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Project ECO-JOBS

Study on job generation in the sector of collective transport within the scope of sustainable mobility
Executive Summary

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1. Introduction

This study is the result of the efforts of the Foundation "Conde del Valle de Salazar" of the Technical University of Madrid in cooperation with trade union Comisiones Obreras. The project was co-financed by the European Social Fund in the scope of the Operative Programme for Adaptability and Employment 2007-2013 and within the framework of Programme "Empleaverde" managed by the Biodiversity foundation as a mediating agent.

There is a growing social consensus regarding the problems and inconveniences of the current mobility model, not only in cities and urban developments where the system has obviously failed but also in terms of the global mobility programme at national level. However there is no agreement on the three fundamental questions of mobility: what is the nature and severity of impacts? i.e. what is the state of affairs of mobility in Spain? How many jobs does sustainable mobility create? What are the mobility alternatives based on economic criteria for the next decade? The mobility model is undoubtedly a significant topic in current socio-political debates.

The basic hypotheses for this study is the reorientation of transport policies towards eco-mobility, which will imply not only a "relief" for the environment, a significant reduction of oil imports, a possibility of creating mobility systems with lower unitary costs, but also the creation of thousands of sustainable jobs with future prospects.

Extensive research was carried out in order to substantiate these notions with a twofold purpose: the opportunity of creating many quality jobs, and on the other hand, calculating mobility in Spain. This twofold perspective allows the design of a new model that would supersede the classic mobility pattern in Spain based on the predominant use of private vehicles and the building of infrastructure. This report supports the shift towards sustainable, non-motorized ways of travelling like pedestrians, bicycles, individual or collective means of public transport, and those that optimize the use of vehicles as car-sharing and carpooling. All these initiatives must be supported and promoted by public actions that focus primarily on the management of transport demands.

The study arrives at the right time: a period of high unemployment levels (20% of working population in 2010) and when the issue of a new economic and environmental approach begins to be buried under an avalanche of proposals to return to traditional economics in an attempt disprove the evidence of last century's failures. New concepts and ideas are needed to face the new challenges of the 21st century and cope with the upcoming economic, environmental, social and labour policy demands and energy challenges in the years to come. A modern transport and mobility policy will not by itself address unemployment, however this study seeks to prove that new environmental, energy and social conditions would reactivate the labour market and make a significant contribution to solve many of the current problems, among them, the soaring number of jobless workers.

For the first time there is complete portrait of the current mobility model in Spain, a model characterized by the evolution of its modalities and their impact: polluting energy and emissions. Besides, the report includes a review of regulation, strategies and available plans for the promotion of sustainable mobility at European, national and regional levels. The second main goal is to determine the number of jobs associated to sustainable mobility.

Good practices are observed in cities like Freiburg (Germany), Barcelona and Vitoria-Gasteiz (Spain). These cases help define the possible impact of policies that support sustainable mobility.

2. The starting point

The Spanish mobility model is largely based upon the use of private motorized vehicles. Public policies helped consolidate this model by promoting a notion of transport as an economic development factor. This approach has developed side by side with economic policies based on the creation of infrastructures, public works and support to the automobile industry for its job potential, and its significance in the consolidation of secondary business networks (common in the Spanish economy).

Government support to this mobility model in the last decades was built upon cheap oil prices and on the assumption that consumption could be maintained indefinitely. Recent experience proves otherwise and that system created serious economic, social and environmental problems that emerge today with full power. Everyday it becomes clearer that those policies which turned cars into the prevailing mobility instrument bring more disadvantages than benefits.

The building of infrastructures often associated in Spain with extensive urban development projects has always been an object of interest, especially when it provided services to private vehicles. Since the admission of Spain in the EEC in 1986, European Cohesion Funds and national budgets provided a powerful financing flow for the development of an outstanding infrastructure network whose efficiency has been brought into question and whose environmental impact in undeniable. The Spanish highway network is the most important in Europe and is in some aspects superior to most US highway systems.

Spain has the biggest highway share *per capita* in Europe and in less than a year will operate the most extensive high speed railway on the continent. Airports are also an outstanding aspect of Spanish transport network: 20 Spanish airports are among the most important aeronautical facilities in Europe. Spain also has five of the most important ports in Europe. There has been an outstanding growth of underground metropolitan railways in Madrid, Barcelona, Valencia and Bilbao and in the last five years some Spanish cities opened new tramway lines. By 2020 Spain's tramway network will cover 20 cities, ten years ago there was only one.

However, commuter, suburban and regional railway lines that do not run on high speed railways did not receive such much support and funding. They did not reach an equivalent level of development even when those networks carry nearly one million passengers a day and provide transport services to 90% of citizens.

The recent economic crisis knocked down many myths of the Spanish economic model, among them the role of infrastructure *per se* as a driving force in economic development. In the upcoming years Spain will not have sufficient resources to finance relevant projects. Those resources were used in the past to fund the infrastructures mentioned above. We must note that sectors that traditionally were potential job sources for the Spanish production model are now unable to create structured and stable jobs, hence the increased interest in a study

that approaches the challenge of a more just, socially inclusive and sustainable mobility; a more economically viable and environmentally concerned mobility capable of creating jobs.

The shift towards sustainable mobility implies providing alternatives for a new model based on the detection and awareness of the negative impacts of the existing mobility pattern. Criteria for the new mobility culture examined in this study include:

- **Working to reduce global warming** associated with energy consumption since road and air transport are the main sources of greenhouse emissions in Spain.

- **Improving air quality in urban areas** and its effects on human health given the fact that urban motorized transport is the main emitter of NOx and micro-particles, among other hazardous compounds.

- **Avoiding energy waste**, low performance of explosion engines (15%) and low vehicle occupation (1 or 2 persons/vehicle) are significant causes of energy inefficiency. The most accurate description of energy waste by cars can be summarized as follows: to carry a person with an average weight 70kg we need a 1,000 kg vehicle that is only capable of using 1 out of every 7 litres of the fuel it needs for its own traction.

- **Minimizing oil products imports:** oil prices have soared significantly in the last years increasing external oil dependence which contributes to alter even more the balance of payments.

- **Reducing accident rates** associated with massive use of cars and motorcycles.

- **Reducing negative social impacts** associated to territorial planning based on excessive access to private motorized vehicle. This limits the options of certain groups of citizens to goods and services and restrains their participation in the labour market, which summarizes in restrictions to participation in social life.

- **Reducing traffic congestions in urban areas** where roads are increasingly overburdened with traffic. This causes a considerable increase of polluting emissions, energy consumption and time used for travelling which has a negative effect on private and family life.

3. How do Spanish citizens move?

According to the methodology used for this study the Spanish transport system had 415.25 billion passengers-km in 2008 in domestic transport for all the modalities (land, air and sea). This figure includes all transport users, residents and tourists. The study calculated the contribution to mobility for each of the 20 transport categories in Spain defined for this study.

The main categories or modalities are:

- Car (urban and intercity)
- Motorcycle (urban and intercity)
- Railway companies:
  - FEVE
  - Independent regional railways (FGC, FGV, Euskotren and SFM)
  - Spanish railways
    - Commuter trains
    - Medium distance and regional
    - Long distance
    - High speed
- Underground railway (operating in five cities in 2008: Madrid, Barcelona, Valencia, Bilbao and Palma de Mallorca)
- Tramway: operating in 7 cities in 2008: Bilbao, Valencia, Barcelona, Madrid, Tenerife, Sevilla and Vélez (Málaga)
- Bus (urban and intercity)
- *Car-Sharing*
- Taxies
- Pedestrians
- Bicycles
- Ships
- Airplanes

Except for ships, airplanes, and long distance and high speed Spanish Railways, which by their characteristics exceed regional transport operations, for the remaining 16 modalities data were disaggregated for the 17 Spanish regions and for the territories of Ceuta and Melilla.

Mobility was also classified in this report by its sustainability levels into two categories: sustainable transport, including pedestrians and bicycle users (the usually ignored modalities in mobility studies), public transport in all its modalities and car-sharing; the not sustainable category includes the rest of modalities. Criteria to include modalities in one category or the other were based on energy efficiency and consumption for each modality and their accident rates. The "not sustainable" category includes cars, motorcycles, sea and air transport. A good example of this is the fact that compared to railway transport, the energy consumption per airplanes and ships passengers was 7 times higher, cars consumed 6 times as much as railways. Motorcycles consumed between 3 and 4 times more than railways.

Compared to the mobility figures of 2003, 402.39 billion passengers-km, 2008 represented a slight 3.20% increase of global mobility which implies a small annual growth of 0.63%.

Not sustainable journeys represented 80.5% of total mobility in 2008 with a relative decrease compared to 2003 of 1%. The good news is that sustainable transport increased its share in domestic journeys in Spain during the period 2003-2008, 1% in relative terms and 8.7% in absolute terms. The bad news is that despite that progress, not sustainable transport is still the mainstream and represents around 80.5% of total mobility.

Regarding energy consumption domestic transport in 2008 consumed 802,605 TJ in Spain. These estimates are made on the assumption that non-motorized transport (pedestrian and

bicycle users do not consume external energy). Compared to the total energy consumption of mobility in 2003, estimated in 823,921 TJ, there is a 2.6% decrease of energy consumption for an annual average of 0.5%.

Sustainable transport only consumed 7.8% of total external energy consumed in mobility which leads to the conclusion that an average journey made by a not sustainable modality in Spain consumed 2.9 times more energy that a sustainable one. Although IDEA (Spanish Institute for Energy Efficiency and Diversification) reported a growth of energy consumption in the five-year period 2003-2008, the conclusions of this study show a decline of energy consumption, at least in the sector of passengers transport, so the global growth should be associated with the increase of freight and of international air traffic, a significant sector for a tourist destination like Spain.

TABLE 1.Mobility modalities in Spain, by groups and energy in 2003 and 2008

Mobility consumption	Cars	Motorcycles	Land public transport + Car-Sharing	Pedestrians	Bicycles	Ships	Airplanes
Unit: millions of travellers/km							
2003	302,755	4,948	63,128	10,893	602	1,281	18,784
%	*75.24%*	*1.23%*	*15.69%*	*2.71%*	*0.15%*	*0.32%*	*4.67%*
2008	303,328	5,162	68,712	11,770	658	1,600	24,021
%	*73.05%*	*1.24%*	*16.55%*	*2.83%*	*0.16%*	*0.39%*	*5.78%*
Relative variation	*-2.19%*	*0.01%*	*0.86%*	*0.13%*	*0.01%*	*0.07%*	*1.12%*
Absolute variation	0.19%	4.33%	8.85%	8.05%	9.26%	24.90 %	27.88%

Mobility consumption	Sustainable	NOT sustainable	Total
2003	**74,622**	**327,768**	**402,390**
%	*18.54%*	*81.46%*	*100.00%*
2008	**81,140**	**334,111**	**415,251**
%	*19.54%*	*80.46%*	*100.00%*
Relative variation	*1.00%*	*-1.00%*	*0.00%*
Absolute variation	8.73%	1.94%	3.20%

Source: Own research

TABLE 2. Transport energy consumption in Spain (2003 and 2008)

SUMMARY BY MODALITY

Unit: Terajoules	Cars	Motorcycles	Land Public transport + Car-Sharing	Pedestrians	Bicycles	Ships	Airplane
2003	696,678	7,381,43	60,050	0.00	0.00	3,459	56,352
%	*84,50%*	0,90%	*7,29%*	0.00%	0.00 %	*0.42 %*	*6.84%*
2008	660,123	7,624.14	62,294	0.00	0.00	4,104	68,460
%	*82.19%*	0.95%	*7.76%*	0.00%	0.00 %	*0.51 %*	*8.52%*
Relative variation	*-2.32%*	*0.05%*	*0.48%*	*0.00%*	*0.00 %*	*0.09 %*	*1.69%*
Absolute variation	-5.25%	*3.29%*	3.83%	-	-	18.66 %	21.49%

SUMMARY BY TYPE OF MOBILITY

Unit: Terajoules	Sustainable	NOT sustainable	Total
2003	60,575	763,870	**823,921**
%	*7.35%*	*92.65%*	*100.00%*
2008	62,896	740,311	**802,605**
%	*7.83%*	*92.17%*	*100.00%*
Relative variation	*0.48%*	*-0.48%*	*0.00%*
Absolute variation	3.83%	-3.08%	-2.58%

SUMMARY BY ENERGY CLASSIFICATION

Unit: Terajoules	Low or no energy consumption	Medium energy consumption	High energy consumption	Total
2003	11,250	40,464	772,207	**823,921**
%	*1.37%*	*4.91%*	*93.72%*	*100.00%*
2008	12,422	41,234	749,110	**802,605**
%	*1.53%*	*5.14%*	*93.33%*	*100.00%*
Relative variation	*0.16%*	*-0.23%*	*-0.39%*	*0.00%*
Absolute variation	8.98%	1.90%	-2.59%	-2.58%

Source: Own research

4. Lack of accurate statistics

It is important to point out that the unavailability of mobility statistics in Spain raises serious concerns. That is why this report drew detailed estimates for 2003 and 2008 for twenty different modalities of transport in Spain. This represents a research effort of considerable value.

Except for the sea and air transport and for railway operation beyond regional boundaries, mobility was calculated for each region of the country. This implied a considerable effort in terms of reckoning and formulation given the fact that with the exception of Catalonia, Spanish statistics do not include data on generated mobility. Spanish statistics are mainly

focused on the automobile industry and on infrastructures but not on data required to calculate mobility, and those data prove essential to design a mobility management policy.

The improvement of statistical information is a basic step to approach the shift to sustainable mobility in a comprehensive way. The current system does not include the necessary information for the purpose of this study and compensating for such lack of information required a painstaking examination and great efforts.

Basic statistics on jobs (EPA) are built upon industrial criteria that have become obsolete and do not meet the requirements to quantify jobs in the sector of green transport. Cases like the association of jobs in motorcycle and bicycle manufacture in one category simply because they are two-wheel vehicles, the quantification of railway transport jobs into one single group without specific subcategories like freight and passengers, or the exclusion of indirect transport jobs misclassified as safety, cleaning or hospitality jobs are clear examples of such wrong practices.

Spain must reorient its transport and mobility statistics from the existing databases focused on providing information on infrastructure towards a new approach that provide information on the use of that infrastructure and the generation of mobility quantified in transport measuring units: passenger-km

5. Mobility scenarios for 2020

The study assessed the total mobility generated in Spain in domestic journeys for the year 2020 in two different scenarios: a trend scenario in which the basic conditions are not altered and in which mobility develops along the same guidelines and similar circumstances as in the last two years (2008-2010); and an energy efficiency scenario in which authorities shift to a new model and implement public policies to favour sustainable mobility. Those policies include fiscal measures, funding of eco-mobility, information and territorial management. They will be measures to promote sustainable mobility and persuade users to abandon not sustainable use of transport (socially, environmentally and economically unviable practices which are currently the mainstream in our mobility model). Such policies already implemented in three metropolitan areas are presented in this study as examples of good practices.

In order to calculate the amount and distribution of mobility in the two scenarios for 20 categories of transport the study assessed mobility changes between 2008 and 2010 and from that year on data were extrapolated according to the conditions in each scenario. For each transport mode we have developed an assumption of the evolution and a discussion on viability. If we examine the mobility groups by their energy consumption they remain practically unchanged; the most significant reduction is of 4.3% of high energy consumption transport due to reduced car and air transport use.

At this point we must calculate mobility and associated energy consumption values in both scenarios. For the trend scenario, mobility in Spain for 2020 would reach 433.9 billion passengers-km, an increase of the reference value of 8.8% in ten years with an average annual growth of 0.9%. Regarding the 2 transport categories (sustainable and not sustainable) a 1.2 % diversion to sustainable mobility is observed in terms of share by mode, although not sustainable transport would increase by 7% and sustainable transport by 15%. In energy classification there is an obvious shift from less efficient modes to the most efficient ones,

although the latter increase their share by just 1.5%.

Regarding energy consumption the 2020 estimate for the trend scenario is 828,574 TJ, similar level to that of 2003. However, we must point out that all these assumptions have been made on the basis of constant population and energy consumption in each mode (2010 values) without considering technological changes in vehicles. Although a considerable improvement is expected in terms of unitary energy consumption due to the rise of fuel prices and increased public awareness of climate change, such considerations have not been included given the high level of uncertainty that implies their assessment.

TABLE 3. Mobility in Spain for 20 modalities by groups and energy category in 2020 based upon trend scenario

Mobility consumption. Summary by types *passengers-km*	Cars	Motorcycles	Land public transport + Car-Sharing	Pedestrians
1) Trend projection 2020	306.509	5.638	76.719	13.262
%	*70.63%*	*1.30%*	*17.68%*	*3.06%*
Rate of variation by modality	*-2.48%*	*-0.01%*	*1.10%*	*0.05%*
Decennial rate of variation 2010-2020	*5.11%*	*8.15%*	*16.01%*	*10.46%*
Annual rate of variation	*0.50%*	*0.79%*	*1.50%*	*1.00%*

	Bicycles	Ships	Airplanes	**Total**
1) Trend projection 2020	1,178	1,600	29,054	**433,960**
%	*0.27%*	*0.37%*	*6.70%*	***100.00%***
Rate of variation by modality	*0.09%*	*-0.02%*	*1.27%*	***0.00%***
Decennial rate of variation 2010-2020	*62.89%*	*3.09%*	*34.39%*	***8.81%***
Annual rate of variation	*5.00%*	*0.31%*	*3.00%*	***0.85%***

Mobility consumption by type of mobility *passengers-km*	**Sustainable**	**NOT sustainable**	**Total**
1) Trend projection 2020	91,159	342,802	**433,960**
%	*21.01%*	*78.99%*	***100.00%***
Rate of variationby modality	*1.23%*	*-1.23%*	***0.00%***
Decennial rate of variation 2010-2020	*15.60%*	*7.13%*	***8.81%***
Annual rate of variation	*1.46%*	*0.69%*	***0.85%***

Mobility consumption by energy classification	**Low or no energy consumption**	**Medium energy consumption**	**High energy consumption**
1) Trend projection 2020	54,164	34,820	344,976
%	*12.48%*	*8.02%*	*79.49%*
Rate of variation by modality	*1.52%*	*-0.29%*	*-1.23%*
Decennial rate of variation 2010-2020	*23.89%*	*4.97%*	*7.15%*
Annual rate of variation	*2.17%*	*0.49%*	*0.69%*

Source: Own research

TABLE 4. Transport energy consumption in Spain in 2020. Based upon trend scenario

Energy consumption. Summary by type of mobility. *Terajoules*	**Sustainable**	**NOT sustainable**	**Total**
1) 2020 Trend projection	66,104	762,470	**828,574**
%	*7.98%*	*92.02%*	***100.00%***

Energy consumption. Summary by energy classification*. Terajoules*	**Low or no energy consumption**	**Medium energy consumption**	**High energy consumption**	**Total**
1) 2020 Trend projection	15,635	41,793	771,145	**828,574**
%	*1.89%*	*5.04%*	*93.07%*	***100.00%***

Source: Own research

There are substantial changes in the energy efficiency scenario. Mobility does not only declines compared to the trend scenario, but there is also an overwhelming shift to sustainable modes and subsequently a reduction of energy consumption.

According to the second scenario mobility in Spain would be of 403,8 billion passengers-km, only a 1.25% increase compared to 2010 but with important changes in the patterns, sustainable transport grows up to 30.9% (+11%) and low or none energy consumption transport rises to 20% (+9%), while not sustainable transport drops up to 69.1% (-11%) and high energy consumption declines to 69.8% (-11%).

TABLE 5. Mobility in Spain in 2020 for 20 modalities by groups and energy categories based upon the energy efficiency scenario

Mobility consumption by modality *Millions of passengers/Km*	Cars	Motorcycles	Land public transport + Car-Sharing	Pedestrians
1) Efficiency projection2020	252,832	5,213	103,384	17,771
%	*62.61%*	*1.29%*	*25.35%*	*4.40%*
Rate of variation by modality	*-10.50%*	*-0.02%*	*8.77%*	*1.39%*
Decennial rate of variation 2010-2020	*-13.29%*	*0.00%*	*54.82%*	*48.02%*
Annual rate of variation	*-1.91%*	*-0.78%*	*2.93%*	*2.97%*

	Bicycles	Ships	Airplanes	**Total**
1) Efficiency projection 2020	4,4789	1,600	19,552	**403,831**
%	*1.11%*	*0.40%*	*4.85%*	***100.00%***
Rate of variation by modality	*0.93%*	*0.01%*	*-0.57%*	***0.00%***
Decennial rate of variation 2010-2020	*519.17%*	*3.09%*	*-9.56%*	***1.25%***
Annual rate of variation	*14.29%*	*0.00%*	*-3.88%*	***-0.72%***

Mobility consumption by type of mobility *Millions of passengers/Km*	**Sustainable**	**NOT sustainable**
1) Efficiency projection 2020	124,634	279,197
%	*30.86%*	*69.14%*
Share of variation by modality	*11.09%*	*-11.09%*
Decennial rate of variation 2010-2020	*58.055%*	*-12.75%*
Annual rate of variation	*3.18%*	*-2.03%*

Mobility consumption Summary by energy classification	**Low or no energy consumption**	**Medium energy consumption**	**High energy consumption**
1) Efficiency projection 2020	80,789	41,671	281,371
%	*20.01%*	*10.34%*	*69.83%*
Rate of variation by modality	*9.04%*	*2.00%*	*-11.05%*
Decennial rate of variation 2010-2020	*84.79%*	*25.62%*	*-12.60%*
Annual rate of variation	*4.08%*	*1.81%*	*-2.02%*

Source: own research

TABLE 6. Transport energy consumption in Spain in 2020 by the energy efficiency scenario

Energy consumption Summary by modalities *Terajoules (TJ)*	Car	Motorcycle	Land Public transport + Car-Sharing	Pedestrians
2) 2020 Efficiency projection	550,866	7,700	82,019	0
%	*78.65%*	*1.10%*	*11.71%*	*0.00%*

	Bicycle	Ship	Airplane	**Total**
2) 2020 Efficiency projection	0	4,104	55,722	**700,411**
%	*0.00%*	*0.59%*	*7.96%*	***100.00%***

Energy consumption. Summary by type of mobility. *Terajoules (TJ)*	**Sustainable**	**NOT sustainable**	**Total**
2) 2020 Efficiency projection	**82,019**	**618,393**	**700,411**
%	***11.71%***	***88.29%***	*100.00%*

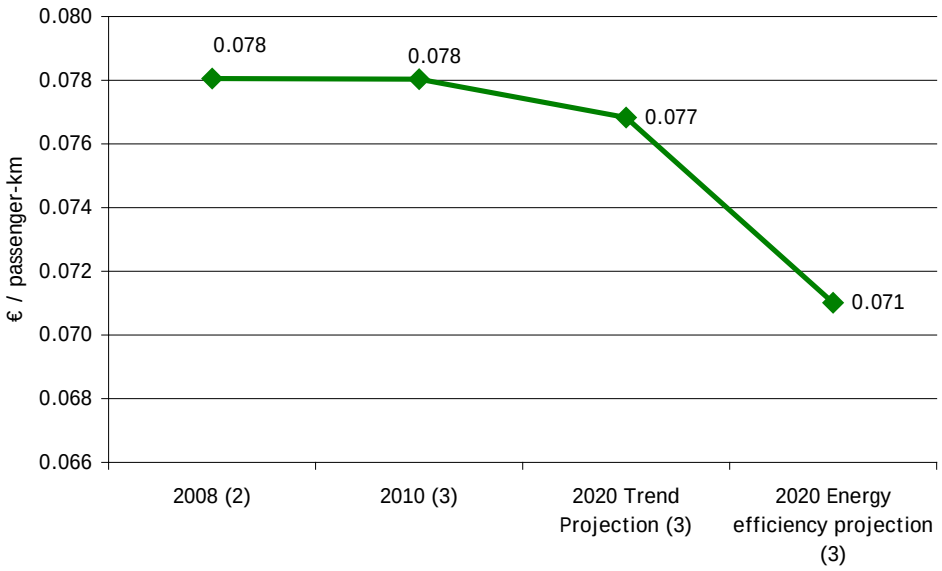
Energy consumption. Summary by energy classificaction *Terajoules (TJ)*	**Low or no energy consumption**	**Medium energy consumption**	**High energy consumption**	**Total**
2) 2020 Efficiency projection	**23,294**	**50,049**	**627,068**	**700,411**
%	*3.33%*	*7.15%*	*89.53%*	*100.00%*

Source: Own research

Energy consumption in the energy efficiency scenario for 2020 would reach 700,411 TJ, which represents 15% less than in the trend scenario, without considering future technological improvements that will affect performance and consumption. It is important to note the strategic significance that represents a substantial reduction of energy consumption as expected in this scenario, energy saving has a direct effect on oil imports. Savings in oil imports must be understood as a way of building a stronger economy.

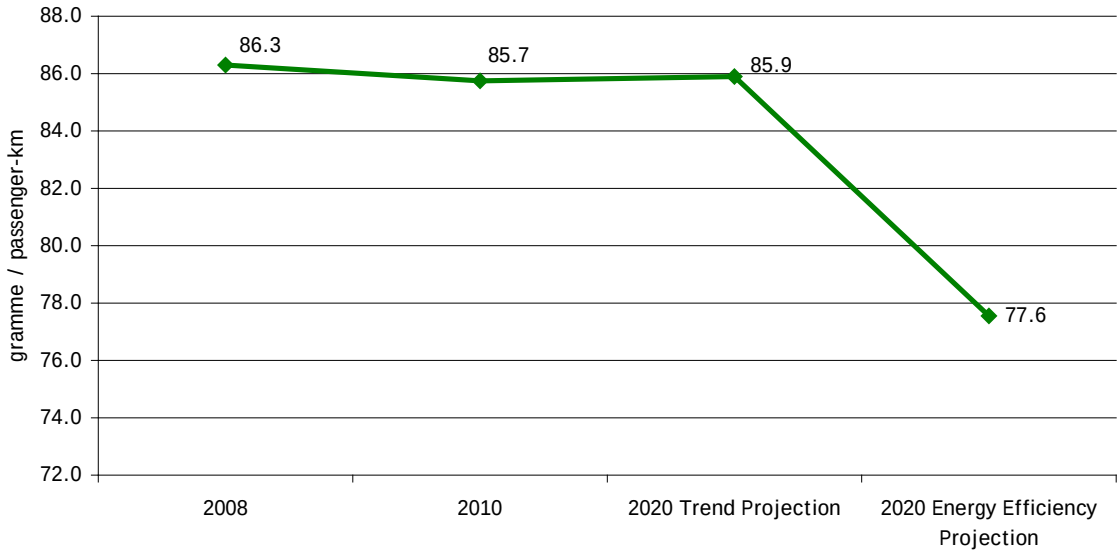
Environmental comparison between both scenarios, externalities drop by 14% in the energy efficiency scenario, CO_2 emissions fall by 16%, NO_X emissions by 12% and PM-10 particles by 4%.

Graphic 1. Evolution of transport externalities in Spain



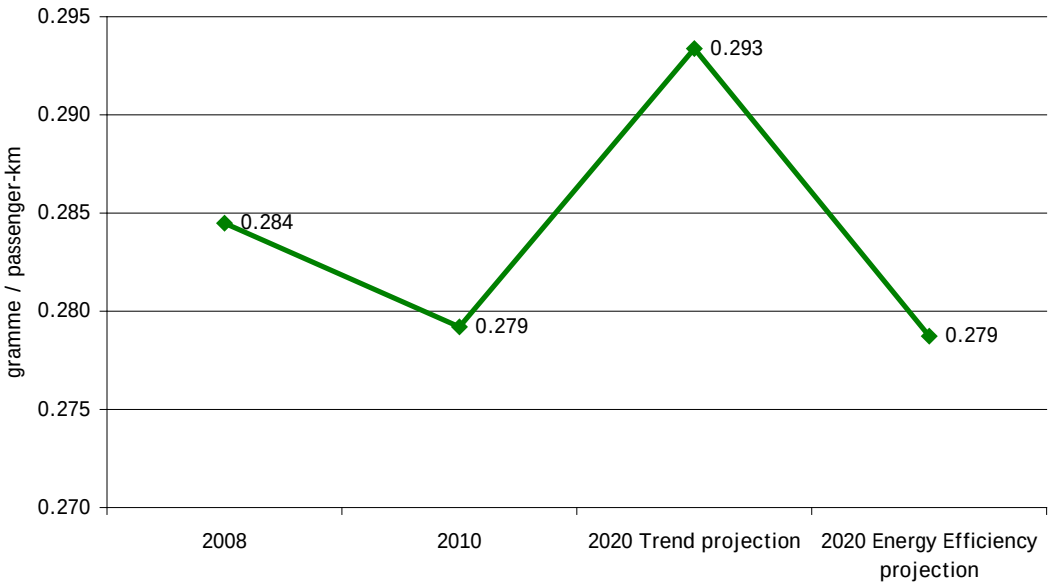
Source: own research.

Graphic 2. Evolution of transport CO2 unitary emissions in Spain



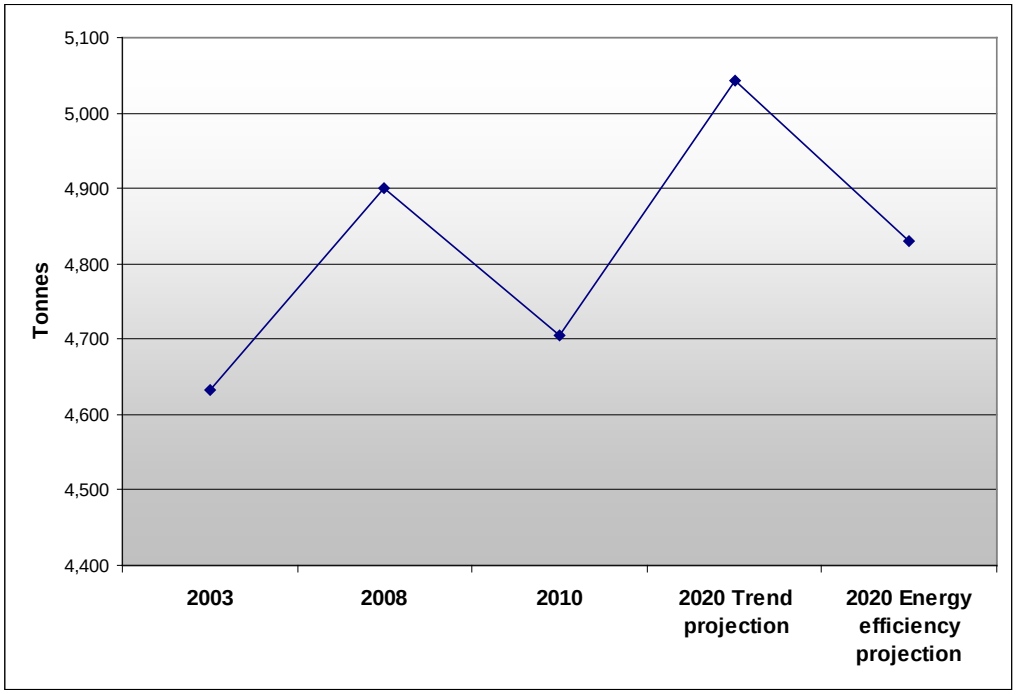
Source: Own research

Graphic 3: Evolution of transport NOx unitary emissions in Spain



Source: Own research

Graphic 4. Evolution of transport PM_{10} particle emissions in Spain



Source: Own research

6. Sustainable transport becomes a major job source

Job estimates for the sector of sustainable transport which covered primarily public transport jobs, including taxies and car rentals, reached the 261,465 jobs in 2008, exceeding by 5% the figures of 2003 (248,782 jobs).

A second approach introduced some methodological improvements that took into account indirect jobs. It also included jobs in the bus manufacturing industry, car-sharing, bicycle (manufacture, marketing, public and private services), jobs of civil servants required for the regulation of mobility. Indirect jobs in the public transport sector cover areas like security, cleaning services, hospitality, ticket sales, etc. have a special importance for the sector, and are usually subcontracted activities. After adjusting the figures to the new methodology the number of jobs in the sector of sustainable transport in Spain rose to 297,109 in 2008, a 14% increase over the initial figures obtained through traditional methodology.

TABLE 7. Data on eco-mobility jobs in 2008 by categories

	2008
Railway	46,600
Underground (Subway)	13,584
Tramway	967
Buses*	115,575
Taxies	72,428
Sustainable cars**	14,509
Bicycles	11,478
Regulated parking	6,053
Mobility management	693
Total	**281,877**

Buses*: Data show jobs in urban bus fleet, intercity bus services and jobs in bus manufacturing industry.
Sustainable cars**: including C*ar-Sharing* and rented cars.
Own research based on multiple sources: EPA, Spanish Railways records (RENFE), Yearbook of the Ministry of Public Works, ATUC, records of different companies in the sector provide by their workers. See further details on methodology in the next chapter.

2008 figures were the basis to calculate jobs in the sector of sustainable transport for each scenario. A unitary parameter, excluding car rentals, (passenger-km) was obtained to measure jobs from extended employment and mobility figures in 2008. Job estimates for 2020 were calculated adding up indirect and direct jobs on the basis of 2008 factors. Total jobs in the reference scenario in 2020 would be 307,114, a slight increase of 3% compared to 2008. Job estimates for the energy efficiency scenario are of 429,370 jobs, an outstanding 45% increase compared to the conditions in 2008.

The energy efficiency scenario not only maintains 2008 global mobility values in Spain, it also manages to reduce energy consumption in the transport sector by 13% and increases jobs by 45% in the subsector of sustainable mobility.

TABLE 8. Data on eco-mobility for 2020 trend scenario

	Jobs
Railway	58,151
Undergroung(Subway)	15,565
Tramway	2,759
Buses	116,937
Taxies	67,997
Sustainable cars	14,612
Bicycle	20,562
Regulated parking	6,116
Mobility management	779
Total direct jobs	**303,478**
Total direct + indirect jobs	**321,614**

Source: Own research

TABLE 9. Data on eco-mobility for 2020 energy efficiency scenario

	Jobs
Railway	91,948
Undergroung(Subway)	15,565
Tramway	4,302
Buses	139,259
Taxies	67,997
Sustainable cars	15,021
Bicycle	78,180
Regulated parking	5,045
Mobility management	1,057
Total direct jobs	**418,374**
Total direct + indirect jobs	**443,870**

Source: Own research

7. Emergence of green or sustainable transport (ECO-MOBILITY)

The conclusions of this study confirm the emergence of a sustainable transport sector (eco-mobility) that is a significant source of jobs. Those jobs prove to have more quality and cannot be relocated. If the energy efficiency scenario is accurately implemented there will be a shift towards sustainable mobility which means more jobs, less energy consumption, less polluting emissions, and lower internal and external mobility costs. All these factors should be strong arguments in favour of a change of the mobility model in Spain that will eventually improve citizens' wellbeing and increase employment possibilities for those who do not own private vehicles, approximately 50% of the population over 18. It also render effective the principle of universal accessibility.

Achieving this scenario implies a change in mobility policies and transport. The current central and regional approach on mobility must shift from providing transport infrastructure to a new policy focused on mobility management.

8. Outstanding public policies that must be promoted to support those goals

The list of public policies that must be developed to reach the energy efficiency scenario is extensive, however, some of the most significant measures include:

- **Promoting an urban planning favourable to sustainable mobility:** an urban design that favours non-motorized vehicles should be a priority for cities, as well as the blend of urban uses, the implementation of policies to bring services closer and not to locate them farther away from citizens in new urban projects. City councils should also work to promote a responsible use of cars. The approach of Vitoria-Gasteiz which has developed its own mobility programme is a good example for many Spanish cities.
- **Fiscal measures to promote eco-mobility:** public transport, bicycles, car pooling and car-sharing should enjoy tax deductions through adequate procedures to avoid fraud (as it happens in Belgium). The purchase of electric cars and bicycles, and other low consumption and low emission vehicles should be subsidized given their higher efficiency.
- **Changing the public transport fares system:** fare systems in urban and metropolitan networks should develop into full access, all-seasons travelling cards (monthly, quarterly or annual) to achieve a 70-80% use rates. The same cards should also be available for commuter rails, regional and high speed railway transport as in France, the UK or Germany. A plan must be developed to restore railways to passengers with lower income levels that now choose air transport, a heavily subsidized sector which does not pay VAT and fuel taxes.
- **Electrification of urban public transport networks:** by developing new tramway lines or shifting to hybrid buses.
- **Changing the investment priorities of intercity transport:** With the exception of specific projects to improve highway safety, the building of high capacity highways should be discontinued in Spain. Our country already has the better highway share *per capita* and the remaining funds could be better used in the development of commuter and regional railways, bus lanes and high occupancy lanes to improve access to cities. Each regional government, if necessary with the support of the central government, should implement programmes to improve regional transport that include all sustainable modalities.
- **Management and decongestion of urban traffic as a priority goal in cities:** measures to decongest traffic and not building underground tunnels, shortcuts or increasing of road capacity to favour the use of cars. Decongestion will encourage sustainable modalities like bicycles and pedestrians.
- **Taxing of air transport fuel:** Taxing of air fuel to reach the same level of taxation as conventional transport in a 5-year period.
- **Designing a national policy to take up transport externalities:** Spain must design a policy to cover transport externalities in all modes. The development of eurovignettes

as a form of taxing vehicles is an example of good measure to be implemented.

- **Changes in the institutional approach on mobility management:** a clear step into change would be the transformation of the Ministry of Public Works into Ministry of Mobility, Transport and Energy.
- **Implementing a regulatory framework for mobility:** adoption of a mobility law to establish, among other aspects, a new regulation for the funding of public transport. The expected growth of public transport under the energy efficiency scenario cannot be achieved without a new financial framework to support it.

9. Further research based on this study

If further research is to seek new ways for mobility in Spain, it should be taken into account the need to create new databases with statistical information on mobility that allow frequent consultation and interaction, in agreement with the facts described above. Research should also seek to define specific public policies to implement the energy efficiency scenario described in this study.

We expect that the efforts made to complete this report will contribute to raise awareness and promote the design of management policies that favour a better stance on green transport in Spain, and open a new job alternative to reduce high unemployment rates through a commitment to sustainable transport.