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ODYSSEE – MURE 2012

Trends and policies for energy savings and emissions in transport

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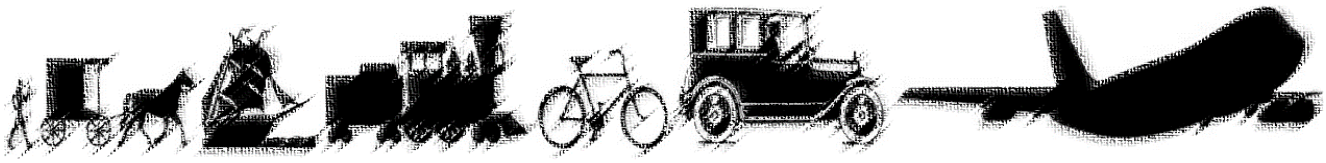

"Competitive transport systems are vital for Europe's ability to compete in the world, for economic growth, job creation and for peoples' everyday quality of life. Curbing mobility is not an option; neither is business as usual. We can break the transport system's dependence on oil without sacrificing its efficiency and compromising mobility."

Declaration of Siim Kallas, ex Vice-President of EC responsible for Transport.

i

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Didier Bosseboeuf

Project leader

[1] Alphabetic order of countries

KEY MESSAGES AND CONTENT OF THE BROCHURE

TRENDS IN THE TRANSPORT SECTOR

- The energy consumption of the transport sector has been decreasing quite rapidly since 2007.
- Around 40% of that reduction is due to the economic recession, with a decrease in freight traffic and the stability of passenger traffic. Almost 60% is due to improvements in energy efficiency, mostly for passenger cars.
- As a result of these trends, transport energy consumption in 2013 was almost the same as in 2000 at EU level and in France, and between 3% and 10% below in Germany, Italy, UK and Spain.
- Since 2007, the economic crisis resulted in a remarkable drop in the traffic of goods which was in 2012 11% lower than in 2007 at EU level. Passenger traffic remains stable despite population growth because of a slight decrease in passenger mobility (decrease by 3% of km travelled per capita per year). In addition, in most countries the average annual distance travelled by cars has been decreasing since 2007.
- The energy efficiency of transport improved by 1.2% per year in the EU between 2000 and 2013. Greater progress was achieved for both cars and airplanes than in the rest of the sector. Energy efficiency progress has slowed down for trucks and light goods vehicles since 2005 and even has virtually stopped since 2007: the fall in freight activity (by 2.5%/year over 2007-2012) led to less efficient operation of the vehicle fleet, as shown by the sharp decrease in load factors (trucks less loaded with increased empty running).
- The average specific consumption of the car fleet decreased from 8.1 l/100 km in 1995 to 6.8 l/100 km in 2012 at EU level, thanks to the progress achieved with new cars.
- The reduction in the specific consumption of new cars has accelerated since 2007 (- 3.7% per year compared to 1.5% between 2000 and 2007), mainly because of EU regulations on labelling and emission standards and national fiscal policies promoting the purchase of low emission cars. This acceleration was especially rapid in the Netherlands, Ireland, Sweden, Denmark, Finland

and UK, where it was above 4% per annum.

- There are now 11 countries in the EU with a specific consumption of new cars below 5 l/100km with Portugal, the Netherlands and Denmark in the lower range. The high share of diesel cars largely explains the good performances of these countries.
- All countries aim at decreasing the share of road in transport, as a way to decrease consumption and emissions. The results are not as bright as the share of public transport in total passenger traffic was the same in 2012 as in 2000 at EU level (18.5%) and the share of rail and water has been decreasing for freight transport.
- The stability in the share of public transport is the result of opposite trends with a decrease in the majority of countries but an increase in 11 countries, among which the largest countries. The Czech Republic and Austria have the highest use of public transport (around 3,000 km/year/person), compared to an EU average around 2,000 km. Belgium and Croatia recorded the highest increase in the share of public transport since 2,000 (over 30%).
- For freight, the Netherlands and Sweden appear as the benchmark for all other countries as they have the highest share of rail and water transport (respectively 53 and 46%) and are among the countries where this share is progressing.
- For road transport, alternative fuels (natural gas and biofuels) supplied around 5% of the consumption in the EU in 2013, of which 90% for biofuels. Around 75% of the biofuel is biodiesel. Sweden is the leader, followed by France and Bulgaria.
- The transport sector represents an increasing share of total CO_2 emissions of final consumers: 43% in 2012 compared to 32% in 1990. Emissions from road freight transport were 33% higher in 2012 than in 1990 and made up 35% of total transport emissions. Emissions from cars have been decreasing since 2000 because of the significant reduction in the specific emissions of new cars.
- In six countries, new car emissions were below 120 g CO_2/km in 2013 (the Netherlands, Greece, Portugal, Denmark, France and Malta) and in total 12 countries were below the mandatory limit of 130g for 2015 for cars manufacturers. The share of low emissions cars (i.e. below 100 g CO2/km) increased from 2.5% in 2010 to 15% in 2013 at EU level.

POLICIES AND MEASURES

- The majority of the transport measures (about 70% of the total) concern the passenger modes with particular emphasis on the private car, and this is reflected in the corresponding energy consumption and traffic trends. In contrast, the approximately 30% of policy measures that directly or indirectly affect freight transport do not seem to have had a tangible impact on the corresponding energy efficiency and traffic indicators.
- In the same way, the approximately 100 measures that address modal shift have not yet been able to noticeably affect passenger mobility habits and freight transport logistics and organization. Positive signs of change

are indeed coming from some countries, especially with regards to the passenger modes, but it is too early to judge whether this is due to the measures that have been implemented or to the economic crisis. The energy efficiency potential of modal shifting is very high but is far from being realised.

- The energy efficiency improvements achieved in the private passenger mode seem to be mainly due to three sets of measures that represent the bulk of the energy efficiency policies enacted in this sector (based on the number and the estimated impact of these policies): those concerning the energy and CO_2 standards for new cars, those addressed to renew the car fleets and those addressed to traffic management. But to achieve a concrete and irreversible impact on the energy efficiency trends of this sector it is necessary to envisage integrated intervention strategies that impact on all the vehicle energy efficiency components (powertrain, market, use) and on the mobility patterns.
- To this end it would be useful to carry out studies to analyse the interactions and the potential of each of these energy efficiency components taking also into account that, presumably[2], a not negligible contribution to the energy and CO_2 savings come from the local measures.
- In contrast to the household and services sectors, in the transport sector EU Legislation does not represent the major driver for the implementation of policies and measures. The transport measures related to the EU legislation represent just 20% of total ongoing measures and the majority of them have been issued in the period 2000 – 2010. This means that the issuing of purely national measures is still rather high in this sector, with the possible exception of the measures concerning the introduction of biofuel in the fuel market that generally refer to the corresponding EU Directive 2003/30/EC.

THIS BROCHURE

The brochure is structured in three chapters. The first chapter is dedicated to EU policy and measures. It initially provides a wide overview on the general European legislation in this sector, starting from the White Paper, that frames the EU overall strategy for the next decade, and then illustrating the main legislative and regulatory initiatives recently enacted in the fields of infrastructure, research and innovation, emissions and the promotion of clean and innovative road transport vehicles.

The last section of this chapter is dedicated to the energy efficiency measures that represent the core content of the MURE database.

Here, chapter 1 first provides an overview on how these measures are organized in the database and then offers a more in depth

[2] The local measures and policies and the corresponding energy efficiency indicators are not taken into account by Odyssee and MURE

analysis on those that have been selected in the last National Energy Efficiency Action Plan (NEEAP3, edition, June 2014). This set of measures is indeed highly representative, not only because it represents 80% of the total, but also because the NEEAP measures are actually those to which the EU countries have entrusted the achievement of the energy efficiency targets, as envisaged by the Energy Efficiency Directive (2012/27/EU).

The second chapter provides an overview on the main EU trends in transport. It is based on the Odyssee indicators and shows a concise but comprehensive review of the main trends in energy consumption as well as the mobility and the energy efficiency data for both the passengers and goods modes. The analysed period concern twelve/thirteen years from 2000 up to 2012 or 2013 and the data provide, as far as possible, in depth country comparison.

Finally, the third chapter analyses in depth two important set of measures, selected from those collected in the MURE database: those concerning modal shift and those concerning non-conventional fuels.

The first set has been selected because of the intrinsic importance of modal shift interventions. Through the analysis of noteworthy case studies, the relationship between the selected measures and the corresponding private and collective traffic trends has been investigated, trying to understand if, at least in some EU countries, a permanent shift from the private/road modes to the more efficient collective/non road ones has started.

Finally we deemed it important to close the brochure with the analysis of the measures concerning the implementation of the Biofuel Directive. Actually the substitution of fossil fuels with biofuels does not modify the vehicles energy efficiency, to which the core part of the brochure is dedicated, but strongly contribute to the system decarbonisation. Also, a review of some noteworthy cases illustrates the effect of the measures on the biofuel consumption trends.

Summary of Contents

Index of figures

Index of Tables

Index of Boxes

1 Policy on Transport in Europe

1.1 *Background*

1.1.1 Introduction – The Transport Sector in Europe

The transport sector is one of the pillars of the European integration process and is closely related to the creation and completion of the internal market, which promotes employment and economic growth. It was one of the first areas of common policy of the European Union, because it was considered essential to achieve one of the targets established for the development of the EU Single Market defined, since 1957, in the Treaty of Rome: "free movement of persons, services, goods and capital."

Over the past sixty years, the EU transport has changed deeply. The sector generates 7% of the EU GDP and employs about 12 million people including vehicle and equipment manufacturing. Efficient transport is also vital to the EU economy in terms of exports – maritime transport accounts for 90% of the EU's external trade.[3]

Several European companies have become world leaders in sectors such as infrastructure, logistics and production of transport equipment. Today, a family spends on average 13.5% of its budget on transport, which occupies the second place in the family budget after housing costs[4].

But the transport sector also contributes relatively much to a large array of environmental problems: various kinds of air-pollution, CO_2-emission, noise, accidents, health , landscape fragmentation, etcetera.

EU versus national policy on transport

Historically, countries have stimulated the construction of transport infrastructure such as rail and waterways. After the 2nd world war, construction of motorways became of primary importance. Since the seventies, environmental problems have led to the introduction of various national, regional or local policies and measures to mitigate the detrimental effects.

Only in recent decades, environmental policies at EU level have gained importance because problems, like car exhaust emissions, could better be solved with setting standards at EU level.

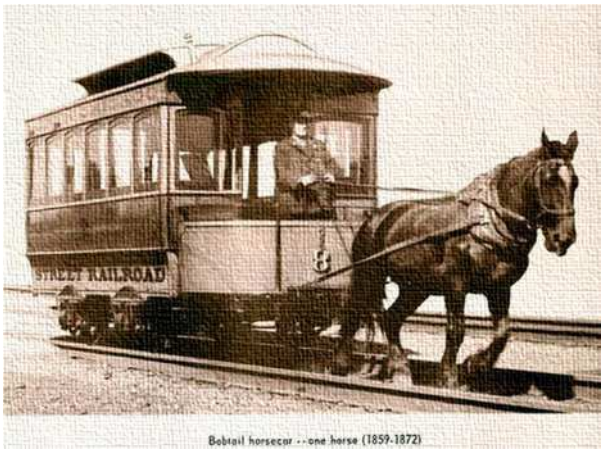
In order to remove distortions of competition between EU countries, the definition of tariffs, taxes and other charges are being phased out.

[3] European Commission, December 2013

[4] This corresponds to 1,900 Euros/year and includes motor fuels, car purchase and maintenance, urban transport, train and air travel. Source Eurostat European Commission, December 2013

In the aviation sector, the EU policy of market liberalization, which started in the nineties, has resulted in an unprecedented traffic growth.

1.1.2 History of EU policy in transport



In 1992, the Maastricht Treaty established the European networks and integrated the requirements of environmental protection into transport policy, a development intended to be strengthened in the first White Paper on the common transport policy, published by the Commission the following year. The importance of the principle of sustainable mobility was emphasized together with the aim of opening transport markets to competition.

From that year (1993) the Directorate General for Mobility and Transport published two White Papers, respectively in 2001 and in 2011.

The White Paper issued in 2001 envisaged a marked shift towards a more environmentally friendly transport policy which is able to adapt to uneven growth in the various forms of transport, congestion on the road and rail network in Europe and the increasing impact of pollution.

In 2006, an interim report concluded that more efforts had to be done to counter the negative impact of transport on energy consumption and the environment. It proposed measures, such as a plan for freight transport logistics, intelligent systems to make transport less polluting and more efficient, and a plan to boost inland waterways.

Finally, the 2011 White Paper ("Roadmap to a Single European Transport Area") focused attention on what needs to be done to complete the internal transport market and sets out the EU transport strategy for the coming decade.

1.1.3 Focus on White Paper on transport 2011

In this White Paper, the Commission sets out a plan for a fully integrated transport network, which links the different modes and allows for a profound shift in transport patterns for passengers and freight. To this purpose, the roadmap puts forward 40 concrete initiatives for the next decade.

The White Paper shows also how Europe can achieve the objective to reduce CO_2 emissions by 60 % by 2050 through:

- The development and deployment of new and sustainable fuels and propulsion systems.
- The optimization of the multimodal logistic chains performance, also through a greater use of more energy-efficient modes.
- The increase of transport efficiency and the modernization of infrastructures through the use of information systems and market-based incentives (such as the application of “user pays” and “polluter pays” principles).

It also sets ten goals to guide policy and measure the progress on:

- phasing out conventionally fuelled cars and trucks from cities by 2050;
- shifting 30 % of medium and long distance road freight to other modes of transport by 2030;

- using cars for less than half of medium-distance travel by 2050;
- halving road traffic deaths by 2020 and achieving near-zero casualties in road transport by 2050.

A transformation of the current European transport system will only be possible through a combination of initiatives at all levels and covering all transport modes.

In **rail transport**, the initiatives include the development of a *Single European Railway Area*[5], opening the domestic rail passengers market to competition, and establishing an integrated approach to freight corridor management.

In **maritime transport**, the *European Maritime Transport Space without Barriers*[6] should be further developed into a "Blue Belt" of free maritime movement both in and around Europe, with waterborne transport being used to its full potential.

In **road transport**, the initiatives include the review of the market situation of road freight transport as well as the degree of convergence on road user charges, social and safety legislation, transposition and enforcement of legislation in EU countries.

With regard to the infrastructure development and in order to develop a seamless chain linking all modes of transport – air, rail, road and sea –, one of the White Paper's top priorities is to complete the trans-European transport network: TEN-T[7]. This ambitious plan is seen as one of the major development factors, essential for creating employment and economic growth.

Innovation is also paramount to this strategy and the EU recognises the need to promote the development and use of new technologies. The Commission therefore proposes a regulatory framework for **innovative transport**, including:

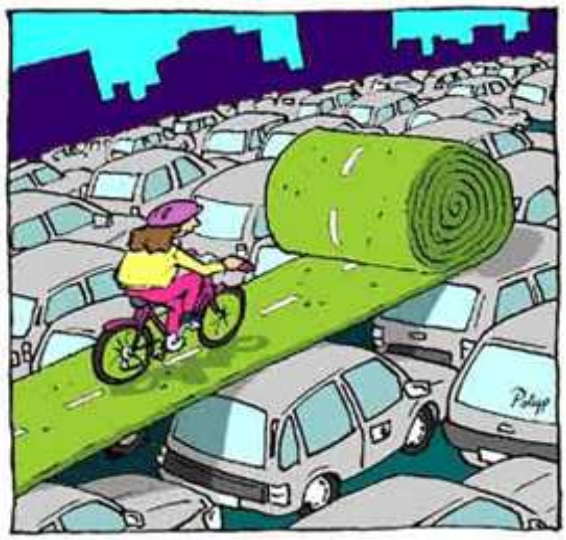
- appropriate standards for CO_2 emissions of vehicles in all transport modes;
- vehicle standards for noise emission levels;
- public procurement strategies to ensure rapid uptake of new technologies;
- rules on the interoperability of charging infrastructure for clean vehicles;
- guidelines and standards for refuelling infrastructures.

Finally, to promote **sustainable behaviour** in EU transport, the White Paper puts forward the following initiatives:

[5] This strategy consists of promoting the development of an effective EU rail infrastructure, establishing an open rail market, removing administrative and technical barriers, and ensuring a level playing field with other transport modes.
More information:
http://europa.eu/legislation_summaries/transport/rail_transport/tr0041_en.htm

[6] This communication proposes the creation of a maritime transport space without barriers in the European Union designed to harmonise and simplify administrative procedures in short sea shipping. This would improve the efficiency and competitiveness of intra-EU maritime transport and make the procedures for maritime transport as simple as those for other modes of transport.
More information:
http://europa.eu/legislation_summaries/transport/waterborne_transport/tr0014_en.htm

[7] More information:
http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/en/abouttent.htm



- promote awareness of alternative means of transport (walking, cycling, car sharing, park & ride);
- review and develop vehicle labelling for CO_2 emissions and fuel efficiency;
- encourage carbon footprint calculators, allowing better choices and easier marketing of cleaner transport solutions;
- include eco-driving requirements in the future revisions of the driving licence directive;
- consider reducing maximum speed limits of light commercial road vehicles to decrease energy consumption and enhance road safety.

1.2 EU legislation on transport

The legislative process aimed at creating a single European market, which began in the eighties, heralds a breakthrough in transport policy. Since then, the measures adopted are aimed at facilitating cross-border movement of goods and services.

This process consists not only in eliminating the barriers at the borders, but also in addressing the national markets integrations. Consistently other goals are to achieve technical compatibility – i.e. of rolling stock – and eliminate other technical and administrative barriers to competition. These developments have led, in turn, to the growth of gross domestic product (GDP) in the EU due to the increase of transport of passengers and goods.

Among the milestones of EU legislation in the field of transport, there are three railway packages, which have initiated the gradual liberalization of the domestic markets of the railways, the rules on road and sea coasting trade and the two packages "Single European Sky", which intend to create a single European airspace with common rules for aviation.

1.2.1 Infrastructures

Currently, transport infrastructures are not uniformly distributed in Europe. In addition to the need to build the missing links, it is necessary to also expand and modernize a considerable part of the transport infrastructure in the EU.

The trans-European transport network (TEN-T) aims to modernize and interconnect national networks and create an interconnected network linking all European regions and the best use of the different modes of transport.

The goal is to make sure that gradually, by 2050, the vast majority of European citizens and businesses will be no further than 30 minutes' drive away from the main network. The mobility is not only easier and faster but also safer and less congested.

1.2.2 Research and Innovation

The research on efficient transport, in terms of use of resources and environmental friendliness, plays a leading role in the EU transport policy. To realize "smart, green and integrated" transport is one of the great challenges to overcome with the program of funding for research projects "Horizon 2020" for the period 2014-2020, to ensure that Europe remains at the forefront of technological advances in the sector.

Technological progress is the basis of the future of transport in Europe, not least in order to maintain the primacy of European industry in the face of global competition. It is also the key for reducing $C0_2$ emissions from transport. Innovation and progress can in fact improve energy efficiency – aircraft engines and motor vehicles, for example – or develop alternative energy sources to oil.

This will be particularly important in the years to come, when we will have to radically increase the share of more sustainable transport modes to reduce oil dependence, greenhouse gas emissions and local pollution: a goal to be achieved by better using alternative modes of cleaner transport (often cheaper), such as railways and waterways.

Even the research, development and deployment of intelligent strategies to make better use of existing infrastructure and ICT to provide effective links between the various forms of mobility help to make transport cleaner, safer and more efficient. Road transport is an example of how innovative technology can help drivers to consume less fuel, find free parking and avoid traffic jams and accidents.

In the aviation sector, the research program for the air traffic management system (SESAR) is the technological element of the transition to a single European sky. SESAR should triple the capacity of airspace and make air transport ten times safer.

$C0_2$ emissions of each flight would decrease by 10% and the cost of air traffic management would be halved. SESAR aims to improve the efficiency in fuel consumption and optimize the access of aircraft to airports and the management of the trajectory of the flight to make aviation more sustainable and productive.

1.2.3 Emissions

The European Union's transport sector heavily relies on fossil fuels. The petroleum-based fuels represent 96% of total supplies of energy sector, with road transport at the top of the standings.

To achieve the EU's objectives on climate protection, it will be necessary to drastically reduce transport CO_2 emissions which represent around 20% of total greenhouse gas emissions in the EU. This means that to reduce global emissions of greenhouse gases by 80% and, thus, keep climate change within safe limits (temperature increase of no more than 2° C), the transport sector must cut emissions by 60% by 2050.

Road transport is the main source of CO_2 emissions: according to the latest data, it produces about 71% of total CO_2 emissions (and cars are responsible for two-thirds). Other modes of transport instead emit far less. Maritime and air transport represent 14% and 13% respectively, while the inland navigation stands at 2%. With less than 1%, the railways emit least.[8]

A quarter of EU transport emissions are produced in urban areas, therefore towns and cities play a key role in mitigating climate change. Many cities also have to contend with congestion and need to improve air quality, which is currently unsatisfactory.

In this framework, the European policy and research aims at decarbonizing the transport sector through appropriate fuel and car efficiency regulations with the final objective to promote the market for clean and energy efficient road transport vehicles.

In the past years, fuel efficiency has been addressed through voluntary agreements with car manufacturers on CO_2 emissions and the mandatory labelling of cars, showing a progressive improvement in CO_2 emissions. Euro 5 and 6 standards for passenger cars were agreed in 2006, and came into force in 2009 and 2014, respectively.

Public and private stakeholders participating in the CARS 21 initiative (Competitive Automotive Regulatory System for the 21st Century) have developed a regulatory framework for the European automotive industry. This initiative addresses CO_2 emission reduction and has led to recommendations to deliver improved measurement standards for cars and light duty vehicles. These recommendations had been, in turn, taken into account in setting the EC Regulation on emission standards and resulting in the issuing of the two Directives: "Promotion of clean and energy-efficient road transport vehicles (Directive 2009/33/EC)" and "Emission performance standards new passenger cars (Regulation 443/2009/EC)" passenger cars (EC, 2009b). These important Directives are briefly outlined in the two following paragraphs.

1.2.4 Promotion of clean and energy-efficient road transport vehicles

The Directive 2009/33/EC requires public authorities and some other operators to take into account the impact of vehicles during their operational lifetime in terms of energy consumption, CO_2 emissions and other pollutant emissions.

The Directive applies to contracts for the purchase of road transport vehicles agreed upon by:

- contracting authorities and contracting entities;
- operators for the discharge of public service obligations under a public service contract.

Member States shall ensure that contracting authorities, contracting entities and operators under a public service contract take into

[8] European Commission, December 2013

account the operational lifetime energy and environmental impacts when purchasing road transport vehicles.

Energy and environmental impacts include:

- energy consumption;
- emissions of $C0_2$;
- emissions of NOx, NMHC and particulate matter.

1.2.5 Emission performance standards new passenger cars[9]

The Regulation 443/2009/EC sets standards to limit specific CO_2 emissions of new passenger cars. The limit set by the Regulation is 130g of CO_2/km, but from 2020, this level has to be reduced to 95g of CO_2. The average limit of 130 g of CO_2/km will fully enter into force in 2015, with a gradual introduction of this emission threshold as follows:

- 65% in 2012;
- 75 % in 2013;
- 80% in 2014;
- 100% from 2015 onwards.

It is worth noting that this Regulation includes specific provisions for vehicles running on a **mixture of fuel with 85% ethanol (E85)**. In order to determine whether a manufacturer meets their CO_2 emission targets, the percentage of specific emissions for this type of vehicle is to be reduced by 5 % by 31 December 2015. This reduction target is only applicable if at least 30% of the service stations in the Member State where the vehicle is registered are able to offer this type of biofuel.

In order to create incentives for the car industry to invest in new technologies, a "super-credits" mechanism[10] encourages the development of cars generating less emissions than traditional cars. In calculating the average specific emissions of CO_2, each new passenger car with specific emissions of CO_2 lower than 50g/km can be counted as:

- 3.5 cars in 2012 and 2013,
- 2.5 cars in 2014,
- 1.5 cars in 2015,
- 1 car from 2016.

Member States shall be responsible for collecting data for each new passenger car registered in their territory. They shall provide the Commission with the following information concerning these vehicles:

- their number;
- their average specific emissions;
- their average mass;
- their distribution;
- their footprint.

In turn, the Commission shall keep a publicly available central register of this data and for each manufacturer shall provisionally calculate the average specific emissions of CO_2 in the preceding year and the difference between this emission and its target for that year. From 2012, manufacturers must pay an additional premium if they exceed their specific emissions target. From 2019, this premium will be calculated in a different way[11].

[9] Regulation 443/2009/EC. MURE database: http://www.measures-odyssee-mure.eu/ and http://europa.eu/index_it.htm

[10] "Super Credits" are additional incentives to produce vehicles with extremely low emissions that are **below 50g/km**.

[11] Manufacturers may apply to the Commission for a derogation in the following cases: i) they produce fewer than 10,000 new passenger cars registered in the EU; ii) they do not belong to a pool of manufacturers; iii) they belong to a pool of manufacturers which represents fewer than 10,000 new passenger cars registered in the EU; iv) they are part of a pool of manufacturers but operate their own production facilities and design centre.

1.2.6 Energy efficiency policy measures in members states

1.2.6.1 MURE database on energy efficiency measures

The measures collected in the MURE database for the transport sector are a subset of the entire body of law of this sector: they only refer to the national measures directly referring to, or indirectly affecting, energy efficiency in transport.

Neither measures issued at local level[12] nor those concerning, for example, the environment (i.e. fuel quality), safety, normative/ trading measures, are included. Despite these limits, the collected measures embrace a wide set of topics as energy efficiency in transport is directly or indirectly affected by several interconnected factors.

In a few words, the lower the fuel consumption per unit of traffic, the more fuel-efficient this mode is[13]. This entails that to achieve the objective to improve the overall transport energy efficiency, a wide set of policies and measures, involving several domains of the transport system, are required. These domains correspond to the energy efficiency improvement of vehicles, the market transformation rate, i.e. the replacement speed of old vehicles with new efficient ones, the way the vehicles are used, and the shift of persons and goods from individual vehicles to collective ones.

1.2.6.2 Policies per savings domain

During the last 20-25 years, the EU Member States (MS) have issued an impressive number of measures affecting these specific domains and the vast majority of those measures have been included and classified in the MURE database. All in all, the database includes 519 measures, of which 75% (402) are related to energy efficiency and 25% are related to the introduction of clean fuels (biofuels) and clean vehicles[14]. Out of these 402 measures related to efficiency, 298 are still ongoing while the rest either no longer exist and have been removed from the national legislations (81) or are planned (23). The distribution between the energy efficiency and non-energy efficiency measures of the transport sector is also shown in Figure 1-1 while Figure 1-2 shows how these measures are distributed within the different energy efficiency domains.

It is important to underline that the figures reported in figure 1.2 and in the other ones shown in this paragraph do not refer to the numbers of measures but to the types of measures related to energy efficiency. Actually, several measures cover more than one measure type and are allocated to more than one energy efficiency category. =Out of the 402 measures related to energy efficiency, 85 cover more than one energy efficiency category. Nonetheless, this double counting is not so relevant and the figures shown in this paragraph provide a trustable picture of real measure distribution.

For the sake of clarity the measures have been classified according to the following five subsets:

- Measures aiming at improving the vehicles energy efficiency. These measures are those concerning standards on energy efficient vehicles, mainly addressing cars and voluntary agreements, and now also addressing freight vehicles.
- Measures aiming at facilitating the purchase of energy efficient new vehicles

[12] Unless the regional/local measure is particularly innovative and has a good replication potential.

[13] Traffic is measured in passenger-km or ton-km that represents the number of persons or the quantity of goods moved multiplied by the distance travelled.

[14] Biofuels decrease CO_2 and pollutant emissions but do not have any relevant effect on the energy efficiency of the vehicles.

("market transformation"). These measures include labelling, financial and fiscal policies aiming at facilitating the purchase of energy efficient vehicles and public procurement.

- Measures aiming at improving the inefficient use of the vehicles, acting on the reduction of traffic congestion (the majority of these measures are implemented at local level), improvement of driving styles, vehicle maintenance and limitation of the vehicles speed. For the sake of conciseness, we have included in this subset also the "*social planning*" measures i.e. teleconferencing, working from home, optimal logistics, etc.

- Measures aiming at facilitating modal shift for both the passenger and goods modes. These measures include infrastructural policies (even if neither the infrastructural investment for the development of e.g. high speed or high capacity trains nor the local intervention are considered in the database), as well as fiscal and informative initiatives favouring public transport.

Figure 1-1: Energy efficiency and non-energy efficiency measures of the transport sector

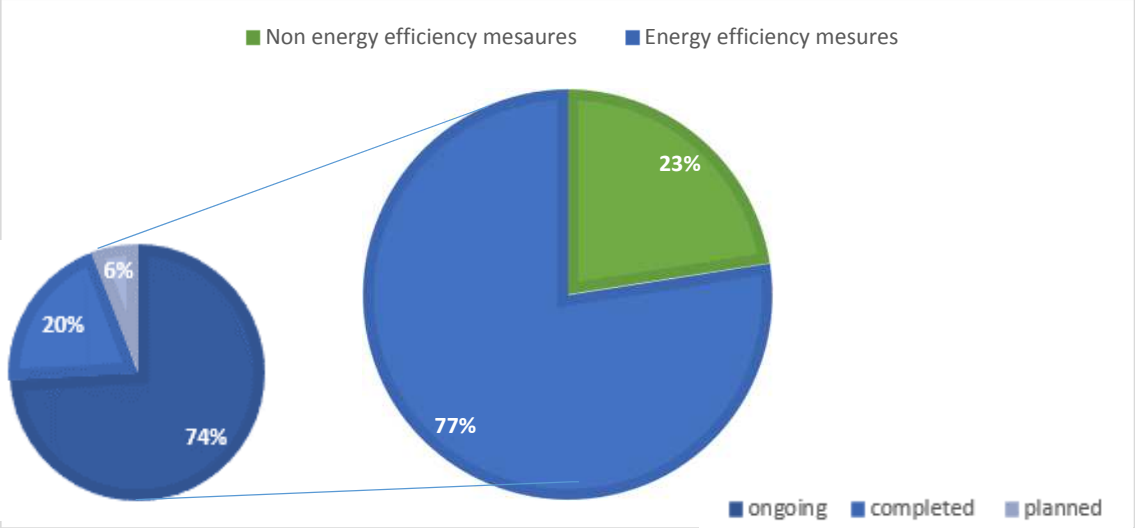
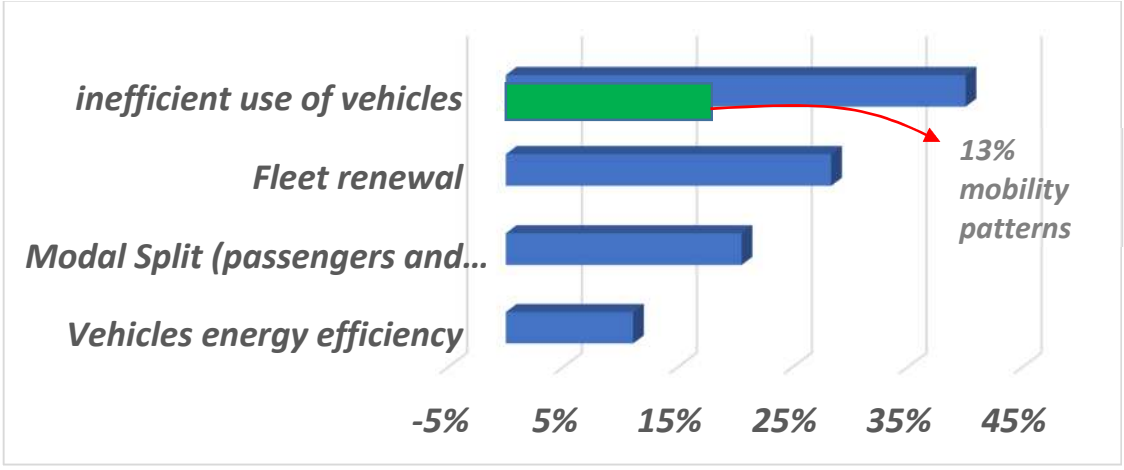


Figure 1-2: Main aims of the energy efficiency transport measures



Source: MURE Database

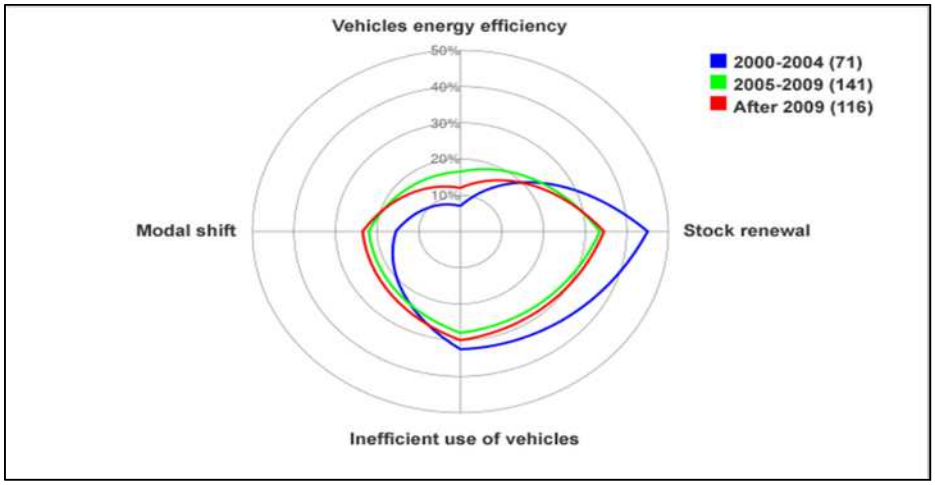
Examining Figure 1-2, it appears that relatively few measures concern the energy efficiency of vehicles, while the majority (55%) are focusing on stock renewal and the mitigation of the inefficient use of the vehicles. The measures addressing the promotion of modal shift are relatively numerous, even if 70% of them refer to passengers modes and only 30% (5% of the total) refer to transport of goods. A more in depth analysis on modal shift measures and the corresponding activity data is carried out in chapter 4.

The reason why the measures on energy efficiency of vehicles correspond to only 8% of the total, is justified by the fact that they mainly refer to the national implementation of the EU Directives (mainly the Emission performance standards of new passenger cars, see paragraph 2.2.5). On the other side, the high number of measures addressing the other two categories (stock renewal and inefficient use of vehicles) show the attention of MS to these two crucial aspects of transport energy efficiency: it is useless to produce very efficient vehicles if they are not widespread in the stocks; and, at the same time, the energy inefficiencies due to driving behaviour and traffic congestion may largely hinder the benefits of the technological improvements.

Finally, Figure 1-3 shows the MS transport energy efficiency policies dynamic for the last 15 years. For the sake of simplicity, the measures implementation has been divided into three periods: from 2000 to 2004, from 2005 to 2009 and from 2010 up to today.

In the first period there was much legislative work in the field of the stock renewal (mainly due to the car labelling measures) and notably less in the field of the modal split. During the second period, the policies were mainly addressing the domain of vehicle energy efficiency, due to the implementation of the EU Directive (actually most of these measures were issued in the year 2009). Finally, the last period shows a more balanced distribution of the issued measures, with a slight emphasis on the modal split measures that probably represent one of the major challenges for the next years.

Figure 1-3: Dynamic of the distribution of the MURE measures by the main domains of the transport energy efficiency



Source: MURE Database

The following chapter 3 (in particular paragraphs 3.4 and 3.5) shows, among other

data, the impact of the transport energy efficiency policy measures on energy efficiency and CO_2 trends of MS road vehicles.

It is not possible to separately calculate the contribution of each energy efficiency measure to the overall energy efficiency improvement. At first glance, the main merit should be awarded to the measures concerning the improvement of energy efficiency of vehicles and to stock renewal (even if in the last years the renewal has been slowed down by the economic crisis). The impact of the measures that aim at mitigating the inefficient use of vehicles is largely uncertain while, to our mind, the impact due to the modal split measures is still really modest even if it might increase in the future (but there is still no evidence of this fact).

1.2.6.3 The transport energy efficiency measures in the third edition of the NEEAP

In June 2014, the MSs have delivered their third edition of the National Energy Efficiency Action Plans (NEEAPs). In the first release of these plans, transport measures were somewhat under-represented but the number increased in the following releases and now, in the 3rd edition, over a total of 768 measures, 150 pertain to this sector. As it is reasonable to expect, the majority of these measures (120 measures, 80% of the total) refer to the transport energy efficiency domains outlined in the previous paragraph.

Classifying these 120 measures in accordance with these domains, we obtain the distribution shown by Table1-1.

Table 1-1: Main aims of the NEEAP3 measures with respect the transport energy efficiency domains at EU level

Vehicles energy efficiency	Fleet renewal	Inefficient use of vehicles	Modal shift
10%	30%	39%	21%

Source MURE Database

In this context, it is important to outline that, as in the case of Figure 1-2, Table 1-1 shows the distribution of the types of measures distributed by the four energy efficiency categories. These means that the reference of this table contains 150 measures because, out of the 120 energy efficiency NEEAP3 ones, 27 cover two or three energy efficiency categories so they are double (or even triple) counted.

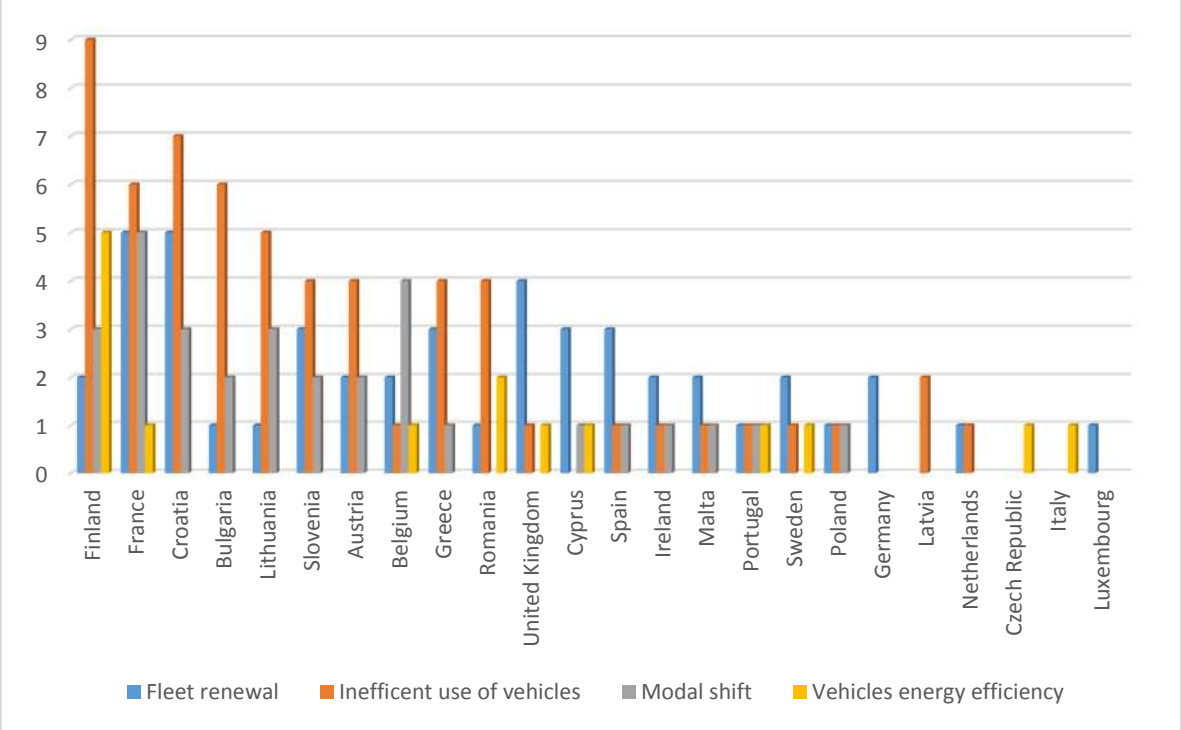
This distribution is not far from that shown in Figure 1-1 but, when applied to each MS, the figures change notably. Actually, up to the date of preparation of this brochure[15], four MSs do not have any transport measure in their NEEAP3, six have up to two measures, eight up to five measures, seven between 6 and 10 measures and three more than 10 measures, with France leading this group with 21 measures. This distribution does not change significantly when referring the to the energy efficiency domains set in this brochure. Even if the number of measures is not a guarantee of an effective impact, we could expect that the more these measures are evenly distributed among the four energy efficiency components, the higher is the expected impact. Actually, it is our opinion that what really works are not only effective single measures but a coordinated set of interventions that cover, as far as possible, all

[15] June 2015

the transport energy efficiency components: vehicles, stock, use and modal shift.

Figure 1-4 below shows the distribution of measures among the energy efficiency domains split by each of the MSs that have inserted the transport measures in their NEEAP3. Out of the twenty-four countries that have at least one transport measure in their NEEAP3, only four, Belgium, Finland, France and Portugal, cover all the four domains. Fourteen cover three domains (mainly fleet renewal, inefficient use of vehicles and modal shift), one covers two domains and the remaining five just one domain with one or two measures per domain.

Figure 1-4: Number of measures per efficiency domains and per country



Source MURE Database

1.2.6.4 *Excerpts and examples of good practices from the third edition of the NEEAPs*

We consider it important to look more closely at the measures selected in the NEEAP3 because these are the measures to which the achievement of the energy efficiency targets as ruled by the Energy Efficiency Directive (2012/27/EU) have been entrusted. Of these 120 energy efficiency NEAP3 measures, 93 refer to just one energy efficiency category and 27 refer to two or even three categories (but none of them address the whole set of the four energy efficiency categories). The measures addressing one energy efficiency category in general either go straight to the scope whether it be a fiscal, financial or normative action, or concern the implementation of an EU directive. The measures that cover different categories, rather frequent in the transport sector, are often wide-ranging, aiming at providing a

reference regulatory framework. In both cases, there are noteworthy examples that are useful to analyse in more depth. In the following paragraph, the energy efficiency categories referring to the energy efficiency of vehicles, the fleet renewal and the inefficient use of vehicles are analysed in more depth, while the entire chapter 4 is dedicated to modal shift.

- *The NEEAP high impact measures addressing the "Vehicles Energy Efficiency"*

As shown by Table 1-1, this set of measures represents only 10% of the energy efficiency NEAP3 measures. Please note that some measures are double or triple counted and thus the total reference is 151 measures. In this category there are 15 measures, of which seven are estimated as having a high impact, four a medium and four a low one. Of these measures, nine are specifically addressed to the vehicles energy efficiency and six have a wider purpose.

Four out of nine measures of the first subset concern the implementation of the EU regulations: CO_2 emissions for new and light duty vehicles and energy labelling of tyres, however these measures are included in the NEEAP3 edition by only three countries: Czech Republic, Finland and Italy. And more, only Finland includes the whole set of these regulations: CO_2 standards for cars and light duty vehicles as well as energy labelling of tyres.

The impact of the measures concerning the CO_2 standards for cars is estimated "high" by Finland and Italy and "low" by the Czech Republic. The impact of the measure concerning the tyre labelling is considered as "low".

The rest of this subset of measures concern voluntary agreements with freight or public transport companies, energy efficiency improvements of rail or metro companies and a law on the public procurement of governmental vehicles. The impact evaluation of the voluntary agreements vary from "medium" as in the case of France (freight companies), to "low" as in the case of Portugal, where the voluntary agreement is limited to the adoption of low rolling resistance tyres for trucks managed by freight companies.

The six measures which address the vehicle energy efficiency category along with at least one other category again concern, to different extents, voluntary agreements with public transport or freight transport companies (Belgium, Cyprus, Finland), or aim to strengthen the EU-ACEA agreement for new cars[16] at national level (UK). In general, these measures also cover the organizational and management aspect of the companies with which the agreements have been carried out and this is why their impact also concern the use of the vehicles and not only the specific energy efficiency of the powertrain.

An interesting example of a comprehensive voluntary agreement with freight companies is offered by Finland. The box below illustrates this measure.

[16] The EU-ACEA agreement was signed in 1998 with the aim to achieve an average of 140 g of CO2/km for new passenger vehicles sold by 2008.

Box 1.1: The Finnish measureTRA-FIN18: "Energy Efficiency Agreement for Freight Transport and Logistics 2008-2016"

Through this agreement, issued in 2008, Finland aims at achieving about one third of the total energy saving target set for the transport sector equivalent to 4.25 TWh (that is about 450 million liters of fuel). The target set for the participation rate in the agreement is 60% of the companies or registered vehicles in the sector. The energy used by transport equipment and in transport sector buildings is covered by the agreement.

In this agreement, the participating company commits to improve continuously, whenever it is possible, its energy efficiency taking into account the economic, safety and environmental related aspects. To this end, it has been recognized that it's necessary to improve the company's management and to optimize the whole transport chain and logistics. In addition, participants agree to make an effort to improve energy efficiency of their non-transport operations (for example buildings). Participating companies will have to report their fuel consumption to a state entity.

So far, various development projects have started involving the agreement parties and other stakeholders. The planned priority areas include:

- Co-operation with clients, i.e. integrating energy efficiency efforts regarding transport chains with those in the industry and commerce
- Improvement of energy efficiency of trucks
- Monitoring and reporting

- *The NEEAP high impact measures addressing the "Fleet Renewal"*

46 measures, corresponding to 30% of the total NEAP3 energy efficiency measures, aim at making the passenger and good vehicles fleets more efficient. Of these measures, only ten (22%) have been classified as high impact ones, 40% have a medium impact and the rest low or unknown. 80% of these 46 measures are specifically addressed to this energy efficiency category and the 20% have a wider scope.

Table 1-2 shows the distribution of this category of measures by the main measures type that, with different extent, encourage fleet renewal:

- annual vehicle tax graded by carbon emissions;
- financial and non-financial incentives for the purchase of alternative fuelled vehicles (mainly electric ones);
- Financial incentives for scrapping of old vehicles;
- car labelling.

The measures are distributed by level of semi-quantitative impact and, if not specifically indicated, generally refer to private cars. It is interesting to note, also in this case, that the impact estimation is notably different for a set of measures having a similar aim. This obviously depends to the country context and the measure mechanism and scope but, as a general rule, it would be useful to have references and official guidelines to calculate such an impact.

Table 1-2: Distribution of the NEEAP3 measures addressing the fleet renewal by their main scope and semi-quantitative impact

Measure Scope	High impact	Medium impact	Low impact
Annual vehicle tax rebate (according to the CO_2 emission levels)	• Ireland (IRL 15)	• Croatia (CR36) • Cyprus (CY5) • Luxembourg (LUX9) • Portugal (POR5) • Nederland (NLD27) • UK (UK8) • UK (car owned by companies, UK29)	• Finland (FIN 32) • Finland (light duty vehicles, FIN29) • Greece (GRE13)
Financial incentives for the purchase of alternative fuelled vehicles	• Croatia (CR22) • Slovenia (Freight transport, SLO4)	• Bulgaria (BG12) • Croatia (polluter pay principle CR33) • Ireland (IR 27)	• Malta (MAL1) • Slovenia (Freight transport. SLO8) • Spain (SPA52) • Spain (wide scope, SP53) • UK (wide scope, buses, UK31)
Financial incentivrs for scrapping of old vehicles	• Greece (GRE10)	• Germany (GER33) • Malta (MAL11) • Romania (RO7) • Spain (SPA51)	
Car labelling	• Slovenia (wide scope,SLO5)		• Cyprus (CY12) • Greece (GRE5)

Source MURE Database

It is worth mentioning at least one of these measures for its innovative mechanism: the French "bonus-malus" mechanism. This measure was issued in 2007 and updated in 2013 due its good results. It is based on the CO_2 emissions per km of new vehicles, rewarding the purchase of vehicles with low CO_2 emissions and penalising the acquisition of vehicles with high emissions (see Box 1.2). It is worth noting that other countries, e.g. the Netherlands and Croatia have implemented or will implement a similar mechanism. Croatia in particular is just launching a measure for which, as in the French case, the demand for specific vehicle categories would be stimulated, while vehicles with higher levels of emissions would be penalized ("polluter pays" principle).

It is also interesting to highlight a measure issued in the UK. The mechanism of this measure is not really innovative, but what is interesting is the audience that the measure addresses: company car drivers and fleet managers respectively, providing them incentives to choose cars that emit lower CO_2 emissions. Despite the fact that this audience represents a limited fraction[17] of the whole set of car owners, the corresponding impact has been estimated as "medium", due to the success achieved with the targeted audience. The success of this measure extends beyond the initial target audience due to the fact that company cars are often resold to the private car market after a relatively short period of time. The measure is illustrated in Box 1.3 below.

Within this energy efficiency category, there are other measures either having an informative scope, like the French measure No. FRA40, aiming at extending the

[17] Actually for some EU countries this audience does not represent a limited fraction as cars owned by companies rather than by private individuals, represent up to 50% of the entire car fleet of the country

requirement for energy certificates also to the transport sector, or setting a broader reference set of objectives like the Austrian "Klimaaktiv mobil" scheme or the French national "Clean Vehicle" plan. Given the very interesting design of the French measure and the wide scope of the Austrian one, these will be further illustrated at the end of this paragraph.

Box 1.2: The French measure : "Automobile Bonus Malus"

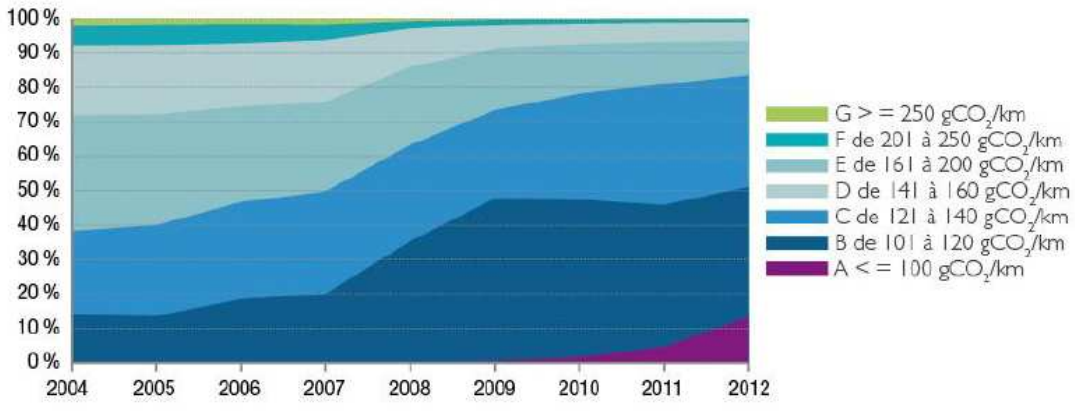
The bonus-malus mechanism, based on the CO_2 emissions per km of new vehicles, rewards the purchase of vehicles with low CO_2 emissions and penalises the acquisition of vehicles with high emissions.

The scheme relies on three criteria:

- a "bonus" for any purchase of a new car with low CO_2 emission, the emission threshold for low emitting cars getting increasingly lower with years.
- a "superbonus" (or "scrapping bonus") if the acquisition of the clean vehicle is accompanied by the scrapping of an old vehicle over 15 years old. From the 4th December 2008 and until the end of 2009, this bonus was modified: the scrapping bonus of 1000€ was given if the new clean vehicle emitted less than 160 g CO_2/km and if the old car was older than 10 years old. This scrapping bonus was maintained in 2010 with new conditions: 700€ until the 30th June 2010 and 500€ after. The emission threshold was reduced too: it switched to 155 gCO_2/km in January 2010. This superbonus mechanism was stopped at the end of 2010.
- a "malus" for the purchase of new cars with high CO_2 emissions, the emission threshold for high emitting cars getting increasingly lower with years.

The financial scheme envisages four levels of "bonus" awarding the purchasing of very clean vehicles with very high grants (6,300€ for vehicles emitting less than 20 gCO_2/km, 4,000€ from 20 to 60 gCO_2/km and "only" 150€ for cars emitting up to 90 gCO_2/km). A special grant of 3,300€ is awarded to those who purchase hybrid cars with CO_2 emissions lower than 110 gCO_2/km. On the contrary, the malus starts adding a tax on the purchased vehicle from 150€ for vehicles emitting more than 131 gCO_2/km up to 8,000€ for cars emitting more than 201 gCO_2/km.

The scheme has been highly successful and enabled average emissions of new vehicles registered in France to fall from 149 g of CO_2/km in 2007 to 140 g of CO_2/km in 2008 and 133 g of CO_2/km in 2009, while the historically-based decline, before introduction of the bonus-malus mechanism, was around 1.5 g of CO_2/km/year. In 2010, 2011 and 2012, the average level of emissions of registered new vehicles again fell to 3 g of CO_2/km/year. The figure below shows the sales of new cars per car labelling class between 2004 and 2012 (in %). A notable increase of the B-D categories starting from the date of the entrance into force of the measure, is evident.



Source: ADEME - Véhicules particuliers neufs vendus en France - Évolution de marché, caractéristiques environnementales et techniques - 2013

Box 1.3: The British measure "Company cars taxation"

The Company Car Tax system is part of a wider package of measures aimed at tackling climate change and greenhouse gas emissions, and was designed to provide financial incentives for employers and company car drivers to choose cars that produce lower CO_2 emissions. It also aimed to encourage car manufacturers to develop and introduce greener cars. The measure entered into force in 2003 and has been then updated several times up to 2014. Further changes are envisaged up to 2016. This financial scheme introduces a broadly revenue neutral reform of Company Car Taxation based on CO_2 emissions to provide an incentive for company car drivers to choose more fuel-efficient vehicles.

Company car tax is calculated by applying the appropriate percentage to the list price of the car. The appropriate percentage is related to the CO_2 emissions of the car and ranges from 15% to 35% in 1% increments for every 5 g/km of CO_2 emissions for a petrol car. On the contrary, diesel cars attract a 3% supplement. A lower rate of 10% for cars with CO_2 emissions of exactly 120 g/km or less (13% for most diesels) was introduced from 6 April 2008 to promote environmentally friendly vehicles. This limit of 120 g/km has been reduced to 115 g/km in 2014 and will be reduced to 110 g/km in 2015.

An ex post assessment carried out two years after the entering into force of this scheme demonstrated its success as it verified that average CO_2 emissions figures from company cars were around 15g/km lower in 2004 than would have been the case if the reforms had not taken place. Furthermore it was found that around 60% of company car drivers who were given a choice of company car by their employers were influenced by the Company Car Tax reform and as a result chose cars with lower CO_2 emissions figures.

- *The NEEAP high impact measures addressing the "Inefficient Use of Vehicles*

This energy efficiency category accounts for 59 measures, about 40% of the NEEAP3 transport measures. One of the reasons for this high percentage is actually that we have included in this category the measures concerning the mobility patterns, like optimal logistics, working at home, congestion charging, etc. This mobility subset accounts for 12 measures, which is 20% of this energy efficiency category. Looking at the semi quantitative impact, for 16 measures it has been estimated as high, for 23 as medium, and for 8 as low. It is worth noting that for 12 measures the semi-quantitative impact has not been evaluated (despite these measures have been included in the NEEAP3 set). It must however be noted that the scope of the majority of the measures without impact evaluation are infrastructural or corporate mobility management interventions (i.e. concerning the rail or public transport systems) rather than the improvement of the vehicles energy efficiency, that can be seen as a side effect not easy to evaluate.

Finally in this energy efficiency category, 40% of the measures are specifically addressed to the category topics (even if, in this case, they are rather wide) and 40% have a wider scope.

Table 1-3 shows the distribution of practically all the measures pertaining to this category according to their main types of objectives. That is, the measures scopes that directly or indirectly aim to improve the inefficient use of vehicles or, more broadly, the inefficient organization of transport.

Table 1-3 Distribution of the NEEAP3 measures addressing the Inefficient Use of Vehicles

Measure Scope	*High impact*	*Medium impact*	*Low impact*	*Unknown*
Vehicle maintenance (i.e. mandatory periodic inspection, other)	• Bulgaria (BG3, inspection) • Croatia (CR18, inspection) • Finland (FIN 20, tyre pressure)	• Latvia (LV15, inspection) • Ireland (IRL29, aviation efficiency)		• Lithuania (LT1, inspection) • Romania (RO17, shipping modernization) • France (FRA41, energy audit to transport companies)
Drivers training/education	• The Netherlands (NLD3, ecodriving) • Portugal (ecodriving) • Slovenia (SLO4, ecodriving) • Slovenia (SLO5, broad measure including educational activities)	• Austria (AU14, ecodriving) • Belgium (BG8, ecodriving) • Finland (FIN10, ecodriving buses and trucks) • Finland (FIN12, ecodriving cars) • Greece (GRE15, ecodriving) • Spain (SPA54, Ecodriving)		• UK (UK31, ecodriving buses)
Speed limit	• Croatia (CR29)	• Finland (Fin21)		
Traffic management and optimization	• Austria (AU7 parking space management) • Croatia (CR27, traffic management) • Slovenia (SLO5, management system of freight distribution • Sweden (SWE24, mobility management)	• Belgium (BEL12, mobility management) • Bulgaria (BG10, mobility management) • Croatia (CR32, mobility management) • Croatia (CR35, traffic management, traffic lights)	• Finland (FIN25, mobility management) • France (FRA5, mobility plan companies) France (FRA33 mobility management schools)	• France (FRA42, information on mobility management) • Greece (GRE12, urban mobility management) • Poland (PL13, traffic management)
Improving the mobility efficiency	Finland (FIN26, walking, cycling)	• Greece (GRE9, car sharing cycling) Malta (MAL3, teleworking)	• Romania (RO14, car-pooling, cycling) • Slovenia (SLO6, cycling) • Croatia (CR21, car sharing)	• France (FRA46, car sharing carpooling) • Lithuania (LT10, walking, cycling)
Traffic, road and non-road infrastructures	• Greece (GRE2, traffic infrastructures)	• Bulgaria (BG1, rail infrastructures) • Bulgaria (BG9, public transport infrastructures)		• Lithuania (LT7, public transport infrastructures) • Lithuania (LT8, , rail infrastructures)

Measure Scope	*High impact*	*Medium impact*	*Low impact*	*Unknown*
	• Romania (RO8, metro infrastructures) • Romania (RO5, rail system efficiency • Slovenia (SLO3, traffic infrastructure)	• Bulgaria (BG13, inland waterways infrastructures) • Sweden (SWE24, mobility management infrastructures		• Lithuania (LT8, road maintenance)

A few measures are not included in Table 1-3 because of their very broad scope. These concern in particular the Austrian measures on the "Klimaaktiv mobil" program and the "The Climate and Energy Fund" that should be actually spread in each of the measures tables shown in this paragraph. The "klimaaktiv mobil" program is described in detail in Box 1.7 at the end of this paragraph.

It is moreover interesting to note that, also for this energy efficiency category, the impact estimation is notably different for a set of measures having similar aim. To this end the considerations made in the previous paragraph also apply here.

Looking at the measures distribution in this table, it appears that the majority of the measures are concentrated on the improvement of the traffic management and on the driver's education. A good example of this last type of measures is shown in Box 1.5.

Few EU countries have deemed it important to include their NEEAP3 measures concerning the vehicle maintenance, the mobility patterns and the speed limits. Despite this, Box 1.4 shows a Finnish measure addressed to fostering of the walking and cycling habit. The measure shows in fact that it is possible to achieve a high impact also through the increase of the non-energy mobility modes.

Finally, several measures concern infrastructural investments to improve the traffic fluidity but also, and especially for some eastern countries, the whole rail and public transport systems. In this case, as already noted, the energy efficiency improvement is often a side effect of the measure even if it could be relevant.

Box 1.4: The Finnish measure: "Promotion of walking and cycling"

It is known that the energy efficiency of urban transport can be improved considerably by replacing short car journeys with walking and cycling. According to the Finnish energy agency Motiva, the most important interventions for promoting walking and cycling are:

1. coordinating land use and transport, particularly in growing urban areas;
2. reforming planning practices and targeting investment in routes at light traffic routes more than previously; improving the maintenance of light traffic routes; and
3. the permanent organization of traffic management activities at both national and major urban level.

In this framework the Finnish Transport Agency has laid out a National Action Plan for Cycling and Walking (KÄPY) which runs until 2020. The objective of this strategy is that in 2020 the number of trips made by cycling, walking and by using public transport will be 20% higher than in 2005. The growth should come from modal sift from private cars. Trips made by cycling and walking should increase by 300 million trips per year and their share among the different transport modes should increase from 32% to 35–38%. These targets are in line with the Climate Policy Program 2009-2020 of the Ministry of Transport and Communications.

According to the Finnish experience, the main criteria to implement an effective and functioning walking and cycling system are:

- Motivation: walking and cycling should have a higher status and motivation is required.
- Distances and safety: attention should be paid to distances and the infrastructures should be pleasant and safe.
- Will and co-operation among the municipality, the involved stakeholders and the citizens: the implementation requires in addition redirection of financing, changes in legislation and adequate monitoring.
- Inclusion of the walking and cycling path into the wider travel chains of the whole transport system.

The savings estimated by Motiva are about 460 GWh in 2020. When compared to the energy consumption in the transport sector in 2009, i.e. 49 260 GWh, this means a reduction of consumption by 0.9% corresponding to the "high" semi-quantitative impact level.

Box 1.5: The Dutch measure : "The "New Driving" Programme"

The New Driving is a programme of the Ministry of Infrastructure and the Environment with contributions from the Ministry of Economic Affairs. It was implemented by NL Agency, but was transferred in 2010 to private participants. The programme aims at encouraging energy-efficient buying and driving behaviour in (learner) drivers, company drivers, fleet managers and intermediary organisations (driving schools, trade organisations, etc.)

Its information campaign aims to change behaviour in transport and car buying. To influence driving behaviour, an information campaign has been launched focusing on driving in high gear and changing to a higher gear earlier. In addition to energy and cost savings, the New Driving also contributes to greater road safety and driving comfort. Furthermore, the New Driving also covers training, transport telematics, smart bicycle use, public transport and/or hire cars and publicity about these activities.

The New Driving program aims to reduce the emission of CO_2 in passenger transport consistently by at least 1 Mton within the period from October 2010 to October 2014. To stimulate changes in consumer behaviour, a passenger car labelling system has been developed (see also TRA-NLD05, Energy labelling of vehicles/tyres). The programme started in 1999 and changed over time up to October 2014. Nonetheless, as envisaged in the Energy Agreement, trade associations (RAI, BOVAG, VNA and the ANWB) are committed to define the next step for the New Driving in passenger transport.

To finish this paragraph, it is important to have a look at two measures that show how an energy efficiency and climate plan can be effectively structured. These deal with the French National Plan "Clean Vehicle" and the Austrian framework program: "Klimaaktiv mobil".

The French plan, launched in 2009, is actually composed of a set of fourteen well integrated measures to foster the development of electric cars and plug-in hybrid electric vehicles. It is something more than a simple "fleet renewal" measure (even if it has been accounted in this subset) because it aims at developing an electric car economy. Box 1.6 shows the list of the fourteen concrete actions envisaged in this plan[18].

The Austrian "Klimaaktiv mobil" program is a comprehensive framework strategy to reduce carbon emissions and boost energy efficiency in transport.

The interest aspect of this initiative is that it has been set up as an action programme bundling all so called "soft" and "voluntary" measures in transport (e.g. "mobility management"), that do not necessarily need to wait for legislation or specific administrative framework conditions.

In its comprehensive nation-wide and long term (2004 to at least 2020) approach – not only transport is targeted, but also buildings and renewable energy sources. From this point of view, klimaaktiv and especially klimaaktiv mobil seem to be one-of-a-kind in Europe. According to the Austrian Energy Agency, the costs per year are about 2 to 3 million euros, including thematic programs, public awareness raising campaigns and management. The geographical scope is Austria. Box 1.7 illustrates this interesting program in more detail.

Finally we remember here that the MURE measures have been analysed in depth in the brochure on the Energy Efficiency Policies delivered in 2013 in the framework of the previous Odyssee-MURE project and then it is possible to refer to this publication for further analyses. This publication analyses all the MURE database measures and, in particular, 427 measures of the transport sector collected in the database up to the year 2012.

[18] Box 2.6 shows the list of actions as envisaged in 2009. Actually, the plan has already provided its first results. According to a report provided by IEA in 2014, the car manufacturers PSA Peugeot, Citroën, and Renault have pledged to produce and deliver 70,000 plug-in electric vehicles (PEV) by 2015, while a group of companies including EDF, SNCF, Air France, France Télécom, and La Poste have committed to an initial purchase order of 50,000 electric vehicles. Those purchasing a vehicle with CO_2 below 60 g/km will receive a €5,000 government grant through 2012.

Environmental legislation has been adopted by the National Assembly. This legislation, Grenelle II, assigns responsibility for infrastructure construction to local and regional authorities, and requires charging points at new construction areas. Thirteen municipalities, among them Bordeaux, Nice, Paris, Rouen, Strasbourg, and Nancy, will deploy public battery recharging infrastructure. The government has also announced an investment plan to support public infrastructure. An estimated one million public and private battery-charging stations will be built by 2015 under the plan.

Box 1.6: The French measureTRA-FRA24: "The national plan: clean vehicle"

The Ministry of Sustainable Development presented in October 2009 a national plan with 14 concrete actions to foster the development of electric cars and plug-in hybrid electric vehicle (PHEVs).

1- Launching in 2010 of a demonstrators infrastructure charging

ADEME was to launch in early 2010 a call for projects regarding "infrastructure charging", to support the demonstrators and experiments combining infrastructure, applications and target territories, and to validate the functioning of the ecosystem of rechargeable vehicles.

2- Integrate no-carbon vehicle in new mobility solutions

Reducing our CO_2 emissions need to invent new ways of mobility with electric vehicles or PHEVs. In this perspective, ADEME was to establish, in early 2010, a specific roadmap for new mobility solutions.

3- Create a battery industry

Renault will build a battery factory in Flins, in partnership with the French Atomic Energy Commission (CEA). Bollore, Dassault and Saft also will conduct parallel projects.

4- Mass purchase of electric vehicles by companies and government by 2015

The aim is to have a private and public market fleet of 100,000 vehicles by 2015

5- Confirmation of the super-bonus of 5 000 Euro for the purchase of vehicles until 2012 (see box on the Bonus-Malus measure)

6- A standard plug to charge his vehicle

It will set up a standard for home plug in devices.

7- Plugs in new buildings

By 2012, the construction of buildings (offices and households) with parking will need to include compulsory charging plugs.

8- In co-ownership, creating a "plug right"

The status of condominium buildings built will evolve to facilitate the presentation of estimates of recharging equipment to the co-ownership. In addition, a "plug right" will be introduce for tenants.

9. Plugs to recharge vehicles at work and in public infrastructure

At work, the creation of plugs will be facilitated, and become compulsory for parking at office buildings by 2015.

10- Normalize a single plug in Europe

An agreement was reached by the Working Group on Franco-German technical characteristics of a single joint venture and whatever power load. This project is in discussions with other European states.

11- Municipalities will receive support to deploy the infrastructure of public charging

A national conference on electrical mobility and infrastructure support will be held in late 2009 for local authorities.

12- Organize the operational deployment of the network

Regarding the deployment of terminals, a new subsidiary to 100% of ERDF will be created to accompany municipalities.

13- Ensure production of non-fossil fuels for no-carbon vehicles

It should be ensured that electrical charging of the vehicle is produced at maximum from non-fossil energy, to ensure optimal environmental performance for no-carbon vehicles.

14- Giving a second life to the battery and its elements

The second battery life is an important research issue due to its cost and its environmental impact. Automakers and French battery producer shall take into account their life cycle when designing the batteries.

Box 1.7: The Austrian measure TRA-AU37: "Mobility management consulting and funding programmes – klimaaktiv mobil"

The klimaaktiv mobil set up:

- Free-of-charge consulting programmes addressing specific target groups (companies, cites & municipalities, real estate developers, schools & youth, tourism)
- A financial support programme with a total of 74.8 million € since 2007 for mobility management measures, fleet conversions to low-carbon technologies, work travel plans etc.
- An Ecodriving training programme with up to now 20,000 trainees and educating all novice drivers in Austria in an efficient driving style (see MURE measure AU 14)
- A broad awareness raising campaign

More than 5,700 klimaaktiv mobil partners among the target groups outlined above are nowadays implementing sustainable transport measures. Klimaaktiv mobil aims in fact at supporting actions conducted by specific target groups, each group being concerned by a specific programme on mobility management (MM): public administrations and companies, schools and youth, local authorities, leisure and tourism, real estate developers and investors in the building sector as well as individual drivers with respect to Ecodriving.

In practice, klimaaktiv mobil is divided into five elements. The first element concerns the **mobility management consulting programmes** for specific target groups. Programme managers consult companies, municipalities, schools etc. and ask them to agree on a specific package of CO_2 reducing measures in transport. These measures are agreed upon in a binding "target agreement", signed by the respective stakeholders and the strategic control level of klimaaktiv mobil in the ministry for environmental affairs. The contract contains certain targets to be achieved, among them tons of CO_2 that have to be reduced after a certain period. If a project implementer has not achieved the goals after the contract period, contractual penalties have to be paid.

A further element is constituted by a **financial support programme**, where project implementers can apply for subsidies when implementing their MM measures. This programme was introduced in 2007 and since then brought a real boost to klimaaktiv mobil and therefore is the basic backbone of the whole programme.

The next element is a broad **awareness raising & information campaign**, targeting the wider public via the media.

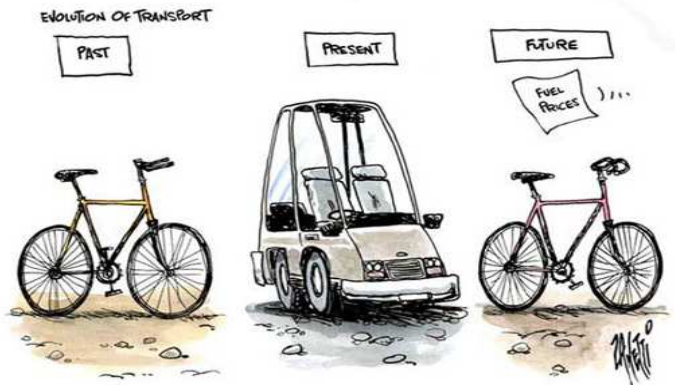
fourth further element are **partnership awards**. Implementers become **partners** and get **awards** for implemented measures and **certificates** for completed trainings (partnership & awards).

Finally, **education & certification** activities (fifth element) help ensure a sustainable impact of klimaaktiv mobil even beyond its planned end in 2020 (advanced).

The klimaaktiv mobil programme achieved impressive results during its first programme period:

- 5,700 climate-friendly mobility projects were initiated and were implemented by 4,200 companies, 650 cities, municipalities and regions, 600 tourism enterprises and 250 schools.
- These projects achieve an annual reduction of emissions of 590,000 tons of CO_2.
- 5,800 so-called green jobs were secured or created.
- 13,800 alternative vehicles for fleets of companies and municipalities were financially supported, including 11,000 e-vehicles and 1,700 charging stations
- 150 bicycle projects, including bicycle infrastructure, logistics and awareness raising, were funded,
- 1,200 driving trainers were upgraded to certified ecodriving trainers.

2 European Trends in transport



2.1 Energy consumption

Decrease of transport consumption since 2007

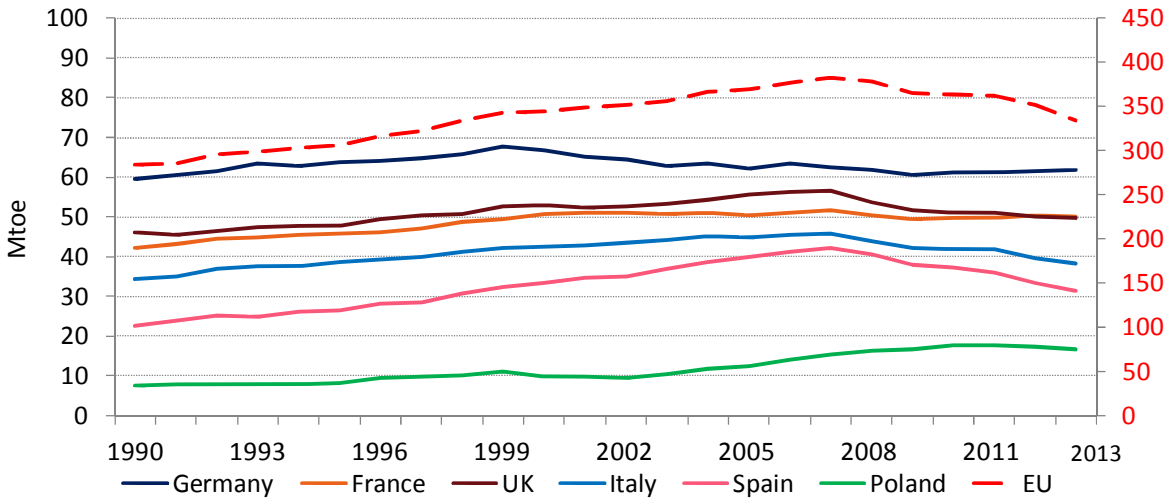
The energy consumption of the transport sector[19] has been decreasing quite rapidly since 2007 at EU level (by 1.6% per year from 2007 to 2013). This trend is mainly explained by a stable or decreasing consumption in the five largest EU countries: stability in Germany since 2005 and France since 2000 and decrease in UK, Spain and Italy with the economic recession (by 4.5 and 2.6% per year for Spain and Italy respectively) (Figure 2 1).

In some new member countries however, there is still a regular progression (Poland, Romania, or Slovenia by around 2% per year). In some countries, consumption has been contracting very rapidly (e.g. by 5-6% per year in Greece, Ireland and Latvia).

In 2012, transport represented 32% of final consumption in the EU as a whole, only one point more than in 2000. Consumption in 2012 was almost at the same level as in 2000.

[19] Transport consumption includes international air transport (Eurostat definition). EU corresponds to EU28. The reduction in 2013 has been even much higher, almost 5%, according to Enerdata estimates.

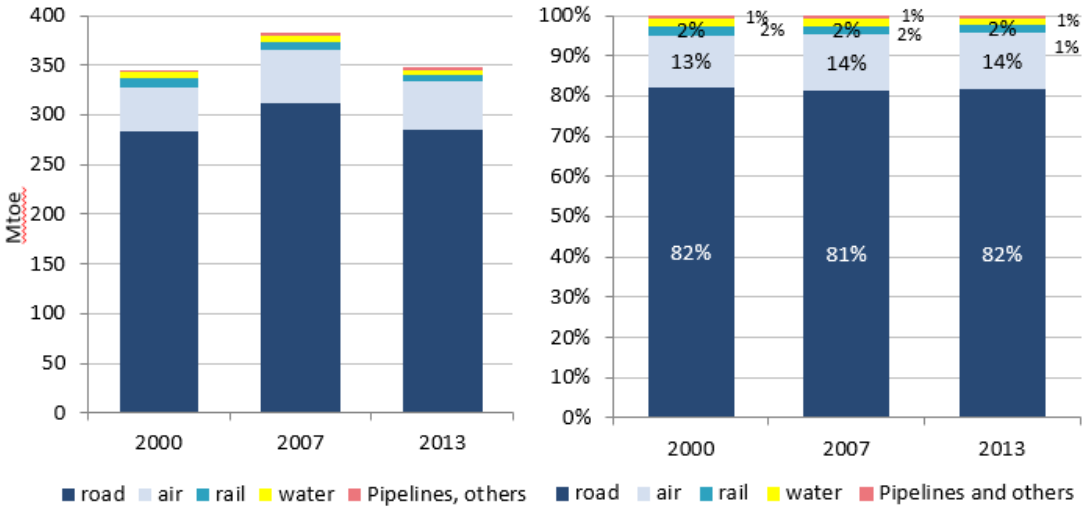
Figure 2-1: The energy consumption of the transport sector



Road transport accounted for 82% of the sector's consumption in 2013, followed by domestic and international air transport (14%). Rail and water only represent 2% each (2012). These shares are almost the same as in 2000 (Figure 2-2). Until 2007, air transport consumption increased most rapidly (2.5% per year since 2000). Consumption of both road and air transport has been decreasing since 2007 with the same magnitude (-1.5% per year), due to three main factors: low economic growth, increasing motor fuels prices (4% per year) and more efficient vehicles and planes.

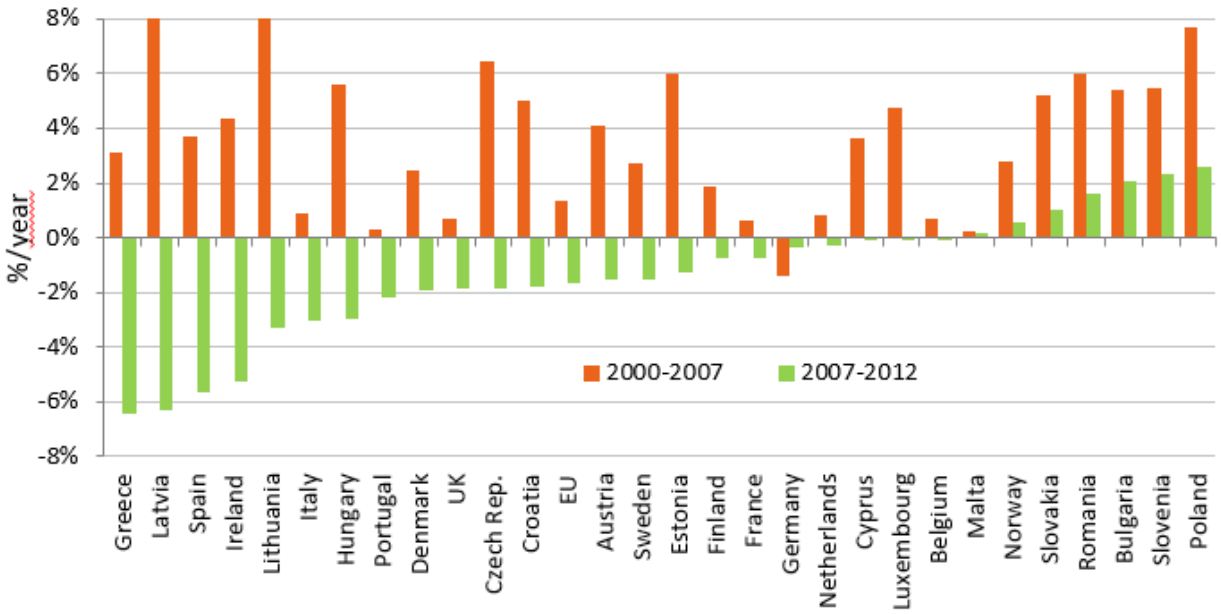
In almost all countries, road transport consumption has been decreasing since 2007, except in 6 countries (mostly new MS) (Figure 2-3). In countries hit the most by the economic crisis (Greece, Spain, Ireland and Baltic countries), this trend contrasts strongly with the period 2000-2007.

Figure 2-2: Consumption of transport by mode in the EU



Source: Eurostat

Figure 2-3: Energy consumption of road transport



Source: ODYSSEE

Half of the energy consumption for cars and 30% for trucks and light duty vehicles

Cars account for 47% of the sector's total consumption and road freight transport (trucks and light-duty vehicles) for 30%. The share of buses and two-wheelers is steady, at 4% of the total transport consumption. Passenger transport represents 63% of total consumption of terrestrial modes (i.e. without air) in 2012, which the same share as in 2000. Until 2007, it was growing less rapidly than freight transport.

The share of cars in the domestic energy consumption of transport[20] varies from less than 50% in Norway, Spain and Greece to above 60% in Austria, Cyprus, Denmark and Slovenia. These differences stem from the importance of other transport modes, namely air transport and water transport (high in Norway, Spain and Greece) and road freight transport.

CO_2 emissions in transport have decreased by 2% since 2000

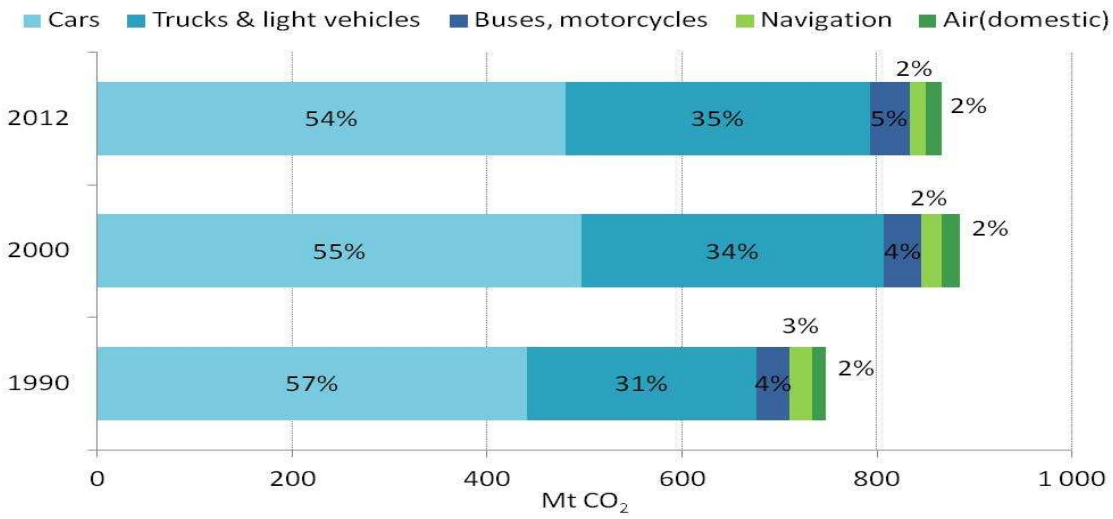
The transport sector represents an increasing share of total CO_2 emissions of final consumers: 43% in 2012 compared to 32% in 1990. However, CO_2 emissions from transport have slightly decreased since 2000 (by 2%) but are still 15% above their 1990 level (Figure 2-4). Road transport represents 94% of these emissions. Emissions from road freight transport were 33% higher in 2012 than in 1990 and made up 35% of the sector's emissions (31% in 1990); this is the main source of the sector's growth in emissions. Emissions from cars have been decreasing since 2000 (by 4%) and are only 9% above their 1990 level. Emissions from domestic air transport[21] have increased by 14% since 1990,

[20] Domestic consumption excludes international air transport and consumption of foreign vehicles.

[21] Emissions from international air transport are not included in accordance with the UNFCCC methodology. The emissions from the other sectors have decreased respectively by 38% in industry and 17% in households, services and agriculture.

but only represent less than 2% of the total.

Figure 2-4: CO_2 emissions from transport (EU)

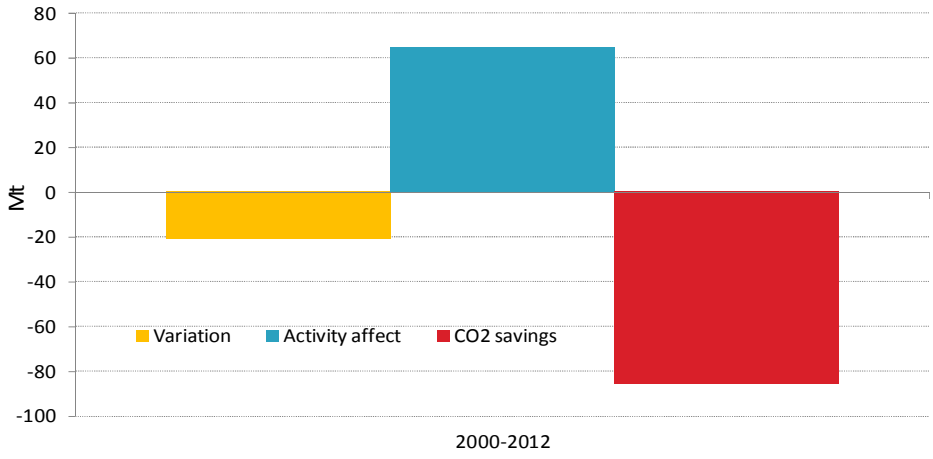


Source: EEA for total emissions and ODYSSEE for the emissions by mode

CO_2 savings have more than offset the effect of increase in traffic since 2000

The increase in the traffic of passengers and freight should have increased CO_2 emissions by 65 Mt CO_2 between 2000 and 2012. CO_2 savings linked to the reduction in the specific emissions of road vehicles per unit of traffic amounted to 85 Mt. These savings have more than offset the effect of increase in traffic and have contributed to reduce CO_2 emissions of around 20 Mt (Figure 2 5). Around 40% of the savings come from trucks and light vehicles and 30% from cars.

Figure 2-5: Variation of CO_2 emissions in transport (EU)



Source: ODYSSEE

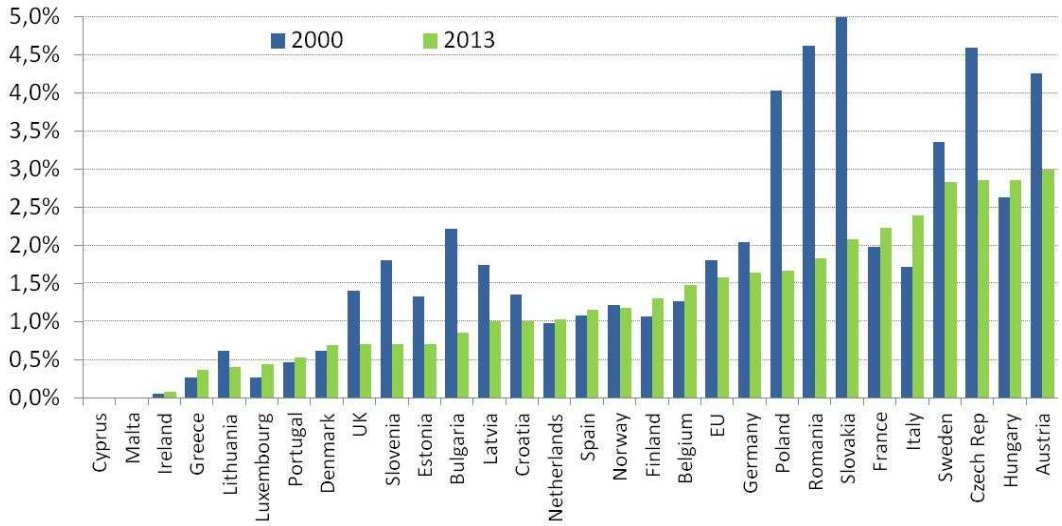
2.2 Non-conventional fuels

Reduction of the high dependence on oil in some EU countries

Alternative fuels, i.e. biofuels, electricity and CNG, supplied 6.5% of the consumption of transport in 2012 (respectively 4.2% for biofuels, 1.6% for electricity and 0.8% for CNG) and their share is progressing rapidly (2.2% in 2000).

The highest penetration rate of electricity is observed in The Czech Republic, Austria and Sweden, however, the share in these countries is still only 3% and moreover the share is decreasing, as in more than half of EU countries (Figure 2-6). Finland, Italy, France and Germany have the highest progression, which is, however, still moderate (+0.2 points since 2000). The large reduction of electricity in transport in a number of new MS is due to the lower use of public transport (trams or trains) as explained below.

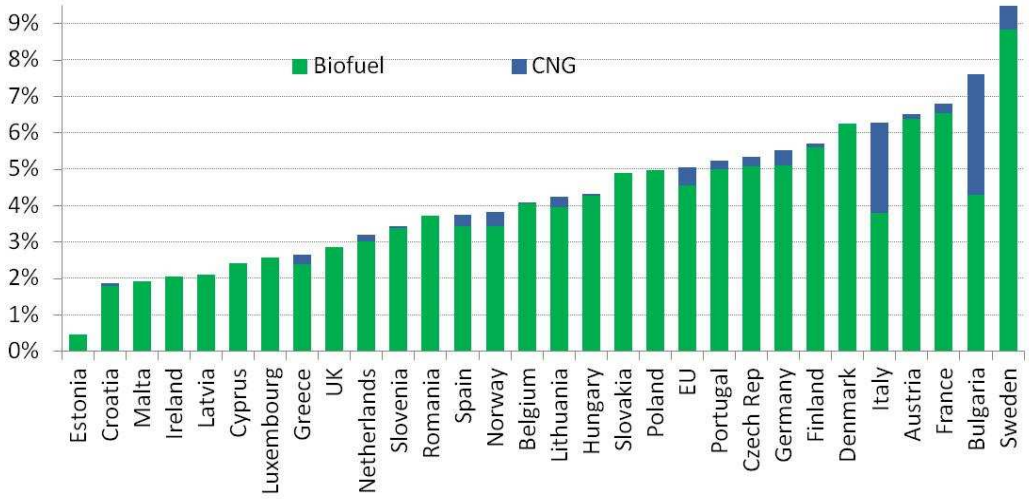
Figure 2-6: Share of electricity in transport



Source: ODYSSEE, Eurostat/AIE for natural gas (CNG)

For road transport only, alternative fuels (natural gas and biofuels) supplied around 5% of the consumption in the EU in 2013, of which 90% for biofuels. Around ¾ of biofuels are biodiesel. Sweden is the leader, followed by France and Bulgaria (9.5%, 7.5% and 7% respectively). Bulgaria and Italy have the highest penetration of CNG with gas representing 3.3% and 2.5% respectively of road consumption.

Figure 2-7: Share of biofuels and natural gas in road transport (2013)



Source: ODYSSEE, Eurostat/AIE for natural gas (CNG)

2.3 Mobility trends

2.3.1 Trends in passenger mobility

No more growth in passenger mobility in most EU countries since 2008

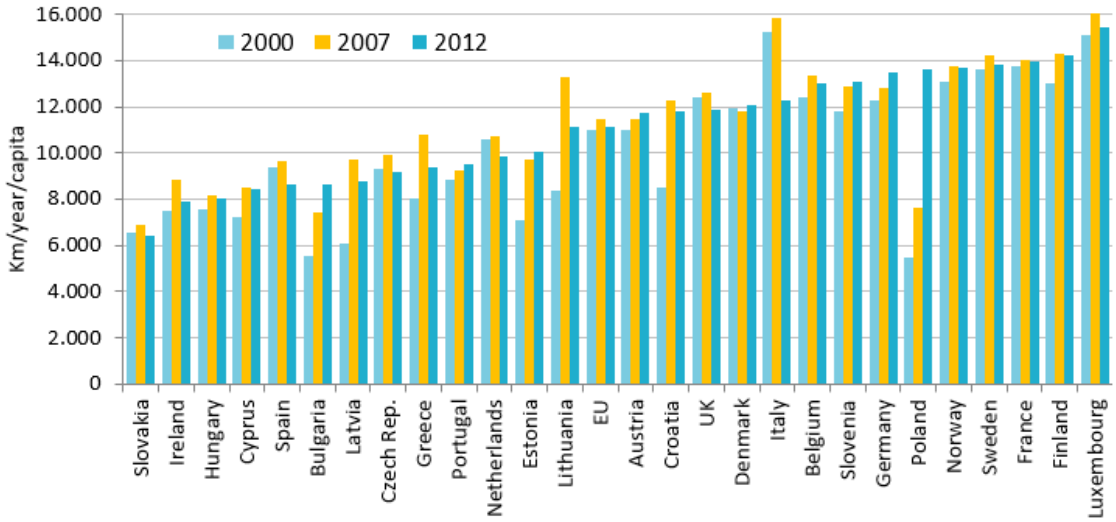
Passenger mobility[22], measured in km travelled per capita per year, has been decreasing at EU level and in 17 countries since 2008; it remained stable in 4 others. On average in the EU, personal mobility reached 11,200 km/capita in 2012, compared to 9,400 km in 1990 and 11,000 km in 2000 (Figure 2-8).

The level of mobility is very heterogeneous among EU countries because of differences in incomes, demographics, employment, car ownership levels, country size and density: from 6,500 km/year (for the three countries with the lowest mobility) to 14,000 km/year (average of three countries with the highest mobility).

In Italy, France, Spain or UK it seems that saturation in mobility was reached before the crisis as mobility has decreased or remained the same since 2000. Mobility has greatly increased until 2008 in most new member countries, as well as in Greece and Ireland, i.e. mostly in countries with the lowest mobility (+200 to 600 km/year).

[22] Passenger mobility is calculated by dividing the traffic in passenger-km by land transport and domestic air transport by the total population.

Figure 2-8: Mobility per capita (km/year per capita)



Source: ODYSSEE

2.3.2 Trends in freight traffic

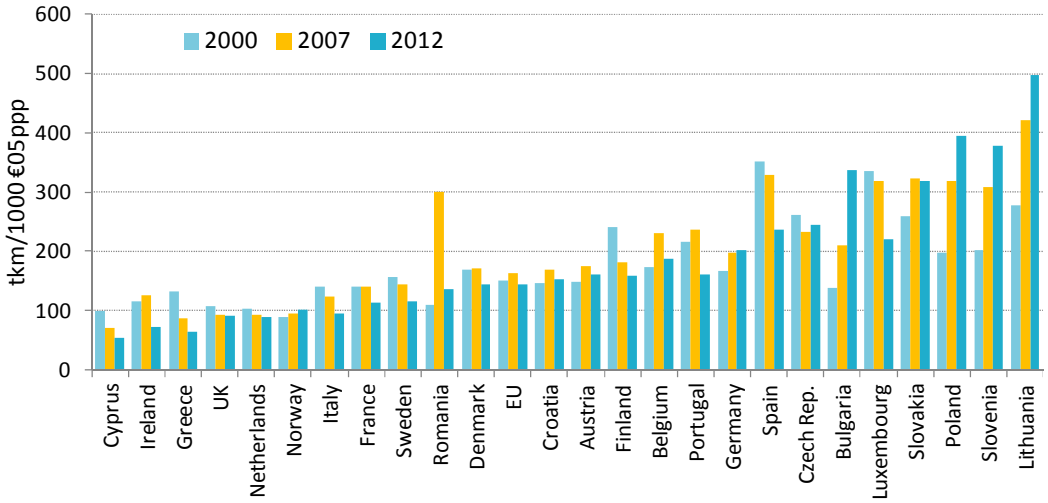
Significant impact of the economic crisis on freight traffic

Between 2000 and 2007, freight traffic, measured in tonne-km, had been growing faster than GDP (2.9% per year compared to 2.3% per year). This is probably due to increasing trade among EU countries, following the expansion of the internal market. From 2008, the economic crisis resulted in a remarkable drop in the traffic of goods which was in 2012 11% lower than in 2007 (Figure 2-9).

Three different patterns can be observed regarding the change in freight traffic per unit of GDP in EU countries:

- an increase in traffic intensity before the crisis and a reduction after the crisis in nine countries, with even a very sharp decrease after 2008 in three of them (Ireland, Romania and Portugal);
- a decrease in traffic intensity since 2000 in nine other countries; for some of them a much larger reduction was recorded since 2008 (Italy, Spain and Sweden);
- finally, an increasing trend, i.e. traffic growing faster than GDP, in seven countries.

Figure 2-9: Trends in freight traffic per unit of GDP



Source: ODYSSEE

2.3.3 Trends in car mobility

2.3.3.1 Trends in car ownership

Low progression since 2008

At EU level, the average rate of car ownership was around 465 cars per 1,000 inhabitants in 2012 (Figure 2-10). This ratio is almost at the same level as before the crisis at EU level.

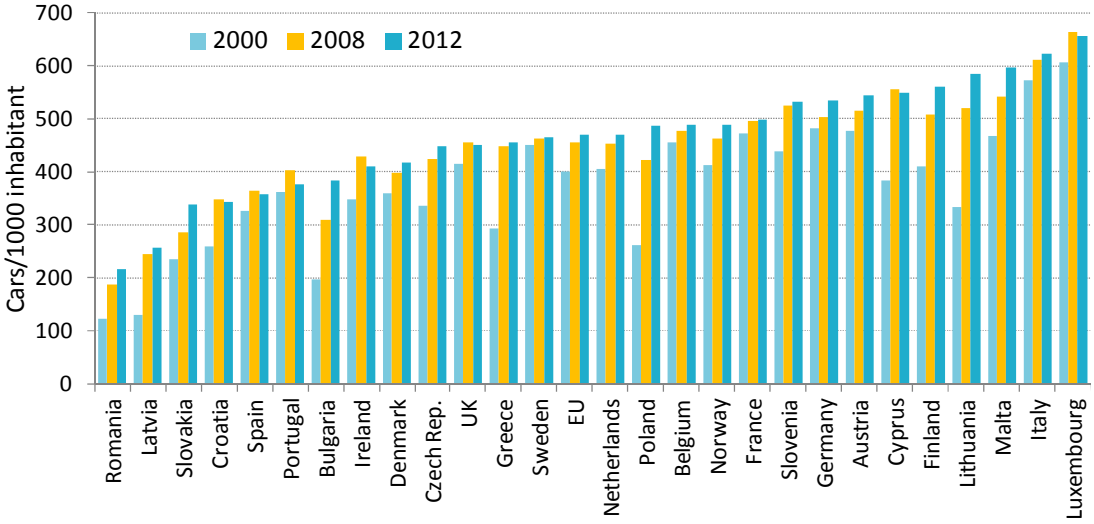
Car ownership varies significantly among countries: it is between 200 and 250 in Romania and Latvia[23], while it is close to or above 600 in Malta, Italy and Luxembourg.

Between 2000 and 2008, the trend in car ownership has been rapidly increasing in new member countries because of their lower car density, with a progression above 5% per year in four countries (Bulgaria, Latvia, Lithuania, Poland). On the other hand, there was a low progression since 2000 in some EU-15 countries due to saturation, especially in UK, Sweden, France and Belgium.

Since 2007, car ownership has even decreased in six countries (Croatia, Spain, Portugal, UK, Ireland and Luxembourg).

[23] Indicator for cars in use; in 2010, only 56% of registered cars were authorized to operate (56% in 2010).

Figure 2-10: Car ownership



Source: ODYSSEE

2.3.3.2 Trends in car use

General decrease in the annual distance travelled by cars since 2007

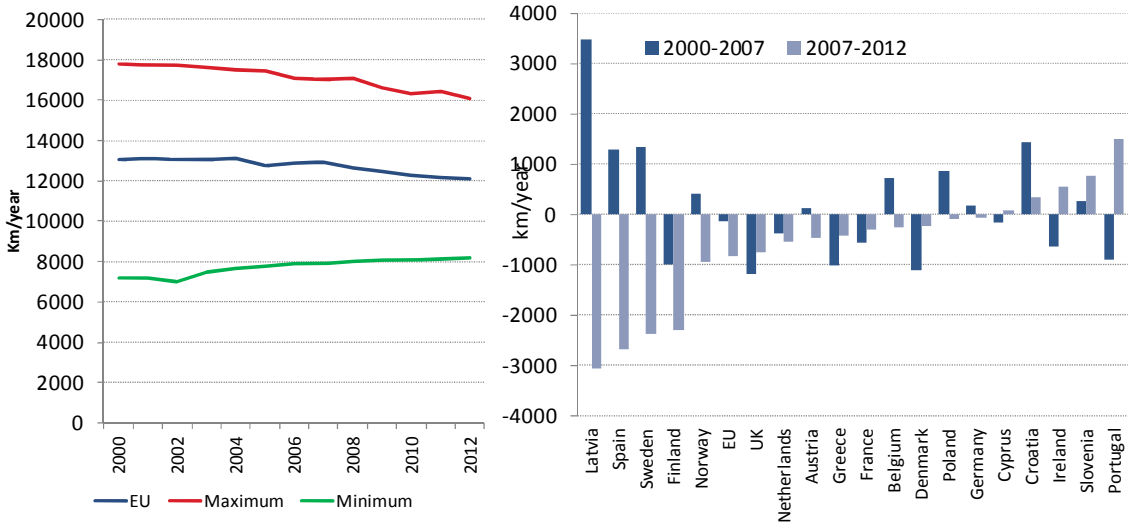
In most countries, the average annual distance travelled by cars has been decreasing since 2007. This trend occurred even earlier, around 1999/2000, in most of the EU-15 countries and in the EU as a whole (Figure 2-11). This trend is the result of three main drivers: the large increase in motor fuel prices since 2000, multiple car ownership in EU-15 countries[24] and, since 2007, the economic crisis. There was a reduction of about 800 km at EU level between 2007 and 2012. In Latvia, the decrease was quite significant (over 2,000 km), as well as (to a lesser extent) in Spain, Sweden and Norway (over 1,000 km). In most EU-15 countries and in the EU as a whole, this reduction has more than offset the increase at the beginning of the nineties, and, as a result the average distance travelled is now lower than in 1990 (by 9% at EU level and by more than 15% in UK, the Netherlands and Finland).

In most new Member States, except Latvia the Czech Republic and Croatia, an opposite trend can be observed, with a regular rise in the distance travelled, linked to disaffection for public transport, at least until 2007.

The annual distance travelled by cars varies greatly among countries, from a minimum of around 8,000 km to a maximum of 16,000 km. The EU average stands slightly above 12,000 km/year

[24] A long term trend towards lower mileage per car is second and third car ownership.

Figure 2-11: Trends in the average annual distance travelled by car



25

Source: Odyssee

2.3.4 *Modal shift for passenger transport:*

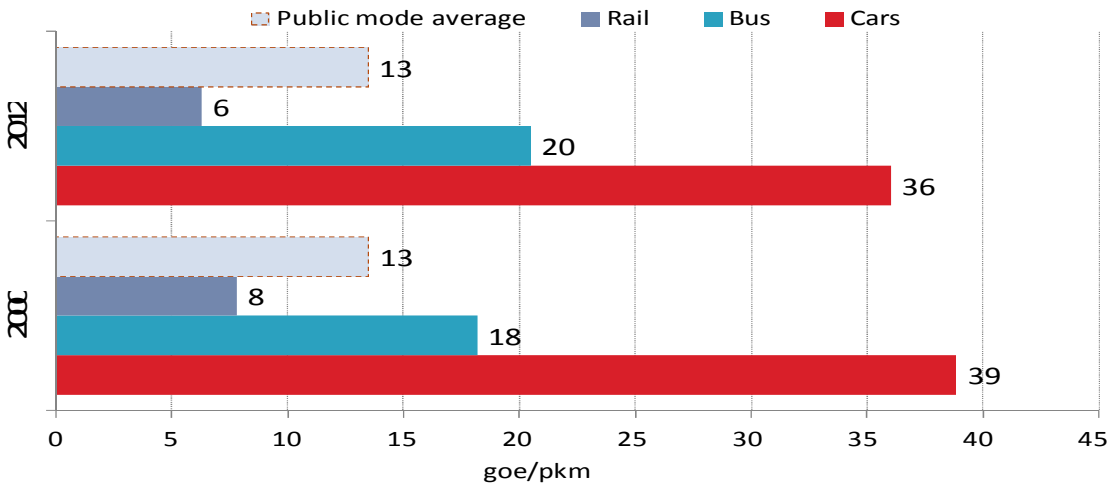
Energy efficiency improvements for passenger transport can come from more efficient vehicles, as well as from a shift of part of the traffic by car to public transport (rail, metro, buses) that are less energy intensive. Indeed, all countries are implementing national and local measures to change the present modal split that is dominated by cars.

Public transport is four times more energy efficient than cars

On average, cars require three times more energy for one passenger-km than public transport (rail transport and buses), and six times more energy than rail transport alone (trains, metros and tramways) (Figure 2-12). The specific consumption of domestic air transport is around twice the value of cars but almost the same if international flights are included.

[25] The maximum corresponds to the country with the highest car mileage and the minimum to the average of the three countries with the lowest value (the values for those three countries are very close).

Figure 2-12: Comparison of specific energy consumption for passenger transport

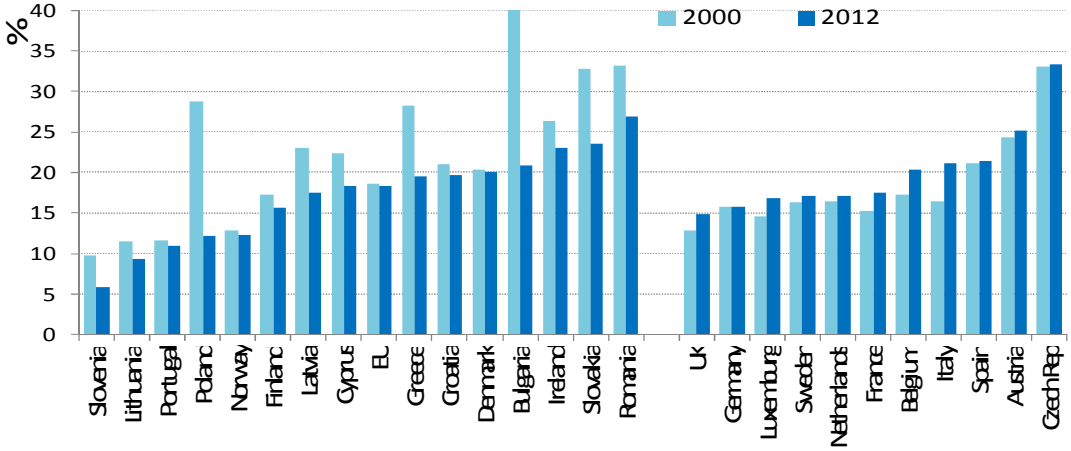


Source: ODYSSEE

Stable share of public transport at EU level

At EU level, the share of public transport in total passenger traffic in 2012 was the same as in 2000 (18.5%) (Figure 2-13). This stability is the result of opposite trends in Member States with a decrease in the majority of countries but an increase in 11 countries, among which the largest countries. Four countries have a share of public transport higher than 20%: Italy, Spain, Austria and the Czech Republic. The highest progression of the share of public transport is observed in Italy (+4 points), Belgium (+3) France, UK, Luxembourg (+2). The decline of public transport is the highest in new member countries (especially in Poland, Latvia, Slovakia and Bulgaria).

Figure 2-13: Share of public transport in total passenger traffic26



Source: ODYSSEE

[26] Traffic measured in passenger-km.

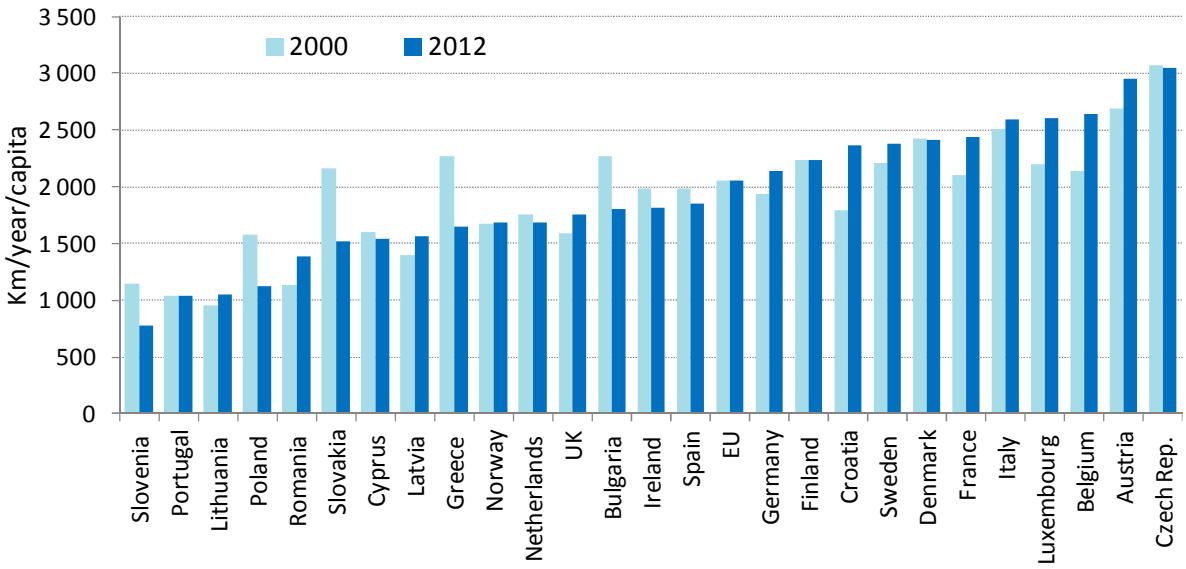
We expect that the declining role of public transport will slow down or reverse in other countries and at EU level in the future, as many governments and local authorities are developing or planning new public transport infrastructures. However, the impact of those is slow given the long lead time in that area.

Mobility by public transport is increasing

The share of public transport in total passenger traffic is one indicator of the impact of national, regional and local policies implemented to promote this type of transport (or the lack of such policies). The trend in mobility by public transport modes (i.e. annual distance travelled per year by public modes) can also be considered.

The Czech Republic and Austria have the highest use of public transport (around 3,000 km/year), compared to an EU average of around 2,000 km (Figure 2-14). Belgium and Croatia recorded the highest increase over the period 2000-2012 (over 30%).

Figure 2-14: Mobility by public transport in total passenger traffic[27]



Source: ODYSSEE

2.3.5 Modal shift for freight transport

Decreasing share of efficient modes

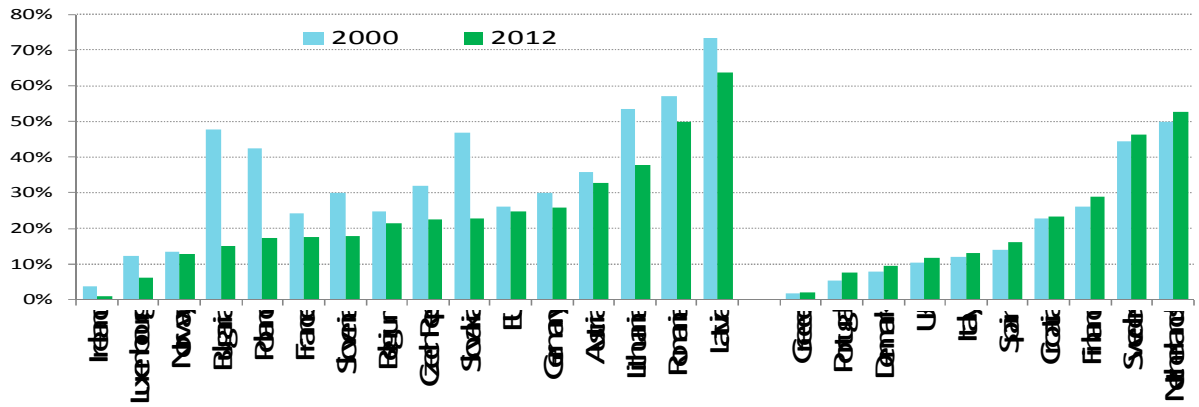
In most countries, the share of efficient transport modes (rail and water) is decreasing; in other words, the trend is moving in the opposite direction to the direction promoted by policy makers (Figure 2-15).

The greatest reduction can be seen in new member countries, especially in Poland, Slovakia and Bulgaria. The share of rail and water transport has slightly increased or remained stable in seven countries. The Netherlands and Sweden appear as the benchmark for all other countries as they are the countries with the highest share of rail and water transport (53% and 46% respectively) and among the countries where this share in progressing. In 2012, the share of rail and

[27] Calculated as the ratio of traffic by public mode of transport (rail, bus, metro and tramway) in passenger-km to the total population.

water varied greatly among countries, ranging from less than 10% for Greece and Ireland, to above 50% for Romania, the Netherlands and Latvia.

Figure 2-15: Share of rail and water in total freight traffic



Source: ODYSSEE

2.4 Energy efficiency trends

2.4.1 Cars

Acceleration of the reduction in the specific consumption of new cars since 2007

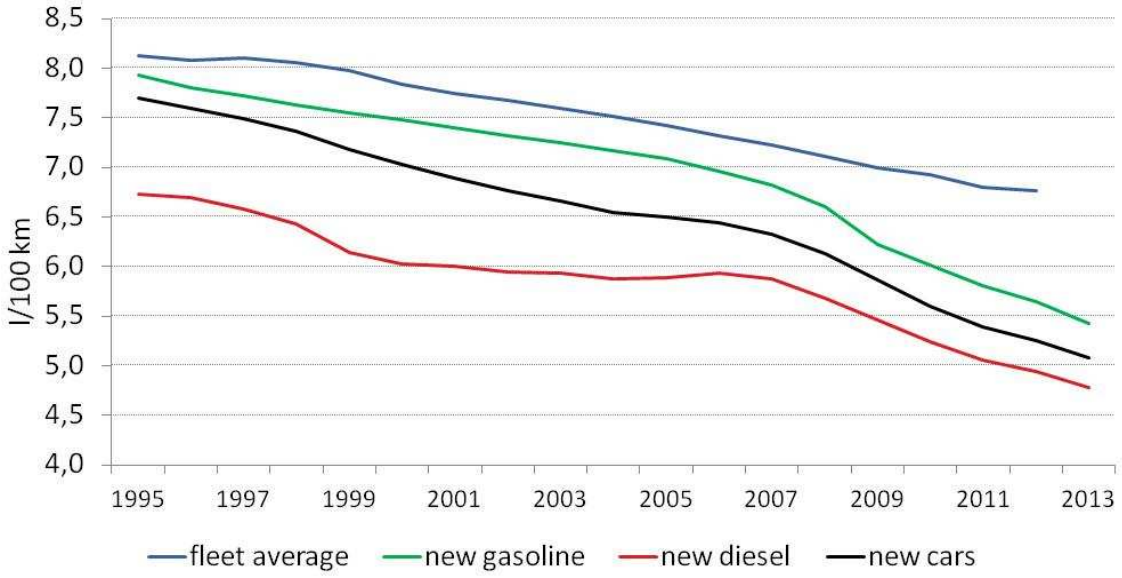
The fuel consumption of new cars has been decreasing since 1995: in 2013, it was 2.6 l/100km[28] less than in 1995 at EU level (reduction from 7.7 l/100 km to 5.1 l/100 km)[29] (Figure 2-16). From 2007, it has decreased significantly for all types of fuel (by 3.7% per year compared to 1.5% between 2000 and 2007), mainly because of EU regulations on labelling and emission standards and national fiscal policies promoting the purchase of low emission cars, and probably also because of higher fuel prices.

Since 2007, this acceleration was especially rapid in the Netherlands, Ireland, Sweden, Denmark, Finland and UK, where it was above 4% per year.

[28] Trends in energy units (MJ/km) and in specific fuel consumption in l/100km would be different given the switch from petrol to diesel in many countries.

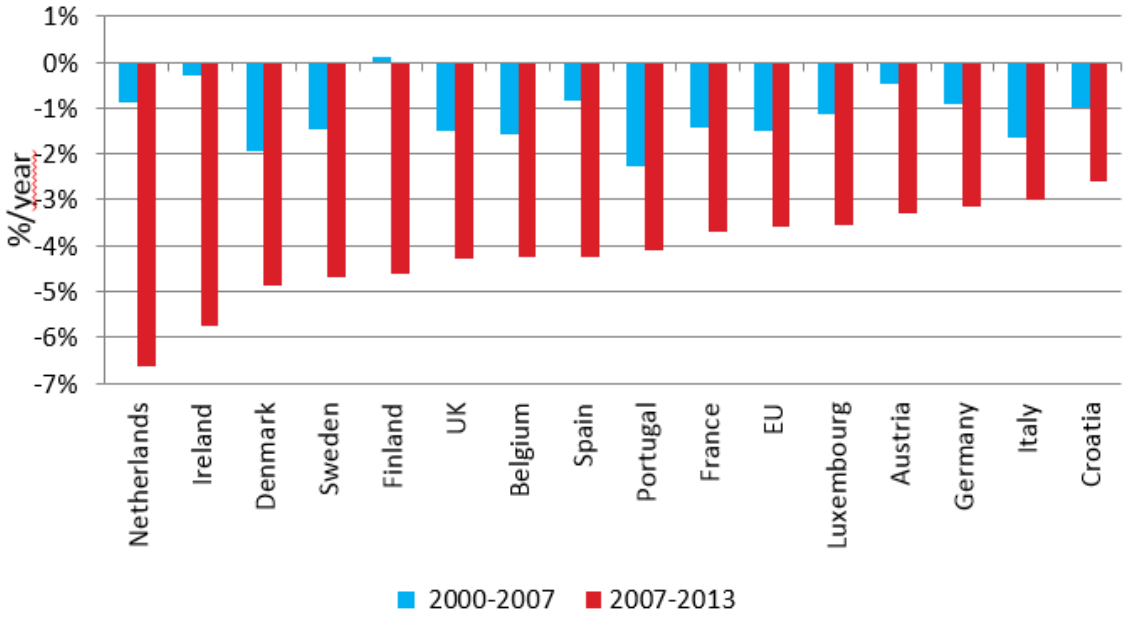
[29] From 7.9 l/100 km to 6 l/100 km for new gasoline cars and from 6.7 l/100 km to 5.2 l/100 km for new diesel cars

Figure 2-16: Specific consumption of new cars[30] and fleet average (EU)



Source: ODYSSEE[31]

Figure 2-17: Trends in the specific consumption of new cars in the EU



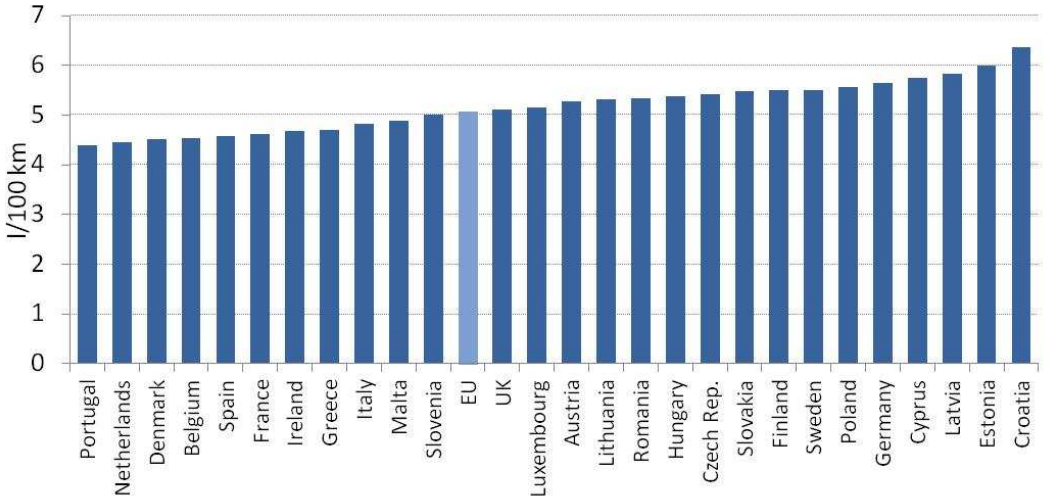
Source: estimation ODYSSEE

[30] Test values for new cars, measured through fuel consumption tests. Data come from the reporting by car manufacturers to the Commission. They are processed by EEA to get national averages. Since 2009 data are only available in gCO_2/km.

[31] Data on new cars come from the reporting by car manufacturers to the European Commission. They are processed by EEA to get national averages. Since 2009 data are only available in gCO_2/km.

The specific consumption of new cars differs among countries with a difference of 2 l/100km between the extreme values in 2013 compared to 2.4 l in 2000. There are now 11 countries below 5 l/100km with Portugal, the Netherlands and Denmark in the lower range (Figure 2-18). The high share of diesel cars, which have a lower specific consumption than gasoline cars for a given type of car, largely explains the good performances of these 11 countries, where diesel cars made up more than 70% of new registrations.

Figure 2-18 : Specific consumption of new cars in the EU (2013)



Source: Estimated by Enerdata based on data from EEA on g_{CO2}/km

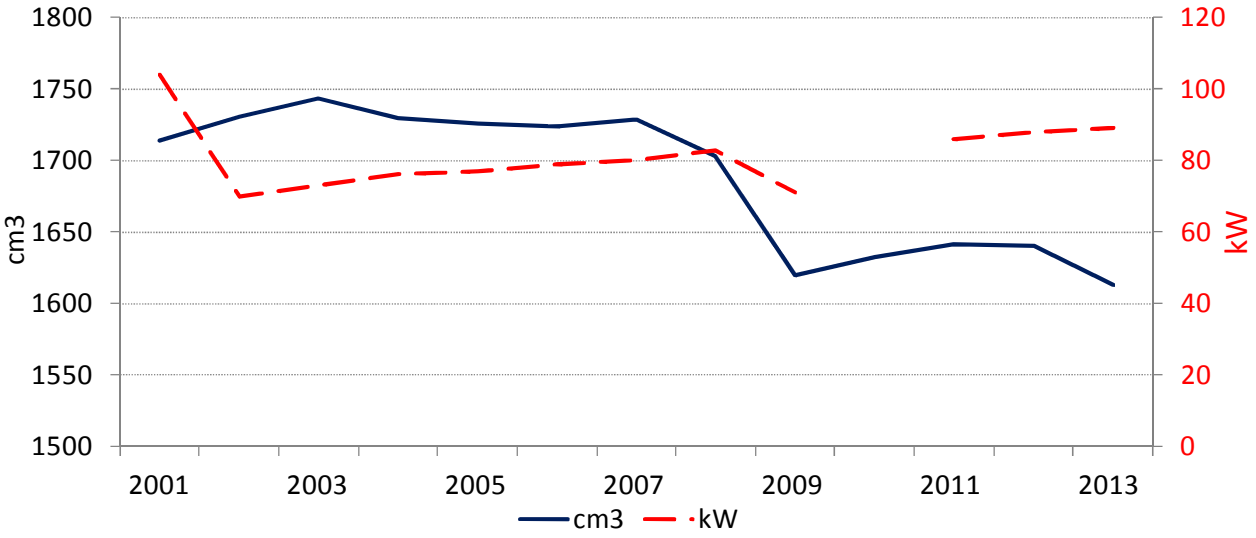
New cars have a smaller engine capacity

Trends in the specific consumption of new cars do not only reflect changes in energy efficiency from a technical point of view, but also changes in the structure of registrations by size or fuel type and in the engine characteristics. Manufacturers are producing more powerful cars: the average engine power of new cars has been generally increasing over the last 10 years, from 73 kW in 2003 to 89 kW in 2013[32]. This increase in engine power was accompanied by a trend towards smaller engine capacities (cm^3), which decreased from 1,714 cm^3 in 2001 to 1,613 cm^3 in 2013. According to EEA, there is a clear correlation between engine capacity and emissions: a decrease in engine capacity means a decrease in CO_2 specific emissions in g CO2 per km.

The average mass of new passenger cars registered in the EU-27 was in 2013 slightly above its 2004 value (1,393 kg compared to 1,347 kg in 2004): it has been increasing until 2007 and from 2011 to 2012. CO_2 specific emissions have therefore decreased significantly, although the average mass has not decreased as well (Figure 2-19).

[32] Steady increase in engine power between 2002 and 2008 and between 2011 and 2013; sharp decrease in 2009 with the economic crisis; no data for 2010.

Figure 2-19: Average horsepower of new cars in the EU[33]



Source: EEA and ACEA

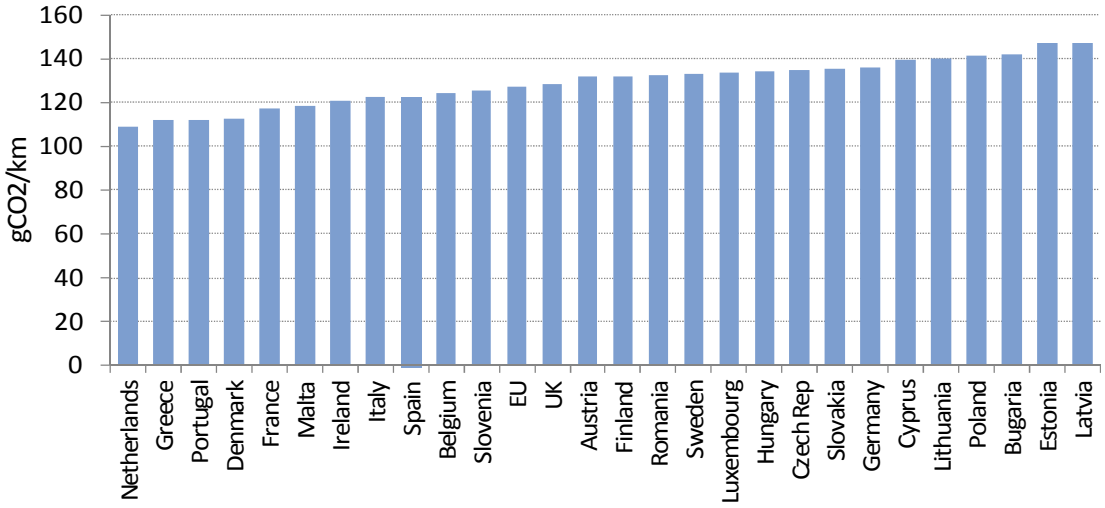
In 2013, six countries with emissions below 120 g CO_2/km for new cars

There exist significant differences among countries regarding the average specific CO_2 emissions of new cars, with a 30% gap between the two extreme groups of countries: around 110 gCO_2/km for the average of the three lowest and 145 g for the three highest in 2013 (Figure 2-20). In 2013, six countries had a specific emission below 120 gCO_2/km (the Netherlands, Greece, Portugal, Denmark, France and Malta); and in total, 12 countries were below the mandatory limit of 130g for 2015 for cars manufacturers.

For Malta, Denmark, Greece and the Netherlands, the low emissions are mainly related to the registration of relatively small cars: the average mass of new cars in these countries is below 1,300 kg. Denmark, Greece and Malta are the countries with the lowest engine capacity (cm^3). Denmark also has the lowest average engine power (kW), followed by Italy, France, the Netherlands and Portugal. The economic crisis is most probably the main driving force for the shift to smaller, less powerful, and hence cheaper cars in Greece and Malta. In Denmark and the Netherlands, however, this trend is most probably attributed to new vehicle taxation.

[33] ACEA member concerning the evolution of horsepower in kW.

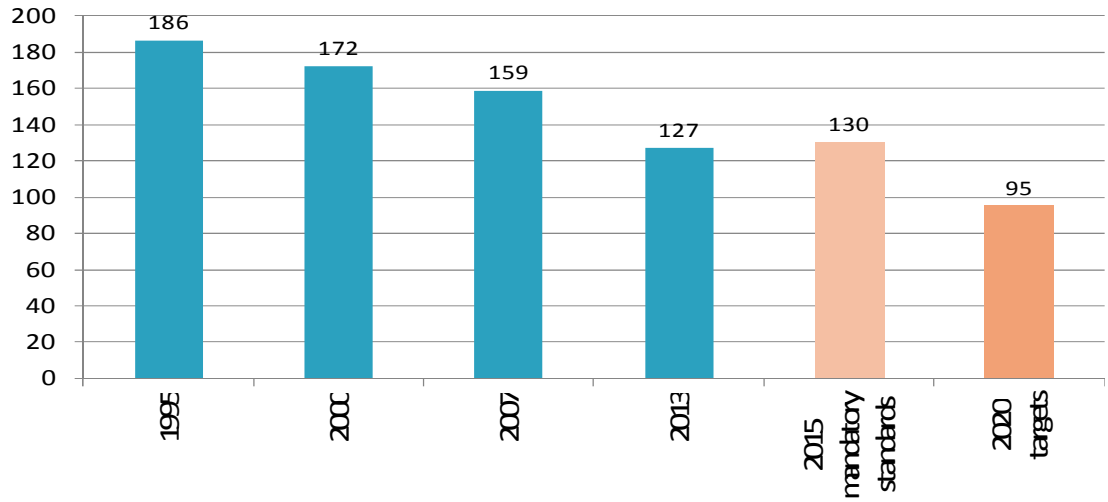
Figure 2-20: Average CO_2 emissions of new cars (2013)



Source: EEA

The average specific CO_2 emissions of new cars sold in the EU decreased from 186 g/km in 1995 to 127 g/km in 2013, which is below the mandatory target of 130 g in 2015; that corresponds to an average reduction of 2.1%/year or 31% (Figure 2-21). To reach the 2020 target, the CO_2 emissions of new cars have to decrease by 4%/year, i.e. at about the same rate as observed between 2007 and 2013.

Figure 2-21: Average CO_2 emissions of new cars: observed values vs target (EU)

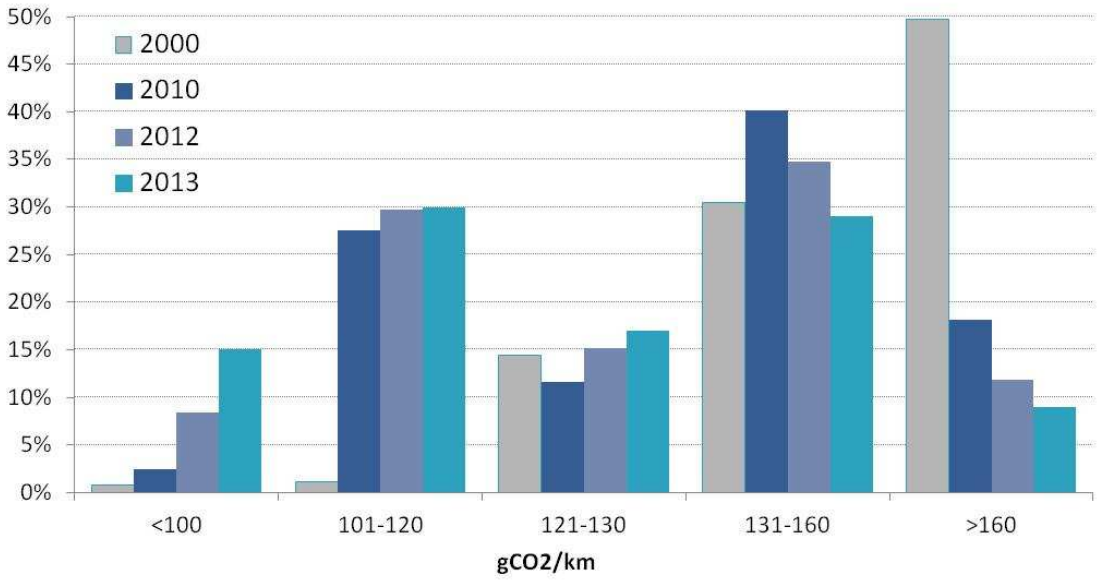


Source: EEA

Increasing penetration of low emission cars

The share of low emissions cars (i.e. below 100 gCO_2/km) increased from 2.5% in 2010 of newly registered cars at EU level to 15% in 2013. Almost half of new cars had emissions below 120 gCO_2/km in 2013 (Figure 2-22).

Figure 2-22: Market share of new low emission cars in the EU



Source: European Commission, EEA; more information in the market diffusion tool of ODYSSEE data base at http://www.indicators.odyssee-mure.eu/market-diffusion.html

Diverse trends in the decrease of the car fleet's specific consumption

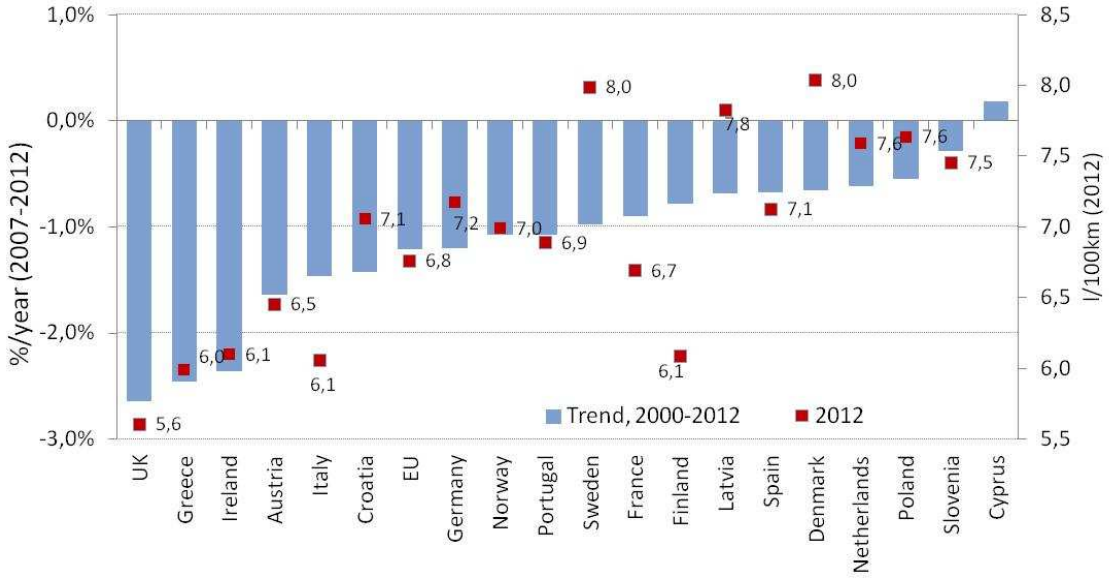
As over 80% of the cars on the road in 2012 have been produced after 2000 and 30% since 2007, the energy efficiency gains achieved in new cars had a direct impact on the average performance of the car fleet[34]. As a result, the average specific consumption of the car fleet decreased from 8.1 l/100 km in 1995 to 6.8 l/100 km in 2012 at EU level (Figure 2-16). The economic crisis since 2008 has slowed down the flow of new cars which represented just under 6% of the car fleet in 2012 compared to 8% in 2000.

The average specific consumption of the car fleet has decreased steadily in all EU countries; although to varying degrees with trends above 5%/year in the Netherlands, Greece and Ireland and an average reduction of 1%/year at EU level (Figure 2-23). This continuous improvement stems from the oldest and less efficient cars being replaced by new ones and the increasing share of diesel vehicles in the car fleet.

The average specific consumption of the car fleet ranged from a minimum around 6 l/100 km (UK, Italy, Greece, Ireland and Finland) to a maximum of 8 l/100 km (Sweden, Denmark) in 2012. The average car size, average horsepower and the share of diesel vehicles are the most important factors behind the differences observed (the high value seen in Sweden is explained by more powerful cars and a low share of diesel cars; the low value in Italy is due to less powerful cars and a high penetration of diesel). Some of the countries with the lowest specific consumption are also those with the fastest reduction in this specific consumption (for instance UK or Greece).

[34] A recent report of ICCT showed is a rapidly increasing discrepancy between the specific carbon emissions reported in the standard test procedure by manufacturers and real emissions, and thus consumption. However, according to ODYSSEE data for new cars and car stock, we do not see such a discrepancy http://www.theicct.org/sites/default/files/publications/ICCT_LaboratoryToRoad_2014_Report_English.pdf

Figure 2-23: Level and trend in the average specific consumption of cars



Source: ODYSSEE

2.4.2 *Energy efficiency trends for road freight transport*

The emphasis will be given here on road freight transport, which absorbs almost 80% of the total energy consumption of freight transport. Freight traffic by road is mainly carried out by heavy trucks, while light-duty vehicles have a limited contribution. For that reason, it would be more relevant to consider the category of trucks only. Unfortunately, certain countries that are significant in terms of traffic, like the UK and Germany, do not separate energy consumption according to these two categories. Therefore, this analysis will consider heavy trucks and light vehicles together.

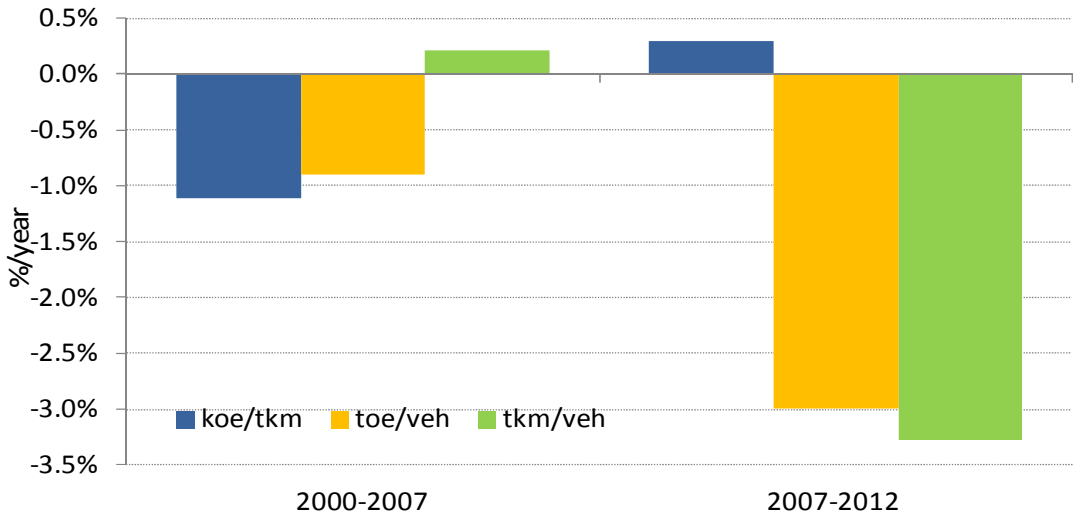
The energy efficiency of trucks and light vehicles can be assessed through an indicator of energy consumption per tonne-km. This indicator helps to demonstrate the fact that although a shift towards heavier trucks increases the average specific consumption (l/100 km), it certainly decreases the consumption per tonne-km. In other words, trucks and light vehicles may consume more fuel per 100 km, but at the same time road freight transport may actually become more efficient. Consequently, in the case of road freight transport, energy efficiency acquires two different meanings depending on whether the focus is on the efficiency of vehicles (l/100 km) or the energy efficiency of the transport services (toe/tonne-km).

Lower efficiency of road freight transport since 2007

Until 2007, the energy consumption per tonne-km has been decreasing, which means that the efficiency of road transport of freight has been improving regularly (by 1.1%/year) (Figure 2-24). Between 2000 and 2007, energy efficiency improvements were driven both by an increase in the efficiency of vehicles (measured by the ratio toe/km) and by a more efficient management of freight transport (as shown by the increase in the ratio tonne-km/vehicle). The later trend is the result of higher load factors and a shift to larger trucks, driven by a rapid growth in the volume of traffic (nearly 5%/year in tonne-km). However, with the economic crisis since 2008, the energy consumption per tonne-km has

been increasing (+0.3%/year). Even though the efficiency of vehicles (in terms of l/100 km) did not change or the vehicles were even consuming less (-3%/year), the fall down in traffic (by 2.5%/year over 2007-2012) led to a less efficient operation of the vehicle fleet, as shown by the sharp decrease in load factors: i.e. trucks were less loaded and empty running increased.

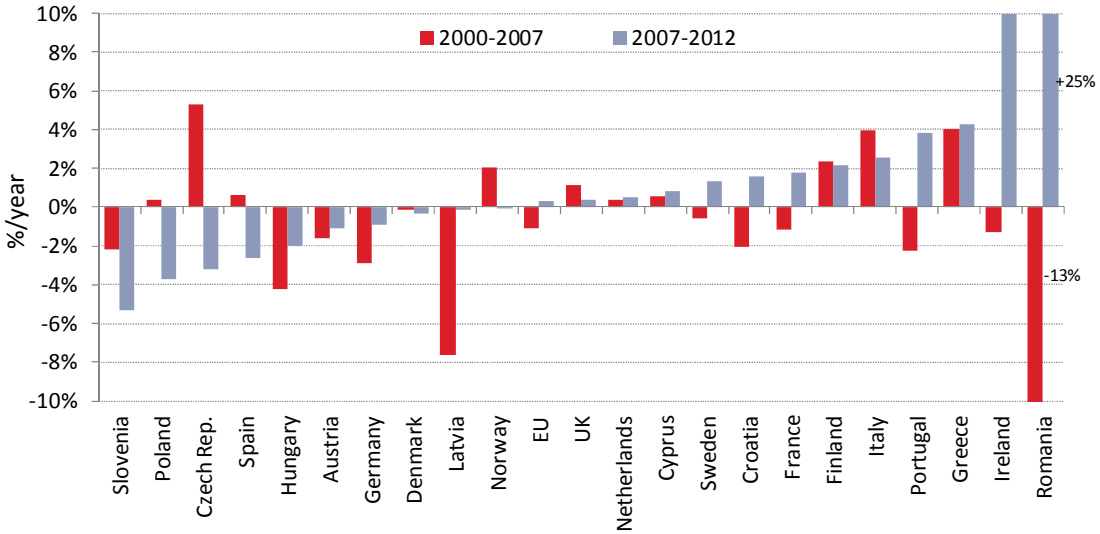
Figure 2-24: Change in the unit consumption of road freight transport (EU)



Source: ODYSSEE

In two thirds of EU countries, the average energy consumption per tonne-km has increased since 2007, implying deterioration in the energy efficiency of road transport of goods (Figure 2-25).

Figure 2-25: Change in the unit consumption of road freight transport



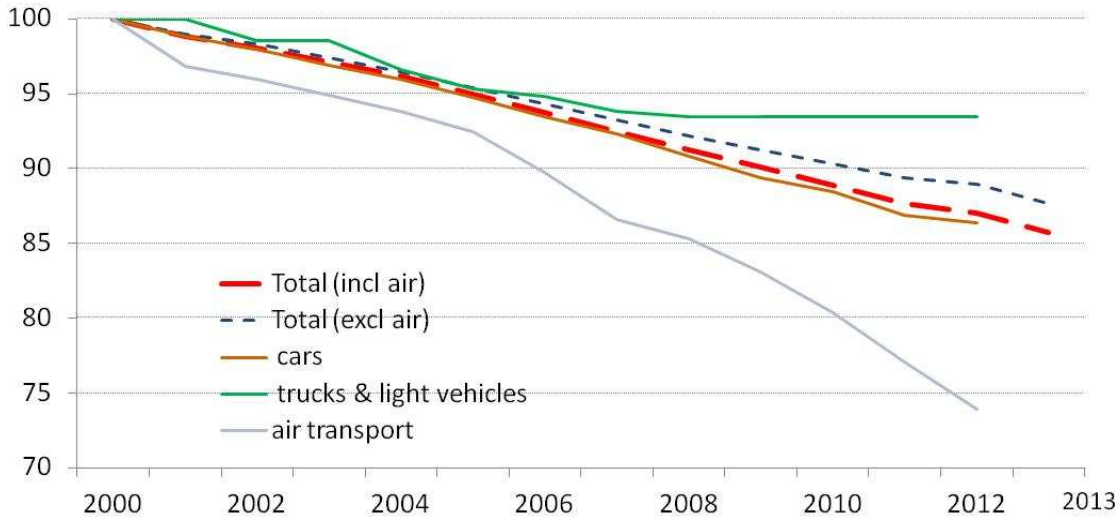
Source: ODYSSEE

2.4.3 Overall energy efficiency trends

Regular improvement of 1.2%/year in the energy efficiency of transport in the EU

The energy efficiency of transport in the EU improved by 1.2%/year between 2000 and 2013, as measured according to the ODEX indicator (Box 1). Greater progress was achieved in the energy efficiency of both cars and airplanes than in the rest of the sector (Figure 2-26). Energy efficiency progress slowed down for trucks and light vehicles since 2005, with no more efficiency progress since 2007 because of the economic crisis, as explained above.

Figure 2-26: Energy efficiency progress in transport in the EU[35]



Box 2.1: Evaluation of energy efficiency trends with ODEX

The evaluation of overall energy efficiency trends in the transport sector in ODYSSEE is based on the ODEX indicator. ODEX aggregates the energy efficiency progress at the level of each transport mode into a single indicator. The energy efficiency progress by mode is captured by a specific consumption measured in:

- litres/100 km for cars, buses and motorcycles;
- goe (gram oil equivalent) per tkm for freight transport (trucks, rail and navigation);
- toe/passenger for air transport;
- goe/passenger-km for passenger rail

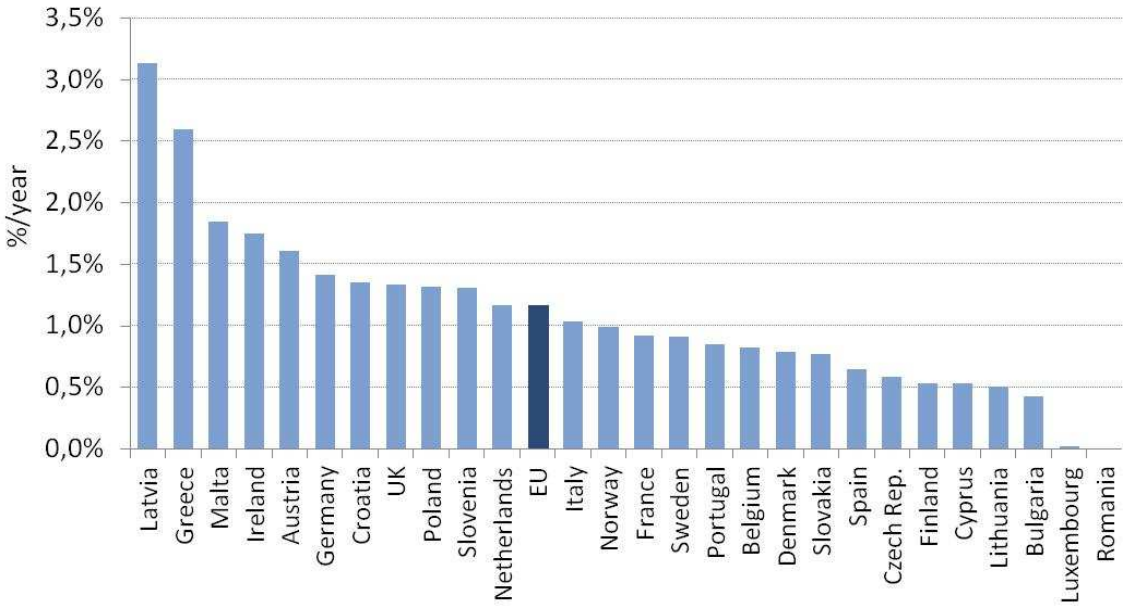
The overall trend is an average of the trend by mode weighted according to the share of each mode in the energy consumption of the transport sector.

Source: ODYSSEE

[35] Only the trends of the main modes are shown in the graph. ODEX is calculated as a three-years moving average.

In 12 EU countries, the rate of energy efficiency progress was above 1%/year.

Figure 2-27: Energy efficiency progress in transport in EU countries[36]



Source: ODYSSEE

[36] Countries with an increase in the ODEX indicator are shown as having no energy efficiency progress: for these countries, negative savings for trucks, due to non-technical factors, have more than offset energy savings for cars.

3 Identification of Noteworthy Cases

3.1 Modal shift for passengers and goods

3.1.1 Introduction

Modal shift could potentially provide a notable contribution to the transition towards a more energy-efficient transport. Moving to alternative modes of transport does not itself contribute to energy efficiency in the road transport sector but is an important measure to achieve the 60% GHG emission reduction target by 2050 set in the 2011 White Paper.

Nonetheless, it is not easy to achieve permanent and effective results with this type of measures. They actually involve substantial infrastructural investments and a change in the traveller's habits and behaviour. For freight transport, moreover, there are structural and logistic constraints that limit the possibilities to move goods by collective modes below a certain threshold of the journeys length (generally 400-500 km).

Despite this inherent complexity, MS are seriously committed to change the current transport paradigm that still shows a dominant presence of the private transport compared to the collective one. Actually, as already outlined, about 20% of the measures recorded in the transport sector in the MURE database regard modal shift (both passengers and freight). Of these measures, 53% relate to passengers, 27% to freight and 19% address both categories.

This effort has not yet produced, at EU level and in the majority of the MS, a tangible impact because of the effects of the economic crisis. There are nonetheless a few countries in which the traffic trends show a slow, but steady, change in the current transport paradigm. It is probably too early to state that these changes will permanently transform this paradigm but these signals show that an effective modal shift is achievable.

The following paragraphs discuss this argument more in depth by briefly analysing the contents and aims of the measures issued in this field and then classifying the countries in accordance to their policies and the corresponding impact on the traffic trends.

3.1.2 Overview on the modal shift measures

All in all, 102 modal shift measures were issued by the MS, including those already completed and those still ongoing.

Figure 3-1 Figure 3-1 shows how these measures are distributed in accordance with their issuing period (from the 1990's to 2014). The legislative activity on the promotion of modal shift has steadily increased during the observed period with a peak in the last five years, reflecting the increased interest of MS for this type of measure (see also Figure 1 1).

Figure 3 2 shows how these measures are distributed by country and by measure type. Spain and Estonia, followed by Hungary and France have the highest number of measures (some of these countries are analysed in more detail in the following pages).

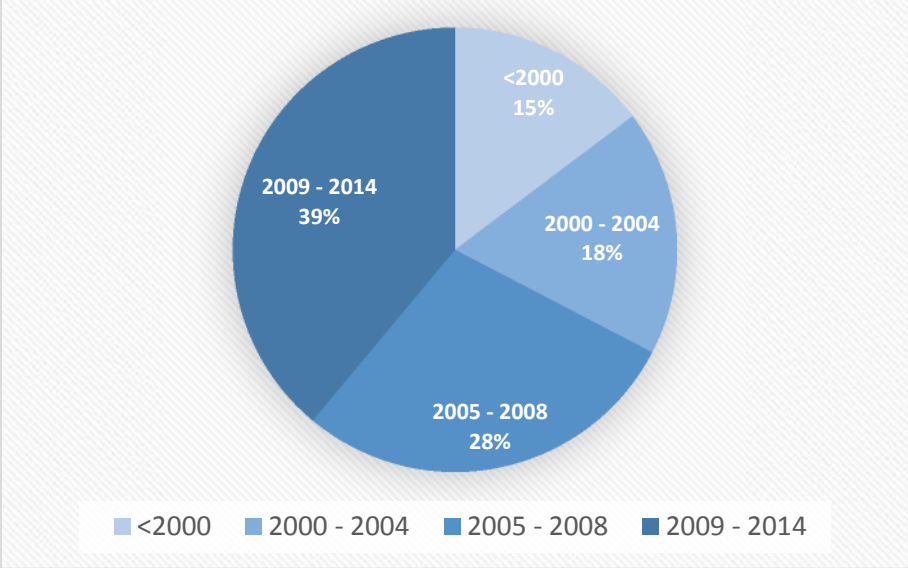
Sixteen countries have implemented an average of three to five measures each; two countries, Cyprus and Slovenia have two measures; and four countries have only one measure. Two countries, Denmark and Luxembourg, have finally issued no measure of this type.

The measures considered in the MURE database for modal shift are classified in three main categories:

- Fiscal
- Informative
- Infrastructural

Only one measure of those represented in Figure 3-2 is not included in the above categories, but pertains to traffic management and into the organizational category that, in general, does not affect the modal shift[37].

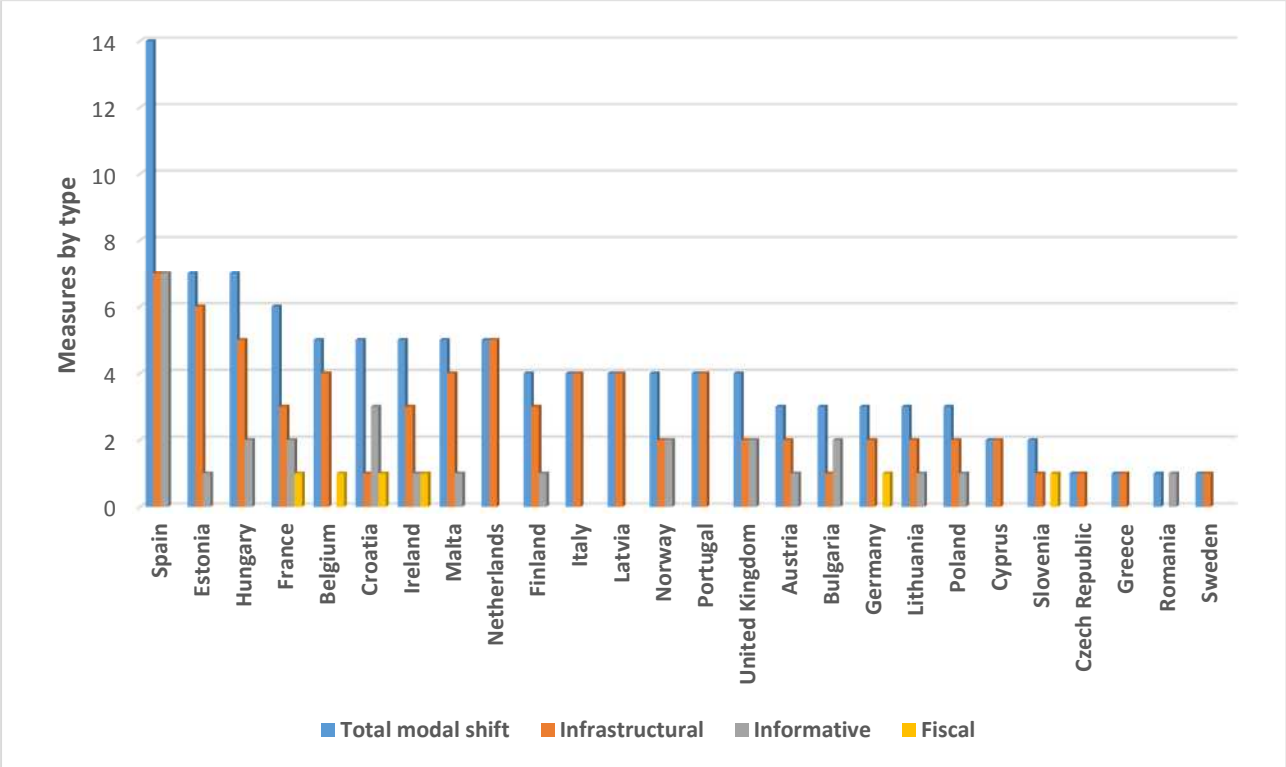
Figure 3-1: Modal Shift measures at EU level by issuing periods



Source: MURE database

[37] It deals with a French measure (Mobility plans for companies) aiming at rationalize the home work journeys of companies' employees by moving them from cars to collective modes. Out of all the measures classified in this category, this is the only one affecting the modal shift.

Figure 3-2 Number of modal shift measures by type and countries



Source: MURE database

Fiscal measures are definitely underrepresented with only six examples. These measures tend to promote modal shift through, e.g., tax deduction for the purchase of seasonal tickets for public transport or other financial incentives favouring collective modes or cycling. Nonetheless it seems that MS do not trust on this type of instruments that probably should be managed more at local level then at the national one (actually it may happen that the benefit goes to the local transport companies while the burden is borne by the central state).

The informative measures are much more frequent (28 measures) and represent about one third of the total measures on modal shift. These measures are notably diverse, but all of them aim at advising users of private modes to give priority to collective modes or even to definitely reduce their use of motorized vehicles. The wide majority of these measures are addressed to passenger transport but some are addressed to freight transport[38]. Finally, the measures classified as "infrastructural" represent the absolute majority of this type of interventions. There are 72 such measures in MURE which represent 68% of the total. In MURE, infrastructural measures are in turn divided in several sub-classes:

- Improvement of intermodality/ interconnection of transport modes;
- Modal shift toward goods transport by rail or water;

[38] A good example of such a measure is represented by the Polish measure: Traffic management system and transport of goods optimization.

- Modal shift toward public passenger transport.

Many of these 72 measures concern two or even all of these three sub-types. Due to this overlapping, the distribution of these measures among the three sub-types provide a final figure greater than the number of measures, as shown in Table 3-1. What it is worth noting from the observation of the figures provided by this table, is that the number of infrastructural measures specifically addressed to passenger modal shift are twice higher than those addressed to goods transport.

Table 3-1: Distribution of infrastructure measures by type

Improve-ment of inter-modality	Modal shift toward public goods transport	Modal shift toward public passenger transport	Total infra-structure measure types
43	21	42	106

In addition, analysing the measures addressed to the improvement of the intermodal infrastructures, the result is that they generally concern both goods and passenger modes with a slight prevalence of passenger ones. From this simple analysis based on the measures type distribution, it appears that, all in all, the efforts of MS legislators are mainly addressed to fostering of the collective passenger modes rather than to the goods ones[39]. This observation is supported by the traffic trend data provided in chapter 2 and by the case studies analysis carried out in the following paragraphs of this chapter. In all cases it is evident that collective passenger modes have progressed much more than the goods ones.

To finalize this short review on the modal shift measures, it is worth mentioning that, out of the 102 measures, 32, issued by 15 countries, have been included in the NEEAP3. These 32 measures represent 21% of all the transport measures selected to contribute to the energy efficiency goals of the MS (see paragraph 1.2.6.3), underlying again the important role that modal shift may have in achieving such goals.

Table 3-2Table 3-2 shows the complete list of these 32 measures and their distribution among the modal shift measures type. Again it is worth noting the prevalence of the infrastructure measures.

Table 3-2: The modal shift measures inserted in the NEEAP 3 release

Country	*Measure code and title*	*Fiscal*	*Information/Education*	*Infrastructure*
Austria	AU35 Transport measures of the Climate and Energy Fund	x	x	
	AU37 Mobility management consulting and funding programmes – "klimaaktiv mobil"	x	x	
Belgium	BEL12 Brussels – Measures in the transport sector			x
	BEL19 Campaign for car-free commuting in the city since 2002			x

[39] It is worth remembering that MURE mainly collects national measure; so, from this list, the majority of regional and local interventions to improve local passenger transport are missing.

Country	*Measure code and title*		*Fiscal*	*Information/Education*	*Infrastructure*
	BEL4	Development of Intelligent Transportation Systems			x
	BEL8	Ecodriving – driver training and licensing	x		
Bulgaria	BG1	Eco-driving training for drivers of road vehicles			x
	BG9	EU Structural Funds 2007-2013: Comprehensive development of ecological public transport		x	
Croatia	CR18	Eco-driving training for drivers of road vehicles			x
	CR19	Intermodal freight transport			x
	CR26	Promotion of sustainable urban transport systems			
Cyprus	CY17	Mobility management		x	x
Finland	FIN25	Municipal programmes for public transport optimization			x
	FIN26	National Strategy for the development / upgrading of public transport			x
	FIN30	Program for improvement of energy efficiency in the Transport sector		x	x
France	FRA1	Development of infrastructure for combined transport : road/rail, road/river, short sea shipping			x
	FRA29	Sea motorways			x
	FRA31	Employer responsibility for half of the cost of public transport season tickets		x	
	FRA41	Information and awareness-raising measures		x	
	FRA42	Multimodal information for passengers		x	
Greece	GRE3	Promoting public transport			x
Ireland	IRL25	Promoting sustainable freight transport	x		
Lithuania	LT10	Promoting walking and cycling		x	
	LT13	Promotion and competitiveness of public transport			x
	LT7	Promotion of e-working or tele-working			x
Malta	MAL3	Promotion of sustainable urban transport systems			x
Poland	PL13	Restructuring of the CP (national railways) offer			x
Portugal	POR24	Special Programme for Climate Change: Energy efficiency improvement in the transport sector			x
Slovenia	SLO3	Wallonia – Financial incentives or funding devoted to transport	x	x	x
	SLO4	Wallonia – Saving measures for transport in the public sector			x

Country	Measure code and title	Fiscal	Information/Education	Infrastructure
Spain	SPA54 Efficient Driving Programme in the Driving Licence of new drivers		x	
	SPA55 Aid programmes for modal and means of transport shift		x	x

Source: MURE database

3.1.3 Member States behaviour with respect to modal shift measures and trends

This section describes the results elaborated on the basis of a deep and combined analysis of the ODYSSEE and MURE databases concerning measures and indicators on modal shift, for both passenger and freight[40].

1) Countries in which there is a **traffic transfer from the private/individual modes to the collective ones** and that have implemented **measures on modal shift**[41];
2) Countries in which **there is no such traffic transfer** but which have implemented **measures on modal shift;**
3) Countries with **neither a traffic transfer nor measures implemented;**
4) Countries **with a traffic transfer** but **without any modal shift policy.**

The reference period for this analysis is 2000-2012; but for some countries (indicated with "*" or "**") it is 2000-2011 or 2000-2010 according to the data availability.

3.1.3.1 Passengers traffic

For what concerns passengers traffic, countries in which a modal shift is detectable from the Odyssee indicators (categories 1 and 4) can be further divided into two subcategories:

a) Those that show an increase of collective traffic with parallel decrease of private transport;
b) Those that show an increase of collective traffic with parallel lower increase of private transport.

The following conclusions can be drawn from the graphs and the table below:

- 16 countries pertain to category 1: they have actually implemented measures on modal shift and show a transfer from private traffic to the collective one (rail and road). For two of these (Italy and the Netherlands), there is in addition a decreasing trend of private transport, while, for the remaining 15 countries, the modal shift has simply (or, even, apparently) contributed to mitigate the pace of increment of the private traffic.
  We use here the word "contribution" because in the traffic trend analysis of the last 5-6 years it is not possible to decompose the effect of the economic crisis from those provided by the modal shift and other regulatory policies[42].

- Nine countries have implemented modal shift measures but the corresponding

[40] In this analysis we only consider the modal shift related to the motorized surface modes: the measures related to airborne traffic and to cycling and walking are not included.

[41] Trends in modal shift are based on ODYSSEE indicators and are shown in Chapter 3.

[42] Because of the crisis, people may have chosen collective modes, even at the expense of the journey time and quality, because they are simply less expensive than cars.

traffic indicators do not show any traffic transfer. This could be due to several reasons:

- Most measures have only a local dimension without any relevant impact at national level (in addition the local measures identified in MURE cannot be verified with ODYSSEE national indicators);
- Measures are simply not successful.

- Three countries (Slovakia, Luxembourg and Denmark) have not implemented any modal shift measure (according to the MURE records). Of these countries, Slovakia does not have any apparent traffic transfer while Luxembourg and Denmark show a slight modal shift from private to collective modes.

Table 3-3: Countries per category and subcategory_Passengers

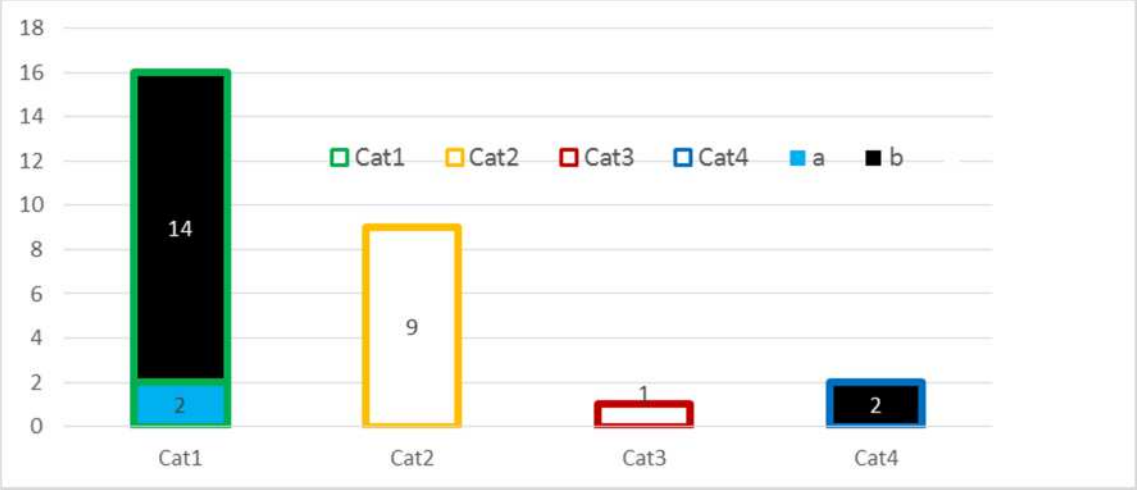
Category	Subcategory	*Countries*	Measures in MURE	Modal shift	
				Increase of public	Decrease of private
1	a	Italy	YES	YES	YES
1	a	Netherlands	YES	YES	YES
1	b	Austria	YES	YES	NO
1	b	Belgium*	YES	YES	NO
1	b	Croatia	YES	YES	NO
1	b	Cyprus	YES	YES	NO
1	b	Czech Republic	YES	YES	NO
1	b	Finland	YES	YES	NO
1	b	France	YES	YES	NO
1	b	Germany	YES	YES	NO
1	b	Ireland	YES	YES	NO
1	b	Portugal	YES	YES	NO
1	b	Romania*	YES	YES	NO
1	b	Spain	YES	YES	NO
1	b	Sweden	YES	YES	NO
1	b	UK	YES	YES	NO
2		Bulgaria	YES	NO	NO
2		Estonia	YES	NO	NO
2		Greece	YES	NO	NO
2		Hungary	YES	NO	NO
2		Latvia	YES	NO	NO
2		Lithuania	YES	NO	NO
2		Malta	YES	NO	NO
2		Poland	YES	NO	NO
2		Slovenia	YES	NO	NO

Category	Subcategory	*Countries*	Measures in MURE	Modal shift	
				Increase of public	Decrease of private
3		Slovakia	NO	NO	NO
4	b	Denmark	NO	YES	NO
4	b	Luxembourg	NO	YES	NO

*2011

Source: MURE and ODYSSEE

Figure 3-3: Number of countries per category and subcategory "passengers"



Source: MURE and ODYSSEE

To further analyse the possible impact of the measures on the traffic trends, we have selected six representative cases from the countries classified in category 1.

Table3-4 provides a synthesis of the main data on the variation of the private and collective passenger traffic during the years 2000-2012 and shows the measures concerning modal shift issued during these years. In addition, Figure 3-4 shows, for the same time period, the modal shift trends of these countries, expressed as percentage of the collective traffic with respect the total one. These trends can be, in turn, classified in three different patterns according to their shape. Three countries show a steady increase toward a continuous traffic shift from the private to the collective one. Two countries show a change on the curve slope, initially decreasing passenger-km of the collective traffic but reverting this trend thereinafter. One country shows a very irregular trend with uneven and sudden variations.

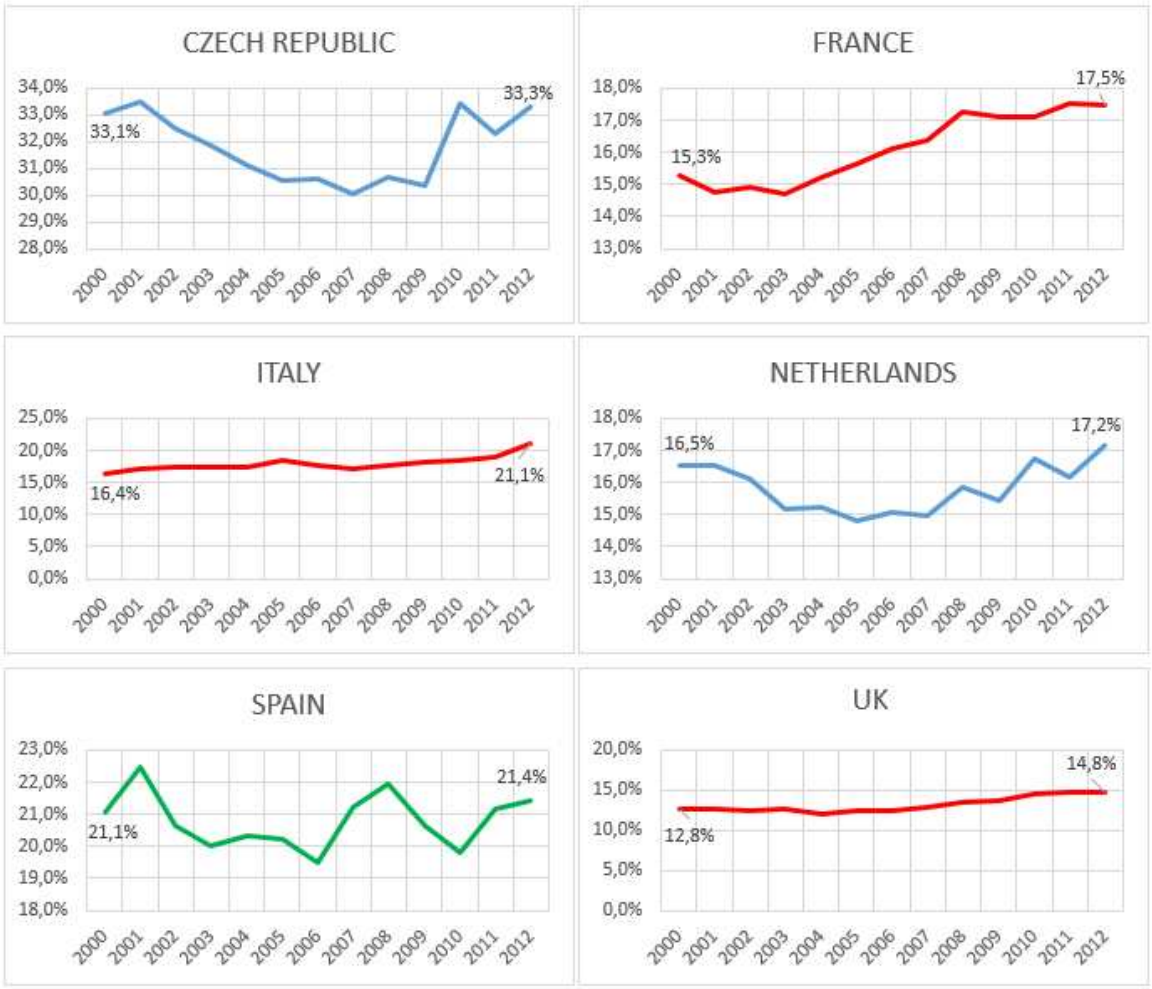
These modal shift patterns are analysed country by country also taking into consideration general traffic trends and measures issued by these MS.

Table 3-4: Indicators and measures for some selected countries – Passengers

Country	Category	Indicators				Possible linked measures (MURE) [Qualitative Impacts: High, Medium, Low, Unknow]
Italy	1a	Modes	Variation of passenger-kilometres (2000-2012)		Net increase of collective traffic (2000-2012)	• *"Urban Mobility Plans (PUM)" (ITA26)* • *Sustainable Mobility in Urban Areas and Mobility Management responsibilities, procedures and funds (ITA8)*
			%	Gpkm	%	
		Cars	-20,4%	-147,86		
		Public Road	9,9%	9,26	+4,7%	
		Rail	5,6%	2,75		
		Total	-15,6%	-135,86		
Netherlands	1a	Modes	Variation of passenger-kilometres (2000-2012)		Net increase of collective traffic (2000-2012)	• "Increase in fuel tax/excise tax" (NLD13) • "Parking as a means of managing and restraining mobility" (NLD20) • "Traffic performance on location" (NLD7) • "Urban remodelling schemes" (NLD23)
			%	Gpkm	%	
		Cars	-3,3%	-4,67		
		Public Road	-13,4%	-1,48	+0,6%	
		Rail	10,9%	1,83		
		Total	-2,6%	-4,32		
Czech Republic	1b	Modes	Variation of passenger-kilometres (2000-2012)		Net increase of collective traffic (2000-2012)	• "Measures of support to combined transport" (CZ9)
			%	Gpkm	%	
		Cars	0,7%	0,42		
		Public Road	-5,2%	-0,84	+0,2%	
		Rail	9,1%	1,40		
		Total	1,0%	0,97		
France	1b	Modes	Variation of passenger-kilometres (2000-2012)		Net increase of collective traffic (2000-2012)	• "Mandatory urban transport plan" (FRA4) • "Mobility plans for companies" (FRA5) • "Grants for combined rail/road transport equipment" (FRA11) • "Employer responsibility for half of the cost of public transport season tickets"(FRA31) • "Information and awareness-raising measures" (FRA 42) • "Multimodal information for passengers" (FRA43)
			%	Gpkm	%	
		Cars	6,4%	43,8		
		Public Road	20,1%	8,6	+2,2%	
		Rail	27,6%	22,3		
		Total	9,2%	74,8		
Spain	1b	Modes	Variation of passenger-kilometres (2000-2012)		Net increase of collective traffic (2000-2012)	• "Urban Mobility Plans" (SPA14) • "Transport Plans in Enterprises and Activity centres" (SPA15) • "Greater Share of Collective transport used in Road transport"(SPA16) • "Increased Use of Rail transport" (SPA17) • "Management of road transport fleet" (SPA20) • Action Plan 2011-2020: Sustainable Urban Mobility Plans (SPA30) • "Transport Plans in firms and activity centres" (SPA31) • "Larger participation of collective means in road transport" (SPA32) • "Larger participation of railways in passenger and goods transport" (SPA33) • "Strategic Infrastructures and Transport Plan (PEIT) 2005" (SPA50) • " Aid programmes for modal and means of transport shift (SPA55)
			%	Gpkm	%	
		Cars	6,7%	20,1		
		Public Road	7,2%	4,0	+0,3%	
		Rail	12,6%	3,2		
		Total	7,2%	27,3		
UK	1b	Modes	Variation of passenger-kilometres (2000-2012)		Net increase of collective traffic (2000-2012)	• "Energy Saving Trust – Transport Initiatives (UK2) • "Smarter choices" (UK17) • "Transport Innovation Fund" (UK20)
			%	Gpkm	%	
		Cars	0,6%	4,1		
		Public Road	-9,9%	-4,6	+2,1%	
		Rail	49,2%	23,1		
		Total	3,1%	22,5		

Source: Elaboration of data from ODYSSEE and MURE databases

Figure 3-4: Share of collective passenger traffic on total passenger traffic



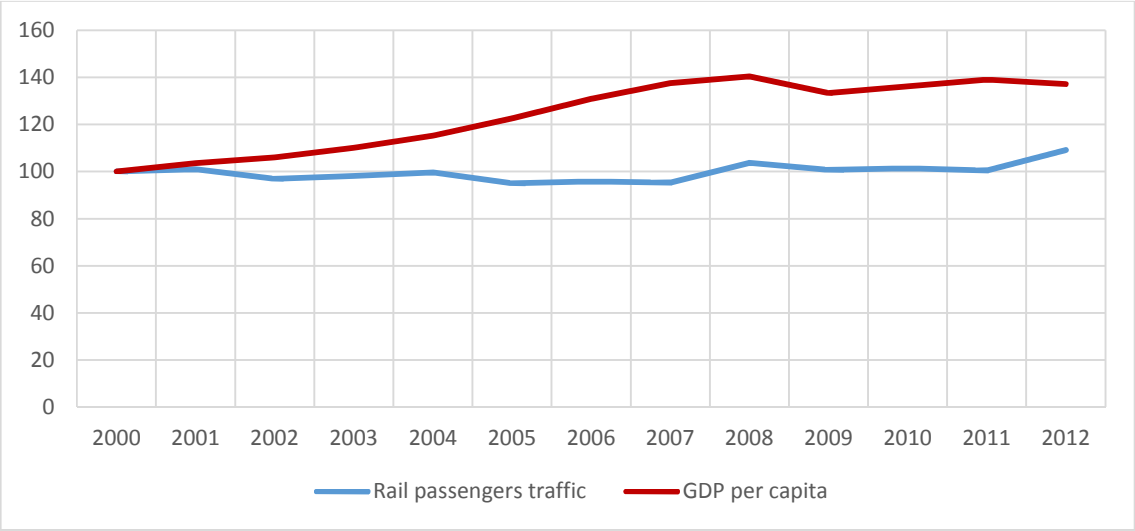
Source: Our elaboration of ODYSSEE data

Czech Republic

In 2001, a measure aiming at supporting the construction and modernization of new and old transship points, vehicle fleets, and services was issued. The sudden inversion of the slope in the year 2007 – 2008 shown in Figure 3-4 is mainly due to rail transport (Figure 3-5 below) whose trend is very similar to that shown in Figure 3-4.

The sharp increase of the rail traffic from the year 2007 onward is hardly justified by this measure only, but it is possible that the funds allocated in 2001 started to have an effect some years after. Also the economic crisis could have contributed to this increase of rail traffic. Actually the Czech Republic's GDP (Figure 3-5) had a slowdown from the year 2008 without recovering significantly in subsequent years.

Figure 3-5: Rail passengers' traffic and GDP per capita (index 100 for the base year), Czech Republic



Source: ODYSSEE

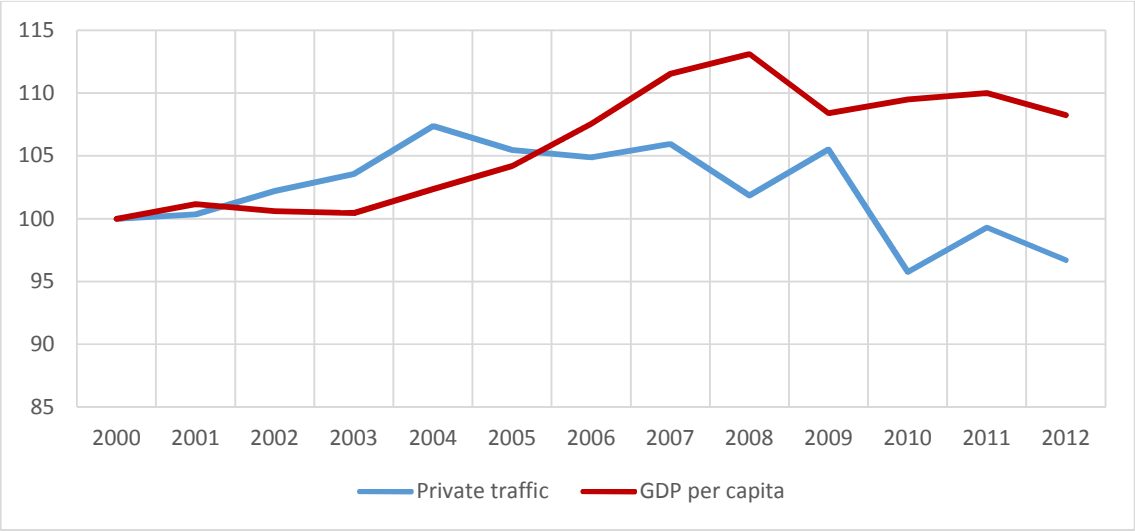
The Netherlands

The Dutch measures on modal shift mainly concern urban traffic and were issued and updated between 2001 and 2005. These measures might have contributed to the observed decreasing extent of private transport (Figure 3-6) which started in 2004, but do not totally justify the sharp decrease which is visible from 2007. The economic crisis may have had an effect (Figure 3-6), but the measures had surely contributed to these trends. Actually, measures on the restriction of parking spaces were implemented since 1995, and, in the period 2000-2005, higher fees for parking in urban areas were introduced in order to discourage the use of private cars and influence citizens' behaviour.

Furthermore, in 2001, the Dutch government adopted a coarse-mesh structure for the road network in order to discourage the use of cars for short journeys. This measure consisted in dividing urban and residential areas into sectors, which can only be reached by car from an external ring route ("ring and loop system"). In this way, internal routes are kept open for bicycles, public transport and delivery vehicles, giving to these modes of transport a clear benefit.

This approach has been used successfully in some pilot cities. The other municipalities have therefore been invited to develop suitable projects with the central government funding availability for the most promising experiments.

Figure 3-6: Private traffic and GDP per capita (index 100 for the base year); the Netherlands



Source: ODYSSEE

France

During the last twenty years, many measures have been issued addressing the modal shift for passengers.

In December 1996, it was made mandatory for all cities with more than 100,000 inhabitants to draft urban travel plans before December 2000. These urban travel plans had to focus in particular on car traffic reduction, on the development of less expensive and less polluting transportation modes, on the development and exploitation of street networks, as well as on the organisation of parking, transportation and freight delivery, etc. Furthermore, 50% of the infrastructure to be developed had to be devoted to soft modes of transport (bicycles, public transport).

Since 2000, subsidies for the development of mobility plans (studies and operation) were provided to private and public companies, which intend to emphasize collective transport to their employees.

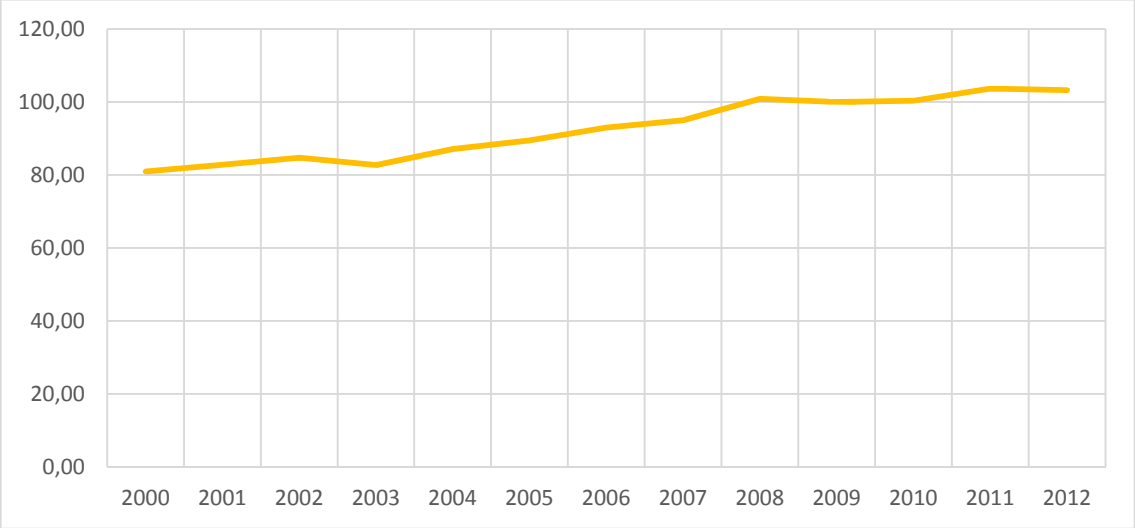
By the following years (2003), financial grants were provided by ADEME (up to 50% and to a maximum of 75,000 €) for the realisation of feasibility studies, concerning commercial actions (market research), organisational aspects (research of partners to develop a transport chain), financial aspects (investments) and for acquiring specific equipment for supporting combined transport (providing up to 20-25% of the investment).

Other actions aimed at stimulating collective modes of transport were implemented in more recent years. Since 1 January 2009, businesses have been made responsible for half of the cost of their employees' public transport season tickets and, afterwards, in 2011 the French agency of multimodal information and ticketing (AFIMB) was created, with the aim to organize the development of information on the territory, to promote interoperability in the field of multimodal information and ticketing; to encourage the development of information services for passengers taking into account all modes of transport and to connect multimodal information networks with voluntary local authorities.

The steady transfer from private to public transport observed in Figure 3-4 above is very likely the result of this strong commitment of the French government in improving and increasing the use of collective transport modes, especially in urban areas.

Two other measures are believed to have contributed to the increase of collective transport: the strong investments to develop the high speed train network and the transfer of the management and development of regional and suburban rail transport to the regional administrations (see Figure 3-7). However, these types of measures are not included in the MURE database.

Figure 3-7: Rail traffic, France



Source: ODYSSEE

Italy

In Italy, two measures, both addressed to the urban context, should, more or less directly, also promote the modal shift. These measures concern the development of the Urban Mobility Plans (UMP) and of the Sustainable Urban Mobility Plans (SUMP).

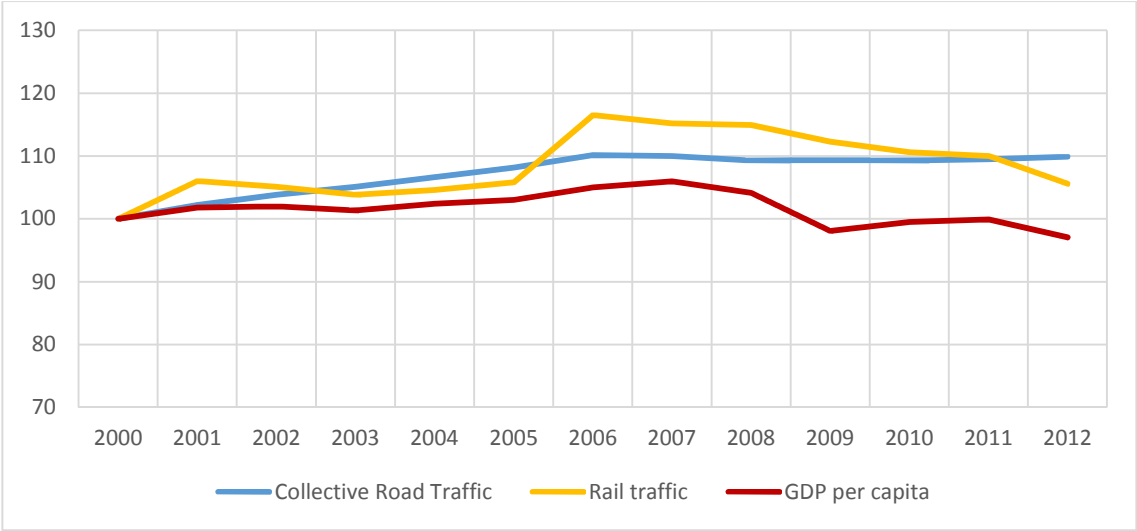
From 2000, municipalities with more than 100,000 inhabitants are requested, on a voluntary basis, to draw up Urban Mobility Plan,s whose objective is to promote sustainable mobility. The Urban Mobility Plans, coordinated with the Urban traffic Plans, take into account the whole structure of transport within urban areas (i.e. infrastructure, parking areas, public fleets, logistics, freight infrastructure, etc.).

In 2007, the Sustainable Mobility Fund was established, which allocates a budget expenditure of € 270 million devoted to the protection of air quality in urban areas and public transport improvement for a three-year period (2007-2009). In particular, the fund aims at improving the efficiency of public vehicles, increasing intermodality, introducing financial packages for sustainable mobility, developing mobility management and car sharing, creating secure school/home paths, creating control centres for the logistic organization of goods transport and delivery as well as promoting the introduction of vehicles with low environmental impact and improving bicycle paths. These measures are believed to have contributed to the steady increment of the share of public transport shown in Figure 3-4, especially during the period 2000 – 2007. After this year, the trend is impacted by the harsh economic crisis that Italy is still suffering (see GDP trend in Figure 3-8) which resulted in an overall drop in the passenger traffic : - 16% in 2012 with respect to 2000 and - 21% with respect to 2007. This loss of traffic is due to the combination of a

strong decrease of the private traffic (respectively - 20% and - 25%) a minor decrease of the rail traffic (- 8% from 2007) and an increase of the road public traffic, which mainly occurred during the years 2000 to 2007 (+ 10% from 2000 to 2012). Actually, observing the trends of the private road and rail traffic and comparing them to the modal shift trend of Figure 3-4, it is possible to divide the modal shift causes into two different periods:

- Before the economic crisis, i.e. until 2007, when the modal shift might have been caused by the local mobility policies and by investments made in the rail network (even if the high speed system has been notably improved only during the last four to five years);
- After the beginning of the economic crisis, up to the year 2012, when the modal shift is mainly explained by economic factors.

Figure 3-8: Passengers traffic and GDP per capita (index 100 for the base year), Italy



Source: ODYSSEE

It is worth noting that the decrease of rail traffic is accompanied by a sharp increase in passenger traffic (+ 26% from 2002 up to 2011) and a stronger reduction in kilometres travelled per passenger (- 32%, from 93 to 70 km/passenger during the same period)[43]. This increment of transported passengers is mainly due to the commuting journeys where the extent of the train network in terms of train-km is practically unaltered during the years 2007 to 2012 while the demand has been notably increased (i.e. the pkm travelled per train). In practice, people prefer to use the train instead of the car for commuting for economic reasons, despite the very scarce quality of the regional railway service.

Spain

Within the Action Plans 2005-2007 and 2011-2020, many measures on transport were issued in Spain. Each Transport Action Plan includes 15 measures divided into three categories: modal transfer to more efficient transport modes, efficient use of means of transport and improvement of the energy efficiency in vehicles. Ten of these measures

[43] Source: Conto Nazionale delle Infrastrutture e dei Trasporti 2012, Ministry of Transport

belong to the first group and involve both passengers and freight traffic.

Among these measures, a strong effort was dedicated to the improvement of passenger mobility. In particular, similar to other European countries, municipalities with more than 50,000 inhabitants have to develop an Urban Mobility Plan which should include actions aimed at achieving a more energy efficient mobility as well as improving citizens' standards of living.

Reducing the rate of commuting journeys in private cars is one of the priorities. To this regard, an organizational action, endowed with an infrastructure funding was issued with the aim of promoting the creation of new fleets, (i.e. enterprises buses or shuttle buses), new infrastructures (metro and train stations) and also new parking policies which make the use of private cars less attractive.

For what concerns interurban transport, there are many measures aimed at achieving a greater involvement of railways, supported by the Ministry of Development. These actions include a better planning process of the railway infrastructure in order to make services more flexible, the establishment of a national real-time train schedule information system, and the development of agreements with railway operators to design competitive services and to value the need of new infrastructures and the renewal of fleets.

Despite this strong policy effort for the promotion of a stable modal shift trend, no impact on the traffic trends is observed (Figure 3-4). The modal shift trend is uneven and does not reveal any clear change of the traffic patterns.

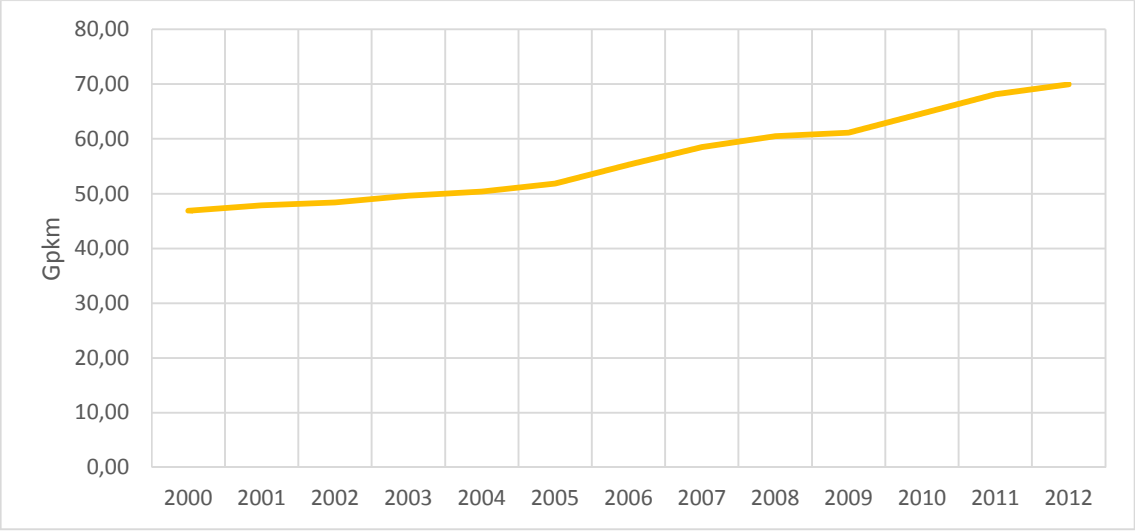
In May 2015, a new measure has been introduced under the national energy efficiency fund (EED, article 20): "Aid programmes for modal and means of transport shift". This aid program seeks to promote the realization of sustainable transport plans to the workplace with a view to achieving significant changes in the modal split, with greater involvement of the most efficient modes. Moreover, keep advancing with the improvements in fleet management - both in terms of loads and routes – carrying out audits, implementing information systems and training in fleet management. Finally, it was deemed appropriate to continue with encouraging continuous training in efficient driving techniques for professional drivers. This line of support was conceived to be further expanded in the following years until 2020.

UK

The most relevant measure in the UK is the Transport Innovation Fund. The measure concerns a remarkable investment plan addressed to improve collective transport services and reducing road congestion. Nonetheless, the measure alone does not justify the steady increase of collective transport that started before the issuing of the measure itself[44] (but the measure might have reinforced and stabilized it). As in the French case, the steady increment of the railway traffic trend (Figure 3-9) should have been caused by infrastructural investments for the development of the railways system.

[44] The measure was issued in 2008

Figure 3-9: Rail traffic in UK



Source: ODYSSEE

Other measures may have partially contributed to this increase in collective transport. For example, in 1992, the government set up the Energy Saving Trust (EST) with the purpose to help British people to achieve the CO_2 reduction targets. Since this date, EST's Transport division worked on behalf of the UK Government to improve energy efficiency and air quality in the transport sector. In 2012, Government's funding for EST ceased and it became a social enterprise (Scotland and Wales still receive funding).

EST played a vital role in improving energy efficiency of the transport sector through the promotion of cleaner, lower carbon vehicles and alternative fuels; advice on eco-friendly (smarter) driving techniques; advice on transport alternatives like cycling, walking and car sharing and information about avoiding unnecessary flights. EST works with hundreds of organisations in the public and private sectors providing telephone and web-based advice through a network of advice centres.

The Energy Saving Trust's transport advice objective is to create a cultural change in organisations and embed best practice in fleet management, as part of long term continuous improvement work with the aim to influence organisations in three key areas:

- The purchase of low carbon vehicles;
- Changing driver behaviour to reduce fuel consumption; and
- Encouraging reduced vehicle usage

3.1.3.2 Goods traffic

For what concerns freight traffic and with reference to the categories outlined in paragraph 3.1.3 above, again countries in which there was a transfer for the transport of goods from road to rail and to inland waterways respectively (categories 1 and 4) can be further divided into two subcategories:

a) Increase of "non road" modes of freight traffic (rail and inland waterways) and parallel decrease of road transport.
b) Increase of "non road" modes of freight traffic and parallel lower increase of road transport.

As can be seen from the table below, not all data are available for all countries. Actually some countries do not report the inland waterways traffic due its marginality with respect the overall non road traffic. In these

cases, only rail traffic was considered for modal shift. The following conclusions can be drawn from the graphs and the table 4-3 below:

- 11 countries have implemented measures on modal shift and show a transfer from road to non-road modes (railways and inland waterways). For two countries out of these 11, road freight transport has significantly decreased. For the remaining countries, there has been a increase of traffic in all goods transport modes but with some visible transfer from road traffic to rail and water.
- Eight countries have implemented measures on a modal shift of freight transport, however the corresponding traffic transfer is not evident from the analysis of the traffic trends.
- Nine countries did not issue measures on modal shift. Despite this fact, in three of those there was a shift between modes. In particular, road goods traffic for Denmark and Sweden has decreased in favour of non-road freight transport.

Table 3-5: Countries per category and sub-category for goods

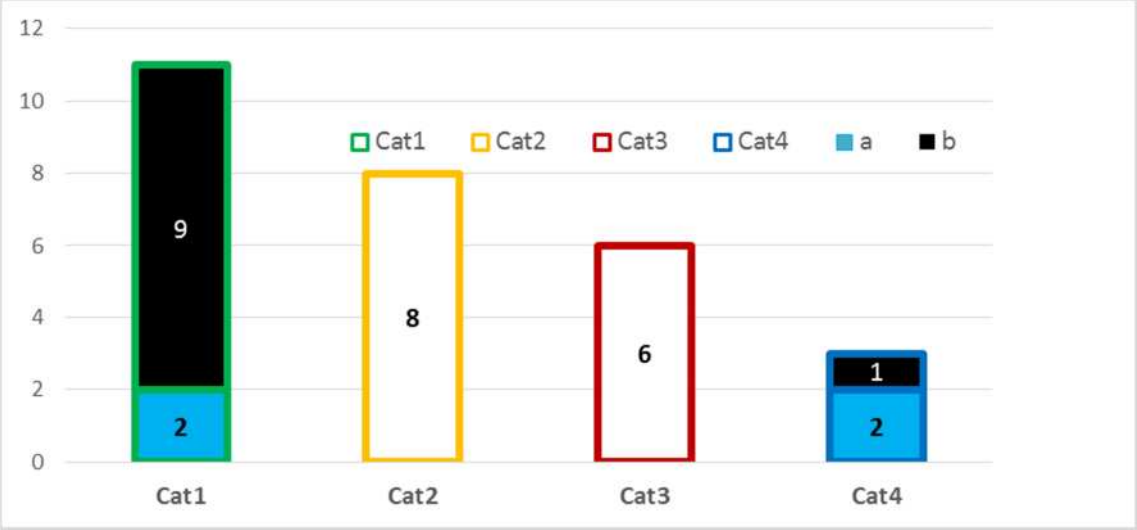
Category	Subcategory	*Countries*	Measures in MURE	Modal shift	
				Increase of non-road modes	Decrease of road
1	a	Netherlands	YES	YES	YES
1	a	Portugal	YES	YES(1)	YES
1	b	Austria	YES	YES	NO
1	b	Belgium*	YES	YES	NO
1	b	Croatia	YES	YES	NO
1	b	Germany	YES	YES	NO
1	b	Hungary**	YES	YES	NO
1	b	Latvia	YES	YES(1)	NO
1	b	Romania*	YES	YES	NO
1	b	Slovenia	YES	YES(1)	NO
1	b	UK	YES	YES	NO
2		Bulgaria	YES	NO	NO
2		Czech Republic	YES	NO	NO
2		France	YES	NO	YES
2		Ireland	YES	NO(1)	YES
2		Italy	YES	NO(1)	YES
2		Luxembourg	YES	NO	YES
2		Poland*	YES	NO	NO
2		Spain	YES	NO	YES
3		Cyprus	NO	n.a.	YES
3		Estonia**	NO	NO(1)	NO
3		Finland	NO	NO(1)	YES
3		Greece	NO	NO(1)	YES

Category	Subcategory	*Countries*	Measures in MURE	Modal shift	
				Increase of non-road modes	Decrease of road
3		Malta	NO	n.a.	n.a.
3		Slovakia	NO	NO	NO
4	a	Denmark	NO	YES(1)	YES
4	b	Lithuania	NO	YES	NO
4	a	Sweden	NO	YES	YES

2011
**2010
(1) Data on Inland waterways not available

Source: Elaboration of data from ODYSSEE and MURE databases

Figure 3-10: Number of countries per category and subcategories Goods



Source: MURE and ODYSSEE

In order to analyse the possible relationship between modal shift measures and corresponding impact on the goods transport in detail, we have selected three representative case studies from category 1 of Table 3-5. These cases are schematically outlined in Table 3-6 by reporting, for each of them, the variation of the main traffic indicators for good transport over the period 2000 to 2012 as well as the corresponding list of measures concerning modal shift for goods.

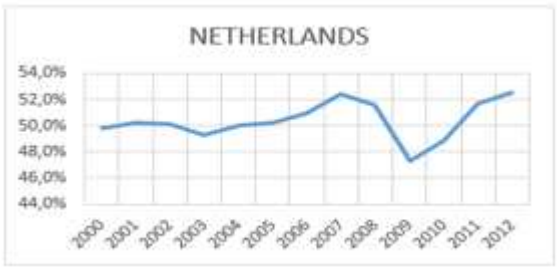
Table 3-6: Indicators and measures for some selected countries; Freight

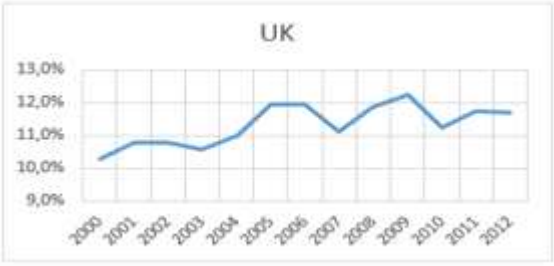
Country	Category	Indicators				Possible linked measures (MURE) [Qualitative Impacts: High, Medium, Low]
Netherlands	1a	Modes	Variation of tonnes-kilometres (2000-2012)		Net increase of non road traffic (2000-2012)	• "Transaction and modal shift" (NLD6) • "Railfreight" (NLD18)
			%	Gtkm	%	
		Road	-2,5%	-1,17		
		Rail	30,8%	1,42	+2,7%	
		Inland w.	6,2%	2,57		
		Total	3,1%	2,82		
Portugal	1a	Modes	Variation of tonnes-kilometres (2000-2012)		Net increase of non road traffic (2000-2012)	• "Logistics Portugal" (POR22)
			%	Gtkm	%	
		Road	-23,6%	-9,20		
		Rail	10,9%	0,24	+2,2%	
		Inland w.	n.a.	n.a.		
		Total	-21,8%	-8,96		
UK	1b	Modes	Variation of tonnes-kilometres (2000-2012)		Net increase of non road traffic (2000-2012)	• "Freight Facilities Grant (closed 2011)" (UK13) • "Transport Innovation Fund" (UK20)
			%	Gtkm	%	
		Road	2,7%	4,28		
		Rail	19,3%	3,47	+1,4%	
		Inland w.	-25,4%	-0,05		
		Total	4,3%	7,70		

To complete this brief overview, Figure 3-11 shows for each of these three cases the modal shift trends over the mentioned period, expressed as the share of non-road good traffic in total traffic.

Despite the uneven trends, which are most probably caused by the economic crisis, the data show for all selected countries a steady tendency toward a structural modal shift. These cases are finally illustrated in more detail in the following pages.

Figure 3-11: Share of non-road goods traffic on total goods traffic





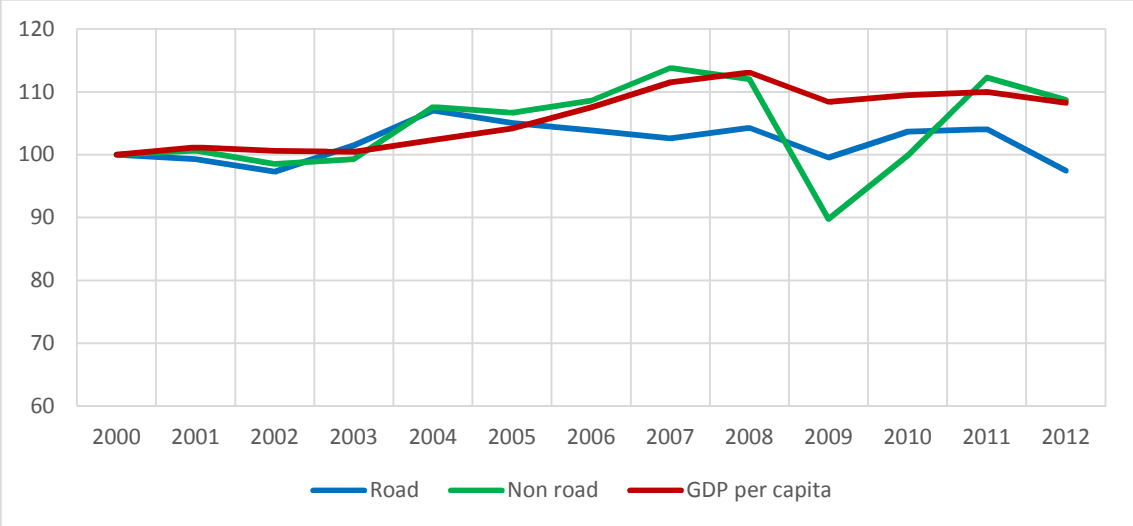
Source: ODYSSEE

The Netherlands

In the Netherlands, a five years program "Transaction Modal Shift" (TMS) was issued in 1999 with the aim to promote efficiency and a modal shift in goods transport. The TMS project agency supported participating companies by granting subsidies and by providing logistical expertise. Options for efficiency improvement in road transport (reduction of kilometres), or a shift to inland waterways, rail transport or short sea shipping were analysed for a large number of companies.

The slow and steady reduction in road goods traffic which started in 2004 (Figure 3-12), as well as the increase of non-road modes, might be caused by this program. It is nonetheless not easy to identify separately the effect of the economic recession, which is, most probably, the main cause of the evident drop of traffic in both modes in 2009.

Figure 3-12: Goods traffic and GDP per capita (index 100 for the base year); the Netherlands



Source: ODYSSEE

Furthermore, important infrastructural interventions and improvements have been developed in the Netherlands in the latest decades in order to reach the target, fixed by the Dutch government, of increasing rail freight transport by 50 Mt per year up to 2010.

Huge investments have been and will be made for the creation of high-grade rail links between the seaport areas and their hinterland, to fully integrate the Dutch system into the European network and for principal routes to be capable of carrying axle loads of

22.5 tonnes. In 2007, the Betuweroute was opened after ten years of works as part of the Trans-European Transport Networks (TEN-T). Despite this, the economic crisis was dominant, interrupting the continued growth of rail freight and inland waterways which had occurred until 2007.**Portugal**

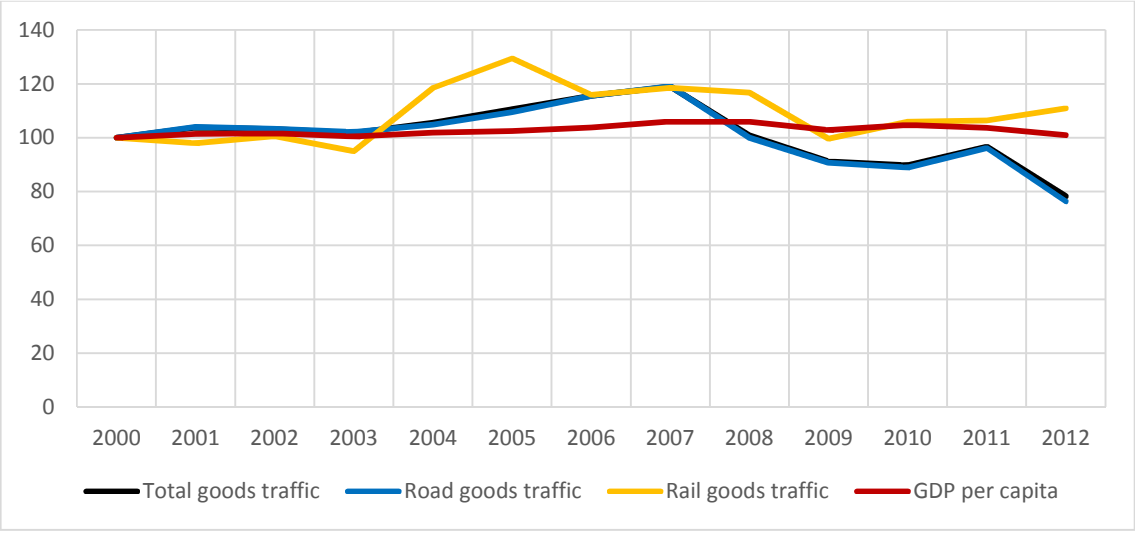
Portugal is another example of how the economic crisis has strongly influenced freight transport despite the government efforts to improve the goods intermodality. Indeed in 2006, the program "Logistic Portugal" was developed with the aim to increase the supply and transport chain efficiency.

The program includes the creation of a national network of 12 multimodal logistics platforms and two air cargo centres, as well as implementation of processes that favour regional planning of activities leading to promote intermodality, thus encouraging the use of the most efficient and effective means of transport, and promote technological innovation in related services.

The objective is also to increase the efficiency of goods transport by strengthening intermodality through the transfer of goods from road to railway and maritime transport, thereby reducing the share of road traffic by 5%, in 2015.

Although this measure could have had a positive effect in rail traffic by fostering the shift from road transport, the small increase in freight transport by rail (Figure 3-13) is not comparable with the substantial reduction of road transport caused by the economic recession started in 2008 which led to a global crisis of the sector.

Figure 3-13: Goods traffic and GDP per capita (index 100 for the base year); Portugal



Source: ODYSSEE

UK

Over the years, the UK government has paid considerable attention to the issues of freight transport.

In 2008, the Freight Facility Grant (FFG) was issued. This grant helps transport companies to ship freight by rail or water instead of road. Transporting freight by rail or water may require expensive specialised equipment, which would not be needed if the goods are transported on road. The high capital costs involved can make rail or inland waterway transport uneconomical. By contributing to the costs of such facilities, the FFG is intending

to enable rail and waterways to compete with road transport in financial terms.

This measure has, in addition to the Transport Innovation Fund (see paragraph 3.1.3.1_ UK), probably provided a good contribution to the global increase of non-road modes in the reference period, but we cannot exclude, once again, the impact of the crisis on freight transport sector as a whole (Figure 3-14).

Figure 3-14: Goods traffic and GDP per capita (index 100 for the base year); UK

Source: ODYSSEE

3.2 Non-Conventional Fuels – Biofuels

3.2.1 Introduction

The use of alternative fuels to partially replace the demand for oil products, is an integral part of the larger design of energy and environmental policies of the European Union which aims to shift towards a low-carbon economy. In particular, in January 2013, the Commission has developed the package "Clean Power for Transport" which, among other things, has prepared a proposal for a Directive on "the development of infrastructure for the deployment of alternative fuels".

The White Paper also calls for reduction of the dependence on oil in the transport sector by using alternative fuels such as biofuels.

The Directive "Promotion of Biofuels or other Renewable Fuels for Transport (2003/30/EC)"[45], repealed by Directive 2009/28/EC[46] with effect from 1 January 2012., requires the Member States to introduce legislation and take the necessary measures to ensure that biofuels[47] account for a minimum proportion of the fuel sold on their territory.

The Commission is proposing a genuine action plan aimed at increasing the share of biofuels to more than 20 % of European petrol and diesel consumption by 2020. The ultimate goal is to reduce the dependency on the use of oil-based fuels, which is a significant cause for concern for the European Union in terms of environment and security of supply.

Biofuels and energy savings

Biofuels may be negative for energy efficiency, but still contribute to the higher level goals of mitigating GHG emissions and reducing the dependence on vulnerable fossil fuel supplies. In this way, biofuels contribute to these two targets in the same way, therefore the analysis of biofuels is part of this report.

Box 3.1: Content of the Directive 2009/28/EC

The Directive "Promotion of the use of energy from renewable sources" (2009/28/EC) establishes a common framework for the production and promotion of energy from renewable sources.

The Member States have to establish national action plans, which set the share of energy from renewable sources consumed in transport, as well as in the production of electricity and heating, for 2020. These action plans must take into account the effects of other energy efficiency measures on final energy

[45] Fuel text at: http://ec.europa.eu/energy/res/legislation/doc/biofuels/en_final.pdf

[46] Full text at: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN

[47] Liquid or gaseous fuels used for transport and produced from biomass, i.e. biodegradable waste and residue from, for example, agriculture and forestry

consumption (the higher the reduction in energy consumption, the less energy from renewable sources will be required to meet the target). These plans will also establish procedures for the reform of planning and pricing schemes and access to electricity networks, promoting energy from renewable sources.

Member States should build the necessary infrastructures for energy from renewable sources in the **transport sector**. To this end, they should:

- ensure that operators guarantee the transport and distribution of electricity from renewable sources;
- provide for priority access for this type of energy.

3.2.2 *Member States strategy on biofuels*

There are in total 44 measures issued by the MS on biofuels, including those already completed and those still ongoing.

In general, the set of measures linked to the introduction of biofuels in the fuel mix have a clear and measurable impact on the fuel mix data trends but no measurable impact on the total energy consumption. Actually, the aim of these measures is to decrease the CO_2 emissions from the transport sector[48] rather than to improve energy efficiency that, in general, is not, or just marginally, affected by various blends of biofuels used in internal combustion engines.

In chapter 2, the member states with a higher share of consumption of biofuels, with respect to total road fuel consumption in 2012, have been identified (Figure 2-7). Among these, the MS, for which a good correlation between trends and relative measures has been identified, are analysed in detail below.

Denmark

The Danish government adopted a law on sustainable biofuels in December 2009. This law implements the government's aim of introducing at least 5.75% biofuels and other renewables in transport by 2012. It is an absolute condition that all biofuels must meet the sustainability criteria adopted by the EU in order to be counted for this target. It is moreover worth noting that the Danish government is aiming at increasing the share of biofuels and other renewables in transport to 10% in 2020, in line with the EU target.

Furthermore, from 1 January 2005, the government decided to exempt biofuels from the CO_2-levy which is imposed on fossil fuels for transport purposes, and the Commission approved this CO_2-exception. Since 2006, Statoil has distributed and sold Bio95 (a 5% volume blend of bioethanol in 95 octane petrol) at its gas stations.

In the following years, the government launched a new national Danish programme for the development of cost-effective second-generation technology for the production of bioethanol of 200 million DKK for 2007-2010 with a focus on large-scale demonstration plants. The programme has taken the form of R&D grants to pre-commercial investments in and operation of pilot-and demonstration-plants.

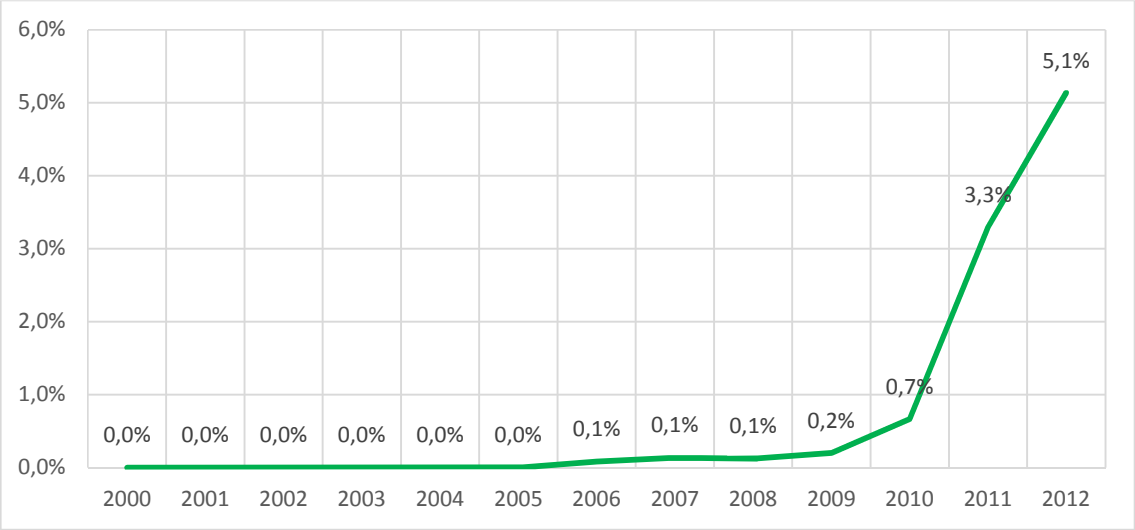
Moreover, the government has launched a limited biodiesel programme for 2007-2009 of 60 million DKK. The programme's aim is to demonstrate the use of biodiesel in selected and limited fleets of vehicles in practise – for instance public bus fleets. The main part of the programme's budget has been used to

[48] To this end, the whole fuel life cycle should be analysed but this exceed the Odyssee Mure scope.

compensate the higher prices on biodiesel compared to mineral diesel during the first part of project period.

Figure 3-15 shows the percentage of biofuels over the period 2000-2012. The strong increase that started in 2009 is the effect of the growing support of the Danish government with respect of this fuel.

Figure 3-15: Share of biofuel consumption on total road consumption; Denmark



Source: ODYSSEE

France

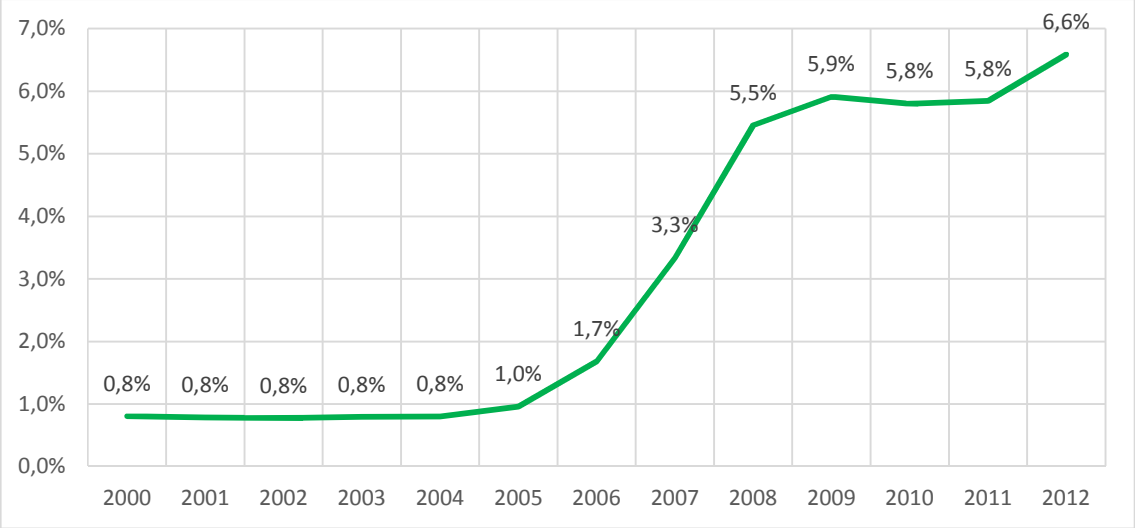
One of the targets of the French law POPE (Programme Law establishing Energy Policy guidelines), passed in July 2005, was to reach a share of 5.75% of biofuels in the road fuel consumption in 2010. The law of agricultural orientation (July 2006) reinforced this target, proposing to reach 5.75% in 2008 and 7% in 2010.

This target was ambitious because in 2005, biofuels represented less than 1% of French motor fuel consumption. Since the end of 2005, the government massively started to support biofuels and strongly increased the available tax incentives in this domain. The effects are visible in Figure 3-16.

Since 2006, biofuels benefit from a reduction of the excise tax TIPP (Taxe Intérieure sur les Produits Pétroliers): around 0.25-0.33 euros per litre, depending on the components of the biofuels (contents of alcohol, vegetable oil, etc.).

In early 2007, the French government announced to support the "Superethanol" E85, made of 85% of ethanol and 15% of gasoline. It is worth noting that the E85 blend cannot be used by traditional engines, but special "cars", known as flex-fuels, which are able to use both blended and not blended fuels, are required. The government is thus aiming at supporting the setup of the E85 distribution network and issuing fiscal incentives for such flex-fuels cars.

Figure 3-16: Share of biofuel consumption on total road consumption; France



Source: ODYSSEE

Poland

The biofuels market in Poland is regulated by the Law on Bio-components and Liquid Biofuels, passed in 2006. The "long-term biofuels or other renewable fuels promotion program for 2008-2014" was adopted by the Council of Ministers on July 24, 2007. It includes in particular:

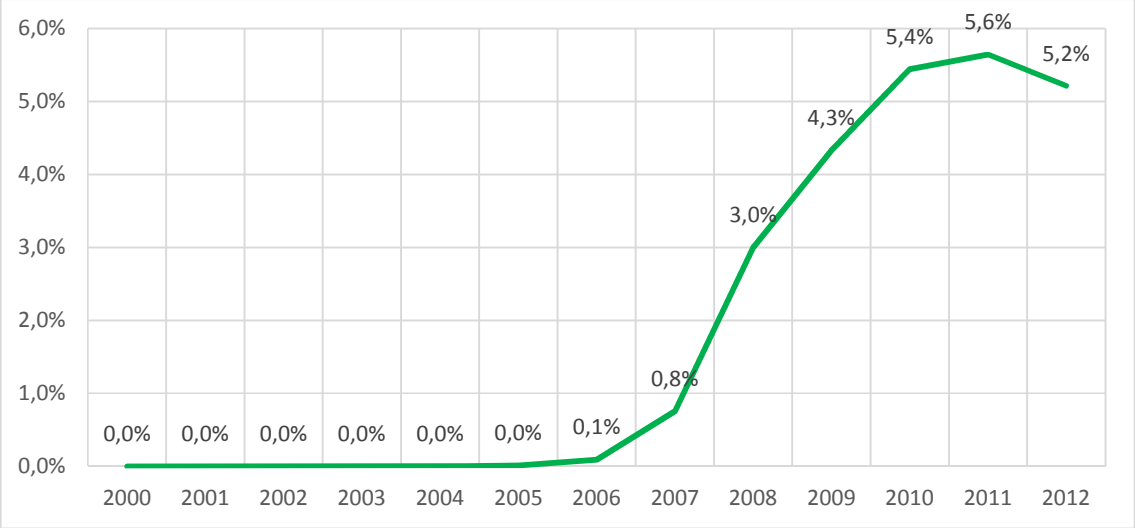
- Long-term exemptions and reductions of the excise tax for bio-components, biofuels and other renewable fuels;
- Financial support from public funds, including EU funds as part of the National Cohesion Strategy, for supporting investments concerning the production of bio-components, liquid biofuels or other renewable fuels;
- Support for public transportation in urban areas, health resort areas, and areas of environmental protection, which use liquid biofuels or other renewable biofuels in at least double extent of the amount described in the **National Indicative Target (NIT).** The targets established by the program are reported in the table below:

Year	Target
2008	3.45%
2009	4.60%
2010	5.75%
2011	6.20%
2012	6.65%
2013	7.10%

- Support for research on the development of new types of liquid biofuels and other renewable fuels;
- Support for educational programs, promoting wide utilization of liquid biofuels and other renewable biofuels.

The program had a positive impact for the development of biofuels in the transport sector, as shown in Figure 3 17.

Figure 3-17: Share of biofuel consumption on total road consumption; Poland



Source: ODYSSEE

Spain

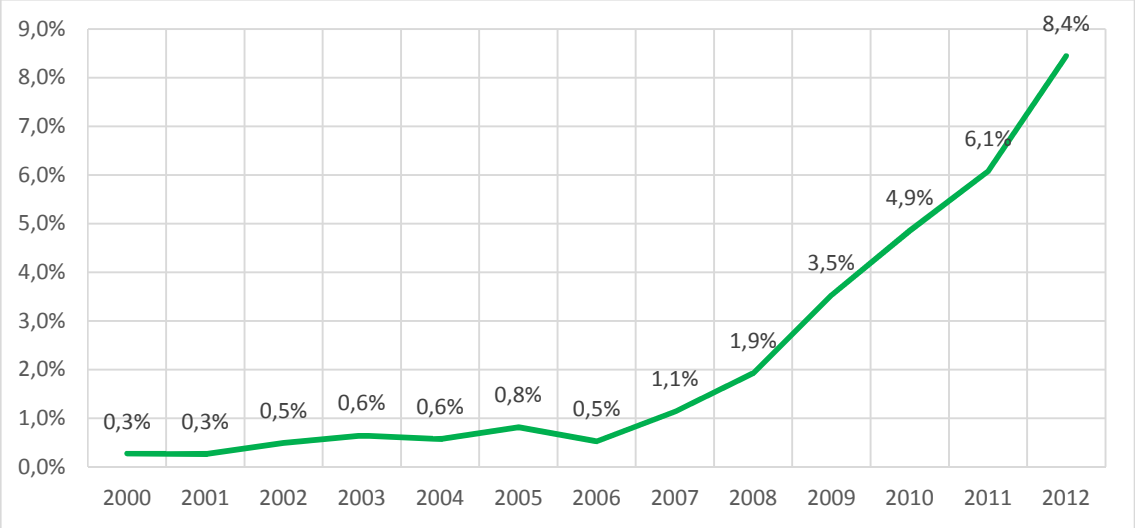
To comply with EU legislation, the Spanish government has passed several Royal Decrees to promote the use of biofuels and other renewable fuels for transport.

In June 2007, Spain imposed mandatory biofuels blending rates for transport starting from the beginning of 2009. The Spanish Government subsequently passed a ministerial order with the aim to fully implement the EU RED and FQD directives which have established minimum requirements for biodiesel and ethanol for the years 2008 and 2009 as well as the mechanisms to achieve the targets.The order also appointed the regulator, the National Energy Commission (Comisión Nacional de Energía, or CNE), as the implementer of the biofuels mandate with responsibility (through a National Certification Scheme system) to monitor and control the amount of biofuels marketed and consumed.

Two further decrees established biofuel targets for the years 2011, 2012 and 2013, in accordance with the National Renewable Energy Action Plan.

This measure, whose effects are shown on Figure 3-18, entailed a boost to the performance of the Renewable Energies Plan 2005-2010 in the biofuels sector, as well as a guarantee of performance, even over the objectives set forth in Directive 2003/30/EC.

Figure 3-18: Share of biofuel consumption on total road consumption; Spain



Source: ODYSSEE