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Transport at a crossroads

TERM 2008: indicators tracking transport and environment in the European Union

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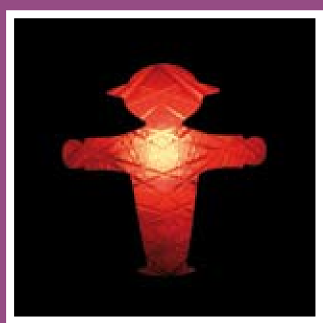

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EMAS
Verified environmental management
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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark
Tel.: +45 33 36 71 00
Fax: +45 33 36 71 99
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

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Foreword — Professor Jacqueline McGlade

The current economic turmoil may lessen the demand for transport but the transport sector still contributes significantly to rising emissions of greenhouse gases, noise exposure, air pollution, fragmentation of habitats and impacts on wildlife.

The Transport and Environment Reporting Mechanism (TERM) report for 2008 highlights this trend. Although there is growing awareness of the transport sector's disproportionate impact on the environment, the report shows that there is little evidence of improved performance or a shift to sustainable transport across Europe. In particular:

1. freight transport has continued to grow;
2. passenger travel by road and air has continued to increase;
3. greenhouse gas emissions increased between 1990 and 2006;
4. air quality is still a problem across Europe despite continued reductions in air pollutant emissions from vehicles; and
5. transport noise levels are affecting the quality of life and health of EU citizens.

Transport has played a significant role in Europe's economic growth during the recent boom years; more construction, shopping and tourism have all ultimately relied on more transport. In recent months governments across the EU have reacted to the economic crisis with stimulus packages. Some of the measures proposed are likely to perpetuate the link between transport and the wider economy, whereas well designed schemes can reduce transport volumes and realise a shift to less polluting modes of transport without changing the underlying economic activity. They could improve the transport efficiency of the economy, effectively decoupling transport growth from economic expansion.

Unfortunately, at a time when we need to tackle our economic and environmental problems through sustainable and green solutions, trends in transport are pointing in the wrong direction. We know that the technology exists to tackle the transport sector's impacts on Europe's environment. However, many vehicles rolling off production lines still have high emissions, the freight sector still favours the least efficient transport modes and railways across the EU have yet to be a unified system.

In 2008 severe consumer reactions to volatile fuel prices — apparent in falling car sales for example — suggest that there is a limit to what consumers are prepared to pay for transport. Although this problem has for now receded, it demonstrated that the price mechanism can be an effective policy tool to influence transport demand. Data indicate that a 10 % rise in fuel prices will produce a 21 % increase in demand for urban bus services and almost 18 % more demand for inter-urban rail services.

From the EEA's perspective, clear, measurable, realistic and time-bound targets are essential for reducing emissions of greenhouse gases and air pollutants, and transport noise. TERM 2008 highlights that little change has taken place in the transport sector and that 'decoupling' transport impacts from economic activity is still in its infancy.

Key messages

1. **Freight transport** continues to grow, with the largest increases occurring in the least energy efficient transport modes — road and air freight. The total volume measured in tonne-kilometres for EU Member States **increased by 35 % between 1996 and 2006.** Rail and inland waterway freight recorded increases of 11 % and 17 % respectively but saw their market share decline.
2. **Passenger transport**. Travel by road and air has continued to increase throughout the EEA member countries. Between 1995 and 2006 **car ownership levels in the EU-27 increased by 22 % (equivalent to 52 million cars)**, and passenger car use increased by 18 %. The number of kilometres travelled by passengers in

EEA member countries grew by 1 % (equivalent to 65 million kilometres) in 2006.

3. **Greenhouse gases**. The EU Energy and Climate Package targets a 20 % overall reduction in greenhouse gases by 2020 and highlights the need for the transport sector to contribute actively. In the EU, growing transport volumes have driven **emissions up by 27 %** between 1990 and 2006 (excluding the international aviation and marine sectors).

4. **Air pollution**. Emissions of regulated air pollutants from vehicles continue to fall across EEA member countries but concentrations remain high in some urban areas. Despite a reduction in road transport exhaust emissions across Europe, there have been **no significant improvements** in concentrations of fine particulates (PM_{10}) and nitrogen oxides (NO_X), which have a major impact on air quality and human health.

5. **Noise**. Many people are exposed to transport noise levels that affect their quality of life and health, notably in large agglomerations. Road traffic is by far the main source of exposure to transport noise. **Almost 67 million people** (i.e. 55 % of the population living in agglomerations with more than 250 000 inhabitants) are exposed to daily road noise levels exceeding 55 L_{den} (an EU benchmark for excessive noise).

1 Transport in perspective

Creating an environmentally sustainable transport system requires a package of policies. Historically, transport policy discussions have tended to deal only with transport supply. But growing transport demand is undermining efforts to solve many of the most pressing environmental problems. Addressing the most important environmental aspects simultaneously will be the most cost-effective approach.

Defining a pathway towards sustainable transport requires a long-term vision to guide the process as well as strong leadership. It is therefore important to identify and highlight the opportunities and challenges along the way. While changes will involve costs in the short term, it should be recognised that Europe may be able to secure 'first-mover-advantage' in the medium to long term, providing many opportunities for the continent to influence global development and secure a return on its investments.

Transport policy: balancing climate change and other environmental priorities

Over the past decade, climate change has moved from being just one among many important environmental issues to being a key driver of global policy-making. Scientifically, there is no longer any doubt that mankind is having a discernible impact on the global climate. Likewise, it is generally agreed that transport is one of the major contributors to carbon dioxide concentrations in the atmosphere.

In Europe transport contributes approximately one quarter of all greenhouse gas output and its emissions are growing. National and international authorities are therefore devoting much attention to identifying ways to reduce the transport sector's greenhouse gas emissions.

In December 2009, at the United Nations Climate Change Conference (COP15) in Copenhagen, a large number of countries and international organizations will be pressing hard to reach a worldwide agreement on climate change. This agreement should not just halt the growth in global greenhouse gas emissions but rather realize a significant global reduction within the next few decades. For developed economies that means reductions from 1990 levels of 25–40 % by 2020 and of up to 80 % by 2050. As a consequence, all sectors of economic activity must contribute to the reductions.

Against this backdrop, transport policy could easily focus solely on reducing greenhouse gas emissions. Adopting such an approach would be unfortunate, however, because some greenhouse gas mitigation options could have negative environmental impacts elsewhere. On the other hand, with proper planning, actions to combat greenhouse gas emission can be designed to deliver environmental benefits in other areas.

Rather than engaging in a zero-sum game, where solutions solving one problem create another one elsewhere, policymakers must clearly strive to identify win-win solutions. In some cases such solutions are not just sensible politically but may also offer sustainable business opportunities for European companies. Certain energy efficiency technologies, for example, reduce emissions of both greenhouse gases and of other pollutants; European firms that take the lead in developing such technologies could be well positioned to take advantage of rapidly expanding global markets for them in the years to come.

The integration of environmental policies into the transport sector needs to address several issues, even if climate change is seen as the overriding concern.

In 1998 EU leaders convened in Cardiff and agreed an environmental integration policy. It provides that sectors such as transport are responsible for their effects on the environment and that Governments should develop policies so that each sector gradually mitigates its unacceptable environmental impacts. The Transport and Environment Reporting Mechanism (TERM) was created to monitor and support this process and has done so for 10 years now. Recent findings include the following:

- Transport is a key sector for the EU as it strives to meet its future climate change targets. But transport plays a role in other environmental problems too — sometimes as the main contributor.
- Regulatory measures have been and still are successful in addressing some environmental issues, such as emissions of pollutants, but other responses are also needed.
- Sector-specific environmental targets would help improve monitoring and benchmarking and assist in progressing towards an environmentally sustainable transport system that addresses all important environmental issues.
- Transport demand is a key issue that must be prioritised because it influences several environmental issues. Transport demand originates outside the transport sector itself and should be addressed there. In the field of transport policy, more research should go into the use of pricing to address demand.

The transport sector has in some cases integrated environmental concerns into its policy decisions. But other sectors have an important influence on the development of the transport sector. Governments therefore need to ensure that the policy frameworks of such sectors reflect their impact on transport and the environment.

Economic challenges provide transport policy opportunities

The international economic outlook has altered significantly in the past year. Whereas 2008 commenced with projections of sustained growth, it closed with fears of an extended worldwide recession. Addressing the environmental challenges will not be easy and is likely to require considerable investment.

It is important to recognise, however, that the environmental problems confronting Europe are also being faced by other world regions. And the fact that responses designed in one region may be relevant elsewhere potentially creates economic and business opportunities. Shortly after taking office at the start of 2009, President Barack Obama declared the intention of reducing greenhouse gas emissions from new vehicles — an area where European automakers have a large lead over their US counterparts. Investments already made may now provide export opportunities either as licences, joint ventures, sales via US-owned subsidiaries or as direct exports. Being a 'first mover' often implies taking on costs and risk but can confer commensurate rewards, including allowing Europe to define or inspire the international standards for a greener economy.

Biofuels illustrate the possibilities for Europe to take the lead. As noted in Chapter 6 of this report many countries are, as Europe, setting biofuels targets. In order to manage the potentially negative impacts of expanding biofuels production on biodiversity and land use, the EU is pioneering the development of sustainability standards for biofuels. Including sustainability criteria in the EU's Energy and Climate Change Package agreed in December 2008 does not yet completely guarantee against negative impacts and there are still gaps to fill concerning methodologies for assessing indirect land-use changes. Nevertheless, the EU has a clear opportunity to impact global development of the biomass-for-energy market and thereby win influence and business opportunities as well.

Noise — now firmly on the EU agenda

EU Member States reported standardised noise data in a structured way for the first time in 2007, following the adoption of the Environmental Noise Directive in 2002. As a result, it is now possible to start looking at noise exposure across Europe.

In the 1970s it was established that many Europeans suffered ill health due to high noise levels, especially around roads and airports but also near railways and other local sources not necessarily related to transport. A number of local and national investigations were carried out and most of them showed that it would be quite a challenge, not least economically, to achieve the noise limits recommended by the WHO to protect human health.

Since then some emissions reduction measures have been implemented, including building noise barriers and improving window insulation. It is obvious, however, that increasing transport activities have exacerbated noise problems. One contributing reason is that during the late 1970s and 1980s public focus shifted towards the air pollution produced by transport, while noise more or less disappeared from the agenda.

Transport noise mitigation can follow a number of different but complementary strategies:

- technical improvements to vehicles and infrastructure to reduce noise generation;
- separating heavily used transport links from densely populated areas;
- using barriers and improved sound insulation of dwellings to reduce the impact on those living in exposed areas;
- reducing traffic levels, banning especially noisy categories of vehicles, imposing restrictions during night-time or changing driving patterns to reduce noise.

Improving vehicles and infrastructure using, for example, better silencers, low noise tires and noise absorbing road surfacing, has been shown to be a successful strategy. Enhancing vehicle aerodynamics to reduce wind noise may also reduce energy consumption and thus emission of greenhouse gases. Largely, however, technology-oriented measures tend to target specific problems; as such, they may be costly solutions because their benefits do little to reduce other environmental impacts or even increase them. Catalytic converters, for example, strongly reduce emissions of regulated pollutants but increase emissions of greenhouse gases because of a small increase in energy consumption and do little to reduce noise emissions.

Using planning measures to separate traffic and people can be very effective in preventing noise exposure. It is possible that such planning will lengthen journeys and therefore increase overall emissions of air pollutants and energy consumption, as well as the total area exposed to noise. On the other hand living in quiet areas with little traffic can encourage people to walk or cycle for short trips. The net effect on emission of greenhouse gas and air pollutants is therefore unclear.

Sound insulation via sound barriers and better windows and facades are used on a large scale across Europe to reduce noise exposure. It can be an effective measure but provides little in terms of ancillary benefits.

Reducing traffic levels is the measure that provides the clearest ancillary benefits because emissions of air pollutants and greenhouse gases decline in proportion to the fall in traffic. From a noise perspective, however, the positive impact is smaller because the noise of each additional car makes a diminishing contribution to overall sound levels. In general terms, it takes an eight-fold increase in traffic to double perceived noise levels. Similarly it takes an eight-fold reduction to halve the noise.

Dealing with transport noise is thus not a straight forward task but it is possible to use packages of measures tailored to address several local problems at once. Chapter 7 of this report provides a more detailed discussion of this issue.

Addressing transport impacts: the need for measures that address multiple problems

Efforts to improve transport's environmental impact have traditionally focused on technological measures. Although such measures are far from uncontroversial, they are the least complicated to analyse. They are often designed to address only one problem — for instance abating exhaust emissions with catalysts reduces 'regulated' air pollutants and installing barriers around roads and railways reduces noise in surrounding areas. Viewed in isolation, such measures may appear a cost-effective way to achieve a certain environmental target. Seen in the context of society's many other environmental goals, however, they may look less good value. From that perspective, the most cost-effective measures are those that simultaneously address several problems, thereby reducing the aggregate expense.

Table 1.1 indicates the impact of different types of measure on issues such as greenhouse gases emissions and noise. It does not, however, specify the strength of the effect, which will often depend on the concrete form of implementation. For example, promoting public transport in some cases attracts more people to shift from walking or cycling than to stop driving their own car. Clearly, in this case the efficacy of the policy measure will be enhanced if the promotion of public transport is accompanied by activities and incentives to encourage motorists to change their behaviour.

Complexities also exist because of the challenges of gathering data on policy effectiveness. With respect to the example above, data on numbers travelling on public transport are commonly used to measure the success of policies encouraging a shift to public transport use, partly because it is easy to assess and verify. Evidently, however, the focus should not simply be on public transport users but on

Table 1.1 Impacts of alternative environmental policy measures

	Local air pollution (human health)	Long-range air pollution (human health, ecosystem damage)	Noise	Emissions of GHGs	Fragmentation (biodiversity)	Barrier effects
Exhaust emission abatement and cleaner fuel.	+	+	+/−	+/−	0	0
Quieter vehicles, trains, aircraft and ships	0	0	+	+/−	0	0
Improving energy efficiency of a mode of transport	+	+	+/−	+	0	0
Shift from individual to public transport	+	+	+/−	+	0	+/−
Renewable fuels	+/−	+/−	0	+	+/−	0
Improved physical planning	+	+/−	+	+/−	+	+
Speed reduction	+	+	+	+	0	+
Demand management and decreased traffic growth	+	+	+	+	+	+

Note: + = positive effect; 0 = in principle no effect; +/− = effect uncertain/depends on implementation.

the extent to which people are shifting from more polluting modes to less polluting modes or vice versa. Unfortunately, data on car occupancy and on non-motorized transport are generally poor and surveys seldom provide much information on the real modal shift occurring. As such, the environmental value of a measure may be impossible (or at least very costly) to assess.

To achieve ancillary benefits, packages of mitigation measures need to be carefully designed. Establishing clear reduction targets for different environmental impacts would make it easier for both public authorities and the private sector to choose the most cost-effective means of achieving them.

Mitigating transport demand is a complex challenge

As Table 1.1 suggests, transport demand management is clearly an attractive strategy for reducing environmental impacts because it can potentially address multiple impacts concurrently. Demand management is far from simple, however, because transport demand derives from a very broad range of sources, most of which lie outside the scope of transport policy.

Food production and consumption demonstrate the role of external factors and sectors in determining transport demand. The globalisation of the economy and the expanding European market has greatly increased consumer choice. This has placed an upward pressure on transport demand for each part of the logistical chain: from farm to processing centre, then to the storage or wholesale centre, the retail outlet and finally to the consumer's home. Farming inputs, such as fertiliser, and by-products also create additional transport demand.

The desire for more diverse diets sourced from further afield can imply greater transport demand even if food consumption is not increasing. Policies on production, trade and consumption have a strong influence on transport demand, with outsourcing of production and lower trade barriers implying more transportation.

Striking the right balance between environmental protection and satisfying demand for a broad variety of food throughout the year does not, however, necessarily imply a shift to trade barriers and local production. The greenhouse gas emissions resulting from transporting a tonne of goods from Shanghai to Rotterdam by ship is roughly equal to the emissions to transport that tonne by truck from Rotterdam to Berlin. It is therefore as much a matter of how we transport the goods as how far. In addition the environmental impacts of production may differ depending on where the food is produced.

Delivering an optimal solution can only be achieved if the issue is addressed in a cross–sectoral fashion. Planning and policy development outside the transport sector must take transport generation into account and provide the information necessary to find an optimal solution. Internalising the full social and environmental costs of transport so that they are reflected in food prices is one important mechanism to achieve the best possible solutions.

Providing consumers and transporters the data they need to make informed choices is also important. In the United Kingdom, for example, the Carbon Trust has developed product labelling detailing the amount of carbon produced per serving. The use of the labels on fresh juice cartons sold by supermarket chain Tesco helped the firm's supply chain partners to identify new carbon saving opportunities, such as changes in production, storage and transportation. While certainly offering useful opportunities, it should be recognised that introducing carbon labels could lead to a focus solely on the climate impacts of production to the exclusion of other environmental effects.

Integrating land-use planning and transport policy

Transport shapes land-use patterns, as new transport infrastructure affects demand for travel and development. Investment in transport networks around cities encourages the decentralisation of facilities and services, impacting significantly on suburban land use and increasing pressure for development on 'greenfield sites' outside the city. That leads to urban sprawl, which is typically unplanned and low density. European cities have sprawled significantly since the 1950s, with built up land expanding faster than population growth.

Increasing the density of inner city areas and encouraging mixed-use developments reduce both the need to travel and the average length of trips. This can also have a marked impact on travel behaviour, as walking and cycling become more attractive as trip lengths decrease. Fifty per cent of all trips are shorter than 5 km and, particularly in urban areas, can often be made by public transport, walking or cycling.

Planning appropriate changes requires a long-term vision for more 'liveable cities'. The time perspective for planning such changes is long (20+ years). Therefore a forward-looking approach that deals both with diverse aims and high levels of uncertainty is needed. Planners and policymakers must essentially decide how they want cities to look and how they want people and goods to be transported in the future.

Scenario techniques are now being employed by the European Commission to support the development of the next EU Common Transport Policy. In this context it is important to decide which aims — environmental as well as economic and social — should guide scenario development and which policies and measures are politically feasible to use consistently over a longer time scale. Land-use planning can be an effective means of defining suitable goals but to be successful requires consistent implementation over many years.

There are many complex relationships between transport and land use but effective planning can help ensure that development encourages sustainable travel behaviour. Using land-use planning successfully as an instrument to influence transport activities requires long-term thinking (25–30 years). Establishing targets on environmental impacts is one way to start formulating a long-term vision.

It is time to go from talk to action

It is clear from the foregoing discussion that we have to apply a methodology that cost-effectively delivers an environmentally sustainable transport system within a reasonable time horizon. The following elements will be needed:

- Vision: identifying the relevant environmental issues to be addressed if the transport system is to be considered sustainable and formulating 'targets' for those issues as a basis for further analysis.
- Pathway: identifying possible measures to address the environmental issues as well as non-environmental issues and possible policy instruments to implement such measures. This includes both a short-term and a long-term analysis and should start with an examination ways to mitigate 'transport demand' because a decrease in transport or slower growth implies fewer environmental problems to address using other measures and policy instruments.
- Prioritisation: analysing the cost-effectiveness of alternative packages of measures that will lead to an environmentally sustainable transport system and build a political consensus strong

enough for a longer term plan to survive changes of government.

- Implementation: putting the agreed measures into action.

Creating a coherent picture of a world with a little less transport and much less pollution is a first step that can guide both governments and industry. Governments are responsible for the adoption of appropriate legislation to tackle the challenge and enterprise and business have a vital role to play as suppliers of cleaner technology. It is a challenging task and the process has to start without delay.

2 Freight transport and modal split

Freight transport volumes continue to grow, with the largest increases occurring in the least energy efficient means of transport — road and air freight. A shift towards less energy intensive modes, notably rail and maritime transport, is desirable. There is also a potential for energy savings via better use of the road transport fleet.

Freight transport volumes continue to grow at approximately the same pace as the economy. The total volume measured in tonne-kilometres for EU Member States (excluding Cyprus and Malta) increased by 35 % between 1996 and 2006. Over the same period road and air freight volumes increased faster (45 % and 43 % respectively), therefore increasing their market share. Maritime transport volume grew by 33 %, thus almost maintaining its market share. Volumes transported by rail freight, on the other hand, increased only 11 % and those on inland waterways rose 17 %; both therefore lost market shares. More recent incomplete data indicate, however, that rail has stopped conceding market share.

Average CO_2 emissions in grams per tonne-km (g/tkm) are significantly lower for rail (18–35 g/tkm), sea transport (2–7 g/tkm) and inland water ways (30–49 g/tkm) than they are for road (62–110 g/tkm) and air transport (665 + g/tkm) (Ifeu, 2005). Real world emissions depend on a variety of factors, however, including the weight and volume of goods, vehicle type, mode choice and logistic efficiency. The relatively faster growth in air and road freight therefore means that CO_2 intensity in freight transport continues to increase even if vehicles improve.

Research indicates that the volume of goods transported grows faster in terms of cubic meters than in tonnes. Thus the density of goods is decreasing, meaning that more trucks are needed to transport the same number of tonnes than ten years ago. Although the loaded vehicles may be slightly lighter the net result is an increase in emissions. These emissions are not just greenhouse gases but also noise and air pollutants, which can have strong impacts in particular around ports, airports and rail terminals, and within and around urban areas. The environmental impact of freight is thus likely to increase owing to the decreasing density of goods transported and the generally increasing frequency and length of journeys (McKinnon, 1999).

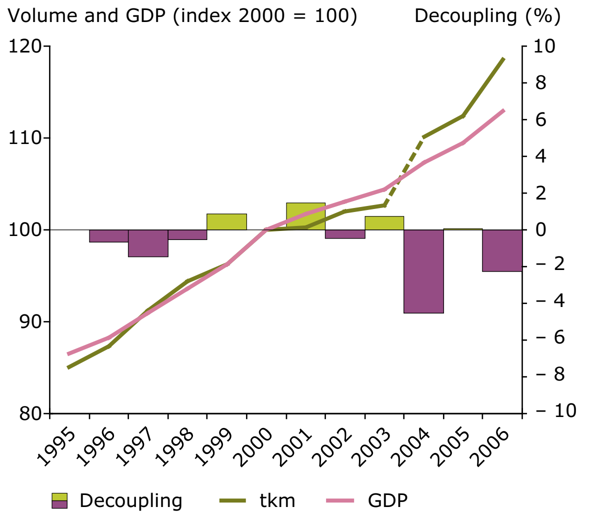
In July 2008, the EU outlined a package of 'Greening Transport' measures to make the freight transport sector more sustainable. The package contains a proposal to reform the EU's Eurovignette Directive (1999/63/EC). The suggested reform would enable Member States to use revenue generated by the road freight toll to reduce the negative impacts of freight transport, such as emissions of nitrogen oxide (NO_X) and fine particulates (PM_{10}), noise and congestion. It is estimated that the strategy could reduce the fuel consumption of lorries by 8 % (EC, 2008b). The continued growth of road and air freight casts doubts on whether the impact of 'Greening Transport' measures will be sufficient to offset increased emissions from the sector.

The impact that freight can have upon urban areas has also led to its inclusion in the EC's 2007 Green Paper on Urban Mobility (EC, 2007c). The Paper calls for more efficient interfaces between long-haul freight transport and short distance deliveries. It suggests that planning and technical measures be implemented to reduce the negative impacts of freight transport passing through urban areas and to reduce incidences of 'empty running', i.e. empty return trips from deliveries. Proposals to lift restrictions on cabotage (see Box 2.1) should also reduce empty running.

The continued dominance of road freight over rail can be attributed in part to concerns over the reliability, capacity, speed and flexibility of the rail network (EC, 2007b). It is therefore important that infrastructure is in place to support an increased rail modal share. Twenty of the 30 Trans-European Transport Network priority projects are rail projects (EC, 2005a). However, overall levels of investment in Europe do not reflect a prioritisation of rail infrastructure. In 2005 a total of EUR 17 billion was invested in rail infrastructure in Europe, compared to almost EUR 45 billion in road infrastructure (OECD, 2007).

Figure 2.1 Freight transport volumes grow alongside GDP

Freight transport activity has grown faster than the economy during most years of the last decade. Freight transport growth can be attributed to improved transport efficiency, enabled in part by the removal of intra-EU transport barriers, which has encouraged investment and stimulated trade. However, other factors such as rising fuel prices and slowing economic growth may have a significant impact on freight transport development in the future. A more detailed breakdown is available in Table A.1 of Annex 3 on data.

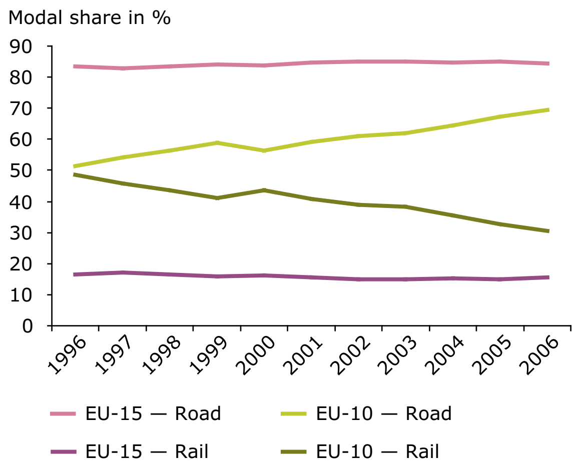


Note: The two curves show the development in GDP and freight transport volumes, while the columns show the level of annual decoupling. Green indicates faster growth in GDP than in transport while purple indicates stronger growth in transport than in GDP. The large change in 2004 appears to be tied to a change in methodology but no correction figure exists. See Annex 1 on metadata for details.

Source: Eurostat, 2008.

Figure 2.2 Road transport's market share increases strongly in EU-10

The figure compares rail and road transport trends (shares of transport volume in tkm) in two regions over the last decade. In the EU-15 the modal shares of road and rail freight stayed almost constant. At the same time, the modal share of rail and road in the EU-10 diverged as the removal of trade barriers and liberalisation of markets led to a decline in heavy industry, which prompted increased demand for road transport. A change in the geographic orientation of trade (from east to west) has also contributed to the shift because the new markets are not connected by rail links and offer much more flexible road transport connections as an alternative. At the present rate of change, the balance of rail and road freight transport in the EU-10 will be similar to the EU-15 within a decade. A more detailed breakdown is available in Table A.2 of Annex 3 on data.



Source: Eurostat, 2008.

Box 2.1 Reforming cabotage regulations for better efficiency

The liberalisation of the internal EU market has led to complex freight transport movements. One impact of this has been the practice of cabotage, whereby hauliers from one country pick up and deliver goods within another country. Cabotage is used to reduce 'empty runs', which account for 10 % of long distance and 19 % of local and regional operations in Germany (BDI, 2007). Experience has shown that reducing barriers to the movement and activities of freight can lead to increased efficiency and reduced incidences of empty running.

Cabotage, which constitutes approximately 1 % of national road transport demand within the EU (EC, 2006b), is currently only legal if hauliers conduct no more than three cabotage operations in the country of destination within seven days of completing a delivery. The European Parliament has called for the lifting of all limits on cabotage by 2014.

3 Passenger transport and modal split

Passenger travel by road and air has continued to increase throughout the EEA member countries. Levels of growth have been particularly pronounced in eastern Europe where increases in air travel have been fuelled by the expansion of low-cost carriers and car ownership levels are converging with those of western Europe.

The number of kilometres travelled by passengers in EEA member countries grew by 1 % in 2006. This is a little below the annual average of 1.3 % over the past decade. Intra-EU air passenger travel remained the fastest growing area, accelerating to 4.6 % growth in 2006 and 8 % in 2007. Intra-EU sea travel, on the other hand declined by 9 % in the period 1996–2006 (EU-27) bringing its modal share to below 1 %.

Bus and coach travel has decreased from a share of 9 % of intra-EU travel in 1996 to 8 % in 2006. Powered two-wheelers have expanded their market share slightly to just above 2 %. Railways, tramways and metro systems now account for 7 % of passenger transport, while the cars remain the dominating mode with a share of 73 % (DG TREN, 2008).

For comparison it would be useful to include data on non-motorised transport, in particular bicycle traffic in urban areas. Unfortunately, no unified European data set exists in this field. Figure 8.3 in Chapter 8 does, however, provide some indication of bike traffic growth in London as a result of the congestion charging scheme there.

The high modal share of private car and air travel has negative environmental impacts at all geographical levels. Passenger transport contributes strongly to air and noise pollution, habitat fragmentation and greenhouse gas emissions. The latter could compromise Europe's ability to meet stringent greenhouse gas emission targets currently under negotiation.

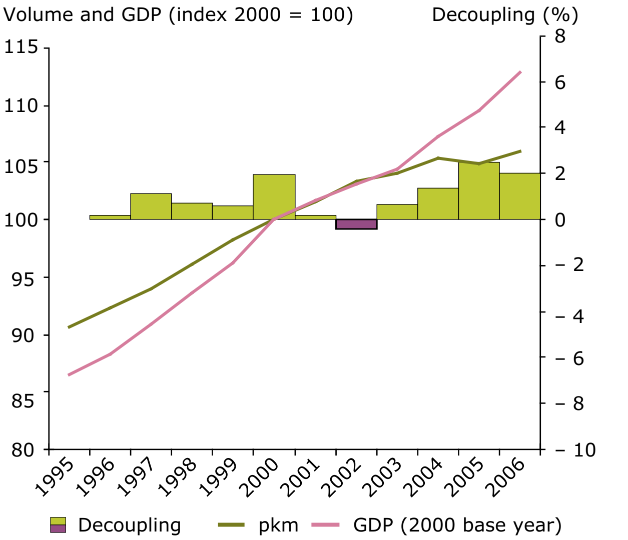
Public transport improvements could influence traveller behaviour and reduce the growth in car ownership, which rose by 22 % between 1995 and 2006 in the EU-27. Car ownership growth rates have been particularly high in eastern and central Europe, where they have almost tripled since 1990, albeit from a lower base than in Western Europe (CfIT, 2006). Experience in Germany illustrates the potential effect of good access to public transport. Research there has shown that car ownership in some cities is up to 42 % higher in households 600 m or more from stations (Hass-Klau *et al.*, 2007). High levels of car ownership and the relatively low modal share of public transport are continuing to have a negative environmental, social and economic impact, with congestion in urban areas being a problem across Europe.

A key aim of the European Commission's Green Paper on Urban Transport (EC, 2007c) is to support policies that encourage greater use of public transport. The Paper includes policies to introduce more bus priority measures; to improve the coverage, reliability and frequency of bus and rail services; and to introduce new rail links. The Paper supports using charging to make better use of existing infrastructure and to influence demand. Fuel price increases experienced over the last year (see Box 3.1) indicate that increasing the cost of private transport relative to public services can influence decisions on how and whether to travel. Chapter 6 includes further discussion on the role of fuel prices in determining demand.

An Urban Mobility Action Plan, which would develop the measures detailed in the Green Paper, has been anticipated since the end of 2007 but not yet produced. It is therefore difficult to assess the impact that the Green Paper will have. It is evident, however, that continuing delays in implementing the Paper's proposals will only exacerbate carbon emissions and environmental damage.

Figure 3.1 Trends in passenger transport demand and GDP

Passenger transport volumes continue to grow slower than the economy. In addition, the growth rate has decreased and even become negative in some countries in recent years. This is probably a reaction to increasing congestion, which lowers the desire for additional transport. A more detailed breakdown is available in Table A.3 of Annex 3 on data.



Note: The two curves show the development in GDP and passenger transport volumes, while the columns show the level of annual decoupling. Green indicates faster growth in GDP than in transport while purple indicates stronger growth in transport than in GDP. A number of countries have changed accounting methodology or have incomplete time series but no correction factor exist. See Annex 1 on metadata for details.

Source: Eurostat, 2008.

Box 3.1 The impact of fuel prices on travel demand and traveller behaviour

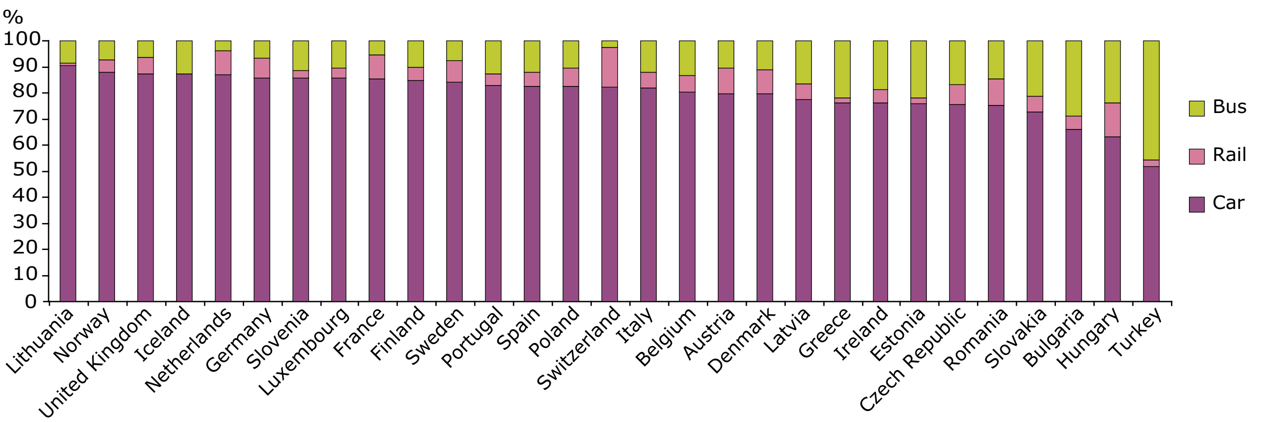
Fuel prices represent a considerable proportion of the total cost of transport. Recent increases in fuel prices (until July 2008) are therefore likely to have had an impact on total transport volumes and traveller behaviour. The extent of the impact has not yet been formally quantified but research indicates that for every 10 % increase in fuel prices, demand will increase by 21 % for urban bus services, by almost 18 % for inter-urban rail services, by 10 % for urban rail services, and by 4 % for inter-urban coach services (Balcombe *et al.*, 2004).

The International Air Transport Association has calculated that if the price of flying increased by 1 % then demand for short-haul intra-European flights and demand for long-haul flights would decrease by almost 1 % each (IATA, 2008).

New car sales contracted for six consecutive months in 2008 and were more than 5.4 % lower in the 10 months from January to October than during the same period of 2007. The number of new cars registered in October 2008 was 14.5 % lower than in October 2007 (ACEA, 2008). The larger decrease in the October figure is explained by the added effect of the economic slow down.

Figure 3.2 Passenger transport modal split in 2006 (without aviation)

The modal split for passenger transport was dominated by the private car in all EEA member countries. Bus travel had the second largest modal share in all but five European countries. Between 1996 and 2006 passenger demand for rail remained stable or grew in all EU-15 member States except in Austria. In contrast, rail transport in all EU-12 Member States countries experienced a major slump, falling to a record low in Lithuania (7 % of the 1990 level) and in Estonia (17 %) due to market reorientation and low investment. A more detailed breakdown is available in Table A.4 of Annex 3 on data.



Note: The Switzerland data are for 2005.

Source: Eurostat, 2008.

4 Greenhouse gas emissions from the transport sector

Greenhouse gas emissions from transport have risen considerably since 1990 and are projected to continue increasing. This contrasts with other sectors of the economy and highlights the challenges for transport. The EU's '20-20-20 by 2020' Energy and Climate Package sets overall reduction targets for greenhouse gases and highlights the need for the transport sector to contribute actively to achieving them. There are no sector-specific goals in the Package, however, and the transport sector's contribution has not yet been defined. Positive steps have been taken, such as the recent inclusion of aviation in the European Union Emissions Trading Scheme, but it is still not clear how all other necessary reductions are to be achieved.

Greenhouse gas emissions from the transport sector continue to grow, in contrast to other sectors such as industry, housing and energy production (see Figures 4.1 and 4.2). While there is anecdotal evidence that high crude oil prices in much of 2008 affected demand for various modes of transport, it is not clear whether this will continue if prices rise once more, or if transport users will simply adapt to higher prices. The production and consumption sectors, which are large consumers of transport services, will be negatively affected by higher fuel prices because technological innovation and the development of cheaper and more energy efficient infrastructure, such as rail, are lagging.

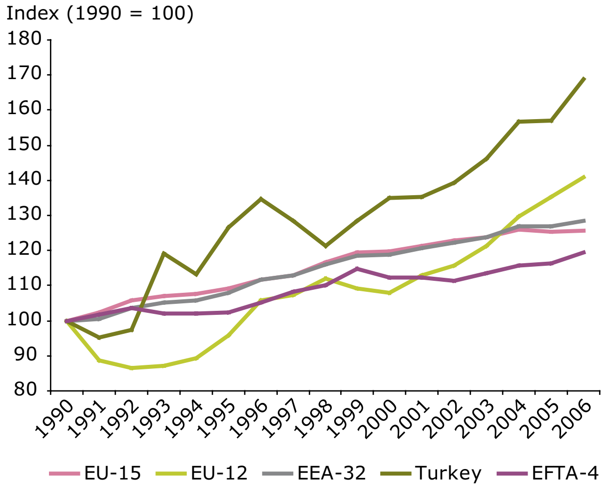
Aviation, particularly international aviation (including within the EU), is projected to increase at a rapid pace, although growth in all transport sectors might slow down because of the economic slowdown and recent high fuel prices. Road transport continues to be the dominant source of greenhouse gas emissions for both freight and passenger transport. Although measures have been implemented to improve the energy efficiency of passenger and freight road transport, gains have been far outpaced by increasing transport demand.

Relative to other transport modes, international aviation and maritime transport have shown the highest growth of greenhouse gas emissions over the last decade. Those emissions are not regulated by the Kyoto Protocol and to date no mandatory emissions reductions have been set for them. The International Maritime Organisation (IMO) and the International Civil Aviation Organisation (ICAO) are investigating different options to reduce emissions of greenhouse gases in their respective sectors and have announced that they will report on the progress at COP15 in Copenhagen. The IMO Marine Environmental Protection Committee adopted an 'interim CO_2 operational index' in July 2005. This has, on a voluntary basis, been used by a number of States and industry organisations to determine the fuel efficiency of their shipping operations. It is also being used to establish a common approach for trials on voluntary CO_2 emissions indexing. In the field of international aviation, the EU's decision in 2008 to include aviation under the Emission Trading Scheme from 2012 can be seen as a first step towards limiting greenhouse gas emissions from the aviation sector.

The proposed EU legislation '20-20-20 by 2020' (EC, 2008a; EP, 2008) calls for a reduction of greenhouse gas emissions of at least 20 % by 2020 compared to 1990 across all sectors. For the sectors outside the EU-ETS, a reduction of 10 % between 2005 and 2020 is proposed. The European Commission's communication notes that 'A specific effort is needed to achieve greenhouse gas emissions reductions and improved security of energy supply in the transport sector'. It is worth noting that efforts to design interventions to reduce overall greenhouse gas emissions might be more effective if targets were defined for individual transport sectors.

Figure 4.1 Transport sector greenhouse gas emissions 1990–2006

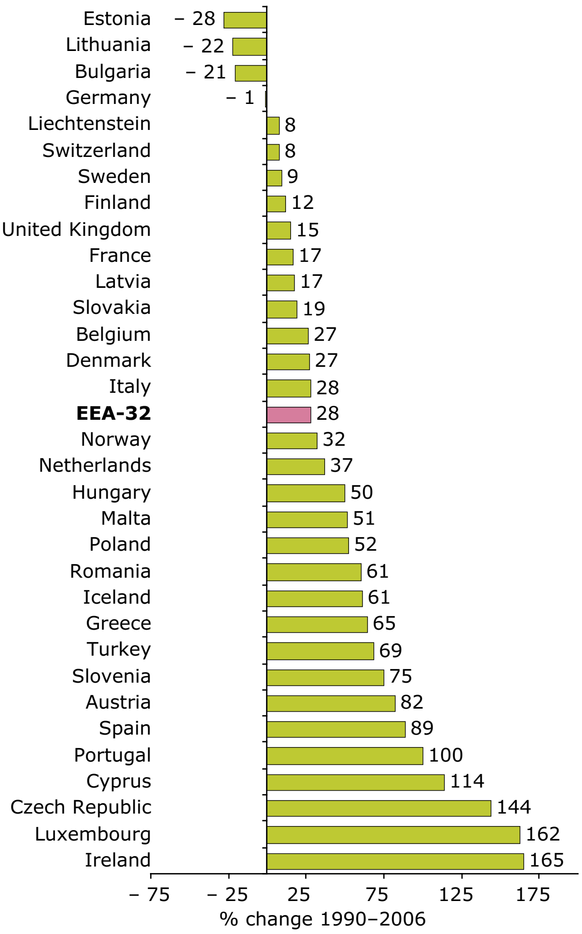
Transport sector greenhouse gas emissions increased by 28 % over the period 1990–2006. This compares with a reduction of 3 % in emissions across all sectors. The increase has occurred even though fleets have generally improved their energy efficiency and therefore reflects increased transport volume.



Source: European Topic Centre for Air and Climate Change, 2008.

Figure 4.2 Trends in transport sector greenhouse gas emissions by country 1990–2006

The majority of EEA member countries saw an increase in transport emissions principally due to increased transport movements. Austria, Malta and Slovakia were the only states that showed decreases in transport greenhouse gas emission compared between 2005 and 2006.



Source: European Topic Centre for Air and Climate Change, 2008.

Box 4.1 Addressing greenhouse gas emissions in the transport sector

Although climate change will be the main environmental challenge in the years to come, it is important to note that interventions designed to reduce greenhouse gas emissions may adversely impact on other areas, such as air quality or biodiversity. These issues have to be taken into account when developing future sustainable transport policies. It is also obvious from previous experience that transport demand has to be tackled at the same time as promoting more technology-oriented supply-side measures.

One interesting possibility is the use of emissions trading in the transport sector. So far no part of the transport sector is covered directly by the EU-ETS. Some activities linked to the transport sector are covered, however, for example electricity produced to power rail travel and fuel production in refineries.

A key development is the inclusion of intra-EU aviation emissions in the EU-ETS from 2012. This will make it necessary for the aviation sector to realise greenhouse gas emissions reductions, by either decreasing their own emissions or buying allowances on the market. For 2012 that cap is set to 97 % of average emissions during the years 2004–2006.

Inclusion of other modes of transport has also been mentioned but so far there are no firm proposals.

5 Local emissions and air quality

Emissions of regulated air pollutants from vehicles continue to fall across EEA member countries but concentrations remain high in some urban areas. High levels of pollutants continue to compromise human health. In response, integrated approaches including low emission zones are being introduced.

Road transport emissions of air pollutants continue to decline in EEA member countries. Nonetheless, a recent report has shown that they remain the primary source of nitrogen oxides and the second most important source of fine particulates (EEA, 2008a). Despite reduced road transport exhaust emissions across Europe, there have been no significant improvements in concentrations of PM_{10} and nitrogen dioxide (NO_2).

As exhaust emissions decline, tyre and brake wear are making a growing contribution to total road transport emissions of air pollutants. For example in the United Kingdom this contribution has increased from 15 % in 1990 to 42 % in 2006 (NAEI, 2009). Although NO_X emissions are declining due to reduced exhaust emission limits, nitrogen dioxide (NO_2) concentrations are relatively stable. This may be due to an increase in the proportion of NO_X emitted as NO_2 by vehicles (primary NO_2 emissions), the result of increased sales of Euro 3 diesel vehicles fitted with oxidation catalysts and the fitting of catalytically regenerative particle traps to heavy goods vehicles (AQEG, 2007). These technologies can produce excess NO_2 as a by-product.

In addition to measures that reduce road transport demand in particularly sensitive areas, the 'Euro' exhaust emission standards for all new vehicles are the main tool to reduce vehicle emissions of regulated air pollutants. The Euro 5 standard for light duty vehicles has now been agreed for September 2009 and Euro 6 for January 2014. Euro 5 is expected to reduce particulate emissions from diesel cars by 80 % compared to Euro 4 (EC, 2007d). The Euro 6 standard should include a method for regulating particle number and should significantly reduce NO_X from diesel cars. For heavy duty vehicles, the Euro V standard came into force in October 2008 and a future Euro VI standard is planned for 2014.

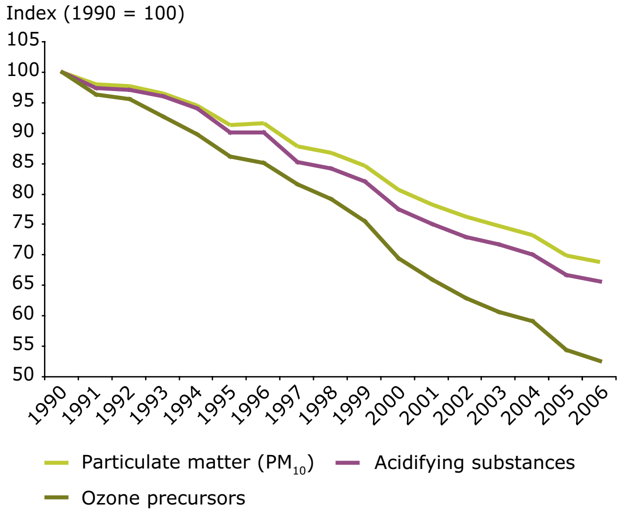
The new EU Air Quality Directive (2008/50/EC) replaces all previous directives except the 4th Daughter Directive (2004/107/EC) and provides a common approach to air quality assessment (EU, 2008). In accordance with the instrument's aims, many cities have introduced measures to control activities that contribute to breaching air quality objectives. For example, Utrecht is planning to construct a tunnel to filter exhaust fumes away from residential areas, replace the city's fleet of cars with clean vehicles and introduce park-and-ride schemes. Some London boroughs have developed car sharing schemes and set differential parking charges based on emissions.

There are low emission zones (LEZs) operating in 70 cities across eight countries (see Box 5.1). Although these schemes can act as an effective driver to accelerate fleet renewal and encourage new cleaner technologies, there is a strong need to harmonise standards across Europe. That includes standardising the vehicles permitted to enter LEZs, unification of LEZ signing across Europe and regulations on how to deal with foreign vehicles. The standards need to be communicated clearly to the public.

Maritime emissions of SO_X and NO_X are expected to be larger than land-based emission in the near future (ASTA/NCM, 2004). Methods to assign marine emissions to countries must be developed and agreed. A benchmarking approach could be useful to reduce the emissions from this sector.

Figure 5.1 Transport emissions of regulated air pollutants in EEA member countries

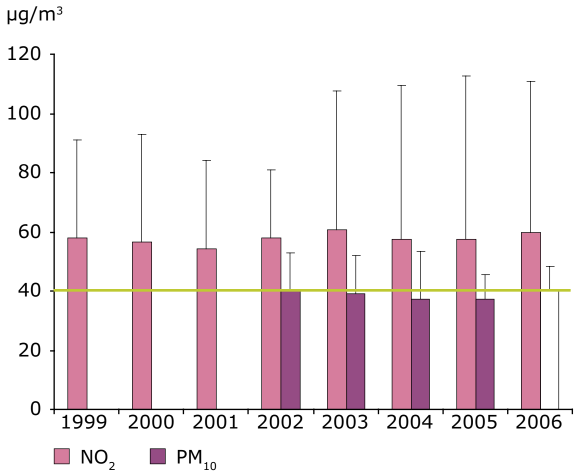
Total transport emissions of particulates, acidifying substances and ozone precursors decreased by 31 %, 34 % and 47 % respectively between 1990 and 2006. The continued tightening of 'Euro' emissions standards for road transport and improvements to fuel quality are the main reasons for these reductions.



Source: European Topic Centre for Air and Climate Change, 2008.

Figure 5.2 Exceedances of annual average air quality objectives caused by traffic

Data from selected air quality monitoring stations close to roadsides in urban agglomerations indicate that PM_{10} concentrations are close to the 2005 limit value shown in green. NO_2 concentrations are stable for the period 1999–2006 and significantly exceed the limit value shown in green. The limit value for NO_2 applies from 2010.



Note: Columns indicate mean values while error bars indicate maximum values.

Source: European Topic Centre for Air and Climate Change, 2008.

Box 5.1 Selected examples of Low Emission Zones in Europe

Austria: A permanent 'motorway LEZ' in Tyrol applies to heavy goods vehicles with trailers and tractor-trailers over 7.5 tonnes and has a current emission standard of Euro II.

Czech Republic: The environmental zone in Prague has a weight restriction in place, which prevents vehicles weighing more than 3 500 kg from entering the city centre. The measure has encouraged heavy vehicles to use alternative routes and a shift towards more environmentally friendly vehicles.

Germany: A national framework currently operating in 12 cities sets out emissions classes for different vehicles. Petrol vehicles that meet Euro 1 standard with a catalytic converter fitted and diesel vehicles that meet Euro 4 or Euro 3 for PM_{10} can enter cities unrestricted.

Greece: Cars may only access the inner traffic ring of Athens on alternate days. Those with number plates ending in even numbers may access on even days and vise versa.

Sweden: LEZs are in operation in Stockholm, Malmo, Lund and Gothenburg. Heavy goods vehicles must be a minimum of Euro II standard or less than six years old to enter unrestricted.

6 Transport fuel developments

Consumer reactions to volatile fuel prices in 2008 demonstrated that there is a limit to what consumers are prepared to pay. As such, pricing can be used as an effective policy tool to influence demand for transport.

Many countries outside Europe have biofuels targets similar to the EU's. Global demand for biofuels and associated pressure on land are therefore set to increase significantly over the coming decade.

Fluctuations in oil prices over the past year have caused consumers to react. Between January and July 2008 the price of crude oil increased by approximately 60 % in United States dollar terms, from around USD 90 (EUR 61) per barrel to USD 145 (EUR 92) (EIA, 2008). Thereafter the price fell dramatically. Notwithstanding these large price movements, when fluctuations are smoothed over a few months the inflation-corrected cost of fuel at the pump is similar to the early- to mid-1980s (see Figure 6.1). The highest oil prices coincided with a period when the dollar was particularly weak against the euro, which acted to soften the effect in Europe. Additionally, the comparatively high fuel tax in Europe compared to USA means that crude oil price fluctuations have less impact on pump prices for European consumers. Nonetheless European consumers reacted to the rising cost of transport fuel. In Germany, for example, fuel sales for June 2008 were 8 % lower than in June 2007 and in Finland fuel volumes for the first half of 2008 were down 5 % from the same period in 2007 (EBR, 2008).

Demand for road transport fuel is gradually shifting from gasoline to diesel. Diesel engines are more expensive but also more energy efficient than similar performance gasoline engines, meaning that the consumer saves on fuel costs. The pricing of fuel types influences the rate of change in consumer preferences, with the shift from gasoline to diesel occurring faster in countries with higher price differentials. The average annual increase in demand for diesel over the past decade was 4.4 % in Europe, while gasoline demand decreased 1.4 % (Eurostat, 2008). At present the EU imports significant amounts of diesel while exporting similar quantities of gasoline. As other world regions adopt similar transport fuel shift strategies to reduce greenhouse gas emissions it is likely to drive the diesel price upwards, making the policy increasingly costly, which in turn will dampen the shift.

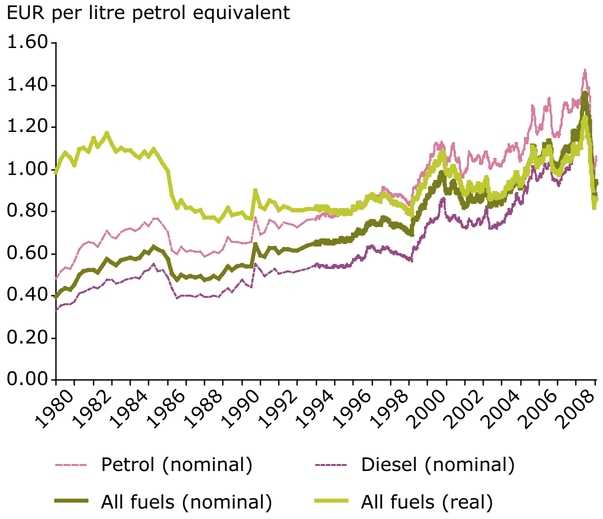
Increasing fossil fuel prices could create an opportunity for renewable alternatives to increase their market share. Unfortunately, the most obvious choice — biofuels — followed a similar price development to oil in 2008. This was partially tied to developments in food demand and agricultural production shortfalls and has led to a heated debate on the ethical dimension of shifting agricultural output from edible plants to transport fuels. Nearly all biofuels offer greenhouse gas savings if potential forest clearance to meet increased demand for biofuels is disregarded. Biofuels are generally far from greenhouse gas neutral, however, and the same volume of biomass would deliver larger emissions reductions if used to replace coal in the heat and power sector.

The EU has recently agreed that 10 % of its transport fuel must come from a mixture of renewable sources, including biofuels, and green electricity. That represents a deviation from the original aim of sourcing 10 % of the bloc's transport fuels from biofuels alone (EP, 2008).

Europe is not the only region aiming to increase the use of biofuels and the global land-use consequences may be dramatic. The EEA projects that biofuels may contribute 6–8 % of road fuel globally in 2020 if all countries meet their targets (see Figure 6.2), up from 1 % today and significantly above the 4 % projected by the International Energy Agency (IEA, 2006). Meeting such ambitious targets will require significant improvements in crop yields and an expansion of cropland for biofuels production. In combination with rising world food demand it increases the likelihood that forest and grassland areas will be converted to meet biofuels targets. While estimates differ it is clear that such induced land-use changes can make the greenhouse gas balance of biofuels negative.

Figure 6.1 Road transport fuel prices (including taxes) in EU Member States

Fuel prices have fluctuated dramatically over the last year. However, apart from a short period in 2008, price levels were still close to the levels of the early- to mid-1980s when corrected for inflation.

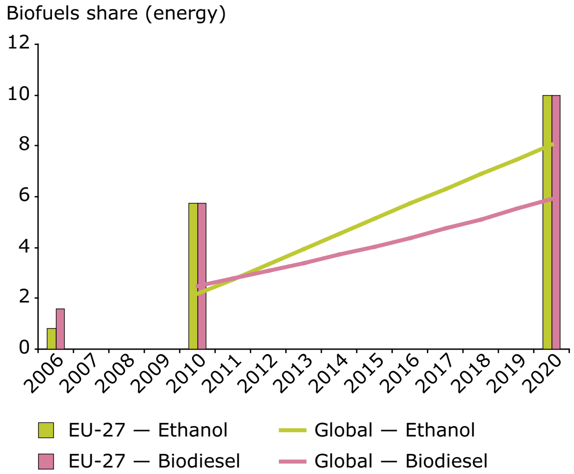


Source: DG TREN, 2008.

Figure 6.2 Global biofuels targets

EU Member States are planning to increase the share of biofuels in transport fuel to 5.75 % in 2010 and 10 % in 2020 (including other renewables). But other regions are going in the same direction. EEA has identified 47 countries — representing around 75 % of global road transport fuel consumption — that have set national biofuels targets. The combined effect is a global target of slightly above 2 % by 2010 rising to 6 % for biodiesel and 8 % for bioethanol by 2020.

A more detailed breakdown of EU-27 data, and data for the remaining EEA countries is available in Table A.8 of the Annex 3 on data.



Source: EEA, 2008.

Box 6.1 Alternative fuels for aviation and maritime transport?

The EC has recently tendered for more research to evaluate the feasibility of aviation biofuels. Currently there is no 'bio' equivalent of kerosene, the petroleum-derived fuel used in aviation. A limited number of test flights have trialled aviation biofuel but because the energy content per kg of fuel is lower than regular jet fuel each plane must carry more fuel or have a lower range. It is therefore not currently an attractive option for airlines but this may well change as second generation technologies are introduced.

Biofuels could also be used in the maritime sector as marine engines are more tolerant of different types of fuel than terrestrial ones. Biofuels have lower sulphur content than marine diesel and potentially offer large carbon savings. A number of trials investigating the feasibility of running ships on biofuels have recently taken place and the results have so far been promising (DfT, 2008b). The main barriers to biofuels replacing marine diesel fuel are cost, the need for bigger fuel tanks and concerns about their long-term availability (DfT, 2008b).

In terms of offsetting greenhouse gases consumption it is unimportant which transport mode uses biofuels. There are limits to the amount of biofuels that can be produced globally, so if more biofuels are used in maritime transport less will be used in road transport. Biomass should be used to produce energy where the greenhouse gas benefit is largest but because the energy used across the transport sector is almost entirely oil-based the difference in benefits is marginal.

7 Transport noise

Many people are exposed to transport noise levels that affect their quality of life and health, notably in large agglomerations. Road traffic is by far the main source of transport noise. In the short term, some technical measures could help reduce road and railway noise at source. Noise emissions standards for road vehicles and aircraft should be reviewed. Strong and comprehensive responses are needed to limit the nocturnal noise arising from rapid air traffic growth.

The EU's current ambient noise limit and target values need to be reviewed in the light of the latest scientific evidence on the health impacts of noise and forthcoming WHO revised guidelines on night noise. Global measurable and time-related targets on exposure to transport noise are also needed. In addition to traditional mitigation measures, land-use and transport planning and housing standards should play an important role in preventing future increases in exposure to transport noise.

Until recently, European data on exposure to transport noise were scarce. Noise indicators and assessment methodologies were not harmonised across the region and were therefore hardly comparable between countries. Directive 2002/49/EC on the assessment and management of environmental noise (see Box 7.1) provides that common noise indicators be used in EU Member States to draw up strategic noise maps and assess exposure to ambient noise. Because this year marks the first assessment of EU-wide data, the issue is addressed in extra detail in this report.

The first set of data on noise exposure in major agglomerations and along major infrastructures reported to the European Commission in 2007 comprised information on 162 agglomerations (with more than 250 000 inhabitants), roughly 82 000 km of major roads, approximately 12 000 km of major railways, and 74 major civil airports (DG ENV, 2008a). The analysis below is based on those data and therefore does not depict the full exposure to transport noise in Europe.

Bearing in mind these limitations, the available data (Figure 7.1) show that road noise is by far the predominant source of exposure to transport noise in large European agglomerations both during the 24-hour and night periods. They also show (Figure 7.2) that large numbers of people still live in hot spots where transport noise levels are likely to have severe effects on human health.

Health effects

In addition to reported annoyance and sleep disturbance, there is increasing evidence that transport noise also has effects on the cardiovascular system, mental health and school performance in children (EC, 2002; EC, 2004a).

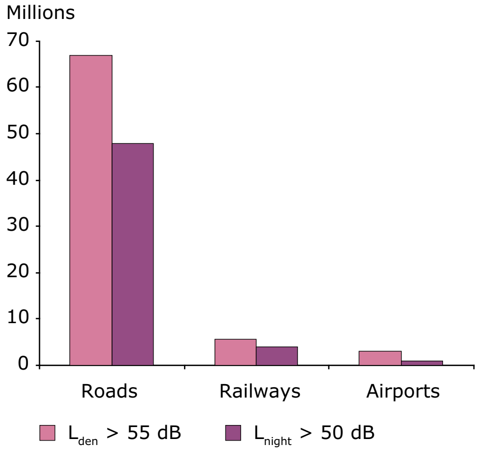
The Hypertension and Exposure to Noise Near Airports (HYENA) Study found that night-time (L_{night}) aircraft noise exposure and road traffic noise ($L_{Aeq,24hr}$, which is very similar to L_{den}) were associated with increased risk of hypertension (Jarup *et al.*, 2008). It also found that aircraft noise events at night were associated with temporary elevation of blood pressure. A recent meta-analysis of studies of road traffic noise and cardiovascular disease suggests that for noise levels between 60 dB and 80 dB ($L_{Aeq,6\text{-}22hr}$)

Box 7.1 EU noise indicators

Directive 2002/49/EC established that two noise indicators — L_{den} and L_{night} — should be used to elaborate mandatory strategic noise maps. L_{night} is the annual long-term average noise level during the night (23.00–07.00). L_{den} is the annual long-term average noise level over 24 hours, combining the L_{day}, $L_{evening}$ (weighted by 5 dB) and L_{night} (weighted by 10 dB) levels. L_{day} and $L_{evening}$ are the annual long-term averages noise levels during the day (07.00–19.00) and evening (19.00–23.00). Directive 2002/49/EC also allows the use of other special indicators and related noise limits where appropriate. It provides guidance in this respect by suggesting, for instance, the use of the maximum noise level (L_{Amax}) or the sound exposure level (SEL) for night period protection in the case of noise peaks.

Figure 7.1 People affected by transport noise in agglomerations > 250 000 inhabitants (EU-27)

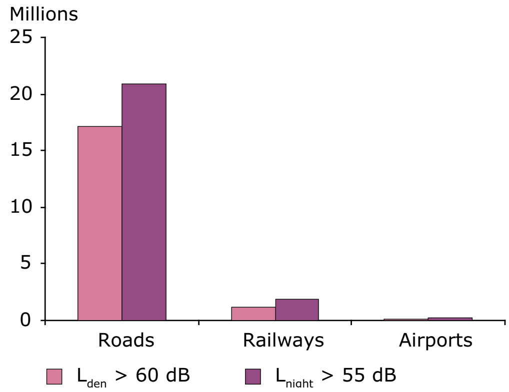
Almost 67 millions people (i.e. 55 % of the population living in agglomerations with more than 250 000 inhabitants) are exposed to daily road noise levels exceeding 55 dB L_{den} (the lower benchmark for the combined noise indicator). Daily exposure to railway noise and airport noise in these agglomerations is lower but still significant, with respectively 5.6 and 3.2 million people exposed to levels above 55 dB L_{den}. With almost 48 million people exposed to levels exceeding 50 dB L_{night}, (the lower benchmark for nighttime noise) road noise is also by far the largest source of exposure to night-time transport noise.



Source: The European Topic Centre Land Use and Spatial Information, 2008.

Figure 7.2 People living in transport noise hot spots in agglomerations > 250 000 inhabitants (EU-27)

Almost 21 million people (i.e. 17 % of the population living in agglomerations with more than 250 000 inhabitants) live in areas where night-time road noise levels have detrimental effects on health. Road noise again is the main source of transport noise hot spots in these agglomerations.



Source: The European Topic Centre Land Use and Spatial Information, 2008.

the relative risk of attributable cardiovascular disease increases significantly (Babisch *et al.*, 2005). It was estimated that around 3 900 myocardial infarction cases per year (1999) could be attributed to road traffic noise in Germany. Women and children exposed to high levels of road traffic noise at night were found to have higher levels of hormones (Babisch *et al.*, 2001).

Both aircraft and road traffic noise exposure have been linked to increased rates of psychological problems and small non-linear associations have been found between road traffic noise and anxiety symptoms (Hardoy *et al.*, 2005). Much evidence confirms that the most common effect of excessive noise on children is cognitive impairment (Haines *et al.*, 2002; Hygge *et al.*, 2002). The Road traffic and Aircraft Noise exposure and children's Cognition and Health (RANCH) Study demonstrated that chronic aircraft noise exposure affects reading comprehension and recognition memory (Stansfeld *et al.*, 2005). High aircraft noise exposure has been associated with decreased quality of life in children, while road and rail traffic noise has been linked to poorer classroom behaviour, poor self-reported child mental health in children, and low birth weight or premature birth (Evans *et al.*, 1998; Lercher *et al.*, 2002).

Targets and limits

The current EU policy framework sets general objectives for reducing exposure to transport noise (see Box 7.2). It does not, however, establish any time-related or measurable targets on the number of people exposed to transport noise. As such, there is no indication of what should be achieved or how much progress has been made towards that goal. Without targets, it is also difficult to devise a consistent strategy achieving the right balance between the vehicle-oriented mitigation measures decided at community level and the national and local action plans.

The EU legislation sets neither ambient noise limits or target values that would compel competent authorities to consider or implement mitigation measures within their action plans. On the contrary, it leaves it up to Member States to set such values and other relevant priority criteria for action. As a result, the countries

Box 7.2 EU objectives on transport noise

'Substantially reducing the number of people regularly affected by long-term average levels of noise, in particular from traffic which, according to scientific studies, cause detrimental effects on human health' (Sixth Community Environment Action Programme, Decision 1600/2002/EC, 22 July 2002)

'No later than 18 July 2009, the Commission shall submit to the European Parliament and the Council a report on the implementation of this Directive … That report shall if appropriate, propose implementing strategies on aspects such as … long-term and medium-term goals for the reduction of the number of persons harmfully affected by environmental noise, taking particularly into account the different climates and different cultures' (Directive 2002/49/EC, 25 June 2002). 'Reducing transport noise both at source and through mitigation measures to ensure overall exposure levels minimise impacts on health' (Renewed EU Sustainable Development Strategy, EU Council, June 2006).

vary greatly in terms of the values, metrics and scope of their standards.

The lack of harmonisation of noise limits can have consequences in the case of major EU airports, for instance, because it may create an incentive for airlines to route air traffic through airports where noise restrictions are less demanding, thus spreading rather than reducing problems. It is therefore advisable that noise limit and target values are reviewed in the light of the latest scientific evidence on health effects of noise and the WHO guidelines on noise (see Box 7.3).

Mitigation measures

The EU policy on mitigation of transport noise follows two major principles laid down by the EU Treaties: the principle for shared responsibility and appropriate level of action between the Community and the Member States (subsidiarity principle, and the rectification of environmental damages at source as a priority.

Community action has so far encompassed setting noise emissions standards for road and rail vehicles and aircraft, setting rules on aircraft-noise-related operating restrictions and, more recently, amending road charging legislation and promoting measures for the mitigation of noise emitted by old railway wagons (EC, 2004b; EC, 2008b). The Commission may give further consideration to reducing noise at source, notably through its review of implementation of Directive 2002/49/EC, which aimed to provide 'a basis for developing Community measures to reduce noise emitted by the major sources, in particular road and rail vehicles and infrastructure, aircraft'. That directive also provided that Member States should draw up complementary action plans for large agglomerations and major transport facilities. States were only required to submit their first action plans to the Commission by 18 January 2009 and this section therefore only reviews the Community measures addressing mitigation at source.

Road noise

Road noise comes from three main sources: power-train noise (cooling-fan, engine, drive-train, and exhaust), tire-road interaction noise and wind noise. Wind noise is only important at high speed, while the importance of the two first depends on factors such as vehicle type, driving style and road surface. Research shows that an holistic approach, combining measures on vehicles, tyres and road surfaces with speed moderation, would yield a 5 dB reduction in road noise at source in most situations with current technology (Kropp *et al.*, 2007). According to road noise experts, more research notably on vehicles, tyres and road surfaces would

Box 7.3 Forthcoming WHO night noise guidelines for Europe

In 2008, the European Commission's Directorate-General for Health and Consumer Protection published a peer reviewed report summarizing the conclusions and recommendations on night noise guidelines for Europe of a group of experts coordinated by WHO (DG SANCO/WHO, 2007). The report highlights that long-term health effects such as cardiovascular disorders are more correlated with indicators such as L_{night}. Instantaneous effects such as sleep disturbance are more correlated with the maximum level per event (L_{Amax}) such as a passage of a lorry, plane or train. The experts found that biological effects are apparent for noise levels exceeding 32 dB L_{Amax} (inside the bedroom) and effects on sleep quality are evident for noise levels exceeding 42 dB L_{Amax}.

The experts also reviewed the relations between L_{night} noise levels and health effects. They concluded that no effects were observed for L_{night} noise levels up to 30 dB(A) and recommended several L_{night} related target values for health protection. In the light of this work WHO intends to publish night noise guidelines for Europe in 2009 (WHO, 2008).

be needed to achieve a 10 dB reduction at source; this long-term objective is deemed achievable by 2020 and has been retained by the Community as a research target (DG RTD, 2007).

Since 1970 the Community has been setting and strengthening noise limits applicable for new road vehicles. There is evidence that these standards have had limited effectiveness on overall road traffic noise over the past 30 years (Affenzeller *et al.*, 2005; I-INCE, 2001). Those standards were revised for the last time in 1992 (for vehicles with four or more wheels) and 1997 (for those with two and three wheels). Following a lengthy process, a new test procedure was established in 2006 under the auspices of the United Nations Economic Commission for Europe (UNECE). Vehicles noise standards probably need to be reviewed again now to take account of the latest knowledge and technological progress. Given the lead time needed for manufacturers to bring production into line with new requirements and the pace of renewal of the road fleet mixes, around two decades might well be needed before new standards deliver their full effects on ambient noise.

Inspection of vehicles is also an important — but often neglected — element in efforts to reduce noise from vehicles. Current EU legislation on technical inspection, for instance, merely requires a subjective check (listening and visual inspection). There is strong evidence, however, that noise levels of road vehicles, even recently manufactured ones, deviate significantly from the limits set for their type (DG ENV, 2008b; Steven, 2005).

Tyre noise has limited the effectiveness of vehicles noise regulations in the past. The EU's first legal standards for tyre noise were introduced in 2001. A technical review showed, however, that they had little impact on overall traffic noise because most tyres already met the standards before they came into force (FEHRL, 2006). Moreover, a significant proportion of tyres have performances much below the limits (by up to 8 dB). The review also demonstrated that it is feasible to reduce tyre noise considerably without compromising safety or energy consumption, with public health benefits largely outweighing the costs for the tyre industry. Taking account of this review, the European Commission proposed strengthened noise limits for new tyres (applicable from 2012 for new design tyres and from 2016 for all new tyres) (EC, 2008e). Consideration may still be needed on tyre noise labelling, and noise standards on retreated tyres and studded tyres. Finally, the trend towards wider tyres increases rolling noise and resistance, thus boosting energy consumption and carbon dioxide emissions.

Low-noise road surfaces are another important option for limiting rolling noise and should be seen as complementary to action on tyres. There is much evidence that low-noise surfaces offer cost-effective noise reduction (SILENCE, 2008; SILVIA, 2008). Low-noise road surfacing can amplify the benefits of better tyres, realising large reductions in rolling noise. Conversely, poor road surfaces may significantly undermine the acoustic improvements obtained on tyres. Recent works (COWI, 2008) demonstrate the need for technical standards defining common methods to measure the acoustic performance of road surfaces and a common acoustic classification scheme for road surfaces. Such standards facilitate the introduction of technologically neutral acoustic specifications in contracts for road surfacing and support the development of local action plans that use the full potential of low-noise road surfacing. Interestingly, various research projects now provide guidance and support on using low-noise road surfaces (INQUEST, 2008).

Airport noise

Estimates show that the number of people exposed to air traffic noise around major EU airports has increased since 2002 and will probably continue to grow, particularly during the night, if measures are not taken (ANOTEC, 2003; MPD, 2007). The increase is caused both by increasing traffic and encroachment around airports. These trends, confirmed by the Commission review of Directive 2002/30/EC, suggest that comprehensive and strong responses are needed, particularly in view of the trend of transport policies in Europe towards increased airports capacity (EC, 2007a; EC, 2008c).

In 2004, the Assembly of ICAO urged its member states to adopt a balanced approach, taking full account of ICAO guidance, when addressing noise problems at their international airports. The 'balanced approach' to aircraft noise management consists of 'identifying the noise problem at an airport and then analysing the various measures available to reduce noise through the exploration of four principal elements: reduction at source, land-use planning and management, noise abatement operational procedures and operating restrictions, with the goal of addressing the noise problem in the most cost-effective manner'. It is based on the principle that solutions to noise problems need to be tailored to the specific characteristics of the airport concerned (the 'airport-by-airport approach'). Directive 2002/30/EC adopted this approach but it remains to be seen whether action plans for major airports will fully implement the balanced approach.

New jet aircraft must comply with ICAO specifications for the noise certification of aircraft (Chicago Convention, Annex 16), specifically Chapters 2, 3 and 4, which provide for progressively lower noise emissions. Over the past 50 years, certified noise levels of aircraft have been reduced by over 30 EPNdB (effective perceived noise in decibels) which corresponds to an eightfold decrease in loudness. Chapter 2 aircraft were permanently banned in Europe with effect from April 2002. Chapter 3 related requirements were set in 1977 and have been enforced until 2006. Chapter 4 was adopted in 2001 and came into force in 2006 with a 10 EPNdB noise reduction compared to Chapter 3. There is however evidence that most aircraft in-use landing and taking off at EU airports already complied with the most recent Chapter 4 when it entered into force (MPD, 2007) (Öko-Institut, 2006). Therefore, latest ICAO standards did not incentivise further improvements in noise emissions of aircraft; they followed the technological progress more than they steered it. Since 2008, the Seventh Framework Programme for the Community Research and Development Information Service (CORDIS) supports projects aiming to demonstrate the readiness of technologies that reduce aircraft noise per operation by 10 EPNdB in 2020 compared to 2001 (CORDIS, 2008).

ICAO encourages States 'not to apply operating restrictions as a first resort but only after consideration of the benefits to be gained from other elements of the balanced approach'. Directive 2002/30/EC laid down rules to facilitate setting operational restrictions in a consistent manner at airport level 'so as to limit or reduce the number of people significantly affected by the harmful effects of noise'. The wide range of restrictions allowed by the directive have only been used at a limited number of EU airports (MPD, 2007), even for the protection at night. The Commission has determined that because chapter 3 aircraft represents a small share of fleets landing or taking off at EU airports, permanent restrictions on them — even beyond the possibilities currently allowed by the legislation — would not reduce overall exposure in the EU by 2015, including night-time exposure (EC, 2008c). The Commission therefore recently announced its intention to examine ways of clarifying the provisions of Directive 2002/30/EC and its scope, and to consider whether more stringent noise-related operating restrictions are needed.

Sanctions for non compliance with operating restrictions, operational procedures or noise limits are implemented in a few airports (e.g. eight airports in France and three in the United Kingdom). Levels of fines vary greatly across countries (up to GBP 1 000 in the United Kingdom, up to EUR 20 000 in France and up to EUR 225 000 in Spain). Strict enforcement is challenging. In France for instance, a dedicated authority (ACNUSA) was set up to ensure strict and fair enforcement of aircraft noise regulations (see Box 7.4). The revenues are not systematically allocated for airports noise mitigation programmes.

Certain operational procedures are sometimes considered for aircraft noise reduction. These include specifying preferential routes, concentrating flight paths in airspace or setting over-flying heights. Research shows that innovative procedures such as continuous descent approaches may also significantly (– 3 to – 6 dB in L_{Amax}) reduce the maximum noise level on the ground of individual aircraft with little impact on airport capacity and no consequences for safety (SOURDINE II, 2008).

Railway noise

Despite exposing fewer people to transport noise, railways may cause annoyance and sleep disturbance leading sometimes to large public demonstrations (e.g. new high speed trains between Paris and Marseille, and the Rhine Valley rail freight corridor). In 2003, European experts ranked rail freight noise as the most important contributor to railway noise problems, followed by high speed railways and inner-urban railways (EC, 2003). High speed trains may cause considerable annoyance and sleep disturbance due to the number of pass-by noise peaks well above background noise levels. Inner-urban railway noise is mostly caused by rolling noise and curve squeal in hot spots where tracks are near buildings.

The experts ranked rail freight noise as most important because of the planned development of rail freight corridors and the correlated potential increase of noise levels during the evening and at night. Control of wagon rolling noise (i.e. due to the contact between the wheels and the track) was deemed to be essential. This is particularly an issue for existing wagons fitted with cast-iron brakes. They have a long life time (30 to 40 years) and represent the bulk of Europe's fleet (more than 600 000 wagons).

Annually EUR 150–200 million is still spent in Europe on constructing noise barriers along railways (UIC, 2007). Some countries also spend large amounts on soundproofing dwellings. Research shows, however, that focusing more on mitigating rail noise at source (e.g. low-noise break blocks, rail and wheel dampers, quieter locomotives, curve squeal control, rail grinding and wheel maintenance) would be much more cost-effective (STAIRRS, 2008; UIC, 2008).

In recent years, the EU set noise emission limits for new and renewed rolling stock on both high speed

Box 7.4 ACNUSA, a unique case in Europe

ACNUSA is a French independent authority set up by law in 1999 with specific powers over France's ten largest airports. It has power to impose sanctions on individuals and airlines for non-compliance with operating restrictions, non-attribution of time slots, deviation in flight paths and non-compliance with noise limits. Since 2000, more than 1 500 sanctions have been issued, corresponding to more than EUR 10 million fines collected. The effectiveness of sanctions has recently been strengthened by the power to ground aircraft of airline companies that do not pay the amount of the fines imposed.

and conventional railways. These standards have to be kept under review in order to take account of technological progress. Regarding existing fleets of wagons, the Commission recently proposed that 370 000 wagons be retrofitted by 2014 with low-noise brakes (EC, 2008d). It also advocated flanking measures such as noise-related track access charges, noise standards capping overall rail traffic noise close to the track and voluntary commitments from the rail sector. This package of measures could bring about significant noise reductions (between – 5 and – 12 dB close to the track for each passing train) for 16 million people living along the European rail freight corridors. Studies indicate a socio-economic benefit/cost ratio up to 10 for such a programme. The broad and quick implementation of this strategy will however crucially depend upon the availability of 'LL brake blocks' and their definitive approval by the International Union of Railways (UIC). Their availability would considerably reduce retrofitting costs (EUR 200–700 million with LL-blocks, instead of EUR 1–1.8 billion if K-blocks are used).

Noise-related charges

Charging mechanisms designed to incentivise the use of less noisy road and rail vehicles are rarely implemented. In June 2008, the Commission proposed to amend road charging legislation in order notably to enable noise and other externalities of heavy duty vehicles to be subjected to charges and to allow revenues derived there from to be earmarked for implementing noise action plans (EC, 2008b). It also promoted the implementation of noise-related track access charging across Europe to incentivise retrofitting of wagons with low-noise break blocks. Such a scheme was introduced in Switzerland several years ago. Others are now envisaged in Austria, Germany and the Netherlands. Noise classification standards for road and rail vehicles, and automatic identification and charging systems are needed to enable their development.

A few aircraft noise-related charging schemes have been introduced at some EU airports (e.g. France, Germany and the United Kingdom). The EU legislation leaves it up to the Member States to set the modalities of their noise-related charging schemes. ICAO and the European Civil Aviation Conference (ECAC) provide guidance on noise-related charges which both promote the certified aircraft noise levels as the noise parameter to consider for the noise-related modulation of the charge. At some airports (e.g. Hamburg Airport), maximum (L_{Amax}) aircraft noise is measured on the ground by monitoring systems and taken into account in calculating the charge in order to better reflect the real noise impact (Öko Institut, 2004).

Land-use and transport planning

Measures addressing land-use and transport planning can play a very important role in avoiding or preventing future transport noise exposure. Some countries have adopted land-use regulations and plans forbidding the construction of dwellings, limiting future encroachments or imposing strict soundproofing standards on new buildings in the loudest areas. The strategic noise maps required by environmental noise legislation can help implement such measures. Some countries have also set strict standards limiting the environmental noise levels of future transport infrastructure. There is evidence, however, that such approaches are not yet broadly implemented across European countries, notably at airports (INECO, 2005).

Box 7.5 Airports noise charging in France

In France, a noise-related charging scheme operates at 10 major airports. The charge varies according to the aircraft noise category (six categories are used) and the time of departure (the night-time charge is 10 times higher than the day charge for the same aircraft). The revenues of the scheme (EUR 20–55 million a year) are entirely used to subsidise programmes for soundproofing the most exposed dwellings (Plan de Gêne Sonore). Between three and eight thousands dwellings benefit from the scheme every year.

8 The need for demand management

Rising transport demand is driven by economic growth and structures, but can be influenced, particularly with respect to the mode of transport used. Efforts to steer urban development in particular can have an important effect on transport demand growth, although the response is often slow. However, congestion charging and parking fees are methods that can very rapidly influence both traffic levels and choice of transport mode.

Transport demand is mostly derived from developments in other sectors of the economy. Very little transport happens for its own sake but rather because it facilitates the flow of people and resources through the economy. Changes in the ease and cost of transport either assist or hamper changes in society's structure. Cheaper and more reliable transport, for example generally leads to more transport because actions that were not previously cost-effective become profitable. More expensive or less convenient transport, on the other hand, will generally lead to less transport demand.

Demand for both freight and passenger transport continues to grow (see Figure 8.1 and Chapters 2 and 3), with increasing greenhouse gas emissions, noise, fragmentation and land take as consequences. Demand is mostly derived from changes in other sectors of the economy, which influence matters such as urban development, culture and life styles. As such, efforts to control transport demand growth need to be directed at areas including urban development, social policy and regional policy.

Governments have introduced increasing numbers of initiatives in recent years reduce transport demand growth. For example, car share schemes like the 'Mobility cooperative' now account for 2 % of the overall modal share in Switzerland (Swissinfo, 2007) but have not stopped car use from growing. Transport policy discussions are largely supply-oriented, aiming to facilitate transport and optimise the transport system. The focus may be on optimising logistically, economically or in many other respects. But even if the target is to optimise environmental outcomes, this normally does not imply attempting to reduce transport demand. Indeed, apart from transport pricing measures, few transport policy tools have been identified to manage demand. One reason for this might be the absence of policy discussions on demand management.

A first step in addressing transport demand is to understand the purposes for which transport is undertaken. Numerous studies of this issue have been conducted across Europe but differing formats mean that their findings are often incommensurable. Nevertheless it is commonly found that leisure trips account for as much as one-third of all trips (EEA, 2009). User requirements for leisure trips are different from commuter journeys. Whereas the commuter requires timeliness and predictability, leisure trips are often less time critical. They may involve a greater load (baggage), and travel in areas where the public transport system is less developed (e.g. vacation house trips) or less known to the user. The demands that leisure travel places on public transport systems therefore differ greatly from those imposed by commuters.

Driving children to school is an example of a journey purpose that has grown sharply in recent decades, partly due to higher car availability and partly because of the demands of two income households. The consequence is that children grow up knowing less about the public transport system and therefore are less likely to become regular public transport users in the future. When asked, parents often mention safety as a key motivator for driving their children to school. Since increasing traffic levels around schools are themselves dangerous, the decision of parents to drive children to school represents both a cause of safety problems and a response to them. As such, it is an example of a development whose internal dynamics can only be reversed through coordinated and dedicated efforts.

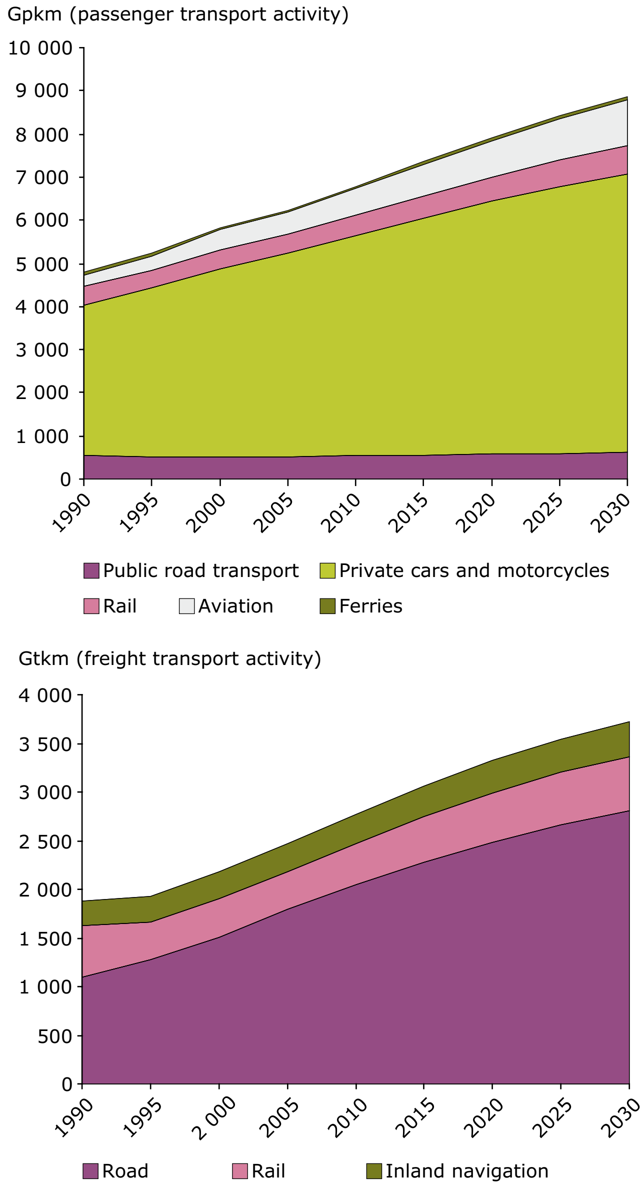
One possible response to the growth of school car journeys could be restrictions on traffic movements

Figure 8.1 Predicted growth in transport activity

The EU has seen a considerable increase in demand for road and air transport, and the European Commission forecasts that this trend will continue. Greenhouse gas emissions from the transport sector will likewise continue to rise. If transport is to contribute positively to greenhouse gas mitigation this trend needs to change.

The data indicate that demand is growing fastest for modes of transport that emit higher levels of CO_2. Fuel efficiency and technology improvements are unlikely to develop at rates that offset this increase, making demand management an indispensable measure.

Between 1995 and 2006 car ownership in the EU-27 increased by 26 %, and passenger-car use measured in passenger km increased by 18 % (EEA, 2008d).

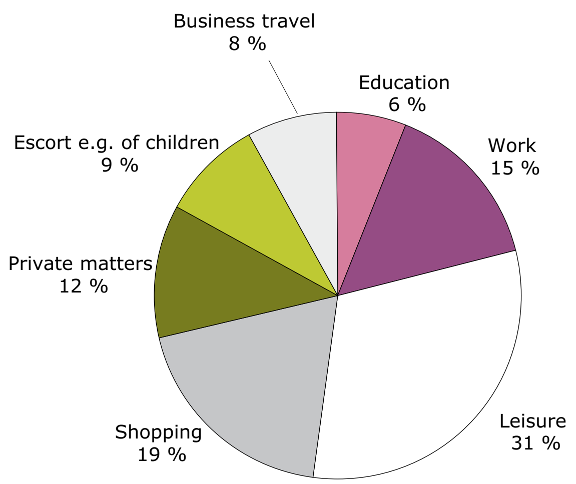


Source: European Commission, 2007.

Figure 8.2 Passenger transport volume by journey purpose in Germany

Leisure, work and shopping appear to be the main drivers of travel in Europe, as indicated by data from Germany. Statistics indicate that the modal split is very similar for other western European countries (DfT, 2007).

Data for the United Kingdom show that there has been very little change in the proportion of trips undertaken for different purposes in recent years (DfT, 2007). The analysis does, however, indicate that the number of shopping trips declined by approximately 8 % between 1998 and 2006 owing to a shift from more frequent, shorter shopping trips on foot to longer, less frequent journeys made by car.



Source: DIW, 2006.

around schools. Another is the use of programmes that teach children and parents about the environmental effects of transport. An example is the Zoom campaign — a European initiative organised by the Climate Alliance. The initiative engages children in education on climate change by asking them to consider issues such as their daily journeys (Climate Alliance, 2008).

Greater car use also occurs when cities are allowed to spread in a manner that expands distances to services and does not facilitate public transport use. This increases the need to use a car to perform normal activities such as shopping. In general, the higher the density of the city the more efficient it is in terms of travel energy consumption. Suburbanisation — scattered low density urban development — is therefore a poor strategy for making the transport system more sustainable. More compact, polycentric development allows shorter travel distances, while maintaining the 'economies of scale' advantages of cities.

Countries are trying a variety of methods to either reduce transport demand growth or reduce transport demand altogether. In most cases however, efforts are directed at ensuring that the most environmentally benign transport mode is used or that new vehicles are cleaner than previous ones.

In general, countries tend to use relatively soft measures, such as providing information, rather than stronger regulatory approaches like charging to make their transport systems more sustainable. There are, however, some examples of cities using charging to address growing traffic, with London perhaps the most well known. One of the scheme's less well known effects has been a large increase in cycling in London (see Figure 8.3).

Cities also sometimes make use of parking policy and pricing as a way to deter urban car use. The efficiency of such schemes depends critically on the availability of private parking facilities, which can

Table 8.1 Population density, energy consumption and cost of transport

Density (population density and jobs per hectare)	Annual energy consumption for travel (mega joules per inhabitant)	Cost of transport (% of GDP)
25 to 50	20 200	11.1
50 to 100	13 700	8.6
>100	12 200	5.7

Note: As density (population and jobs per hectare) increases, annual energy consumption on travel per inhabitant declines.

Box 8.1 Impacts of planning instruments on modal split in Vienna

The Vienna transport master plan, adopted in 2003, emphasised the need for more sustainable transport and planning measures, such as public transport, to be used to link cities and regions. It also called for public space to be reused, cycling facilities to be significantly improved, and parking regulations to be revised. The plan has realised the following impacts:

- reduced occupancy of on-street parking spaces;
- significantly reduced parking violations;
- reduced time spent searching for vacant parking spaces;
- reduced total car traffic volume;
- increased occupancy of commercial garages;
- extra funds for garage construction and public transport improvements.

In 2001, public transport, cycling and walking accounted for 64 % of all travel in the Vienna region. It is anticipated that this figure will increase to 75 % by 2010 (Winkler, 2006).

Box 8.2 Car-sharing in Switzerland

The most successful car-sharing scheme in Switzerland is the 'Mobility cooperative', which has over 70 000 members and accounts for 2 % of total passenger transport nationwide. Members pay an annual flat fee and then reserve the vehicle — by phone or internet — and pay for their usage (by distance and time) by monthly bill. Members receive an annual travel pass, which allows them unlimited travel on railways and other public transport. The scheme is available in all villages with more than 2 000 inhabitants.

According to a 2006 study by the Swiss Federal Energy Office, every car-sharing customer produces approximately 200 kg of CO_2 per year less than would otherwise be the case: a total saving of 11 000 tons of CO_2 in 2005. This is primarily caused by a higher use of public transport, walking and cycling. The company aims to have a Mobility car available on every street corner and in some big cities this is already the case (Swissinfo, 2007).

undermine the effect of pricing for on-street parking. Press reports suggest that large increases in cycling are linked to the risk of terror attacks on public transport (especially since the bombing of buses and underground trains in London in July 2005). In fact, however, cycling has grown since the introduction of the congestion charge in early 2003, suggesting that this is the primary cause.

Box 8.3 Spreading information on sustainable transport modes

A 'mobility centre' is a travel centre office or kiosk area that offers travel information to the public. The advice given is on all modes of transport, with a focus on public transport, cycling and walking. It also provides information on car sharing, more efficient routes of travel and cheaper travel options.

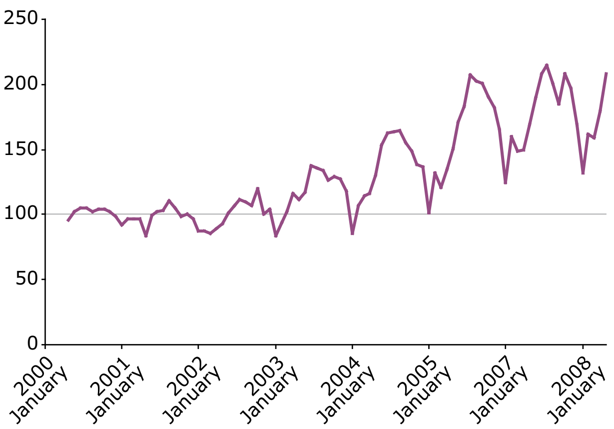
Mobility centres can be tailored to fit a number of different needs; they may provide general overall coverage to a wider public or may provide personalised advice to individuals. Travel information can be provided on personalised public transport timetables, journey planning, and local knowledge.

Mobility centres are often found in regional or local tourism centres, offering transport advice along with general tourist advice and information through internet platforms (Information on the Flemish Mobility Centre is available at: www.slimweg.be.) An additional effect of mobility centres is that they raise the profile of transport issues within the local community, providing a central reference point for all local and national transport queries (DfT, 2005).

Figure 8.3 Increase in cycling in London

With targeted investment and combined measures (e.g. congestion charging), large cities can realise greater use of sustainable transport modes such as cycling.

Since the introduction of congestion charging in 2003 in London, the growth of cycling has intensified. The largest number of trips by bicycle is made by 25–44-year-old males (TfL, 2008). UK statistics demonstrate that men are more likely to travel by car (65 %) compared to women (62 %) and that women are more likely than men to live in households with no access to a car (ONS, 2008).



Source: TfL, 2008.

Table 8.2 Examples of modal shift achieved by travel plans in UK companies

Organisation	Cars per 100 staff		%-point shift	% change
	Baseline survey	Latest monitoring		
Orange (Temple Point)	79	27	52	– 66
Plymouth Hospitals NHS Trust	> 78	< 54	> 24	> – 31
Buckinghamshire County Council	71	56	15	– 21
Addenbrooke's NHS Trust	< 74	< 60	> 14	> – 19
Orange (Almondsbury Park)	92	80	12	– 13
Nottingham City Hospital NHS Trust	73	61	12	– 16
University of Bristol	44	35	9	– 20

Note: In 20 case studies on company travel plans, UK companies on average reduced the proportion of car-based commuter journeys by 18 %, doubling travel by other modes.
In one study showing a particularly high level of change, Orange (Temple Point) staff were relocated to a town centre site. Around half of the recorded change in travel behaviour was thought to be due to the new travel opportunities at the location and half due to the package of measures promoted by the firm's travel plan.

Source: DfT, 2004.

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Annex 1 Metadata and supplementary information

Throughout the report abbreviations are used to refer to specific country groupings. The following definitions are used:

- EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
- EU-10: Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.
- EU-12: EU-10, Bulgaria and Romania.
- EFTA-4: Iceland, Liechtenstein, Norway and Switzerland.
- EU-25: EU-15 and EU-10.
- EU-27: EU-15 and EU-12.
- EEA-32: EU-27, EFTA-4 and Turkey.

Chapter		Supplementary information	
2	Freight transport and modal split	**Figure 2.1**	
		Note:	No data available for Bulgaria, Cyprus, Liechtenstein, Malta and Romania. GDP is expressed in euros at 2000 prices. Freight transport (tonne-kilometres) includes transport by road, rail and inland waterways. Short-sea shipping and oil pipelines are excluded due to lack of data. The two curves show the development in GDP and freight transport volumes, while the columns show the level of annual decoupling. Green indicates faster growth in GDP than in transport while purple indicates stronger growth in transport than in GDP. The large change in 2004 appears to be tied to a change in methodology but no correction figure exists. The change appears to affect in particular data from Spain, Italy, Portugal, Poland and Romania.
		Source:	EEA Core Set Indicator 036, to be published (based on Eurostat, 2008).
		Figure 2.2	
		Note:	No data available for Cyprus and Malta.
		Source:	EEA Core Set Indicator 036, to be published (based on Eurostat, 2008).
3	Passenger transport and modal split	**Figure 3.1**	
		Note:	No data available for Cyprus, Malta. 2006 data missing for Switzerland. GDP is expressed in euros at 2000 prices. Passenger-kilometres includes transport by road, rail and bus. A number of countries have incomplete or broken time series: Austria 2005 changed estimation of car traffic; Estonia and Latvia 1995–2004 car transport not included; Lithuania 1996–2001 car transport not included; Switzerland 2006 rail transport not included. The two curves show the development in GDP and passenger transport volumes, while the columns show the level of annual decoupling. Green indicates faster growth in GDP than in transport while purple indicates stronger growth in transport than in GDP.
		Source:	EEA Core Set Indicator 035, to be published (based on Eurostat 2008).
		Figure 3.2	
		Note::	There is no agreement among EU Member States on how to attribute the passenger-kilometres of international intra-EU flights, therefore data for air passenger travels are deemed unreliable and not included.
		Source:	EEA Core Set Indicator 035, to be published. Eurostat 2008.

Chapter		Supplementary information
4	Greenhouse gas emissions from the transport sector	**Figure 4.1** **Note:** This excludes CO_2 emissions resulting from land-use changes and forestry. **Source:** TERM indicator 02. EEA, 2008. Data compiled by European Topic Centre for Air and Climate Change. **Figure 4.2** **Note:** Data is for 1990–2006. **Source:** TERM indicator 02. EEA, 2008. Data compiled by European Topic Centre for Air and Climate Change.
5	Local emissions and air quality	**Figure 5.1** **Source:** TERM indicator 03. EEA, 2008. Data compiled by European Topic Centre for Air and Climate Change. **Figure 5.2** **Note:** The data represent a selection of cities across EU where sufficiently complete data sets were available. **Source:** TERM indicator 04. EEA, 2008. Data compiled by European Topic Centre for Air and Climate Change.
6	Transport fuel developments	**Figure 6.1** **Note:** Compilation of biofuels targets around the globe based on information form contacts, journal, etc. For each country transport energy consumption is projected assuming the 2000–2006 trend will continue. Linear interpolation is used from present levels of consumption to target levels and between several different targets. **Source:** Compilation carried out by EEA, 2008. Energy use statistics from IEA. **Figure 6.2** **Note:** Data are from 1980 to 2008 and represent quarterly averages (from 1994 weekly averages). **Source:** TERM indicator 21. EEA, 2008. Based on European Commission, DG TREN, Oil Bulletin.
7	Transport noise	**Figures 7.1 and 7.2** **Note:** Both figures should be taken as preliminary estimations by the EEA of the exposure to transport noise in 2006, based on incomplete data sets reported by the EU-27 Member States under Directive 2002/49/EC and made available to the EEA by the end of November 2008. These estimates do not fully assess the exposure to transport noise in Europe. Their scope is limited to the 162 agglomerations with more than 250 000 inhabitants designated by the EU-27 Member States under the directive. The countries report other data for major roads, railways and airports located outside these agglomerations. The EEA and ETC-LUCI are reviewing their quality and could use them for this report. Further data on exposure to transport noise should be reported later under the directive. They should cover more roads and railways as well as agglomerations with between 100 000 and 250 000 inhabitants. The EEA intends to publish further reports where these estimations may be refined and completed to take account of the latest data reported by the EEA member countries. **Source:** EU Member States (http://circa.europa.eu/Public/irc/env/d_2002_49/home), EEA and the European Topic Centre Land Use and Spatial Information, 2008.
8	The need for demand management	**Figure 8.1** **Note:** Estimate of future transport demand based on PRIMES model. **Source:** European Commission, 2007. DG TREN data. **Figure 8.2** **Note:** The chart details transport by journey purpose in Germany (2005). **Source:** DIW, 2006. **Table 8.1** **Note:** Density is calculated as a sum of population density per hectare and jobs per hectare. **Source:** Newman and Kenworthy, 1999.

Chapter	Supplementary information
	Figure 8.3 **Note:** Data from automatic cycle counters. **Source:** Transport for London Statistics, 2008. **Table 8.2** **Note:** In 20 case studies on company travel plans, UK companies on average reduced the proportion of car-based commuter journeys by 18 %, doubling travel by other modes. In one study showing a particularly high level of change, Orange (Temple Point) staff were relocated to a town centre site. Around half of the recorded change in travel behaviour was thought to be due to the new travel opportunities at the location and half due to the package of measures promoted by the firm's travel plan. **Source:** DfT, 2004.
Annex 3 Data	**Table A.1** **Note:** No data for Liechtenstein and Malta. **Source:** EEA CSI 036 based on Eurostat, 2008. **Table A.2** **Note:** No data for Cyprus, Liechtenstein and Malta. Data in purple estimated by Eurostat; data in green estimated by countries **Source:** EEA CSI 036 based on Eurostat, 2008. **Table A.3** **Note**: No data for Cyprus, Liechtenstein and Malta. Austria 2004/2005 changed estimation of car traffic; Estonia and Latvia 1995–2004 car transport not included; Lithuania 1996–2001 car transport not included; Switzerland 2006 rail transport not included. **Source**: EEA CSI 035 based on Eurostat, 2008. **Table A.4** **Note**: No data for Cyprus, Liechtenstein and Malta. Data in purple estimated by Eurostat. **Source**: EEA CSI 035 based on Eurostat, 2008. **Table A.5** **Note:** Passenger car stock at end of year n has been divided by the population on 1 January of year n+1. Stock at end of year, except for Belgium (1 August) and Switzerland (30 September). **Source:** Eurostat 2008 and United Nations Economic Commission for Europe. **Table A.6** **Note**: Data in purple estimated**.** **Source**: Eurostat 2008 and DG TREN 2008. **Table A.7** **Note**: No detailed breakdown available for Liechtenstein. **Source**: EEA Greenhouse gas dataviewer, 2008. **Table A.8** **Note**: Biodiesel data in purple estimated by industry. Biofuel production data are subject to a +/-5% margin of error, data in purple are subject to a +/-10% margin of error. Conversion of bioethanol and biodiesel to fossil oil equivalents follows the energy content principle: 1 000 kg bioethanol ~ 535 kg gasoline. 1 000 kg biodiesel ~ 790 kg diesel. **Source**: Biofuels production: EBB, 2008, http://www.ebb-eu.org/stats.php# and EBIO, 2008, http://www.biofuelcities.eu/fileadmin/template/projects/biofuels/files/eBio_PR_0408.PDF, data for 2002 and 2003 from http://www.biofuels-platform.ch/en/infos/eu-bioethanol.php (bioethanol). Biofuels consumption: EEA CSI 037 based on Eurostat, 2008. **Table A.9** **Note**: Data in purple are estimated. **Source**: OECD/ITF, 2008.

Annex 2 Overview of TERM fact sheets

TERM indicators have been published annually since 2000, subject to data availability. In 2000, the indicators appeared only in the annual TERM report but since then they have been published individually on the EEA website (www.eea.europa.eu/themes/transport/indicators). When the indicator set was defined it was foreseen that data that were then limited would eventually become available. For that reason, not all indicators have been published every year. Some indicators to be published shortly.

Indicator		2000	2001	2002	2003	2004	2005	2006	2007	2008
TERM 01	Transport final energy consumption by mode	+	+	+	+	+	+	+	+	+
TERM 02	Transport emissions of greenhouse gases		+	+	+	+	+	+	+	+
TERM 03	Transport emissions of air pollutants	+	+	+	+	+	+	+	+	+
TERM 04	Exceedances of air quality objectives due to traffic	+	+	+	+	+	+	+	+	+
TERM 05	Exposure to and annoyance by traffic noise	+	+							+
TERM 06	Fragmentation of ecosystems and habitats by transport infrastructure	+	+	+						
TERM 07	Proximity of transport infrastructure to designated areas		+	+						
TERM 08	Land take by transport infrastructure	+	+	+						
TERM 09	Transport accident fatalities	+	+	+	+	+	+		+	+
TERM 10	Accidental and illegal discharges of oil at sea		+	+						
TERM 11	Waste oil and tires from vehicles			+						
TERM 11a	Waste from road vehicles (ELV)	+	+	+						
TERM 12a	Passenger transport	+	+	+	+	+	+	+	+	+
TERM 12b	Passenger transport modal split by purpose				+	+	+	+		
TERM 13a	Freight transport	+	+	+	+	+	+	+	+	+
TERM 13b	Freight transport modal split by group of goods				+	+	+	+		
TERM 14	Access to basic services	+	+		+					
TERM 15	Regional accessibility of markets and cohesion		+		+					
TERM 16	Access to transport services	+	+							
TERM 18	Capacity of infrastructure networks	+	+	+	+	+	+			
TERM 19	Infrastructure investments	+	+	+					+	
TERM 20	Real change in transport prices by mode	+	+	+		+	+		+	
TERM 21	Fuel prices and taxes	+	+	+	+	+	+	+	+	+
TERM 22	Transport taxes and charges				+	+	+	+		+
TERM 23	Subsidies							+		
TERM 24	Expenditure on personal mobility by income group					+	+		+	
TERM 25	External costs of transport		+	+	+	+	+		+	
TERM 26	Internalisation of external costs	+	+	+	+	+	+	+		+
TERM 27	Energy efficiency and specific CO_2 emissions	+	+	+	+		+		+	+
TERM 28	Specific emissions	+	+		+		+		+	+
TERM 29	Occupancy rates of passenger vehicles	+	+	+		+	+			+
TERM 30	Load factors for freight transport		+	+		+	+			+
TERM 31	Uptake of cleaner and alternative fuels	+	+	+	+	+	+	+	+	+
TERM 32	Size of the vehicle fleet	+	+	+	+	+		+		+
TERM 33	Average age of the vehicle fleet		+	+	+		+		+	+
TERM 34	Proportion of vehicle fleet meeting certain emission standards	+	+	+	+	+		+		+
TERM 35	Implementation of integrated strategies	+	+	+		+				
TERM 36	Institutional cooperation		+	+		+				
TERM 37	National monitoring systems	+	+	+		+				
TERM 38	Implementation of SEA	+	+	+		+				
TERM 39	Uptake of environmental management systems by transport companies	+								
TERM 40	Public awareness	+	+			+				

Annex 3 Data

This annex provides an overview of key statistics that underpin the assessments in this report. It is generally based on data from sources such as Eurostat. For a full explanation of the data sources, see the Annex 1 on metadata.

Table A.1: Freight transport volume by country (1995–2006).

Table A.2: Freight transport modal share (rail, road, inland waterways) by country (1997, 2002, 2006).

Table A.3: Total passenger transport demand by country (1995–2006).

Table A.4: Passenger transport by mode (car, bus/coach, rail) by country (1997, 2002, 2006).

Table A.5: Car ownership by country (1995–2006).

Table A.6: Air passenger transport in EU-25 (1995–2006).

Table A.7: Greenhouse gas emissions from transport by mode and by country (1990–2006).

Table A.8: Biofuels production (2002–2007) and consumption (1995 and 2006) by country.

Table A.9: Investment in infrastructure by mode (rail, road, inland waterways, seaports, airports) and country (1995, 2000, 2005)

Table A.1 Freight transport volume by country (1 000 million tonne km)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Austria	41.75	43.21	44.88	47.24	51.25	54.17	56.98	58.48	58.70	59.69	58.20	62.00
Belgium	58.90	54.74	56.96	54.70	51.02	65.94	67.92	68.26	66.06	63.96	60.54	60.41
Bulgaria	n/a	n/a	n/a	n/a	n/a	12.26	13.37	13.99	15.38	17.87	20.29	19.95
Cyprus	1.08	1.11	1.13	1.17	1.19	1.23	1.27	1.32	1.40	1.12	1.39	1.17
Czech Republic	54.33	52.65	61.75	52.72	53.76	54.90	56.03	59.56	62.46	61.15	58.38	66.20
Denmark	24.35	23.07	23.49	23.48	25.21	26.08	24.14	24.46	25.02	25.44	25.28	23.15
Estonia	5.39	6.10	7.33	9.03	10.77	12.92	12.43	13.91	13.64	15.59	16.46	15.97
Finland	33.85	33.89	35.68	38.13	39.53	42.20	40.44	41.74	41.08	42.51	41.64	40.84
France	232.99	235.52	242.36	250.99	266.63	268.56	265.51	262.66	258.47	265.74	254.89	261.64
Germany	372.27	367.88	381.93	395.84	413.02	424.67	429.95	425.66	428.75	459.34	469.62	501.00
Greece	13.53	16.25	18.46	16.32	16.95	17.93	18.88	19.63	19.80	21.69	24.02	34.66
Hungary	23.67	23.35	24.44	28.38	27.29	28.10	27.48	27.33	27.75	31.26	36.35	42.56
Iceland	0.47	0.49	0.52	0.55	0.58	0.58	0.64	0.66	0.68	0.74	0.82	0.90
Ireland	6.10	6.89	7.52	8.67	10.73	12.77	12.84	14.71	16.05	17.54	18.21	17.66
Italy	184.85	196.52	196.79	207.30	199.00	207.60	208.73	213.15	194.44	219.22	234.62	244.65
Latvia	11.59	14.62	17.32	17.10	16.37	18.10	19.54	21.22	24.76	26.00	28.17	27.58
Lithuania	12.40	12.30	13.78	13.89	15.59	16.69	16.02	20.48	22.92	23.92	28.37	31.03
Luxemburg	6.39	4.40	5.36	5.96	7.32	8.67	9.71	10.03	10.49	10.54	9.54	9.63
Netherlands	105.62	108.12	115.04	122.98	128.99	125.44	124.58	122.25	123.50	138.01	138.21	131.79
Norway	12.37	15.27	17.06	17.66	17.82	18.13	18.08	18.13	19.22	20.31	21.40	22.74
Poland	120.26	124.77	132.29	131.53	126.44	127.95	126.35	129.17	136.41	155.51	162.13	182.23
Portugal	20.81	25.06	27.07	27.34	28.27	29.02	32.11	31.92	29.50	43.10	45.30	47.27
Romania	47.08	47.84	48.19	36.61	30.94	33.28	37.39	44.21	49.41	58.44	76.55	81.24
Slovakia	n/a	29.47	29.24	30.94	30.04	26.97	25.76	25.38	26.96	28.32	32.12	32.31
Slovenia	8.76	8.50	8.87	9.18	9.28	9.51	9.87	9.69	10.32	12.16	14.28	15.49
Spain	112.60	113.11	122.01	136.32	145.75	160.33	172.76	196.12	204.34	232.70	244.87	253.42
Sweden	51.00	52.17	54.24	52.50	52.27	55.71	53.71	55.85	56.81	57.81	60.25	62.19
Switzerland	12.28	12.11	21.21	22.27	22.86	24.70	25.39	25.26	25.61	26.95	27.51	28.68
Turkey	121.02	144.69	149.40	160.58	159.20	171.31	158.90	158.09	160.78	166.19	163.13	186.94
United Kingdom	174.97	181.46	186.25	189.45	184.62	183.93	182.85	182.92	186.06	190.68	190.06	195.44

Table A.2 Freight transport mode share (%)

	1997			2002			2006		
	Rail	Road	IWW	Rail	Road	IWW	Rail	Road	IWW
Austria	31.6	63.7	4.7	29.3	65.8	4.9	33.8	63.2	3.0
Belgium	13.1	76.7	10.2	10.7	77.5	11.8	14.0	71.2	14.7
Bulgaria	21.5	76.7	1.7	33.1	62.9	4.0	27.1	69.0	3.9
Czech Republic	34.0	65.8	0.2	26.5	73.3	0.1	23.8	76.1	0.1
Denmark	8.5	91.5	0.0	7.9	92.1	0.0	8.2	91.8	0.0
Estonia	69.6	30.4	0.0	69.7	30.3	0.0	65.3	34.7	0.0
Finland	27.6	72.1	0.3	23.2	76.6	0.3	27.1	72.8	0.2
France	22.2	74.9	2.9	19.0	77.8	3.1	15.7	80.8	3.4
Germany	19.3	64.4	16.3	17.9	67.0	15.1	21.4	65.9	12.8
Greece	1.8	98.2	0.0	1.7	98.3	0.0	1.9	98.1	0.0
Hungary	33.3	60.8	5.9	28.4	65.5	6.1	23.9	71.6	4.5
Iceland	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
Ireland	6.9	93.1	0.0	2.9	97.1	0.0	1.2	98.8	0.0
Italy	11.6	88.3	0.1	9.6	90.4	0.0	9.9	90.1	0.0
Latvia	80.6	19.4	0.0	70.8	29.2	0.0	61.0	39.0	0.0
Lithuania	62.6	37.4	0.1	47.7	52.3	0.0	41.6	58.4	0.0
Luxemburg	11.4	81.9	6.6	5.7	91.5	2.8	4.6	91.5	4.0
Netherlands	3.0	61.4	35.6	3.3	63.3	33.4	4.8	63.1	32.1
Norway	17.6	82.4	0.0	14.9	85.1	0.0	14.7	85.3	0.0
Poland	51.2	48.1	0.7	37.0	62.2	0.8	29.4	70.4	0.2
Portugal	8.3	91.7	0.0	6.9	93.1	0.0	5.1	94.9	0.0
Romania	45.9	45.1	9.0	34.4	57.3	8.2	19.4	70.5	10.0
Slovakia	42.3	52.5	5.2	40.9	58.7	0.4	30.9	68.8	0.3
Slovenia	32.2	67.8	0.0	31.8	68.2	0.0	21.8	78.2	0.0
Spain	10.3	89.7	0.0	5.9	94.1	0.0	4.6	95.4	0.0
Sweden	35.4	64.6	0.0	34.4	65.6	0.0	35.8	64.2	0.0
Switzerland	41.7	57.8	0.6	42.5	57.5	0.0	43.0	57.0	0.0
Turkey	6.4	93.6	0.0	4.5	95.5	0.0	5.1	94.9	0.0
United Kingdom	9.1	90.8	0.1	10.2	89.7	0.1	11.8	88.1	0.1

Note: Data in purple estimated by Eurostat; data in green estimated by countries.

Table A.3 Total passenger transport demand in EEA member countries (1 000 million passenger kilometres)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Austria	95.3	96.9	96.5	97.6	99.7	101.2	102.2	103.8	104.6	105.5	88.6	90.1
Belgium	117.3	118.1	119.6	123.6	125.8	127.2	129.5	132.2	134.3	137.3	134.9	137.0
Bulgaria	16.3	15.6	17.7	17.5	18.6	41.1	42.0	44.6	43.4	43.4	45.1	46.9
Czech Republic	74.3	82.6	82.3	83.2	84.8	87.4	88.3	88.4	90.3	89.4	91.8	92.1
Denmark	60.9	61.9	63.1	63.7	64.6	64.2	63.3	63.5	64.1	65.4	65.7	67.1
Estonia	2.5	2.4	2.5	2.5	2.5	2.9	2.6	2.5	2.5	2.7	13.1	13.1
Finland	61.2	61.7	63.3	64.5	65.9	66.8	68.0	69.3	70.6	71.9	72.9	73.6
France	737.3	751.3	763.1	785.2	807.5	812.2	840.1	848.9	853.1	855.3	848.1	848.7
Germany	954.8	956.1	957.5	968.9	990.2	975.7	997.1	1 001.9	996.6	1 009.6	998.9	1 014.1
Greece	58.8	59.2	62.6	65.8	70.1	76.6	80.5	84.8	87.5	91.3	95.6	99.6
Hungary	70.8	72.8	72.5	72.6	73.9	75.0	75.2	75.9	75.9	75.7	74.5	74.2
Iceland	3.4	3.6	3.8	4.0	4.2	4.7	5.1	5.2	5.4	5.5	6.1	6.4
Ireland	21.9	23.1	24.9	26.1	27.4	28.5	29.8	31.0	32.1	33.1	34.5	36.8
Italy	745.7	760.9	772.4	794.5	798.9	867.2	860.0	854.8	854.6	865.2	840.2	845.5
Latvia	3.2	2.8	2.9	3.0	3.4	3.1	3.0	9.3	3.3	3.6	16.5	16.8
Lithuania	15.1	4.6	4.0	3.8	3.4	3.4	3.4	19.5	22.9	30.0	38.9	43.6
Luxembourg	5.5	5.6	5.8	5.9	5.9	6.6	6.8	7.0	7.0	7.1	7.4	7.6
Netherlands	152.4	153.7	158.7	159.8	163.8	164.0	164.7	166.9	167.4	168.0	170.0	169.9
Norway	49.7	51.7	51.6	52.6	53.2	53.7	54.8	55.9	56.9	57.8	58.5	58.5
Poland	171.4	175.4	185.1	195.7	197.8	205.5	211.2	217.4	222.0	230.0	244.5	265.6
Portugal	57.0	59.6	63.4	66.6	70.3	73.4	74.7	77.0	78.8	81.5	84.8	87.0
Romania	31.2	31.2	29.3	22.4	20.6	19.3	18.0	13.8	18.0	18.0	19.8	19.8
Slovakia	33.4	32.8	31.6	31.2	32.3	35.2	35.1	35.9	35.3	34.4	37.2	36.2
Slovenia	21.0	22.7	24.0	23.5	24.8	24.6	24.9	25.4	25.6	26.0	26.3	26.9
Spain	305.3	318.6	328.1	343.1	361.7	371.5	378.8	405.4	414.5	428.6	412.1	412.6
Sweden	102.1	102.8	103.1	104.1	107.2	108.9	109.6	112.2	114.5	114.6	115.0	115.3
Switzerland	90.9	91.3	92.3	93.4	94.9	95.7	97.2	98.8	99.9	100.9	106.9	92.1
Turkey	144.1	154.4	165.2	171.5	174.3	172.3	166.5	172.7	179.9	182.8	195.0	208.3
United Kingdom	692.6	698.6	711.2	717.5	726.7	725.4	740.3	763.9	766.2	770.3	770.4	773.0

Note: Austria 2005 changed estimation of car traffic; Estonia and Latvia 1995–2004 car transport not included; Lithuania 1996–2001 car transport not included; Switzerland 2006 rail transport not included.

Table A.4 Passenger transport demand by mode (%)

	1997			2002			2006		
	Rail	Bus/coach	Car	Rail	Bus/coach	Car	Rail	Bus/coach	Car
Austria	8.4	15.3	76.3	8.0	14.2	77.8	9.9	10.3	79.8
Belgium	5.8	11.1	83.0	6.2	11.0	82.8	6.5	13.2	80.3
Bulgaria	33.2	66.8	n/a	5.8	38.1	56.1	5.1	28.8	66.1
Czech Republic	9.4	19.0	71.7	7.5	18.7	73.8	7.5	16.9	75.6
Denmark	8.2	12.0	79.8	9.1	11.5	79.5	9.1	11.2	79.8
Estonia	10.5	89.5	n/a	7.1	92.9	n/a	2.0	22.0	76.0
Finland	5.3	12.6	82.0	4.8	11.1	84.1	4.9	10.2	84.9
France	8.1	5.5	86.4	8.6	5.0	86.4	9.4	5.3	85.3
Germany	7.6	7.1	85.3	7.1	6.7	86.1	7.8	6.5	85.7
Greece	3.0	33.1	63.9	2.2	25.9	71.9	1.8	21.9	76.3
Hungary	11.9	24.0	64.1	13.9	24.6	61.5	13.0	23.8	63.2
Iceland	0.0	11.4	88.6	0.0	9.7	90.3	0.0	12.8	87.2
Ireland	5.6	22.1	72.3	5.3	20.5	74.2	5.1	18.8	76.1
Italy	5.6	11.7	82.7	5.4	11.4	83.3	5.9	12.1	81.9
Latvia	40.2	59.8	n/a	8.0	25.5	66.5	5.9	16.6	77.5
Lithuania	20.9	79.1	n/a	2.5	15.4	82.0	0.9	8.5	90.6
Luxembourg	5.1	9.7	85.1	5.1	10.3	84.6	3.9	10.5	85.6
Netherlands	8.9	5.0	86.0	9.3	4.3	86.4	9.1	3.8	87.1
Norway	4.9	8.2	86.9	4.5	7.4	88.2	4.8	7.3	87.9
Poland	10.8	17.9	71.3	9.5	13.5	77.0	6.9	10.6	82.5
Portugal	7.2	18.3	74.5	5.1	12.9	82.0	4.5	12.8	82.8
Romania	53.9	46.1	n/a	13.3	8.3	78.4	10.1	14.7	75.2
Slovakia	9.7	31.6	58.8	7.5	22.9	69.6	6.1	21.2	72.7
Slovenia	2.6	18.2	79.2	3.0	13.2	83.9	3.0	11.4	85.6
Spain	5.1	13.4	81.5	4.8	12.3	82.8	5.4	12.0	82.6
Sweden	6.8	8.6	84.5	8.1	8.3	83.6	8.3	7.5	84.2
Switzerland	13.1	2.5	84.4	14.4	2.6	83.0	15.1	2.6	82.3
Turkey	3.5	57.7	38.7	3.0	45.4	51.6	2.5	45.6	51.8
United Kingdom	4.9	6.2	88.9	5.2	6.2	88.6	6.1	6.5	87.5

Note: Data in purple estimated by Eurostat.

Table A.5 Car ownership (cars per 1 000 inhabitants)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Austria	452	463	475	487	501	511	519	492	498	501	503	507
Belgium	421	427	433	440	448	456	460	462	464	467	468	470
Bulgaria	196	205	209	220	233	245	264	277	296	314	329	230
Cyprus	335	340	348	365	372	384	397	402	414	448	463	479
Czech	295	310	329	339	335	335	346	357	363	373	386	399
Denmark	320	330	337	342	346	347	349	351	351	354	362	371
Estonia	269	289	307	327	334	339	299	295	321	350	367	413
Finland	371	379	378	392	403	412	416	422	436	448	462	475
France	481	482	484	489	497	503	508	509	506	502	499	504
Germany	495	500	504	509	516	532	538	541	546	550	559	566
Greece	207	218	231	246	269	292	312	331	348	368	387	407
Hungary	218	220	224	216	221	232	244	259	275	280	287	293
Iceland	445	463	486	509	543	561	558	561	574	598	625	641
Ireland	276	292	310	324	339	348	360	370	379	390	400	418
Italy	533	536	540	551	563	572	583	588	593	581	590	597
Latvia	134	155	178	201	221	236	250	266	280	297	324	360
Lithuania	199	219	248	277	310	336	326	341	365	384	428	470
Luxemburg	556	556	561	593	608	622	632	641	645	650	655	661
Malta	487	487	488	462	479	483	495	508	522	525	525	535
Netherlands	364	369	379	388	400	409	417	423	425	429	434	442
Norway	386	378	398	402	405	411	414	417	422	429	437	445
Poland	195	208	221	230	240	261	275	289	294	314	323	351
Portugal	255	273	292	310	329	336	347	373	379	389	397	405
Romania	99	105	111	118	123	127	132	137	142	149	156	167
Slovakia	189	197	211	222	229	237	240	247	252	222	242	247
Slovenia	357	374	391	410	426	435	442	448	456	468	479	488
Spain	360	373	386	403	421	431	443	450	441	454	463	464
Sweden	411	413	418	428	439	450	451	452	454	456	459	461
Switzerland	457	462	468	475	484	492	500	506	510	514	518	519
Turkey	49	52	55	58	61	65	66	66	66	75	80	84
United kingdom	378	392	402	408	419	425	436	446	452	463	469	471

Table A.6 Air passenger transport in EU-25 (1 000 mio passenger kilometres)

Year	1 000 mio passenger kilometres
2007	589
2006	547
2005	526
2004	493
2003	462
2002	445
2001	453
2000	456
1999	424
1998	410
1997	385
1996	352
1995	335
1995–2006	63.3 %
Per year (1995–2006)	+ 4.6 %
2005–2006	+ 4.0 %

Note: Data in purple estimated.

Table A.7 Greenhouse gas emissions from transport in Europe (million tonnes), unless otherwise stated

	Emissions included in the Kyoto Protocol																	
	Total transport (excl. international aviation and international navigation)			**Road transportation**			**Navigation (domestic)**			**Civil aviation (domestic)**			**Railways**			**Other transportation**		
	1990	**2006**	**1990–2006 (%)**	**1990**	**2006**	**1990–2006 (%)**	**1990**	**2006**	**1990-2006 (%)**	**1990**	**2006**	**1990–2006 (%)**	**1990**	**2006**	**1990–2006 (%)**	**1990**	**2006**	**1990–2006 (%)**
Austria	13	23	82	12	22	83	0	0	– 1	0	0	611	0	0	– 18	0	0	101
Belgium	21	26	27	20	25	28	0	1	22	0	0	– 24	0	0	– 42	0	0	– 21
Bulgaria	11	9	– 21	8	8	0	0	0	n/a	0	0	– 61	0	0	– 72	3	1	– 69
Cyprus	1	2	114	1	2	114	0	0	n/a	0	0	n/a	0	0	n/a	0	0	n/a
Czech Republic	7	18	144	6	18	191	0	0	– 67	0	0	– 89	1	0	– 60	0	0	– 68
Denmark	11	14	27	9	13	35	1	0	– 36	0	0	– 42	0	0	– 24	0	0	n/a
Estonia	3	2	– 28	2	2	– 2	1	0	– 94	0	0	– 24	0	0	– 16	0	0	– 70
Finland	13	14	12	11	13	13	0	1	29	0	0	– 16	0	0	– 32	1	1	8
France	119	139	17	112	130	16	2	3	63	4	5	11	1	1	– 43	0	1	176
Germany	164	162	– 1	152	150	– 1	2	1	– 58	3	5	86	3	1	– 56	4	4	1
Greece	15	24	65	12	21	71	2	2	25	1	1	89	0	0	– 36	0	0	n/a
Hungary	8	13	50	8	12	58	0	0	– 88	0	0	8262	1	0	– 64	0	0	n/a
Iceland	1	1	61	1	1	74	0	0	– 14	0	0	– 11	0	0	n/a	0	0	n/a
Ireland	5	14	165	5	13	177	0	0	– 95	0	0	92	0	0	– 8	0	0	144
Italy	104	133	28	96	123	28	5	6	13	2	3	74	0	0	– 21	0	1	155
Latvia	3	3	17	2	3	35	0	0	167	0	0	3846	1	0	– 57	0	0	n/a
Lichtenstein	0	0	n/a	0	0	n/a	n/a	n/a	n/a	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lithuania	6	5	– 22	5	4	– 21	0	0	23	0	0	260	0	0	– 38	0	0	n/a
Luxemburg	3	7	162	3	7	165	0	0	0	0	0	146	0	0	– 21	0	0	n/a
Malta	0	1	51	0	0	49	0	0	135	0	0	n/a	0	0	n/a	0	0	n/a
Netherlands	26	36	37	26	35	37	0	1	55	0	0	0	0	0	6	0	0	n/a
Norway	11	15	32	8	10	30	2	3	30	1	1	27	0	0	– 57	1	1	73
Poland	25	39	52	22	37	73	0	0	– 93	0	0	35	2	0	– 78	1	1	– 53
Portugal	10	20	100	9	19	105	0	0	– 16	0	0	164	0	0	– 57	0	0	n/a
Romania	8	12	61	7	12	85	0	0	– 78	0	0	– 52	1	0	– 77	0	0	650
Slovakia	5	6	19	5	6	28	0	0	n/a	0	0	52	0	0	– 70	0	0	– 73
Slovenia	3	5	75	3	5	78	0	0	n/a	0	0	– 46	0	0	– 42	0	0	n/a
Spain	58	109	89	51	98	91	2	3	84	4	7	74	0	0	– 27	0	0	800
Sweden	18	20	9	17	19	11	1	0	– 10	1	1	– 8	0	0	– 37	0	0	19
Switzerland	15	16	8	14	16	10	0	0	3	0	0	– 52	0	0	25	0	0	– 39
Turkey	26	44	69	24	38	55	0	1	189	1	5	398	1	1	32	0	0	n/a
United Kingdom	119	137	15	111	126	13	4	6	33	1	2	93	2	2	29	0	1	68
EU-15	698	878	26	647	814	26	20	23	19	16	26	56	9	6	– 27	7	9	27
EU-27	779	992	27	715	924	29	21	24	13	17	26	52	15	8	– 44	12	10	– 12

Table A.7 Greenhouse gas emissions from transport in Europe (million tonnes), unless otherwise stated (cont.)

	Emissions not included in the Kyoto Protocol								
	International aviation			International navigation			Total transport (estimation)		
	1990	2006	1990–2006 (%)	1990	2006	1990–2006 (%)	1990	2006	1990–2006 (%)
Austria	1	2	104	n/a	n/a	n/a	14	25	84
Belgium	3	4	20	14	29	105	38	59	55
Bulgaria	1	0	– 46	1	0	– 62	13	10	– 25
Cyprus	1	1	21	0	1	221	2	4	89
Czech Republic	1	1	72	n/a	n/a	n/a	8	19	138
Denmark	2	3	49	3	4	11	16	20	26
Estonia	0	0	0	1	1	17	4	3	– 21
Finland	1	1	42	2	2	– 1	16	18	12
France	9	17	92	8	9	15	135	164	21
Germany	12	21	86	8	9	8	184	192	4
Greece	2	3	17	8	10	22	25	37	46
Hungary	0	1	37	n/a	n/a	n/a	9	13	49
Iceland	0	0	78	0	0	39	1	2	63
Ireland	1	3	168	0	0	612	6	17	170
Italy	4	9	124	4	7	49	113	149	32
Latvia	0	0	– 10	2	1	– 58	5	4	– 9
Lichtenstein	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lithuania	0	0	– 61	0	0	45	7	5	– 21
Luxemburg	0	1	210	n/a	n/a	n/a	3	9	168
Malta	n/a	0	n/a	n/a	2	n/a	n/a	3	n/a
Netherlands	5	11	142	34	56	63	65	103	58
Norway	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Poland	1	1	117	1	1	– 31	27	41	49
Portugal	2	2	52	1	2	20	13	24	86
Romania	0	0	166	1	0	– 90	9	13	47
Slovakia	0	0	60	0	0	– 48	5	6	19
Slovenia	0	0	– 7	n/a	0	n/a	3	5	76
Spain	3	10	192	12	26	128	73	145	100
Sweden	1	2	50	2	7	220	22	29	34
Switzerland	3	4	20	n/a	n/a	n/a	18	20	10
Turkey	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
United Kingdom	16	36	126	7	7	2	142	180	27
EU-15	62	125	103	104	167	61	864	1171	36
EU-27	66	131	98	110	174	58	955	1297	36

Table A.8 Biofuels production (2002–2007) and consumption (1995–2006)

	Biodiesel production (kilo-tonnes)						Bioethanol production (kilo-tonnes)						Biofuel shares in final energy consumption (%)	
	2002	2003	2004	2005	2006	2007	2002	2003	2004	2005	2006	2007	1995	2006
Austria	25	32	57	85	123	267							0.12	1.47
Belgium				1	25	166							0.00	0.00
Bulgaria					4	9							0.00	0.24
Cyprus				1	1	1							0.00	0.00
Czech Republic			60	133	107	61	81			0	12	26	0.43	0.33
Denmark	10	40	70	71	80	85							0.00	0.09
Estonia				7	1	0							0.00	0.00
Finland					0	39			2	10			0.00	0.02
France	366	357	348	492	743	872	90	81	80	114	231	457	0.40	1.56
Germany	450	715	1 035	1 669	2 662	2,890	0	0	20	130	340	311	0.06	6.53
Greece				3	42	100							0.00	0.67
Hungary					0	7	5	0	0	28	27	24	0.00	0.26
Iceland													0.00	0.00
Ireland					4	3							0.00	0.05
Italy	210	273	320	396	447	363					62	47	0.00	0.42
Latvia				5	7	9			9	9	9	14	0.00	0.18
Lithuania			5	7	10	26				6	14	16	0.00	1.57
Luxembourg					0	0							0.00	0.04
Malta				2	2	1							0.00	0.00
Netherlands					18	85			11	6	12	11	0.00	0.41
Norway													0.00	0.00
Poland				100	116	80	66	60	38	51	127	122	0.00	0.77
Portugal				1	91	175							0.00	1.14
Romania					10	36							0.00	0.00
Slovakia			15	78	82	46						24	0.00	2.56
Slovenia				8	11	11							0.00	0.12
Spain		6	13	73	99	168	175	159	201	239	313	275	0.00	0.50
Sweden	1	1	1.4	1	13	63	50	51	56	121	111	55	0.00	2.60
Switzerland										1	1	2	0.00	
Turkey													0.00	0.16
United Kingdom	3	9	9	51	192	150						16	0.00	0.63
EU-27	1 065	1433	1933	3 184	4 890	5 713	467	352	417	715	1 258	1 398	0.08	1.76
EEA-32	1 065	1433	1933	3 184	4 890	5 713	467	352	417	716	1 260	1 400	0.07	1.67

Note: Data in purple estimated by biodiesel industry.

Table A.9 Investment in infrastructure by mode and country (million euro — current prices)

	Railways				Road				Inland waterways				Sea ports				Airports			
	1992	1995	2000	2005	1992	1995	2000	2005	1992	1995	2000	2005	1992	1995	2000	2005	1992	1995	2000	2005
Austria	640	521	1 199	–	557	457	477	857	11	3	–	–	–	–	–	–	116	92	82	–
Bulgaria	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Czech	–	114	371	484	–	286	309	1 415	–	1	11	10	–	–	–	–	–	74	28	237
Denmark	724	726	564	241	191	352	510	928	–	–	–	–	61	61	57	–	20	48	118	–
Estonia	0	4	20	21	2	8	19	107	–	–	–	–	–	19	18	22	0	2	1	1
Finland	174	226	233	281	340	457	488	595	2	2	0	1	41	41	59	136	60	51	65	48
France	3 554	2 726	2 955	4 118	10 555	10 775	10 936	11 443	76	107	114	108	214	235	197	304	703	570	781	860
Germany	6 128	6 810	6 321	4 964	12 159	10 216	11 967	12 040	593	711	828	520	476	506	562	570	1 580	1 156	1 411	700
Iceland	–	–	–	–	38	75	75	84	–	–	–	–	19	18	19	23	–	–	12	0
Ireland	16	29	85	–	219	283	780	1 153	–	–	–	–	9	30	–	–	19	–	–	105
Italy	–	1 987	4 549	–	–	4 980	6 930	–	–	11	30	–	–	213	231	–	–	275	355	–
Latvia	0	7	38	40	0	3	13	161	–	–	–	–	–	–	–	62	–	–	18	10
Liechtenstein	–	–	–	–	19	14	24	29	–	–	–	–	–	–	–	–	–	–	–	–
Lithuania	0	4	18	68	0	15	109	165	–	1	–	–	0	6	13	30	0	19	1	4
Malta	–	–	–	–	2	3	11	8	–	–	–	–	–	–	–	–	–	–	–	–
Poland	57	248	195	235	177	638	1 001	1 875	2	10	0	7	19	30	11	9	186	27	69	131
Portugal	114	196	401	415	465	804	926	1 985	–	–	–	–	5	29	76	18	–	–	–	124
Romania	5	72	43	109	23	356	631	1 331	1	244	105	140	0	6	–	–	1	12	7	2
Slovakia	24	59	53	160	85	53	227	360	35	21	1	1	–	–	–	–	9	4	4	32
Slovenia	9	55	–	–	46	188	375	530	–	–	–	–	–	–	–	–	2	5	–	–
Spain	973	648	920	1 926	4 213	4 167	4 738	8 245	–	–	–	–	337	383	498	1 012	154	458	460	1 343
Sweden	–	1 301	661	1 779	–	1 393	1 336	1 491	–	–	–	–	–	51	56	97	–	53	578	87
Switzerland	815	1 079	1 463	2 288	2 198	2 520	2 717	–	3	8	17	0	–	–	–	–	59	131	411	109
United Kingdom	3 174	2 414	4 578	–	6 445	5 224	5 564	–	–	–	–	–	145	199	336	–	586	703	1 196	–
Total	16 408	19 228	24 664	17 129	37 731	43 267	50 162	44 802	723	1 119	1 107	786	1 327	1 828	2 133	2 283	3 495	3 679	5 597	3 794

Note: Figures in purple are estimates.

Annex 4 Background information on the 2008 TERM report

The TERM report comprises an assessment of selected issues from the European Environmental Agency Transport and Environmental Reporting Mechanism (EEA TERM) set of transport and environment indicators.

The objective of the report is to present main findings, to indicate some challenges in reducing the environmental impacts of transport and to make suggestions to improve the environmental performance of the transport system as a whole. Climate change stands out as the primary environmental challenge to be addressed by the transport sector in coming years but this report emphasises that transport activities and infrastructure cause other important environmental impacts that also need to be addressed (such as noise, air pollution, land-use consumption, biodiversity and habitat fragmentation). These issues are derived partly from the policy questions that form the backbone of TERM and partly from other ongoing work at EEA. As with previous TERM reports, the 2008 report evaluates the indicator trends with respect to progress towards existing objectives and targets from EU policy documents and various transport and environmental directives and regulations.

The selection presented in the 2008 TERM report does not represent a full inventory of conclusions that can be extracted from TERM but rather a selection that tries to give deeper insight into the link between transport development, climate change and other impact categories. Readers are therefore encouraged to seek further information in the TERM fact-sheets themselves (see web address below), as well as in other sources referred to in the report.

TERM: a two-layered information system

TERM reports have been published since 2000 as an official indicator-based reporting mechanism. As one of the environmental assessment tools of Common Transport Policy, TERM offers important insights that can help the development of EU policies.

With this report, the EEA aims to show the main developments over the past decade and the challenges that lie ahead, thereby also making it a comment on contemporary EU transport policy.

Currently, TERM consists of 40 indicators (see Annex 2) that are structured around seven policy questions (see Box A.1, page 52). It addresses various target groups, ranging from high-level policymakers to technical policy experts. It is therefore set up as a two-layered information system, with different degrees of analytical detail.

This report summarises the key messages from the indicators. Indicator fact-sheets constitute a more detailed information layer. The fact-sheets provide an in-depth assessment for each indicator, including an overview of the main policy context and existing EU policy targets related to the indicator; an analysis of data quality and shortcomings; a description of metadata; and recommendations for future improvement of the indicator and data. The TERM indicator fact-sheets form the reference information system of this report and can be downloaded from the EEA website at: www.eea.europa.eu/themes/transport.

Scope of the report

The report aims to cover all 32 EEA member countries. These are the 27 EU Member States, one candidate country (Turkey) and four EFTA countries (Norway, Iceland, Liechtenstein and Switzerland). Switzerland only recently joined the EEA and has not provided data for all indicators. Where data are not complete, this is generally noted in the metadata section, where different country groupings used in graphs are also described.

Most indicators cover the years since 1996 subject to data availability but in some cases data for some Member States have only become available recently.

Unless other sources are given, assessments covered in this report are taken from TERM fact-sheets and are based on data from Eurostat. In some instances, member countries have also provided additional data.

The underlying fact-sheets used for this report have been developed by the European Topic Centre for Air and Climate Change and a consortium led by TRL from the United Kingdom.

The project was managed and the final version of the text edited by Peder Jensen, EEA. Substantial input, drafting and review was also provided by Jan Karlsson, David Delcampe, Peder Gabrielsen and Francois Dejean, all from EEA. In addition, comments were received from other EEA staff, a number of EEA member countries and the European Commission.

Box A.1 TERM policy context, process and concept

The Amsterdam Treaty identifies integration of environmental and sectoral policies as the way to achieve sustainable development. The European Council, at its summit in Cardiff in 1998, requested that the Commission and transport ministers focus their efforts on developing integrated transport and environment strategies. At the same time, and following initial work by the EEA on transport and environment indicators, the joint Transport and Environment Council invited the Commission and the EEA to set up a transport and environment reporting mechanism (TERM), which should enable policy-makers to gauge the progress of their integration policies.

The Sixth Environment Action Programme (EC, 2001b) and the Renewed EU Sustainable Development Strategy (EC, 2006c) re-emphasised the need to integrate strategies and monitor environmental themes and sectoral integration, making full use of instruments for better regulation, such as balanced impact assessment and stakeholder consultations.

The main aim of TERM is to monitor the progress and effectiveness of transport and environment integration strategies on the basis of a core set of indicators. The TERM indicators were selected and grouped to address seven key questions:

1. Is the environmental performance of the transport sector improving?
2. Are we getting better at managing transport demand and at improving the modal split?
3. Are spatial and transport planning becoming better coordinated so as to match transport demand to the need for access?
4. Are we optimising the use of existing transport infrastructure capacity and moving towards a better balanced intermodal transport system?
5. Are we moving towards a fairer and more efficient pricing system, which ensures that external costs are internalised?
6. How rapidly are cleaner technologies being implemented and how efficiently are vehicles being used?
7. How effectively are environmental management and monitoring tools being used to support policy- and decision-making?

The TERM indicator list covers the most important aspects of the transport and environment system (driving forces, pressures, state of the environment, impacts and societal responses — the so-called DPSIR framework). It represents a long-term vision of the indicators that are ideally needed to answer the above questions.

The TERM process is steered jointly by the European Commission (Directorate General for Environment, Directorate General for Energy and Transport, Eurostat) and the EEA. The EEA member countries and other international organisations provide input and are consulted on a regular basis.

European Environment Agency

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Fax: +45 33 36 71 99

Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

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