



DYNAMIX

Decoupling growth from resource use  
and environmental impacts

# DYNAMIX policy mix evaluation



Reducing transport CO<sub>2</sub> emissions in  
Spain

## AUTHORS

Ms Martha Bicket, PSI

Mr Roger Salmons, PSI

Mr Matthew Smoldt, PSI

With contributions by:

Ana Faria Lopes, IEEP

Project coordination and editing provided by Ecologic Institute.

Front page photo: [http://www.notre-planete.info/actualites/actu\\_1756\\_transport\\_routier\\_source\\_pollution\\_air\\_Europe.php](http://www.notre-planete.info/actualites/actu_1756_transport_routier_source_pollution_air_Europe.php)

Manuscript completed in September 2013

This document is available on the Internet at: <http://dynamix-project.eu/results>.

## ACKNOWLEDGEMENT & DISCLAIMER

The research leading to these results has received funding from the European Union FP7 ENV.2010.4.2.3-1 grant agreement n° 308674.

Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use which might be made of the following information. The views expressed in this publication are the sole responsibility of the author and do not necessarily reflect the views of the European Commission.

Reproduction and translation for non-commercial purposes are authorized, provided the source is acknowledged and the publisher is given prior notice and sent a copy.

## DYNAMIX PROJECT PARTNERS



# Table of Contents

<b>1</b>	<b>RESOURCE/ISSUE</b> .....	<b>5</b>
<b>2</b>	<b>GEOGRAPHICAL AREA OF POLICY MIX COVERAGE</b> .....	<b>5</b>
<b>3</b>	<b>POLICY CONTEXT</b> .....	<b>5</b>
3.1	The environmental problem and its scope .....	5
3.2	Policy context and policy needs .....	9
3.3	Historical performance and projections into the future: Insights on decoupling .....	11
<b>4</b>	<b>DRIVERS AFFECTING CHANGE: RESOURCE USE/ENVIRONMENTAL ISSUES</b> .....	<b>14</b>
4.1	Drivers of transport activity .....	14
4.2	Drivers of specific emissions .....	15
<b>5</b>	<b>SITUATION/TREND PRIOR TO INTRODUCTION OF POLICY MIX</b> .....	<b>17</b>
<b>6</b>	<b>DESCRIPTION OF POLICY MIX(ES)</b> .....	<b>18</b>
6a.	Supplementary context questions including elements pertinent to paradigm discussions in DYNAMIX .....	18
6b.	Instruments and orientation of policy mix .....	19
6c.	Evolution of policy mix .....	19
<b>7</b>	<b>EVALUATION OF POLICY MIX: EFFECTIVENESS (ENVIRONMENTAL SUSTAINABILITY)</b> .....	<b>25</b>
<b>8</b>	<b>EVALUATION OF POLICY MIX: EFFICIENCY (ECONOMIC SUSTAINABILITY)</b> .....	<b>27</b>
<b>9</b>	<b>OVERALL ASSESSMENT</b> .....	<b>29</b>
<b>10</b>	<b>RELEVANCE TO THE EU AND TRANSFERABILITY</b> .....	<b>30</b>
<b>11</b>	<b>REFERENCES</b> .....	<b>31</b>

## List of Tables

<i>Table 1: Decomposition of Spanish transportation emissions, 1990-2008</i>	17
<i>Table 2: Spanish transport policy mix instruments</i>	20
<i>Table 3: Spanish transport policy mix and government timeline, 1992-2012</i>	21
<i>Table 4: Spanish energy and CO<sub>2</sub> savings of instruments</i>	25

## List of Figures

<i>Figure 1: Spanish CO<sub>2</sub> emissions from freight and passenger transport, 1990-2010</i>	6
<i>Figure 2: Spanish primary road network</i>	7
<i>Figure 3: Spanish highway and motorway network</i>	7
<i>Figure 4: Spanish railway network</i>	8
<i>Figure 5: Spanish air traffic (domestic and international)</i>	8
<i>Figure 6: Timeline of Spanish policies affecting the use of transport</i>	10
<i>Figure 7: Spanish domestic transport CO<sub>2</sub> emissions versus GDP, 1990-2010</i>	12
<i>Figure 8: Spanish domestic transport CO<sub>2</sub> emissions versus alternative economic indicators</i>	12
<i>Figure 9: Spanish freight transport CO<sub>2</sub> emissions versus activity</i>	13
<i>Figure 10: Spanish passenger transport CO<sub>2</sub> emissions versus activity</i>	13
<i>Figure 11: Spanish transport activity versus GDP</i>	14
<i>Figure 12: Spanish drivers of passenger transportation activity</i>	15
<i>Figure 13: Spanish modal share of freight transport</i>	16
<i>Figure 14: Spanish modal share of passenger transport</i>	16
<i>Figure 15: Spanish trend in GDP, transport activity and transport CO<sub>2</sub> prior to 2005 (against 1990 baseline)</i>	17
<i>Figure 16: Instruments used in the Spanish transport policy mix and their relationships</i>	19
<i>Figure 17 Estimated environmental impact of 2005-7 Action Plan</i>	27

## List of Abbreviations

CETM	Spanish Goods Transport Confederation
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
IDAE	Spanish Institute of Energy Saving and Diversification (Instituto de Diversificación y Ahorro de la Energía)
PAE4	2005-2007 Spanish Action Plan on Energy Saving and Efficiency (Plan de Acción de la Estrategia de Ahorro y Eficiencia Energética en España)

# 1 Resource/Issue

*Name of resource targeted (or focus of the case study, if the policy mix is broader than the specific resource(s) we have decided to analyse).*

This case study focuses on the freight and passenger transport sector in Spain, examining the extent of decoupling of CO<sub>2</sub> emissions from the transport sector from economic growth, and the policies put in place that have contributed to decoupling efforts.

This document sets out the findings from the DYNAMIX WP3 case study on Transport in Spain, examining the extent of decoupling of CO<sub>2</sub> emissions from transport from economic growth (and other economic indicators, such as domestic demand), with a specific focus on relevant policies under the Spanish 2005-2007 Action Plan on Energy Saving and Efficiency. The sections and content in this document correspond to the WP3 case study evaluation template provided by IEEP.

## 2 Geographical area of policy mix coverage

*Country name, and region or city if appropriate (if policy mix is applied regionally or locally)*

The policy mix explored in this case study covers Spain.

## 3 Policy context

### 3.1 The environmental problem and its scope

*What is the environmental problem/concern (consider both quantity and quality), e.g. soil erosion, excessive use of non-renewable or renewable resources and the crossing of environmental thresholds/tipping points for impact, resource scarcity concerns?*

*Are there any economic or social problems related to the issue and environmental problems – e.g. is there important price volatility, (risk of) unavailability of resources for the economy or society?*

*Who is the target group affected that have been, are or will be beneficiaries of the policy response?*

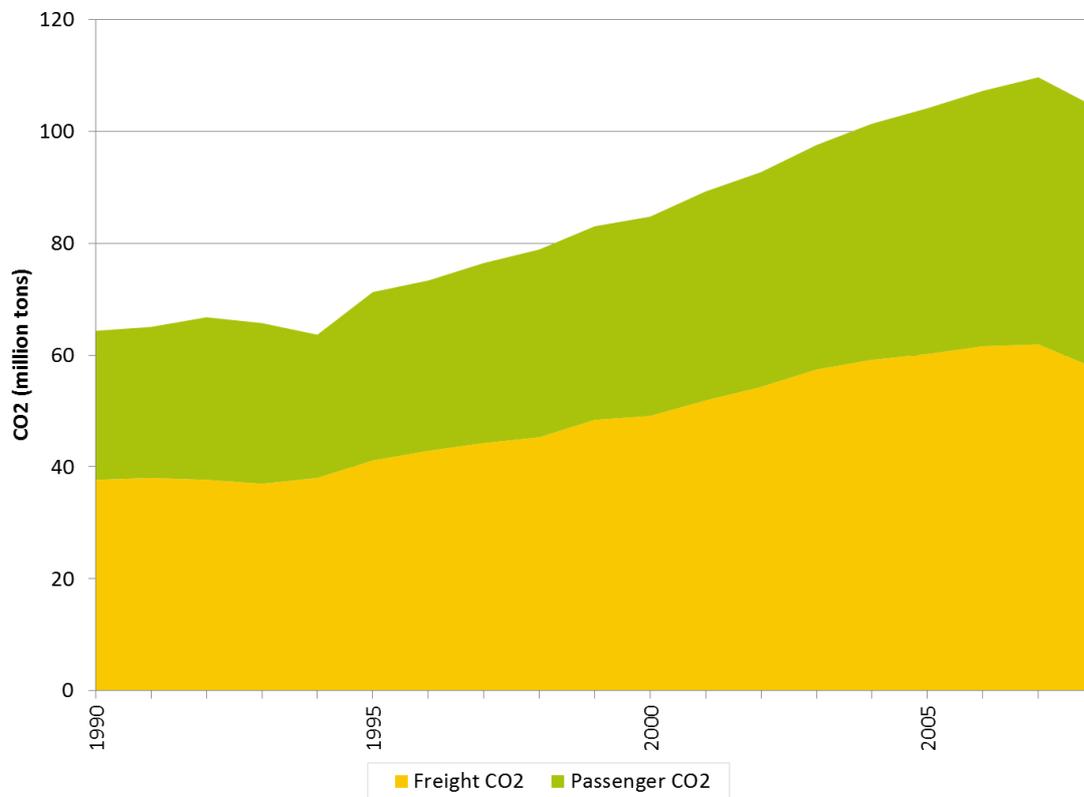
The environmental issues associated with transport include: air pollution (including CO, CO<sub>2</sub>, NO<sub>x</sub>, lead, particulate matter, and volatile organic compounds); climate change (predominantly from CO<sub>2</sub>); and nature, landscape and urban effects (e.g. the impacts of extending transport infrastructure on soil and biodiversity). There are also upstream and downstream impacts such as those associated with the extraction and transportation of fuel for the transport sector, and the disposal of disused transport stock (OECD 2006).<sup>1</sup>

The contribution of the transport sector in Spain to national CO<sub>2</sub> emissions is amongst the highest in Europe. Emissions from transport account for roughly one third of CO<sub>2</sub> emissions in Spain.

In 2008, the total external costs of transport in Spain were estimated to be €983 per inhabitant<sup>i</sup>. Road transport accounted for nearly 90 % of these total costs, with 65 % from passengers on roads, and 24 % from road freight (CE Delft, Infrac, and Fraunhofer ISI 2011).<sup>2</sup>

Figure 1 below shows the distribution of CO<sub>2</sub> emissions arising from modes of freight and passenger transport in Spain. Freight transport is responsible for a larger share of CO<sub>2</sub> emissions from transport than passenger transport.

**Figure 1: Spanish CO<sub>2</sub> emissions from freight and passenger transport, 1990-2010**



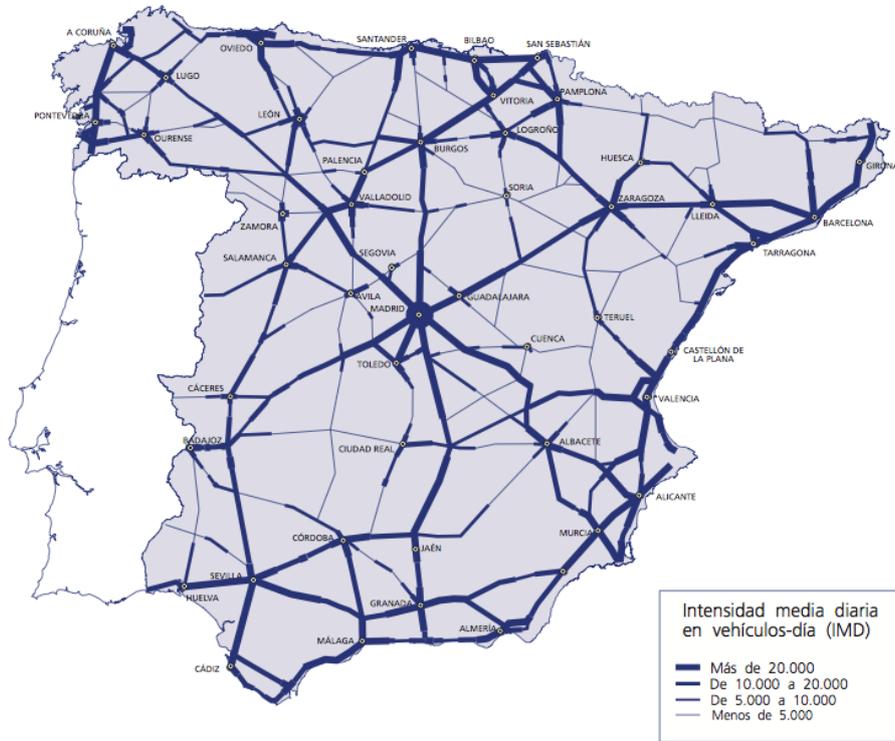
Source: Mendiluce, María, and Lee Schipper. 2011. "Trends in passenger transport and freight energy use in Spain." *Energy Policy* no. 39 (10):6466-6475. doi: <http://dx.doi.org/10.1016/j.enpol.2011.07.048>

### Geographic scope

Figures 2 to 5 illustrate the geographical scope of the road, rail and air transport networks in Spain. Across all three modes, transport nodes and networks are more densely concentrated in and around urbanised areas.

<sup>i</sup> In addition to the external costs from climate change, air pollution, and upstream and downstream impacts, this estimate also includes external costs arising from accidents and noise pollution.

Figure 2: Spanish primary road network



Source: Ministerio de Fomento. 2012. "Los transportes y las infraestructuras." <http://www.fomento.es/MFOM.CP.Web/handlers/pdfhandler.ashx?idpub=BTW002> (accessed 3 September 2013).

Figure 3: Spanish highway and motorway network



Source: Ministerio de Fomento. 2012. "Los transportes y las infraestructuras." <http://www.fomento.es/MFOM.CP.Web/handlers/pdfhandler.ashx?idpub=BTW002> (accessed 3 September 2013).



## 3.2 Policy context and policy needs

*What policy challenge(s) did the problem pose and what policy challenges does it still pose?*

*What is the policy context related to the policy mix being evaluated? What policies have been put in place to address the issues, what policies are currently in place and which ones are already foreseen for future introduction (e.g. to address past, existing and future objectives)?*

*What sort of policy response did (and does) the problem call for?*

The policy mix examined in this case study comprises policies from the Spanish 2005-2007 Action Plan on Energy Saving and Efficiency, 'Plan de Acción de la Estrategia de Ahorro y Eficiencia Energética en España' ('2005-7 Action Plan', or PAE4), described in section **Error! Reference source not found.** The 2005-7 Action Plan was implemented as the first of two action plans in the 2004-2012 Spanish Energy Efficiency Strategy, the second of which formed Spain's first National Energy Efficiency Action Plan (NEEAP) submission to the European Commission, in accordance with Directive 2006/32/EC.

The 2005-7 Action Plan was preceded by a range of local, regional and national policies and initiatives both directly and indirectly affecting the energy efficiency of and CO<sub>2</sub> emissions arising from transport in Spain. These include: the Energy Conservation and Efficiency Plan, which ran from 1991-2000 and aimed to decrease final energy demand without adversely affecting economic activity or welfare; financial incentives such as a reduction in registration tax when scrapping old cars to promote the renovation of the national vehicle stock<sup>ii</sup>; policies to encourage the use of electric vehicles in cities such as Madrid, Sevilla, Salamanca, La Coruña; and those to encourage the use of renewable energy alternatives including biofuels<sup>iii</sup> (Institute of Studies for the Integration of Systems n.d.).<sup>3</sup>

In 2011 the Energy Conservation and Efficiency Plan was supplanted by the current 2011-2020 Action Plan which constitutes Spain's second NEEAP submission to the European Commission in accordance with Directive 2006/32/EC, with the objective to improve final energy intensity by 2 % per year in the period 2010-2020 (Instituto para la Diversificación y Ahorro de la Energía 2011).<sup>4</sup>

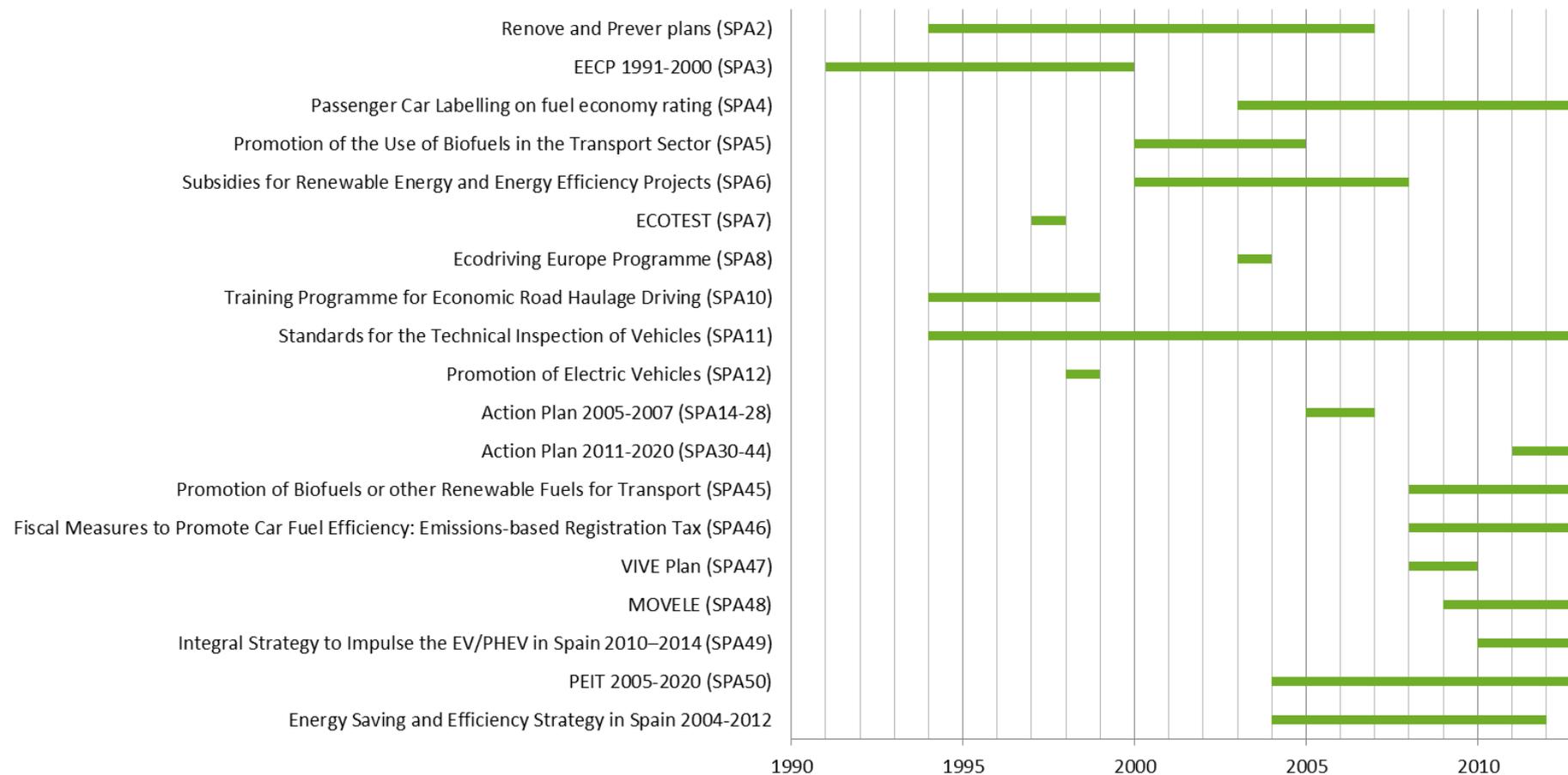
**Error! Reference source not found.** illustrates a range of policies affecting transport in Spain that were in effect before and after the 2005-7 Action Plan and their respective timeframes.

The policy challenge posed by the transport industry with respect to resource use and environmental impacts may be considered as the need to: (i) internalise the environmental costs associated with transport in Spain (including air pollution, climate change, nature, landscape and urban effects, and other upstream and downstream impacts such as the disposal of disused transport stock); (ii) improve and promote alternative transport modes and technologies with lesser impact; while maintaining overall social and economic welfare.

<sup>ii</sup> Such as the Renove and Prever plans (Institute of Studies for the Integration of Systems, 2011).

<sup>iii</sup> For example, see policies SPA5 and SPA6 in the MURE II database (Institute of Studies for the Integration of Systems, 2011).

**Figure 6: Timeline of Spanish policies affecting the use of transport**



Source: Institute of Studies for the Integration of Systems. Mure II Database [cited 11 July 2013. Available from [http://www.muredatabase.org/summary1\\_tr.asp](http://www.muredatabase.org/summary1_tr.asp). Codes in brackets refer to the corresponding entry in the ISIS MURE II database where further information may be found.

### 3.3 Historical performance and projections into the future: Insights on decoupling

*What has been the trend vs. GDP (or other economic performance metrics, such as sectoral growth) and what type of decoupling has been achieved?*

Figure 7 shows the trends in total CO<sub>2</sub> emissions from domestic transportation and real gross domestic product (GDP) for the period 1990 to 2010 (2008 for emissions), together with the resultant emissions intensity (transport CO<sub>2</sub> per unit GDP) trend.

For the first eight years, CO<sub>2</sub> emissions grew at a slightly faster rate than GDP, with the emissions intensity index rising to around 110 by 1998. For the next ten years, emissions grew at the same rate as GDP, with emissions intensity remaining (approximately) constant. That is, there is no evidence of any relative decoupling over this period.

In 2008 (the last year for which transportation emissions data is available) there was a sharp decline in emissions while GDP continued to rise, with a corresponding reduction in emissions intensity. However, this is most likely an artefact of how the GDP time series is constructed rather than evidence of any absolute decoupling. 2008 was a very unusual year for economies around the world, with economic growth collapsing on an unprecedented scale. While GDP was slightly up on the previous year when averaged over the year as a whole (as shown in Figure 7), economic activity had actually started to turn down during the second quarter (Q2) and by Q4, GDP was almost 1.5 % lower than the corresponding quarter in 2007. Furthermore, for the first half of the year, GDP benefited from an increase in net exports. Domestic demand – which is a more relevant driver for domestic transportation emissions – actually declined in all four quarters of 2008, being 0.5 % down versus 2007 for the year as a whole and almost 4 % down for the final quarter.

Figure 8 compares the trend in CO<sub>2</sub> emissions with the trend in domestic demand averaged over the year, and the trends in GDP and domestic demand based on Q4 figures. When compared to all of these measures, the decline in CO<sub>2</sub> emissions appears to reflect the downturn in economic activity rather than result from absolute decoupling.

**This conclusion is reinforced when one looks at the individual trends for freight and passenger transportation – see Figure 9 and**

Figure 10. While there had been a significant reduction in specific emissions for freight transportation since 1995, this had flattened off by 2007-8, and the reduction in emissions in 2008 was driven entirely by the significant drop in activity. For passenger transportation, there is some suggestion of a reduction in specific emissions (and absolute decoupling). However, this is based on a continuing increase in passenger activity – which seems questionable given the severity of the economic downturn. For example, the employment rate – which is one of the key drivers of transport activity (see section 5 below – experienced a 10 % decline between 2007 and 2009.

Figure 7: Spanish domestic transport CO<sub>2</sub> emissions versus GDP, 1990-2010

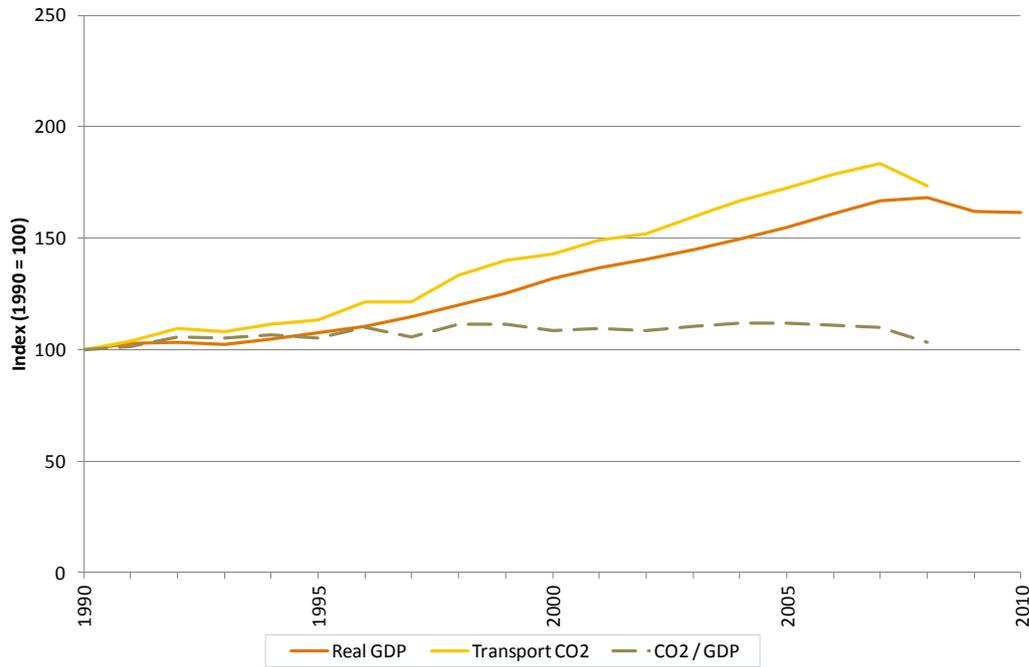
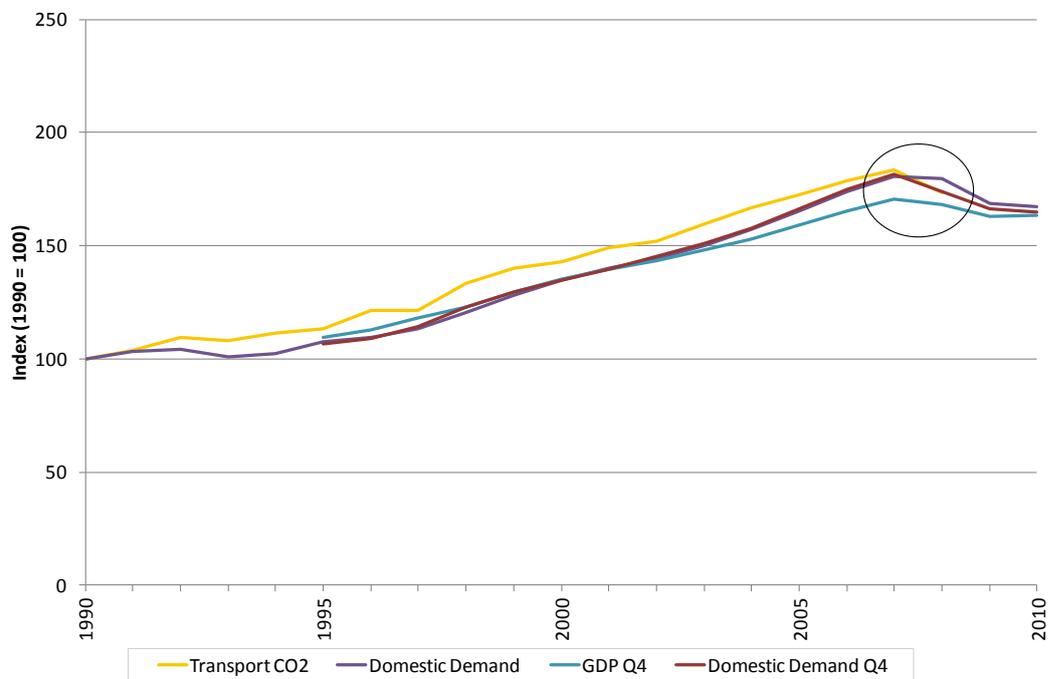


Figure 8: Spanish domestic transport CO<sub>2</sub> emissions versus alternative economic indicators



Source: OECD Website(<http://www.oecd.org/>) (CO<sub>2</sub> emissions, real GDP); EUROSTAT (<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>) (alternative economic indicators)

Figure 9: Spanish freight transport CO<sub>2</sub> emissions versus activity

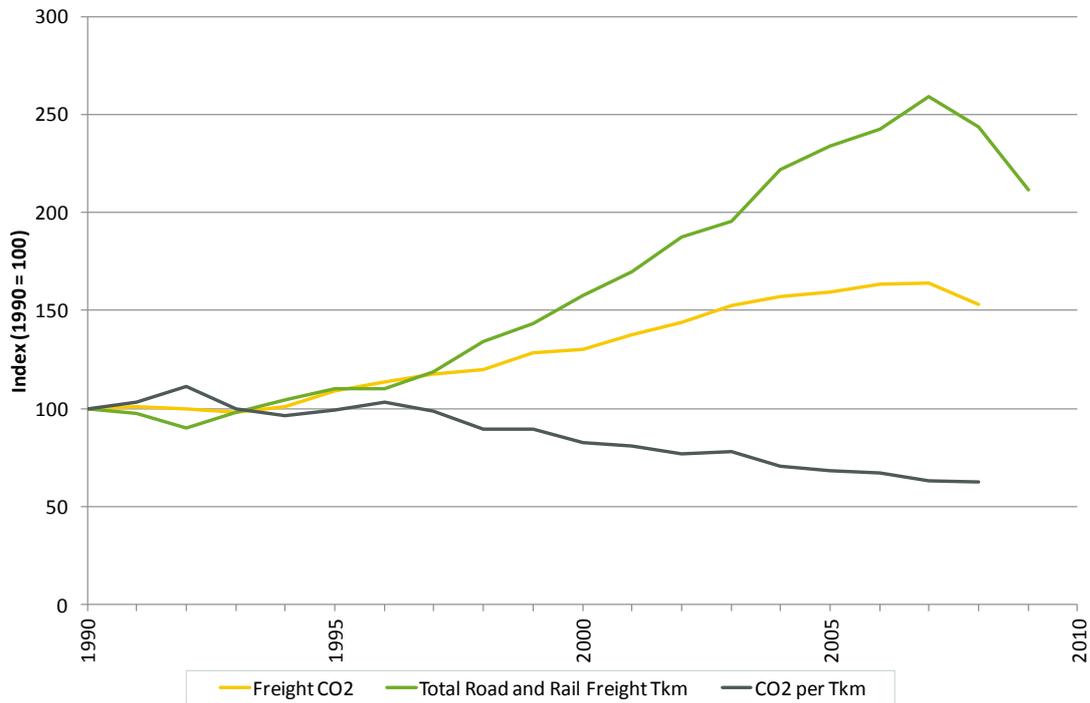
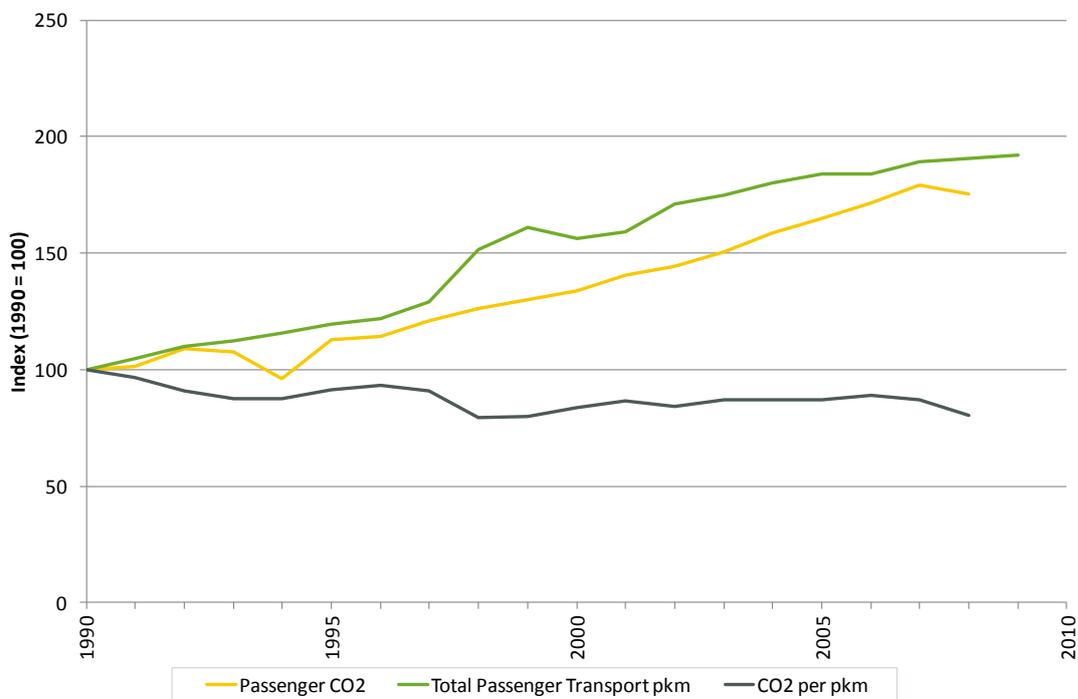


Figure 10: Spanish passenger transport CO<sub>2</sub> emissions versus activity



Source: Mendiluce, María, and Lee Schipper. 2011. "Trends in passenger transport and freight energy use in Spain." Energy Policy no. 39 (10):6466-6475. doi: <http://dx.doi.org/10.1016/j.enpol.2011.07.048>. and International Transport Forum. 2011. Transport Explorer

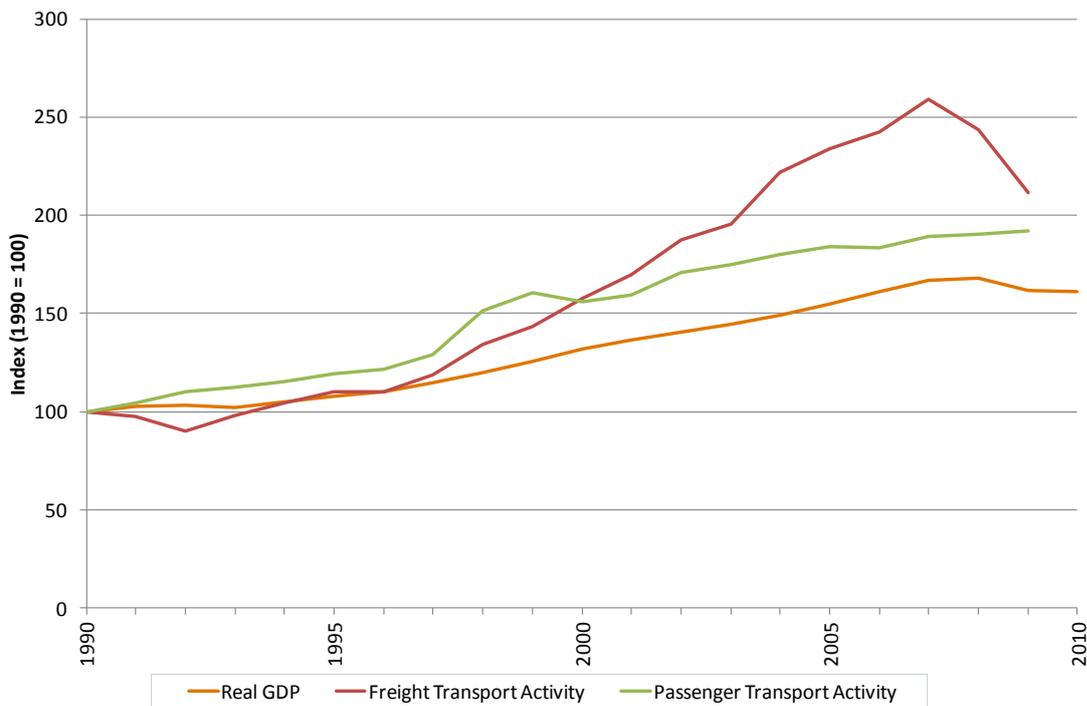
## 4 Drivers affecting change: resource use/environmental issues

*What are the drivers affecting resource use (driving demand for the resource and leading to resource overuse) or other environmental impacts?*

### Drivers of transport activity

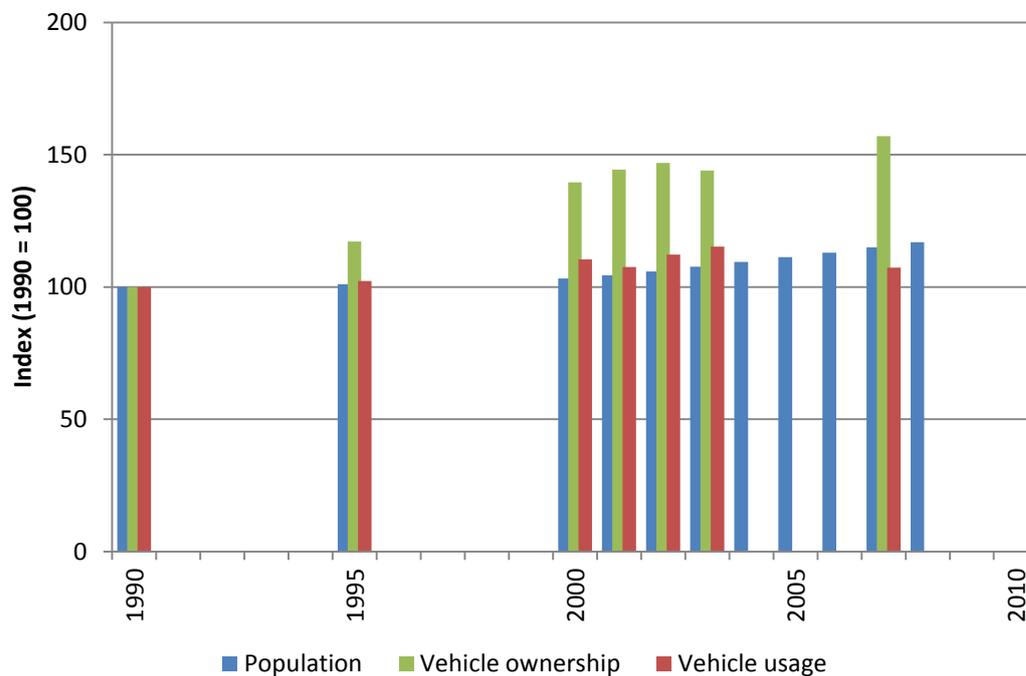
A major driver of transport activity is general economic activity as measured by real GDP. However, as can be seen in Figure 11, both passenger and freight transportation activity have grown faster than the Spanish economy over the past 20 years. In particular, freight transportation activity more than doubled between 1996 and 2007, while GDP grew by only around one third.

**Figure 11: Spanish transport activity versus GDP**



Source: International Transport Forum. 2011. Transport Explorer.

Decomposition of the trend in passenger transportation activity into changes in population, vehicle ownership and vehicle usage shows that the key driver of the increase in activity has been the increase in vehicle ownership (see Figure 12). While population and vehicle usage increased by 15 % and 7 % respectively between 1990 and 2007, vehicle ownership increased by 57 % over the same period – with most of the increase occurring over the first ten years.

**Figure 12: Spanish drivers of passenger transportation activity**

Source: International Transport Forum. 2011. Transport Explorer

### Drivers of specific emissions

**Changes in the modal composition of transportation can have an impact on specific emissions (i.e. emissions per unit activity). As can be seen in Figure 13 and**

Figure 14, the shift has been more significant for freight transportation, with the share of freight transported by rail falling from slightly over 10 % in 1990 to around 3.5 % in 2009. The shifts have been less marked for passenger transportation, with transportation by private car increasing its share of the total from around 78 % to 82 % over the same period. This increase came equally at the expense of passenger transport by buses and coach, and passenger transport by rail, which each lost around 2 % points of share.

The increases in specific emissions caused by these modal shifts were more than offset by improvements in the energy efficiency of vehicles. This can be seen in the analysis of carbon emissions undertaken by Mendiluce and Schipper (2011)<sup>5</sup> – which decomposed changes in total carbon emissions for passenger and freight transportation into changes in activity, structure (i.e. modal shifts), energy intensity and average carbon factor (see Table 1).

Figure 13: Spanish modal share of freight transport

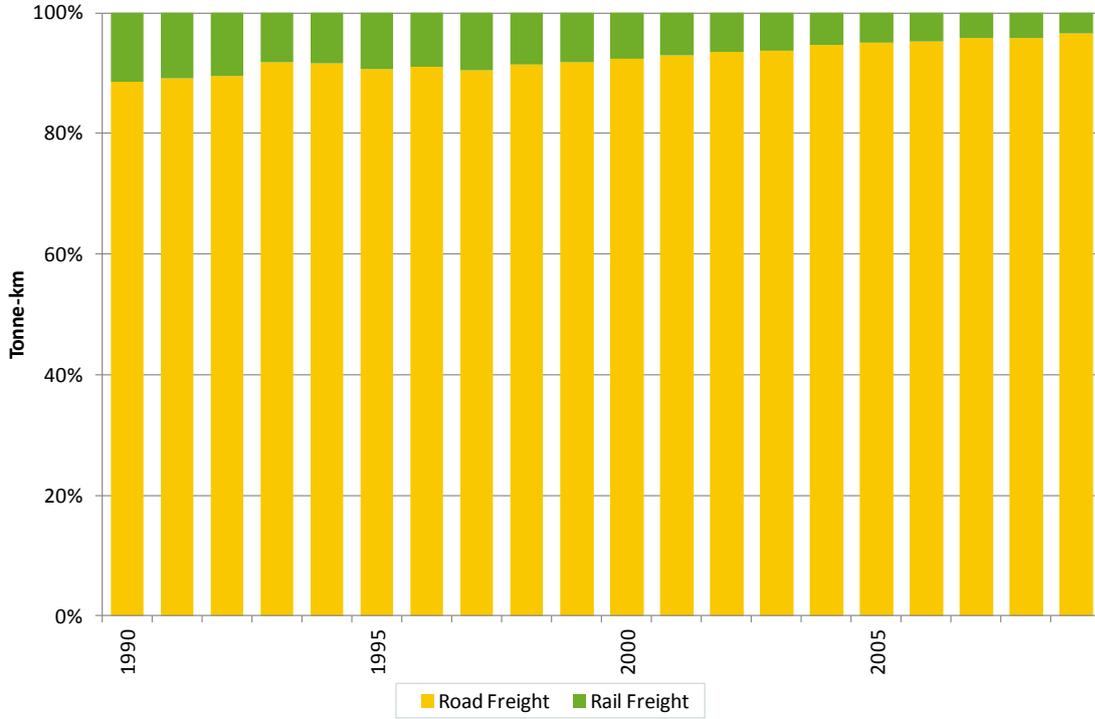
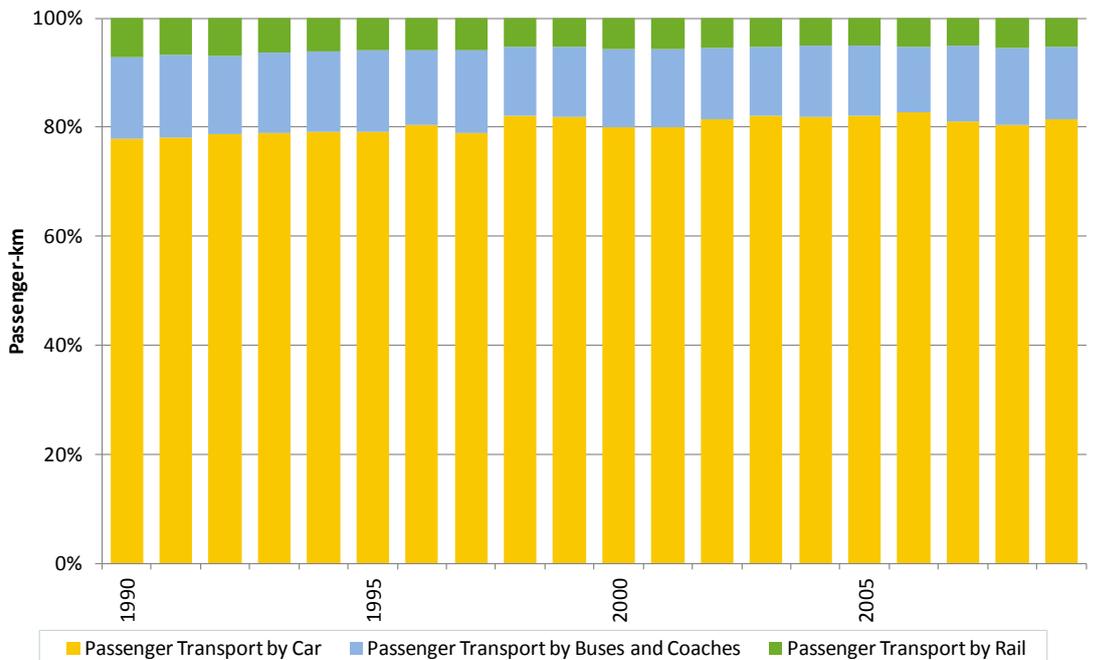


Figure 14: Spanish modal share of passenger transport



Source: International Transport Forum. 2011. Transport Explorer

**Table 1: Decomposition of Spanish transportation emissions, 1990-2008**

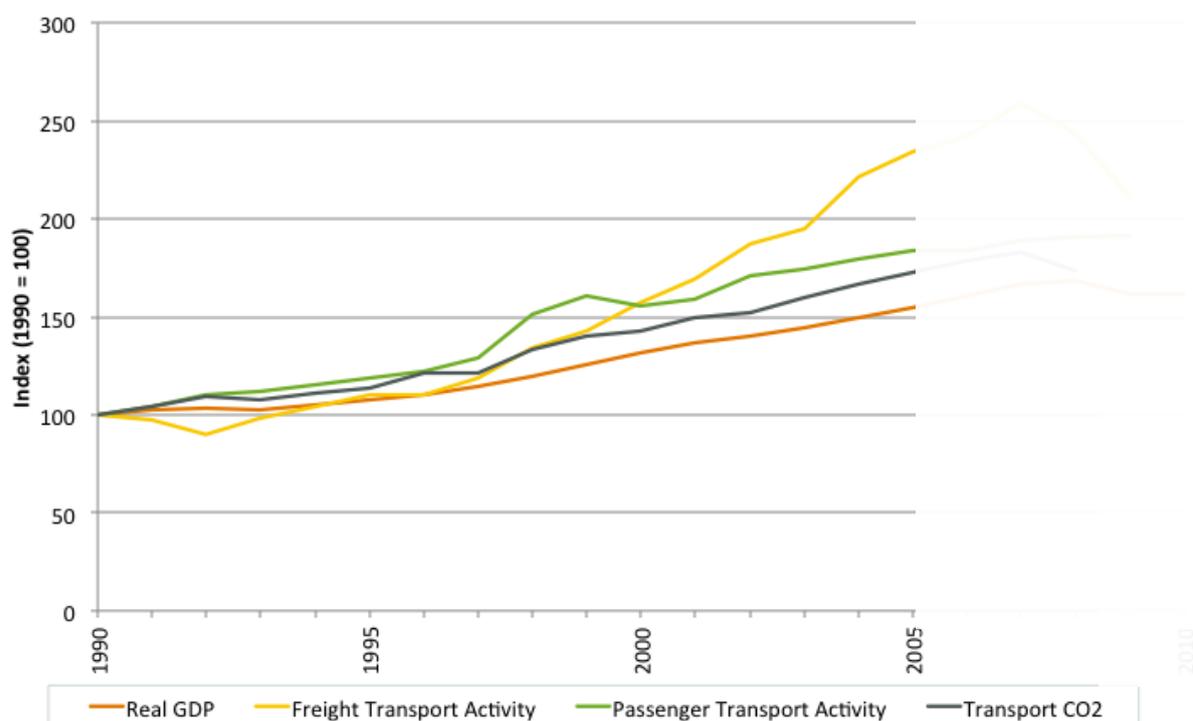
	Passenger			Freight		
	1990	1998	2008	1990	1998	2008
Activity	100	143	181	100	105	183
Structure	100	101	105	100	114	110
Energy intensity	100	88	93	100	100	75
Carbon factor	100	100	100	100	100	100
<b>Total carbon emissions</b>	<b>100</b>	<b>126</b>	<b>175</b>	<b>100</b>	<b>120</b>	<b>153</b>

Source: Mendiluce, María, and Lee Schipper. 2011. "Trends in passenger transport and freight energy use in Spain." *Energy Policy* no. 39 (10):6466-6475. doi: <http://dx.doi.org/10.1016/j.enpol.2011.07.048>.

## 5 Situation/trend prior to introduction of policy mix

*Information on the baseline situation before the policy mix was introduced.*

**Figure 15: Spanish trend in GDP, transport activity and transport CO<sub>2</sub> prior to 2005 (against 1990 baseline)**



Source: International Transport Forum. 2011. Transport Explorer

## 6 Description of policy mix(es)

*This section presents the main policy mix that will be the focus of this ex-post assessment.*

<b>Lifecycle focus of the policy mix:</b>	Transportation
<b>Sector(s) covered:</b>	All sectors (including all modes of transport)
<b>Scale of application of policy mix:</b>	National level
<b>Implementing body:</b>	Spanish Autonomous Communities and the IDAE, Ministerio de Industria, Turismo y Comercio
<b>Objective of policy mix:</b>	reduce growth rates in consumption and in energy intensity indicators

The policy mix examined in this case study comprises instruments from the Spanish 2005-2007 Action Plan on Energy Saving and Efficiency, 'Plan de Acción de la Estrategia de Ahorro y Eficiencia Energética en España'. The 2005-7 Action Plan was implemented as the first of two action plans in the 2004-2012 Spanish Energy Efficiency Strategy, which proposed an overall 87.9 million oil equivalent tonne saving through transport policies, amounting to a total goal of 238 million tonnes of CO<sub>2</sub> avoided. The 2005-7 Action Plan was approved by the Council of Ministers in Spain in July 2005 and "set out priority measures to start a process applying pressure to all sectors, so as to reduce growth rates in consumption and in energy intensity indicators" (IDAE, Ministerio de Industria, Turismo y Comercio 2007).<sup>6</sup>

The 2005-7 Action Plan was co-managed jointly by the Spanish Autonomous Communities and the IDAE, and aimed to address a range of different sectors in the economy through a strategy of coordinated and simultaneous measures (IDAE, Ministerio de Industria, Turismo y Comercio 2007).<sup>7</sup>

### 6a. Supplementary context questions including elements pertinent to paradigm discussions in DYNAMIX

*Timeline for the different phases of the policy cycle (i.e. rationale and objective-setting; appraisal; implementation and monitoring).*

*Description of the government in power during each of the three following policy phases: rationale and objective-setting; appraisal; and implementation and monitoring.*

*Does the mix contain policies that are unusual or not typical of the country/ies or regional/local administration that implemented it?*

*Names of resource efficiency concepts, terms, models, ranking/classification systems, accounting methods etc. used or relied upon in each of the three phases of the policy cycle: rationale and objective-setting; appraisal; and implementation and monitoring, and how they were used (e.g.: 'waste hierarchy' – used in objective-setting to link policy objectives to more desirable uses for waste).*

Policy mix and government timeline (See **Error! Reference source not found. Error! Reference source not found.**).

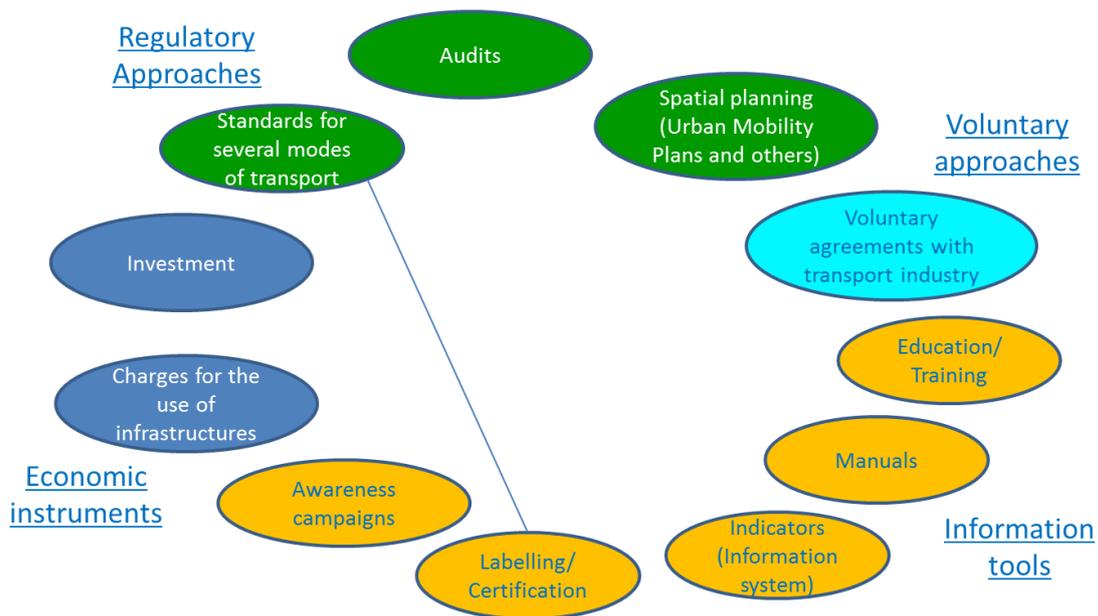
## 6b. Instruments and orientation of policy mix

*Instruments in the mix and whether one type of tool (i.e. regulatory, economic, information) is dominant.*

*For each instrument, what is its aim? What requirements does it place on relevant players (for example, phasing out a certain substance, meeting minimum recycling targets, etc.)? What reporting requirements exist?*

The instruments in the policy mix, namely the transport-oriented policies of the 2005-7 Action Plan, are outlined in Table 2 and in Figure 16.

**Figure 16: Instruments used in the Spanish transport policy mix and their relationships**



Source: Own compilation

## 6c. Evolution of policy mix

*Evolution of the policy mix throughout its existence –details of the introduction of the first policy tool(s), then all subsequent relevant tools, and related revisions/reforms (e.g. progressive increases in rates applied through economic tools, broader extension of regulation requirements, etc.).*

Table 3 lists the key events (e.g. reports, consultations, implementation, and changes) associated with the policy mix. Government changes are noted on a national level.

**Table 2: Spanish transport policy mix instruments**

Instrument	Urban Mobility Plans	Transport Plan in Enterprises and Activity Centres	Greater Share of Collective Transport used in Road Transport	Increased Use of Rail Transport	Increased Use of Maritime Transport	Management of Transport Infrastructure	Management of Road Transport Fleet	Management of Aircraft Fleets	Efficient Driving of Private Vehicles	Efficient Driving of Lorries and Buses	Efficient Driving of Aircraft
Mure II Reference	SPA14	SPA15	SPA16	SPA17	SPA18	SPA19	SPA20	SPA21	SPA22	SPA23	SPA24
Instrument type	Regulatory and planning	Regulatory and planning	Regulatory and planning	Regulatory and planning	Voluntary /cooperation instruments	Information; Regulatory and planning	Information	Voluntary /cooperation instruments	Information	Information	Information
Objective	Action plan objective for the transport sector: A final saving of 2,984 Mtoe										
Geographic scope	Urban	Urban	Inter-Urban, Regional	Inter-Urban	European, Worldwide	Inter-Urban, Regional	Inter-Urban, Regional	European, Worldwide	Urban	Inter-Urban, Regional, Urban	Regional
Key Actors	Central Government, Energy Agencies, Local Authorities	Central Government, Energy Agencies, Local Authorities	Central Government, Energy Agencies	Central Government, Energy Agencies	Central Government, Energy Agencies	Central Government, Energy Agencies, Local Authorities	Central Government, Energy Agencies, Local Authorities, Transport Companies	Central Government	Central Government, Energy Agencies, Vehicle manufacturers	Central Government, Energy Agencies	Central Government, Energy Agencies, Transport Companies
Target Audience	Collective passengers, Individual passengers	Employers	General Public, Individual passengers	General Public	Individual passengers	General Public	Fleets Owners	Contract Hauliers, Fleets Owners	General Public	Transport companies	Transport companies
Source and more information	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description	View Detailed Measure Description

Source: Institute of Studies for the Integration of Systems. *Mure II Database* [cited 11 July 2013. Available from [http://www.muredatabase.org/summary1\\_tr.asp](http://www.muredatabase.org/summary1_tr.asp)]

**Table 3: Spanish transport policy mix and government timeline, 1992-2012**

Date	Event	Source	Government
1992	Inauguration of Spanish high-speed rail system (AVE)	{Mendiluce, 2011 #111}	Spanish Socialist Working Party
1992	Economic slowdown	{Mendiluce, 2011 #111}	Spanish Socialist Working Party
01 Dec 1992	EU White Paper published, outlining means to open the transport market.	<a href="http://europa.eu/legislation_summaries/environment/tackling_climate_change/l24007_en.htm">http://europa.eu/legislation_summaries/environment/tackling_climate_change/l24007_en.htm</a>	Spanish Socialist Working Party
01 Dec 1992	Tax introduced to be paid upon first registration of a vehicle in Spain. Provides incentives to reduce CO <sub>2</sub> emissions from new cars.	(Law 38) <a href="http://noticias.juridicas.com/base_datos/Fiscal/l38-1992.t2.html">http://noticias.juridicas.com/base_datos/Fiscal/l38-1992.t2.html</a>	Spanish Socialist Working Party
01 Dec 1992	Introduction of a fuel tax at €330 for kerosene and €15 for heavy fuel oil on maritime shipping and aviation	<a href="http://noticias.juridicas.com/base_datos/Fiscal/l38-1992.t2.html">http://noticias.juridicas.com/base_datos/Fiscal/l38-1992.t2.html</a>	Spanish Socialist Working Party
1993	Economic slowdown	{Mendiluce, 2011 #111}	Spanish Socialist Working Party
1996	José María Aznar López takes offices as prime minister	<a href="http://www.lamoncloa.gob.es/Presidente/Presidentes/index.htm">http://www.lamoncloa.gob.es/Presidente/Presidentes/index.htm</a>	People's Party
23 Jul 1996	Directive 96/48/CE defines the terms of interoperability for the trans-European high-speed rail system as well as for the conventional rail system.	<a href="http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1996:235:0006:0024:EN:PDF">http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1996:235:0006:0024:EN:PDF</a>	People's Party
01 Dec 1996	Additional taxes introduced for transport vehicles.	<a href="http://noticias.juridicas.com/base_datos/Admin/l13-1996.html">http://noticias.juridicas.com/base_datos/Admin/l13-1996.html</a>	People's Party
22 Jul 1998	EU White Paper on 'Fair Payment for Infrastructure Use' outlines a plan toward the gradual and progressive harmonisation of charging principles in all major commercial modes of transport in Europe.	<a href="http://aei.pitt.edu/1136/1/transport_infra_wp_COM_98_466.pdf">http://aei.pitt.edu/1136/1/transport_infra_wp_COM_98_466.pdf</a>	People's Party
1998	Cabotage is liberalised under Community provisions of the EU	<a href="http://www.fomento.es/NR/rdonlyres/31E89424-6423-4636-AB64-C4CC678FA3A1/19579/PEIT2005Glossary092.pdf">http://www.fomento.es/NR/rdonlyres/31E89424-6423-4636-AB64-C4CC678FA3A1/19579/PEIT2005Glossary092.pdf</a>	People's Party

Date	Event	Source	Government
2001	The Strategic Goods Transport Plan (PETRA) outlines actions to modernize the goods transport sector	<a href="http://www.fomento.es/NR/rdonlyres/D2CD6F51-CBDB-467B-88F6-82026A8AA8E3/8698/petra.pdf">http://www.fomento.es/NR/rdonlyres/D2CD6F51-CBDB-467B-88F6-82026A8AA8E3/8698/petra.pdf</a>	People's Party
19 Mar 2001	Directive 2001/16/CE defines further terms of interoperability for the trans-European high-speed rail system as well as for the conventional rail system.	<a href="http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:110:0001:0027:EN:PDF">http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:110:0001:0027:EN:PDF</a>	People's Party
01 Sep 2001	EU White Paper on 'European Transport Policy for 2010' proposes 60 measures to develop a transport system capable of shifting the balance between modes of transport, revitalising the railways, promoting transport by sea and inland waterway and controlling the growth in air transport	<a href="http://ec.europa.eu/transport/themes/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf">http://ec.europa.eu/transport/themes/strategies/doc/2001_white_paper/lb_com_2001_0370_en.pdf</a>	People's Party
01 Dec 2001	Law 24/2001 imposes an extra tax on fuel for municipal authorities.	<a href="http://noticias.juridicas.com/base_datos/Admin/l24-2001.t1.html#a9">http://noticias.juridicas.com/base_datos/Admin/l24-2001.t1.html#a9</a>	People's Party
01 Nov 2003	Introduction of reservation fee to be collected from railway undertakers per volume of traffic per year plus reserve capacity charge plus variable charge per train-km actually used by type of line and type of service.	(Law 39/2003) <a href="http://www.adif.es/en_US/conoceradif/doc/CA_DRedEn_Completo.pdf">http://www.adif.es/en_US/conoceradif/doc/CA_DRedEn_Completo.pdf</a>	People's Party
2003	Directive 2003/87/EC introduces measures to reduce the climate change impact attributable to aviation	<a href="http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm">http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm</a>	People's Party
2004	José Luis Rodríguez Zapatero takes office as prime minister	<a href="http://www.lamoncloa.gob.es/Presidente/Presidentes/index.htm">http://www.lamoncloa.gob.es/Presidente/Presidentes/index.htm</a>	Spanish Socialist Working Party
2004	The Bus Transport Plan of Action (PLATA) establishes actions to modernise Spanish bus transport. Themes include network integration, market competition, sustainable practice, and corporate responsibility	<a href="http://www.fomento.es/NR/rdonlyres/A668AD46-4B60-4E80-9967-204BE390FCF4/8701/boletin1_plata.pdf">http://www.fomento.es/NR/rdonlyres/A668AD46-4B60-4E80-9967-204BE390FCF4/8701/boletin1_plata.pdf</a>	Spanish Socialist Working Party
01 Mar 2004	Introduction of a vehicle ownership tax	<a href="http://noticias.juridicas.com/base_datos/Admin/rdleg2-2004.t2.html#c2s3ss4">http://noticias.juridicas.com/base_datos/Admin/rdleg2-2004.t2.html#c2s3ss4</a>	Spanish Socialist Working Party
July 2005	Action Plan (2005-2007) is approved by the Council of Ministers, as part of the 2004-2012 Action Plan for Spanish Strategy on Energy Efficiency and Saving.	{Mendiluce, 2011 #111}	Spanish Socialist Working Party

Date	Event	Source	Government
2005	The Strategic Plan on Infrastructures and Transport [PEIT] (2005-2020) proposes various measures for the integration of transportation infrastructure such as an intermodal system, more popular public transport, and better resource allocation.	EEA 2011 Survey of Member Countries	Spanish Socialist Working Party
2005	Establishment of the 'Red de Redes de Desarrollo Local Sostenible', a forum for debate between municipalities.	<a href="http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/medio-ambiente-urbano/desarrollo-medio-am-urb/default.aspx#para1">http://www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/medio-ambiente-urbano/desarrollo-medio-am-urb/default.aspx#para1</a>	Spanish Socialist Working Party
01 Jul 2007	Introduction of law 12/2207 mandating the use of biofuels in transport, in accordance with Directive 2003/55/EC.	EEA 2011 Survey of Member Countries	Spanish Socialist Working Party
2008	Economic slowdown	{Mendiluce, 2011 #111}	Spanish Socialist Working Party
2008	Publication of the 2008-2012 Action Plan (PEA4+), proposing policy measures in seven sectors (Agriculture, Industry, Building, Transport, Public Services, Energy Transformation, Building Equipment and Office Automation). The second action plan under the Spanish Energy Efficiency and Saving Strategy (2004-2012), it forms Spain's NEEAP submission to the EC.	EEA 2011 Survey of Member Countries	Spanish Socialist Working Party
2008	Directive 2008/101/EC introduces measures to reduce the climate change impact attributable to aviation	<a href="http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm">http://ec.europa.eu/clima/policies/transport/aviation/index_en.htm</a>	Spanish Socialist Working Party
01 Feb 2009	Start of the MOVELE Project on electric mobility which aims to establish 2000 electric vehicles and 500 recharging stations in urban areas between 2009 and 2010.	Appendix I from "Prospective Study" by the Servicio Público de Empleo Estatal	Spanish Socialist Working Party
13 Feb 2009	The Comprehensive Automotive Programme outlines specific measures to maintain the Spanish automobile industry. One measure includes an increase in the use of hybrid and electric vehicles so 1 million are realized by 2014.	Appendix I from "Prospective Study" by the Servicio Público de Empleo Estatal	Spanish Socialist Working Party
01 Apr 2009	The Spanish Strategy on Sustainable Mobility (EEMS) outlines 48 measures for the integration of the transportation sector. An efficient and sustainable transport system is the objective. Improvements to infrastructure and urban planning are proposed.	EEA 2011 Survey of Member Countries	Spanish Socialist Working Party

Date	Event	Source	Government
01 Mar 2010	The Integral Plan for the Promotion of the Electric Vehicle plans for the introduction of 250,000 electric vehicles into the transport fleet by 2015.	Appendix I from "Prospective Study" by the Servicio Público de Empleo Estatal	Spanish Socialist Working Party
01 Mar 2011	Spanish government decreases the highway speed limit from 120 km/h to 110 km/h	(Mendiluce and Schipper; 2011)	Spanish Socialist Working Party
01 Mar 2011	The Sustainable Economy Act consolidates political objectives on sustainable mobility, and promotes efficient and environmentally-friendly transport with little social and environmental cost. Particular attention is given to railway freight.	Appendix I from "Prospective Study" by the Servicio Público de Empleo Estatal	Spanish Socialist Working Party
01 Mar 2011	EU White Paper, a 'Roadmap to a Single European Transport Area', proposes measures to develop sustainable automotive technologies, to improve multimodal networks, and to improve the transport sector's efficiency using information systems and market-based incentives.	<a href="http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF">http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF</a>	Spanish Socialist Working Party
01 Mar 2011	Law 1/2011 redefines the total charge an airline must pay for flying in and out of the Barcelona-El Prat airport. Also imposes a noise charge for air carriers, in accordance with Directive 2009/12/EC.	<a href="http://www.aena-aeropuertos.es/csee/ccurl/655/209/guia%20tarifas%20aena%20aeropuertos%202012_EN.pdf">http://www.aena-aeropuertos.es/csee/ccurl/655/209/guia%20tarifas%20aena%20aeropuertos%202012_EN.pdf</a>	Spanish Socialist Working Party
2011	Mariano Rajoy Brey takes office as prime minister	<a href="http://www.lamoncloa.gob.es/Presidente/Presidentes/index.htm">http://www.lamoncloa.gob.es/Presidente/Presidentes/index.htm</a>	People's Party
01 Jan 2012	Law 1/2011 redefines the total charge an airline must pay for flying in and out of the Madrid-Barajas airport. Also imposes a noise charge for air carriers, in accordance with Directive 2009/12/EC.	<a href="http://www.aena-aeropuertos.es/csee/ccurl/655/209/guia%20tarifas%20aena%20aeropuertos%202012_EN.pdf">http://www.aena-aeropuertos.es/csee/ccurl/655/209/guia%20tarifas%20aena%20aeropuertos%202012_EN.pdf</a>	People's Party
01 Jan 2012	Law 1/2012 redefines the total charge an airline must pay for flying in and out of the Madrid-Barajas airport. Also imposes a noise charge for air carriers, in accordance with Directive 2009/12/EC.	<a href="http://www.aena-aeropuertos.es/csee/ccurl/655/209/guia%20tarifas%20aena%20aeropuertos%202012_EN.pdf">http://www.aena-aeropuertos.es/csee/ccurl/655/209/guia%20tarifas%20aena%20aeropuertos%202012_EN.pdf</a>	People's Party

## 7 Evaluation of policy mix: effectiveness (environmental sustainability)

*Does/did the policy mix result in a positive environmental outcome?*

*Were its stated objective(s) met? Were the instruments used sufficient to meet the objectives?*

*Did other, unforeseen/unintended positive outcomes or impacts (environmental, social, economic) result? Did other such negative outcomes or impacts result?*

*Were these objectives set at a level to meet environmental needs (e.g. avoid crossing environmental thresholds/tipping points or achieve more sustainable levels of resource use/extraction (e.g. maximum sustainable yield (MSY) in fisheries)?*

*Which sectors/actors were identified as having key impacts/influences on the problem/issue? (e.g. specific industrial/ business sectors, consumers, economy as a whole?) Did any of the instruments specifically target these key sectors/actors? Was there significant take-up/implementation of (voluntary) instruments by these sectors?*

*Was the policy mix applied to a sector previously not targeted by policies on the issue under question, or in a new area/issue – thereby aiming to stimulate change?*

*What were the anticipated and actual outcomes, impacts and effects of the policy mix on the behaviour of sectors and actors targeted? (e.g. reductions in emissions from industry, increased recycling rates, increase/decrease in certain product purchases, etc.).*

*Relationships between the instruments, identifying positive/negative influences on the overall policy mix or on key instruments in the mix, as well as any positive or negative impacts from changes to the mix (introduction or termination of instrument(s), increase or decrease in tax/levy/charge, etc.). Level of ‘connectivity’ (strong, weak) between each instrument and the primary one(s).*

*Are there any indicators, monitoring systems, review processes or other monitoring mechanisms in place to track progress?*

Table 4 provides a summary of the ex-ante assessment of the measures included in the 2005-7 Action Plan, as reported by the Institute of Studies for the Integration of Systems (ISIS) (2011). The Action Plan was expected to deliver energy savings of around 3 mtoe in the final year (2007) and a reduction in CO<sub>2</sub> emissions over the three years (2005-7) of around 14.5 mt CO<sub>2</sub>. Based on a semi-quantitative assessment, all of the measures were judged to have high or medium impacts.

**Table 4: Spanish energy and CO<sub>2</sub> savings of instruments**

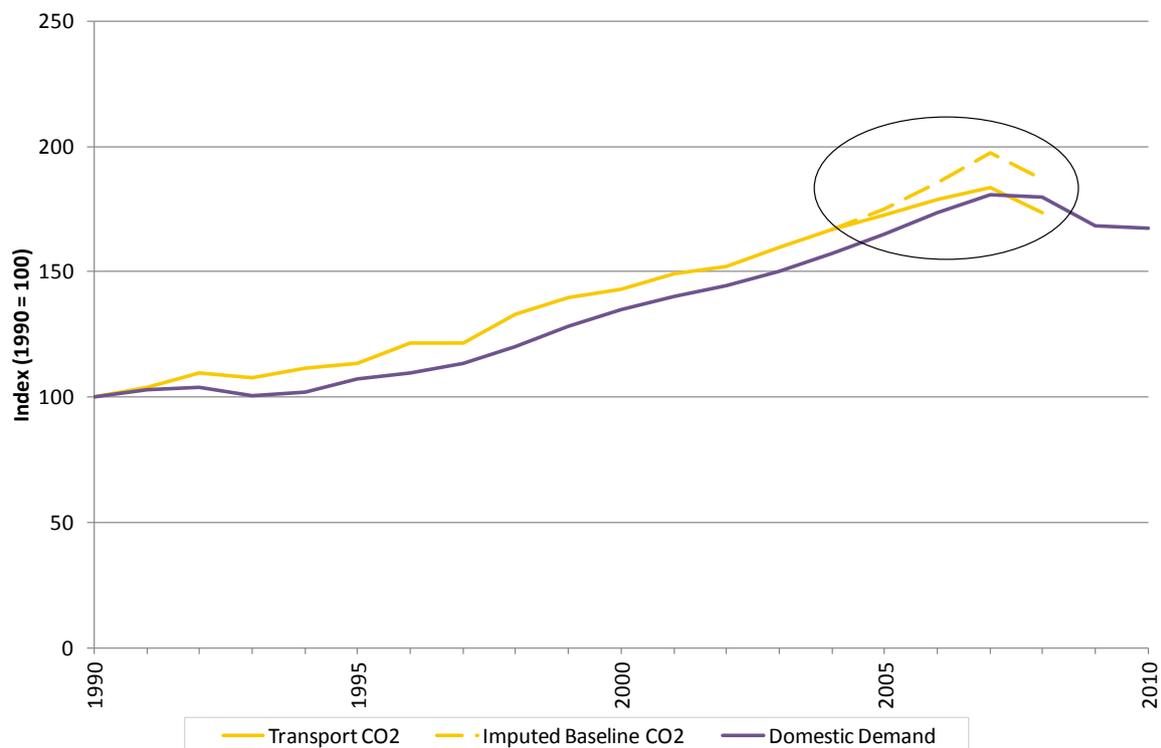
Mure II Database Ref.	Measure	Final energy saving ktoe (2007)	kt CO <sub>2</sub> avoided (2005 – 2007)	Semi-quantitative Impact
SPA14	Urban Mobility Plans	288	1,640	High

SPA15	Transport plan in enterprises and activity centres	141	835	High
SPA16	Greater share of collective transport used in road transport	34	172	High
SPA17	Increased use of rail transport	457	1,976	High
SPA18	Increased use of maritime transport	42	230	Medium
SPA19	Management of transport infrastructure	847	3,512	High
SPA20	Management of road transport fleet	126	829	High
SPA21	Management of aircraft fleets	49	99	Medium
SPA22	Efficient driving of private vehicles	210	1,144	High
SPA23	Efficient driving of lorries and buses	210	1,443	High
SPA24	Efficient driving of aircraft	40	83	Medium
SPA25	Updating of the road transport fleet	180	1,105	High
SPA26	Updating of the aircraft fleet	17	34	Medium
SPA27	Updating of the shipping fleet	12	58	Medium
SPA28	Updating of the stock of private vehicles	304	1,322	High
<b>Total</b>		<b>2,957</b>	<b>14,482</b>	

Source: Institute of Studies for the Integration of Systems. Mure II Database [cited 11 July 2013. Available from [http://www.muredatabase.org/summary1\\_tr.asp](http://www.muredatabase.org/summary1_tr.asp)

For around half of the measures, ISIS provide an estimate of the impacts by year across the three years of the plan. As one would expect, the impacts grow over the period, with around 10 % of the total reduction in CO<sub>2</sub> emissions occurring in year one, 30 % in year two and 60 % in year three. Applying these percentages to the total expected reduction of 14.5 mtCO<sub>2</sub> (and assuming that the reduction in 2008 is the same as in 2007) it is possible to construct a “counterfactual” baseline trajectory for CO<sub>2</sub> emissions (i.e. in the absence of the Action Plan).

The baseline emissions trajectory is shown as the dashed line in Figure 17, along with the actual trajectory and that of domestic demand. While the construction of the baseline relies on the assumption that the ex ante assessment of the impact on emissions is a good approximation of the actual (ex post) impact, comparison of the baseline emissions trajectory with domestic demand before and after 2005 suggests that this is plausible – i.e. there is minimal change in the relationship between the two periods.

**Figure 17** Estimated environmental impact of 2005-7 Action Plan

Source: International Transport Forum. 2011. Transport Explorer and authors' calculations

Therefore, to the extent that constructed baseline trajectory is valid, it would appear that while the 2005-7 Action Plan did have an impact on CO<sub>2</sub> emissions from transportation, but this was not sufficient to result in absolute decoupling.

## 8 Evaluation of policy mix: efficiency (economic sustainability)

*Is/was the policy mix considered cost-effective?*

*What has been the level of impact on resource use of the policy mix (the effect)?*

*What have been the costs of implementing the policy mix for target audience (e.g. business, households, etc.)?*

*What are the costs (financial, human) of implementing the policy mix for the implementing authority – i.e. the administrative/transaction costs?*

*Were sufficient resources made available to ensure an effective implementation of the policy-mix?*

*Was anything foreseen in the policy-mix to address competitiveness concerns (e.g. use of exemptions) or minimise transaction costs (e.g. thresholds below which monitoring wasn't required)?*

*Did the policy mix involve providing financial support (e.g. subsidies, low interest loans, tax breaks etc.) to key actors (e.g. sector, households, etc.)?*

*Did the measures generate revenues (e.g. in the case of taxes) and if so, was revenue recycled/re-injected into the economy, and to what levels and activities? Did revenue recycling have positive amplifying effects?*

*In synthesis - was the policy mix cost-effective?*

*What elements of the mix were (un)helpful in improving cost-effectiveness?*

*How was relative/absolute decoupling achieved?*

*Were resource limits or other thresholds taken into account and how were they addressed?*

**Table 5 Estimated cost of instruments**

Mure II database reference	Measure	Related investments (M€)	Public Support (M€)
SPA14	Urban Mobility Plans	807.3	52
SPA15	Transport plan in enterprises and activity centres	147.0	17
SPA16	Greater share of collective transport used in road transport	3.5	3.5
SPA17	Increased use of rail transport	6.6	6.6
SPA18	Increased use of maritime transport	1.8	1.8
SPA19	Management of transport infrastructure	3.4	3.4
SPA20	Management of road transport fleet	8.6	8.6
SPA21	Management of aircraft fleets	3.3	3.3
SPA22	Efficient driving of private vehicles	5.8	5.8
SPA23	Efficient driving of lorries and buses	2.7	2.7
SPA24	Efficient driving of aircraft	1.6	1.6
SPA25	Updating of the road transport fleet	11.2	11.2
SPA26	Updating of the aircraft fleet	0.3	0.3
SPA27	Updating of the shipping fleet	0.2	0.2
SPA28	Updating of the stock of private vehicles	9.8	9.8
<b>Total</b>		<b>1,013.1</b>	<b>127.8</b>

Source: Institute of Studies for the Integration of Systems. *Mure II Database* [cited 11 July 2013. Available from [http://www.muredatabase.org/summary1\\_tr.asp](http://www.muredatabase.org/summary1_tr.asp)]

The total cost of investments under the 2005-7 Action Plan has been estimated at around one billion euro, of which around 12 % was funded by public support. Based on the estimated reduction in emissions, this equates to 70 euro per tonne of CO<sub>2</sub> saved, although figure this takes no account of any continuing savings after 2007.

## 9 Evaluation of policy mix: welfare (social sustainability)

*What social impacts have you found associated with the policy mix? E.g. jobs created, reduced health impacts, distributional impacts etc.*

*Were social aspects included in an ex-ante impact assessment of the policy mix if one was undertaken? What were these?*

*Has monitoring of social impacts been included in implementation, to identify actual effects compared to anticipated ones?*

*Was the policy mix designed to not be socially regressive? What measures were undertaken to ensure this?*

*Were equity concerns addressed and, in case of re-structuring of the economy/sector, measures in the area of reskilling of the workforce foreseen?*

*What other public acceptability elements were addressed or considered?*

Not available.

## 10 Overall assessment

*What is your overall view on the success(es) or failure(s) of this policy mix?*

*How did the policy mix enable decoupling?*

*How could it have been improved to achieve its original objective(s) and to achieve absolute decoupling?*

The scope of this case study has been limited to the 2005-7 Action Plan measures focusing on transport, however, there are some methodological challenges associated with this approach. Both the availability of data, perhaps due to how recently the measures were implemented, and the ability to disentangle the impacts of the 2005-7 Action Plan from other policies effective in Spain prior to, during and since the 2005-7 Action Plan (of which some are mentioned in 3.2) are limited.

Nonetheless, the evaluation of the environmental impact of the 2005-7 Action Plan in the previous section suggests that it did result in a reduction in CO<sub>2</sub> emissions from the transportation sector, amounting to around 8.5-9.0 mtCO<sub>2</sub> in the final year. However, this was not sufficient to induce absolute decoupling. The reduction was achieved at a cost of around

70 euros per tonne of CO<sub>2</sub>, although this takes no account of any continuing reductions in CO<sub>2</sub> emissions after the end of the Action Plan.

There has not been any official ex-post evaluation of the 2005-7 Action Plan (IDEA 2012).<sup>8</sup> However, in July 2007 the IDAE and the Spanish Ministry of Industry, Tourism and Commerce published provisional results of the 2005-7 Action Plan in their joint report on the subsequent 2008-12 Action Plan. The following key messages and conclusions were highlighted:

- The co-management system between the IDAE and the 19 Autonomous Communities, which managed the 2005-7 Action Plan and its public funds (of €540.5 M), was considered to be “highly efficient” and successful.
- Value for money was claimed to be achieved by “acquiring high-efficiency equipment in bulk and introducing it to the market (for example: the replacement of traffic lights with LED, the bulk purchase of low-consumption bulbs, etc.)” (IDAE, Ministerio de Industria, Turismo y Comercio 2007)<sup>9</sup>
- the number of measures implemented has grown continuously: 8 in 2005, 22 in 2006 and 24 in 2007;
- The 2005-7 Action Plan’s training, education and information measures were championed as having “a very active future value”
- Indirect effects induced by the direct measures such as the market elimination of inefficient products and the rate of uptake of new technologies were estimated to be substantial, and as important as the 2005-7 Action Plan’s direct measures themselves.
- Regulatory instruments which aimed to create a more systemic, ‘structural’ change, such as the Technical Building Code, were highlighted as having strong impact.

## 11 Relevance to the EU and transferability

*Can the policy mix be applied at the EU level? Is it transferable to other Member States/countries?*

*What lessons are there that may be of general interest regarding policy mixes and what issues are there as regards transferability of the insights?*

Given that the majority of instruments in the 2005-7 Action Plan policy mix were information or education campaign measures, there is little challenge to the transferability of these instruments and their success in Spain to other EU member states. In the case of the Action Plan’s measures to increase the use of rail transport, the quality and extent of the existing rail infrastructure in the transfer country in question would be a key factor. With regard to financial measures to incentivise the updating of the road transport fleet and stock of private vehicles<sup>iv</sup>,

<sup>iv</sup> E.g. MURE II database measures SPA25 and SPA28 (Institute of Studies for the Integration of Systems, 2011)

vehicle registration and ownership taxes vary greatly across Europe, and in many cases are already complex. The transferability of financial incentives for renovating the road transport fleet and stock of private vehicles is therefore more strongly dependent on the transfer country in question and its existing vehicle taxation system (Kunert and Kuhfeld 2007).<sup>10</sup>

## 12 Stakeholder contribution

*What insights did stakeholders provide?*

Not available

## 13 References

- CE Delft, Infrac, and Fraunhofer ISI. 2011. "External Costs of Transport in Europe: Update Study for 2008". In *External Costs of Transport in Europe*: CE Delft.
- Institute of Studies for the Integration of Systems. "Mure II Database" [cited 11 July 2013]. Available from [http://www.muredatabase.org/summary1\\_tr.asp](http://www.muredatabase.org/summary1_tr.asp).
- IDAE, Ministerio de Industria, Turismo y Comercio. 2007. "Estrategia de ahorro y eficiencia energética. Plan de Acción 2008-2012". (PAE4+)
- IDAE. 2012. "Energy Efficiency Policies and Measures in Spain. Odyssee - Mure 2010. Monitoring of EU and national energy efficiency targets". Madrid.
- Instituto para la Diversificación y Ahorro de la Energía. 2011. "Energy Saving and Efficiency Action Plan 2011-2020". Gobierno de España.
- International Transport Forum. 2011. "Transport Explorer".
- Kunert, U. and Kuhfeld, H. 2007. „The diverse structures of passenger car taxation in Europe and the EU Commissions proposal for reform”, *Transport Policy*, Volume 14, Issue 4.
- Mendiluce, María, and Lee Schipper. 2011. "Trends in passenger transport and freight energy use in Spain." *Energy Policy* no. 39 (10):6466-6475. doi: <http://dx.doi.org/10.1016/j.enpol.2011.07.048>.
- Ministerio de Fomento. 2012. "Los transportes y las infraestructuras." <http://www.fomento.es/MFOM.CP.Web/handlers/pdfhandler.ashx?idpub=BTW002> (accessed 3 September 2013).
- OECD. 2006. "Decoupling the Environmental Impacts of Transport from Economic Growth". OECD Publishing.

- 
- <sup>1</sup> OECD. 2006. "Decoupling the Environmental Impacts of Transport from Economic Growth": OECD Publishing.
- <sup>2</sup> CE Delft, Infrac, and Fraunhofer ISI. 2011. "External Costs of Transport in Europe: Update Study for 2008. In External Costs of Transport in Europe": CE Delft.
- <sup>3</sup> Institute of Studies for the Integration of Systems. N.d. "Mure II Database" [cited 11 July 2013. Available from [http://www.muredatabase.org/summary1\\_tr.asp](http://www.muredatabase.org/summary1_tr.asp).
- <sup>4</sup> Instituto para la Diversificación y Ahorro de la Energía. 2011. "Energy Saving and Efficiency Action Plan 2011-2020". Gobierno de España.
- <sup>5</sup> Mendiluce, María, and Lee Schipper. 2011. "Trends in passenger transport and freight energy use in Spain." *Energy Policy* no. 39 (10):6466-6475. doi: <http://dx.doi.org/10.1016/j.enpol.2011.07.048>.
- <sup>6</sup> IDAE, Ministerio de Industria, Turismo y Comercio. 2007. "Estrategia de ahorro y eficiencia energética. Plan de Acción 2008-2012". (PAE4+)
- <sup>7</sup> IDAE, Ministerio de Industria, Turismo y Comercio. 2007. "Estrategia de ahorro y eficiencia energética. Plan de Acción 2008-2012". (PAE4+)
- <sup>8</sup> IDAE. 2012. "Energy Efficiency Policies and Measures in Spain. Odyssee - Mure 2010. Monitoring of EU and national energy efficiency targets". Madrid.
- <sup>9</sup> IDAE, Ministerio de Industria, Turismo y Comercio. 2007. "Estrategia de ahorro y eficiencia energética. Plan de Acción 2008-2012". (PAE4+) p. 2
- <sup>10</sup> Kunert, U. and Kuhfeld, H. 2007. „The diverse structures of passenger car taxation in Europe and the EU Commissions proposal for reform”, *Transport Policy*, Volume 14, Issue 4.