makers to improve transportation policy decisions. To assess, evaluate and monetarise external effects of transport, the following process is used:

First, describe the phenomena. Second, where possible, quantify it. The third, completing step is to attribute monetary values to external effects, which allows the corresponding impacts to be more easily incorporated in economic cost-benefit analyses.

If it is possible to monetise external effects, comparisons can be made between their magnitude and relative impact. They can also be added together and added to internal costs to calculate the full costs. This allows for more consistent and equitable decision-making.

2. EU Transport in Figures 2011, pp118 and 119
3. Eurostat, Table ref: tsdtr420
http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tsdtr420&plugin=1

Monetising External Costs: Methodological Approaches

There are, broadly speaking, two steps used to assess external costs:

a. A «physical» approach, which expresses the relationships between transport activities and impacts on the environment, based on scientific knowledge; for example emissions of air pollutants by vehicle category.

b. An "economic" approach which takes quantity as its starting-point (e.g. number of deaths, quantities of crops destroyed and species disappeared) and applies unitary values to these quantities (value of a death, value of a crop).

For non-market goods, external costs are determined by methods that essentially aim to evaluate what individuals who suffer from the impact on the environment would be willing to accept in compensation (that is, the amount of financial compensation that victims would have demanded before they would "volunteer" to accept such damages).

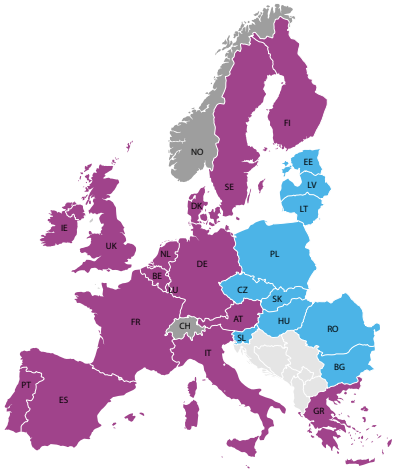
Two approaches in particular are used to determine the external costs of non-market goods:

a. Demand methods which aim at evaluating individuals' willingness to pay. They can be assessed through "revealed preference" methods based on a choice between greater or lesser degrees of pollution or nuisance (for example willingness to pay for a certain reduction of fatal crash to monetarise value for statistical life in accidents), or through asking questions about fictitious conditions ("stated preference" methods based on questions about intended behaviour).

b. The main supply method is known as the "cost of damage". It seeks to estimate the monetary cost of repairing the damage caused by the pollution or nuisance in question or of avoiding its effects.

The methods of revealed or stated preferences estimate the willingness to pay those who bear the nuisance; they deal with demand avoidance while repair costs deal with supply.

Figure 1: European countries included in the estimation of external costs



The scope of the study

Several studies have previously been undertaken in order to estimate the external costs of the European transport sector. One of these was the "External Costs for Transport in Western Europe" (Infras, 2000) presenting 1995 data, which was followed in 2004 by an update study (Infras, 2004) with 2000 data.

The study undertaken for UIC[4], summarised in this brochure, uses 2008 data and extends the geographical scope from Western European countries to also include the EU Member States Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, Romania, Slovenia and Bulgaria (see map in Figure 1).

Norway and Switzerland are also added, while Malta and Cyprus are excluded as these countries lack any railway infrastructure. Comparing the different studies that have been done, each one has developed better methodology, with more countries included and more externalities considered.

The new study is the product of an independent well-known consortium of consultants (CE Delft, Infras and Fraunhofer ISI) that also completed the 'Handbook on estimation of external costs in the transport sector' for the European Commission in 2008.

It is currently the most recent (representing scientific state-of the-art) and most comprehensive report related to the external costs, adding not only more European countries but also more external effect components into the analysis (ten, compared to the three 'principal costs' considered in the recent revision of the 'Eurovignette Directive' and compared to the two finally kept).

Above all, the results of this study can be used directly at operational level for anyone in charge of designing a new system of taxation or subsidy, in calculations of the socio-economic profitability of business plans for a new exploitation or the socio-economic return on investment of a new infrastructure.

The results of the study are prudent, if not under-evaluated: this is a tendency for many studies where the results imply a raised level of charging or taxation, which is never easily acceptable on a political level.

4. **CE Delft, INFRAS, Fraunhofer ISI: 'External costs of Transport in Europe: Update study 2008**'- November 2011
The study is available at: http://uic.org/IMG/pdf/external_costs_of_transport_in_europe-update_study_for_2008.pdf

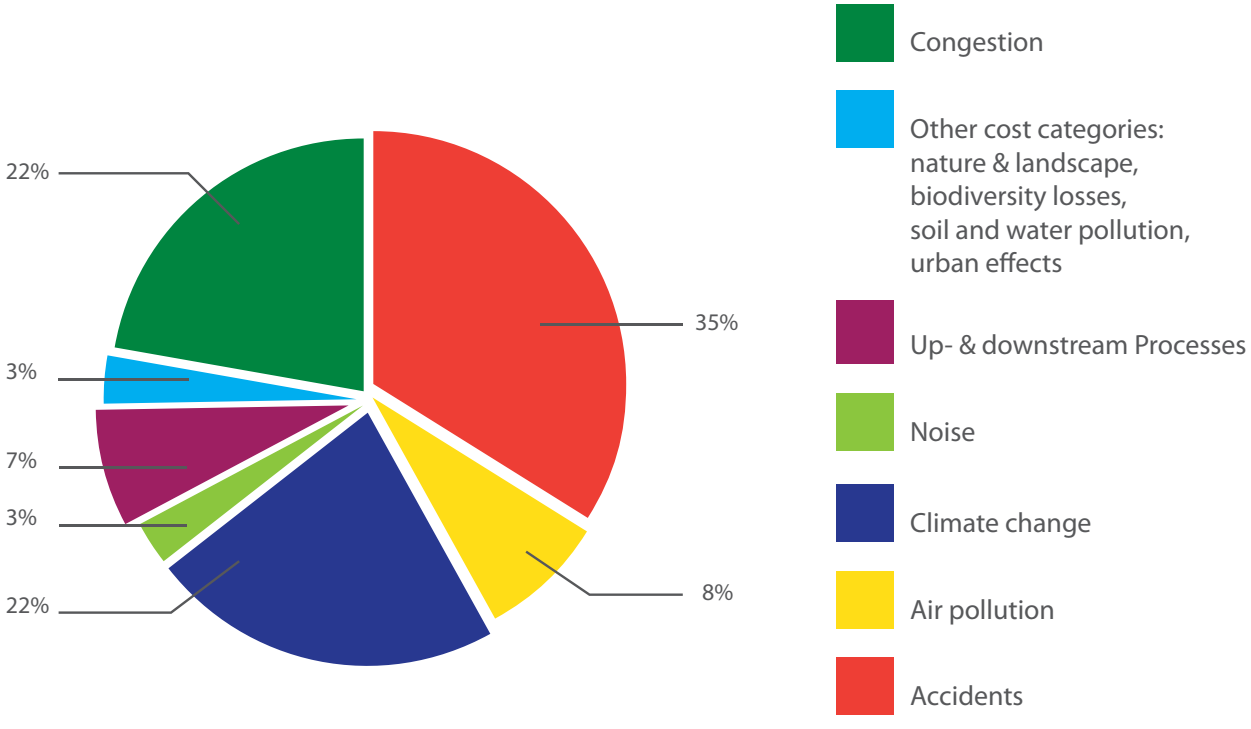
The main results

Total external costs

Total external costs for 2008 for the 27 European countries included here have been estimated at €510 billion, excluding congestion. Adding congestion in, the costs amount to €660-760 billion, depending on whether low or high congestion values are used. Accidents, congestion, climate change and air pollution represent 86% of total costs but other externalities should not be neglected (see Figure 2).

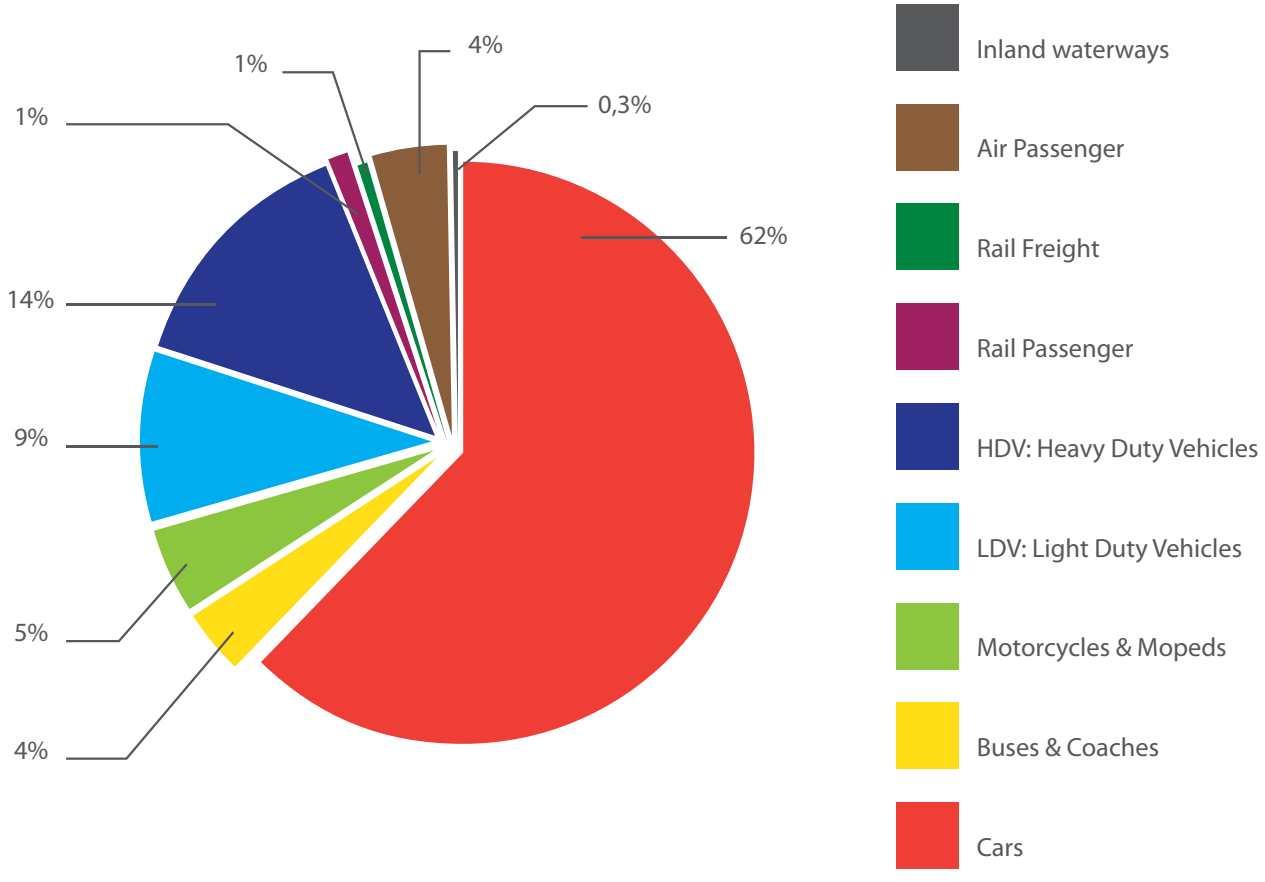
The total external costs represent 4% of the total GDP of the 27 countries considered in the study, excluding congestion. Congestion costs amount to 0.9%-1.9%, bringing the total impact of externalities to between 5% and 6% of GDP.

Figure 2: Total external costs of transport 2008 by externality



Turning to the relative impact of each mode, Figure 3 shows that the road sector users generate 93% of total external costs between them. Rail accounts for 2%, the aviation passenger sector 4% (only continental flights), and inland waterways (0.3%).

Figure 3: Total external costs of transport 2008 by transport mode

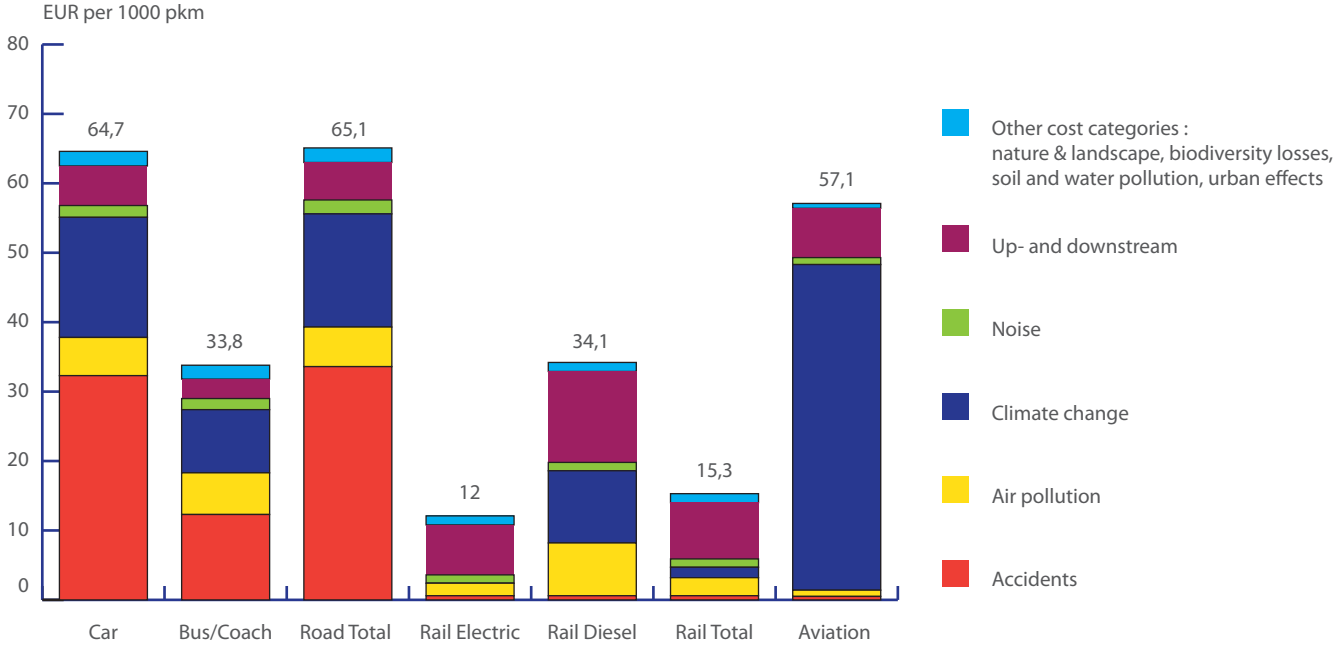


Average external costs

Total costs divided by traffic volumes indicate the average costs for each transport mode. It allows for an intermodal comparison, calculating the costs that could be avoided by means of shifting from one mode to another one with less external impact.

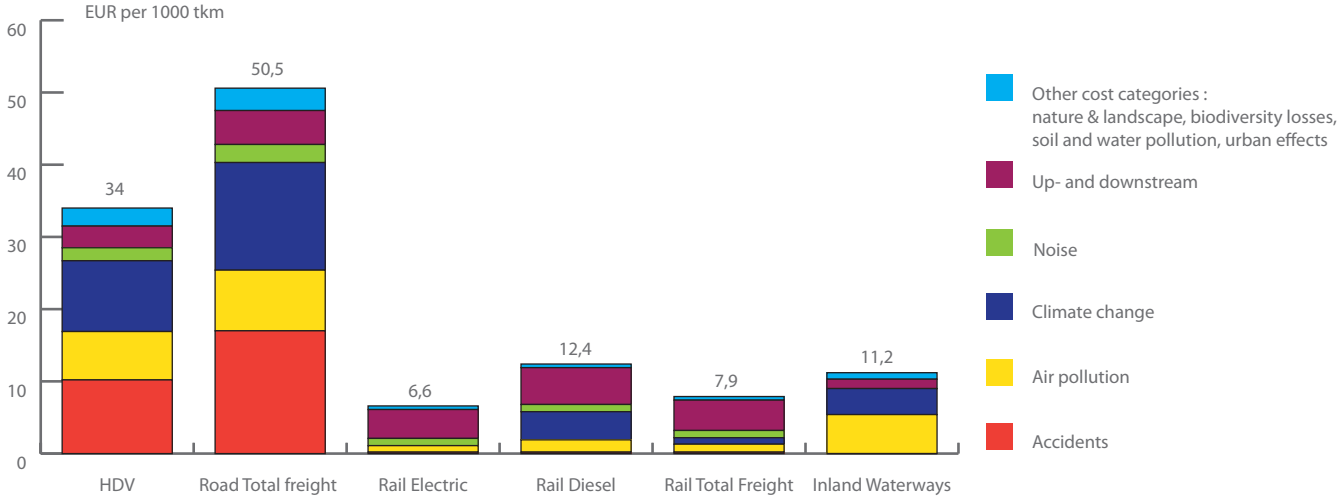
When considering the charts (Figures 4 and 5) it becomes clear that average external costs for road transport are more than four times higher than rail for passenger and more than six times higher for freight services (excluding congestion).

Figure 4: Average external costs 2008 for EU-27: passenger transport (excluding congestion)
without motorcycles and mopeds[5]



5. Motorcycles and mopeds not presented here. These modes are less in competition for long distance traffic.

Figure 5: Average external costs 2008 for EU-27: freight transport (excluding congestion)
without LDV[6]



6. LDV not presented here. These modes are less in competition for long distance traffic.

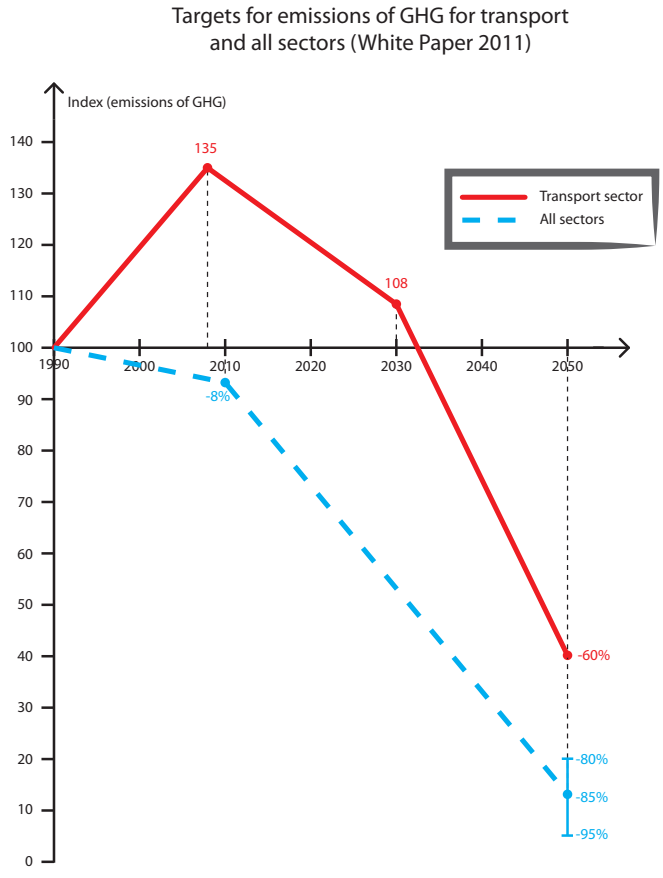
The transport sector, which is already lagging behind, needs drastic reductions based on high estimates

Of the different sectors, the transport industry is the second main source of emissions of greenhouse gases (GHG) in the EU after the energy sector, and it is the only sector where emissions have continued rising since 1990. The 15 pre-2004 EU member states have a common GHG reduction target of 8% under the Kyoto Protocol between 1990 and the period 2008-2012; and while they are on track to achieve this, it is not helped by the 33% increase in transport emissions across the EU-27 up to 2008.

In the Commission's 2011 Transport White Paper, "Roadmap to a Single European Area – Towards a competitive and resource efficient transport system", for the first time, two transport-specific goals on reducing GHG emissions are laid down, as part of the EU's aim of reducing overall emissions by 80%-95% by 2050. These are a reduction of -20% between 2008 and 2030, and of -60% between 1990 and 2050.

As the transport sector's emissions continued to increase between 1990 and 2008 and would remain on an upward trajectory if present trends continued, the efforts needed to meet the White Paper targets will be more profound and costly than if the general trend was downwards. For this reason all results are presented using a high climate change value in this study.

Graph 1: Targets for emissions of GHG for transport and all sectors (White Paper 2011)



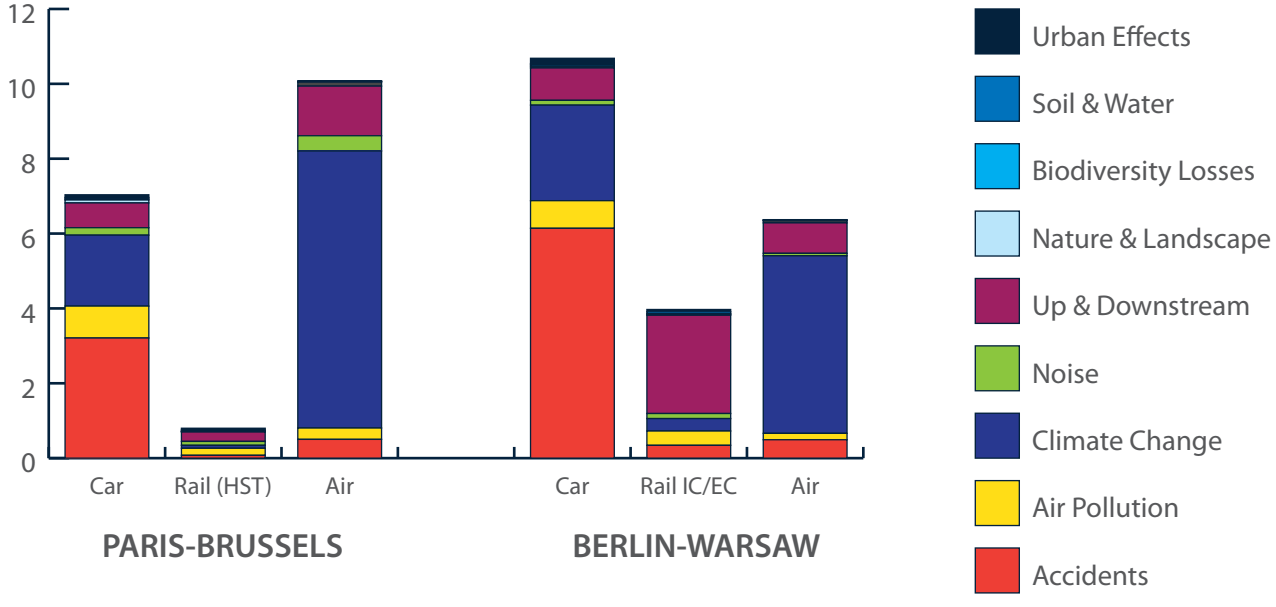
Case Studies: Comparing modes for passenger and freight traffic

The study presents two case studies of passenger transport by each mode in competition on two corridors: Paris-Brussels by car, by high speed train and by air and Berlin-Warsaw by car, by standard train and by aviation. All costs are calculated with the specific average national values. These are shown in Figure 6.

Costs are very low for HST on Paris-Brussels because the load factor is very high and the electricity source is largely nuclear, which produces zero carbon emissions when generating the energy. Results remain lower for standard train compared to car and airplane on the Berlin-Warsaw route. (These results do not include congestion and therefore external costs are under-estimated for car and airplane.)

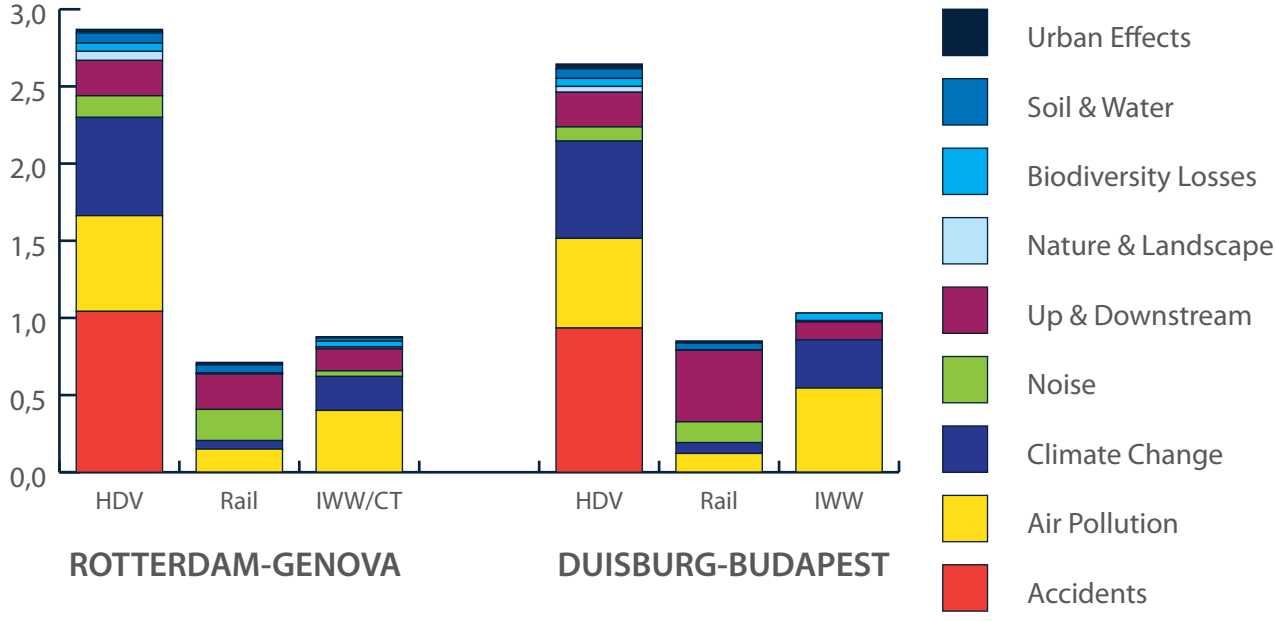
For freight, we can see the clear advantages that train and internal waterways (plus combined transport on the Rotterdam-Genoa route) have compared to road transport.

Figure 6: Corridor results passenger transport per passenger and 100 corridor-kilometres (excluding congestion)



HST: High Speed Train
EC: Eurocity train
IC: Intercity train
IWW: Inland Waterways
CT: Combined Transport

Figure 7: Corridor results freight transport per tonne and 100 corridor-kilometres (excluding congestion)



HST: High Speed Train
EC: Eurocity train
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What can be done to reduce external costs?

In the European Treaties, the objective of the protection and improvement of the quality of the environment must be sought in all activities and this policy must be based on three principles:

» Precautionary Principle

» Preventive action

» 'Polluter Pays' Principle

There are many policy options to internalise external costs. Indeed, external costs analyses provide useful policy tools. They provide data to enable decision makers to determine taxes, charges and subsidies based on the amount of pollution emitted. They also enable environmental and social factors to be incorporated into Cost-Benefit Analyses (CBA). This section of the brochure provides examples of European and national policies and analyses the extent to which they are achieving these goals.

Consolidated version of the Treaty on European Union

Article 3

3. The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.

Consolidated version of the Treaty on the Functioning of the European Union

Article 11

Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development.

Title XX - Environment

Article 191

1. Union policy on the environment shall contribute to pursuit of the following objectives:

» preserving, protecting and improving the quality of the environment,

» protecting human health,

» prudent and rational utilisation of natural resources,

» promoting measures at international level to deal with regional or worldwide environmental problems, and in particular combating climate change.

2. Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. It shall be based on the precautionary principle and on the principles that preventive action should be taken, that environmental damage should as a priority be rectified at source and that the polluter should pay.

In this context, harmonisation measures answering environmental protection requirements shall include, where appropriate, a safeguard clause allowing Member States to take provisional measures, for non-economic environmental reasons, subject to a procedure of inspection by the Union.

EN C 83/132 Official Journal of the European Union 30.3.2010

Regulations, standardisation, or voluntary agreements

Regulation is the first legal instrument to reduce external effects of transport. External effects can be taken into account by a set of regulations, perhaps in complement with other economic instruments.

For road accidents for example, many standards in the European legislation reinforce the protection of vehicles but also take into account the pedestrian or bicycles. In the aviation sector, aircraft are controlled and classified on lists. In the maritime sector, safety packages ERIKA I to III define double hull tankers, controls, responsibility and other key aspects.

Legislation of air pollution is very important for all categories of fuels (in particular gasoline, diesel, and kerosene) and of vehicles. The latest standards for new cars are EURO 6 in 2014, for commercial vehicles EURO 6 in 2014 or 2015, and for lorries and buses EURO5/6 in 2012/2013. There is also 2006 legislation for "Non Road Mobile Machinery" that covers maritime vessels, railcars and locomotives.

Climate change was not taken into account at the time that air pollution regulations were set. The first regulation setting European standards for CO2 emissions from new cars was adopted in 2009 after the failure to achieve the targets set in voluntary agreements between car-manufacturers and the European Union.

For noise, there is legislation for all vehicles and an environmental noise directive of 2002 relating to the assessment and management of noise, often known as the "END" Directive.

Taxation

Environmental taxation is already used across Europe in a variety of sectors. For example, in some countries car taxation (either purchase or ownership tax) may be charged at different levels depending on the CO2 performance of the car. Some cities have introduced congestion charging for vehicles that enter the city centre. However, the value of external costs is not covered by existing taxation.

Transport Infrastructure Charging

Infrastructure charging based on external costs has been debated in Europe for nearly twenty years, and has had many scientific and political steps:

- the 1996 Green Paper 'Towards fair and efficient pricing in transport'
- the 1998 White Paper 'Fair payment for infrastructure use'
- the 1995 and 1998 ECMT reports on external costs
- the 1999 report from the European Commission's High Level Group on transport infrastructure charging
- the 2001 White Paper 'European transport policy for 2010: time to decide'
- the 2008 Communication "Strategy for the internalisation of external costs" in the Greening Transport Package

In the European Union, the 'Eurovignette directive' on the charging of heavy vehicles for the use of certain infrastructures forbade Member States from taking external costs into account.

The third and most recent revision of the Directive in 2011 allowed a first step of internalisation, but it was limited only to air pollution and noise, and at very low levels with caps. There was a rejection of charging for congestion, and the option of charging for accidents and climate change were not introduced.

The three Eurovignette Directives

Directive	*Permissible gross laden weight*	*Vehicle taxes*	*User charge for a given period*	*Tolls for a given distance* *Differentiation of certain tolls to reduce congestion and air pollution and facilitate modal split for rail, within the same amount of tolls*	*Internalisation of external costs in tolls*
1999/62/EC of 17.6.1999 national legislation to comply with this directive by 1.7.2000	Max 12t	Min by category	Max by EURO class and scheme of axles	Possible increase with: -emission class: ≤ 50% of min -time of day: ≤ 100% of min	**NO** Only infrastructure costs
2006/38/EC of 17.5.2006 to comply with this directive by 10.6.2008	Possible below 12t	Min by category	Max by EURO class and scheme of axles	Possible increase for: -combating environmental damage, -tackling congestion, -minimising infrastructure damage, optimising the use of infrastructure, -promoting road safety -EURO emission class: ≤ 100% of min -time of day, type of day, season: ≤ 100% of min -mark-up in mountainous regions to invest in priority projects of TEN-T: ≤ 15% of tolls (or 25% for cross-border sections of these priority projects) -for specific projects of high European interest to secure their commercial viability	**NO**
2011/768/EU of 27.9.2011 to comply with this directive by 16.10.2013	No limit (without exceptions)	Min by category	Max by EURO class and scheme of axles	Possible increase for: -combating environmental damage, -tackling congestion, -minimising infrastructure damage, optimising the use of infrastructure, -promoting road safety -time of day, type of day, season: ≤ 175 % of max of toll (peak periods: 5 hours per day) -mark-up in mountainous regions to invest in priority projects of TEN-T: ≤ 15% of tolls (or 25% for cross-border sections of these priority projects) Obligatory with: -EURO emission class: ≤ 100% of min	**Air pollution** by EURO class and differentiation on sub/inter-urban road **Noise** differentiated for day/night and sub/inter-urban road **"Revenues should be used to make transport more sustainable"**

Subsidies for greener modes

If there is no internalisation of external costs, subsidies to the more environmentally-friendly modes of transport are legitimate in relation to the European right of competition: subsidies must be evaluated as the difference of external costs of the modes of transport in competition. This is the basis of subsidies to combined transport in many European countries.

Cost-Benefit Analyses – using social and environmental criteria

From a purely financial perspective, an investment in the transport sector is usually selected according to criteria such as “the best discounted financial benefit” or “the best rate of internal productivity”.

To take into account the external effects for the environment and society, national governments and multilateral lenders such as the European Investment Bank add a “socio-economic” approach for all public investments in infrastructure. The analysis is based not just on financial benefits of the project compared to the “business as usual” case but also on social and environmental benefits or disbenefits.

To finance the more sustainable projects, the Transport White Paper of 2001 proposed cross-subsidies between projects in certain corridors: in other words, the projects of environmentally-friendly modes of transport are paid by less sustainable modes. The idea is used in the latest revision of the Eurovignette Directive for the revenues of the internalisation of external costs: improving current transport systems in a more sustainable way or financing new systems of environmentally-friendly modes of transport.

Planning of areas and organisation of infrastructures

Planning of areas and development of infrastructures at all levels (cities, regions, countries or continents) have important consequences on traffic for each mode of transport, and also on the global impact on environment.

The European Transport White Paper of 2001 confirmed that the volume of traffic in each mode is in direct relation to the volume of infrastructure. In this matter, rail has been affected by the decrease of the network over the last 30-40 years, while, on the contrary, road has had a large advantage through the construction of the network of motorways. There are now European targets to increase the modal share of rail, which were laid down in the 2011 Transport White Paper.

Case Study: Switzerland

After the Popular Initiative of 1994, a new policy was determined in the Federal Constitution of Switzerland (article 84) prioritising modal shift from road to rail for environmental reasons. The effects of this are:

1. the Swiss government has to protect the alpine zone against the effects of transit traffic
2. goods crossing the Alps should be transported by rail
3. the capacity of roads crossing alpine regions shall not be increased

A similar policy was subsequently adopted in 2000 for the Transport Protocol of the Alpine Convention, a framework agreement for the Alpine region signed by all the countries that have a 'footprint' in it.

The Swiss policy led to the first "real-world" application of full external cost charging, the Heavy Vehicle Fee (HVF) that was introduced in Switzerland in 2001 and covers all routes. The aim of the kilometre-based HVF, payable by all trucks over 3.5 tonnes using Swiss roads, is to internalise the external costs of trucks and therefore reduce their transit traffic. The charge is based on eight separate external cost categories.

The experience of the HVF also shows that it does not have the negative effects on the economy that some predicted: Switzerland remains the world's most competitive economy according to the World Economic Forum's annual Global Competitiveness Report (GCR).

The revenues from the fee have also been used to invest in more sustainable infrastructure on alpine transit routes and lead to wanted modal split. It is the basis of the funding of the AlpTransit Projects: two new railway tunnels, the Loetschberg Base Tunnel and the Gotthard Base Tunnel have been constructed beneath the Swiss Alps. Their construction has been funded by the Swiss public transport fund that is fed mainly by the HVF.

In urban areas, public transport is more attractive if residential zones are not too dispersed. Good cooperation and inter-modality between all means of public transport in a single system is an important factor of success.

Emissions Trading

To apply the market mechanisms agreed in the Kyoto Protocol, the European Union established the EU Emissions Trading System (ETS), the first large-scale emissions trading scheme in the world for greenhouse gas emissions.

Directive 2003/87/EC set up the scheme, which covered sectors such as energy activities, metal production, and the mineral industry. However, in the first phase of the ETS, the free allocation of allowances by member states along with high caps kept the price of CO2 allowances on the market low and failed bring about a significant reduction in emissions or act as a driver for technological change in these sectors.

A further directive of 2008 included aviation activities in the scheme, while the most recent directive in 2009 improved and extended the scheme for Phase III, which begins in 2013. Changes included the setting of an overall EU cap, with allowances then allocated to EU member states and a shift from free allowances to auctioning.

Due to the complexities of the transport system, there have been no attempts to include all transport activities within the ETS. However, rail is currently included indirectly through its use of electricity (the electricity generators pass on the cost of allowances to their customers), while aviation entered the ETS at the beginning of 2012, and consideration is now being given to include maritime shipping as well. There are currently no plans to include road transport within the scope of the scheme.

European Transport Policy: Time to Decide

The previous sections have introduced the concept of external costs and briefly described how they are calculated. We have presented the results of the new report into external costs for transport, and have summarised the extent to which transport policies in Europe have succeeded in internalising external costs. This section concludes by outlining how policies can be introduced to better internalise external costs, thus creating the framework conditions for a sustainable transport system.

Introduce a consistent, fair policy framework for external costs

If we want "real prices" in transport that incentivise the best choice of mode of transport for sustainable mobility, we need to pursue internalisation:

- in each mode of transport, at the same time
- for all negative external effects, with the same definition in each case
- set at the 'right', scientifically-based level and not at the minimum level necessary for political acceptance.

The 'right' level is that which achieves the reduction target for each negative impact. For example, the price per tonne of CO2 should incentivise the reduction of greenhouse gas emissions to ensure that the EU target for transport of a 60% cut in emissions by 2050 will be met (in coordination with the other measures planned).

During the Eurovignette debates the European Parliament wanted a study and the European Commission issued the 2008 IMPACT Handbook which recommended a range of strategies for internalising external costs. These included kilometre-based charges for the internalisation of air pollution, noise and congestion costs, differentiated by vehicle characteristics, location and time of the day; for external accident costs, either a kilometre-based charge or the charging of insurance companies based on accident rates; local road pricing schemes as an alternative to differentiated kilometre based charges for congestion costs; and for climate change costs, carbon-content based fuel taxes or emissions trading (particularly suitable for maritime shipping and aviation).

There are various economic instruments currently in use to reduce different external effects. These include taxation for road vehicles, and for fuels (with fiscal incentives for more environmentally-friendly vehicles and fuels); regulations, which vary according to the external effect targeted and the means of transport (e.g. EURO standards for heavy road vehicles); cordon charging in urban areas for road vehicles (e.g. in London); permit trading via the EU Emissions Trading System for energy consumed by electric transport, for aviation and potentially for the maritime sector; and track access charge for railways in relation to their noise levels (e.g. in the Netherlands and Germany).

These instruments have been introduced at different times and for different reasons, usually without coordination. **Measures need to be converged as part of a coherent approach that seeks to fully internalise all external costs for all modes**. With this approach in mind, the European Commission has already said that it intends to bring out a report in 2012 on the further internalisation of external costs. This will consider what measures need to be taken for the full and mandatory internalisation in road and rail, and the internalisation of local pollution and noise costs in ports and airports, by 2020, as was envisaged in the 2011 Transport White Paper.

Addition tools to support sustainable transport

If internalisation of external costs is going to take place, there also need to be accompanying measures undertaken to maximise the benefit they would bring. These include:

- eliminating environmentally-harmful subsidies including tax reductions or exemptions, such as those for short distance (<20 kilometres) in some EU countries (sometimes known as “sprawl premium”). This approach was supported in the European Commission’s Roadmap to a Resource Efficient Europe (2011); if it is not done, internalisation is similar to stepping on the brake while accelerating at the same time.
- eliminating counterproductive subsidies and policies in transport-related fields – for example, the subsidising of car-dependent housing developments in suburbs, or the requirement for extensive parking facilities in areas where there is good public transport provision.

Create additional benefits for transport sector and for society

A key additional benefit of internalising external costs is that as well as ensuring that users pay for the full impact of transport, it raises large amounts of revenue. Public acceptance of charging for external costs is likely to depend in part on the transparent and appropriate use of these revenues; one obvious use is to reinvest them in sustainable transport where the public can clearly see the benefits.

Doing this can help strengthen changes that internalisation encourages towards more environmentally-friendly transport, and also takes the pressure off wider public finances for the funding of new transport infrastructure.

Conclusion: act today

The impacts of the external effects of transport can manifest themselves in both short and long-term ways – for example, the immediate impact of fatal accidents and noise, as opposed to the longer-term impact of air pollution in urban areas and climate change. Experience has shown that we need to address both the immediate and the longer-term impacts if we do not want to be faced with much larger costs in the future. Decision-makers should apply the precautionary principle to all external costs, adopt a long-term vision, and act today.

Cost Category	Total Costs per Cost Category										
	Road							Rail		Aviation	Waterborne (freight)
	Passenger cars	Buses and coaches	Motorcycles & mopeds	LDV	HDV	Total road passenger transport	Total road freight transport	Passenger transport	Freight transport	Passenger transport (cont.)	Inland waterways
	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a	Mio €/a
Accidents	157,105	6,839	22,584	18,677	19,604	186,528	38,282	238	71	223	0
Air pollution	26,636	3,347	1,696	5,933	12,995	31,678	18,928	1,092	483	426	782
Climate change high scen.	84,135	5,06	1,597	14,787	18,845	90,791	33,632	630	413	22,166	516
Climate change low scen.	*14,407*	*866*	*273*	*2,532*	*3,227*	*15,546*	*5,759*	*108*	*71*	*3,796*	*88*
Noise	8,201	865	2,076	2,094	3,537	11,143	5,631	477	476	457	0
Up- & downstream Processes high scenario	27,679	1,568	523	4,765	5,802	29,77	10,567	3,354	1,947	3,356	194
Up- & downstream Processes low scenario	*16,621*	*855*	*325*	*2,777*	*3,27*	*17,8*	*6,047*	*1,633*	*1,078*	*1,849*	*113*
Nature & landscape	3,008	149	75	284	1,293	3,232	1,577	75	21	296	64
Biodiversity losses	1,152	212	20	208	893	1,384	1,101	1	1	40	69
Soil & Water pollution	1,582	485	40	601	1,629	2,107	2,23	220	164	0	0
Urban effects	4,814	232	116	1,035	965	5,162	2	229	59	0	0
Total (high scen	**314,31**	**18,757**	**28,727**	**48,384**	**65,564**	**361,794**	**113,948**	**6,318**	**3,636**	**26,964**	**1,625**
Road congestion	98,416	4,836	2,439	13,827	26,695	105,691	40,522	:	:	:	:
Road congestion	161,331	7,729	3,841	27,633	42,66	172,901	70,293	:	:	:	:

* Data include the EU-27 with the exemption of Malta and Cyprus, but including Norway and Switzerland; ":": not applicable. Total excluding congestion costs.

Cost Category	Average Costs per Cost Category												
	Passenger Transport							Freight Transport					
	Road				Rail	Aviation	Total	Road			Rail	Waterborne	Total
	Passenger cars	Buses & coaches	Motorcycles & mopeds	Total road passenger transport	Passenger transport	Passenger transport (cont.)		LDV	HDV	Total road freight transport	Freight transport	Freight transport	
	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)
Accidents	32.3	12.3	156.6	33.6	0.6	0.5	29.0	56.2	10.2	17.0	0.2	0.0	13.4
Air pollution	5.5	6.0	11.8	5.7	2.6	0.9	5.2	17.9	6.7	8.4	1.1	5.4	7.1
Climate change high scenario	17.3	9.1	11.1	16.3	1.5	46.9	17.6	44.5	9.8	14.9	0.9	3.6	12.1
Climate change low scenario	*3.0*	*1.6*	*1.9*	*2.8*	*0.3*	*8.0*	*3.0*	*7.6*	*1.7*	*2.6*	*0.2*	*0.6*	*2.1*
Noise	1.7	1.6	14.4	2.0	1.2	1.0	1.9	6.3	1.8	2.5	1.0	0.0	2.1
Up- and downstream high scenario	5.7	2.8	3.6	5.4	8.1	7.1	5.7	14.3	3.0	4.7	4.2	1.3	4.4
Up- and downstream low scenario	*3.4*	*1.5*	*2.3*	*3.2*	*3.9*	*3.9*	*3.3*	*8.4*	*1.7*	*2.7*	*2.4*	*0.8*	*2.5*
Nature & landscape	0.6	0.3	0.5	0.6	0.2	0.6	0.6	0.9	0.7	0.7	0.0	0.4	0.6
Biodiversity losses	0.2	0.4	0.1	0.2	0.0	0.1	0.2	0.6	0.5	0.5	0.0	0.5	0.4
Soil & water pollution	0.3	0.9	0.3	0.4	0.5	0.0	0.4	1.8	0.8	1.0	0.4	0.0	0.8
Urban effects	1.0	0.4	0.8	0.9	0.6	0.0	0.8	3.1	0.5	0.9	0.1	0.0	0.7
Total (high scen	**64.7**	**33.8**	**199.2**	**65.1**	**15.3**	**57.1**	**61.3**	**145.6**	**34.0**	**50.5**	**7.9**	**11.2**	**41.7**
Total (low scena	*48.1*	*24.9*	*188.7*	*49.4*	*9.8*	*15.0*	*44.3*	*102.8*	*24.6*	*36.1*	*5.3*	*7.7*	*29.7*

* Data include the EU-27 with the exemption of Malta and Cyprus, but including Norway and Switzerland. Data do not include congestion costs.

	Average Costs per Cost Category for rail transport					
	Rail Passenger			Rail Freight		
	Electric	Diesel	Total Rail Passenger	Electric	Diesel	Total Rail Freight
Cost Category	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 pkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)	€/(1,000 tkm*a)
Accidents	0.6	0.6	0.6	0.2	0.2	0.2
Air pollution	1.8	7.6	2.6	0.9	1.7	1.1
Climate change high scenario	0.0	10.4	1.5	0.0	3.9	0.9
Climate change low scenario	0.0	1.8	0.3	0.0	0.7	0.2
Noise	1.2	1.2	1.2	1.0	1.0	1.0
Up- & downstream high scenario	7.2	13.1	8.1	4.0	5.1	4.2
Up- & downstream low scenario	2.7	11.4	3.9	1.7	4.4	2.4
Nature & landscape	0.2	0.2	0.2	0.0	0.0	0.0
Biodiversity losses	0.0	0.0	0.0	0.0	0.0	0.0
Soil & Water pollution	0.5	0.5	0.5	0.4	0.4	0.4
Urban effects	0.6	0.6	0.6	0.1	0.1	0.1
Total (high scena	**12.0**	**34.1**	**15.3**	**6.6**	**12.4**	**7.9**
Total (low scenar	*7.4*	*23.8*	*9.8*	*4.3*	*8.5*	*5.3*

* Data include the EU-27 with the exemption of Malta and Cyprus, but including Norway and Switzerland. Data do not include congestion costs.

Greening Transport - *Reduce External Costs*

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