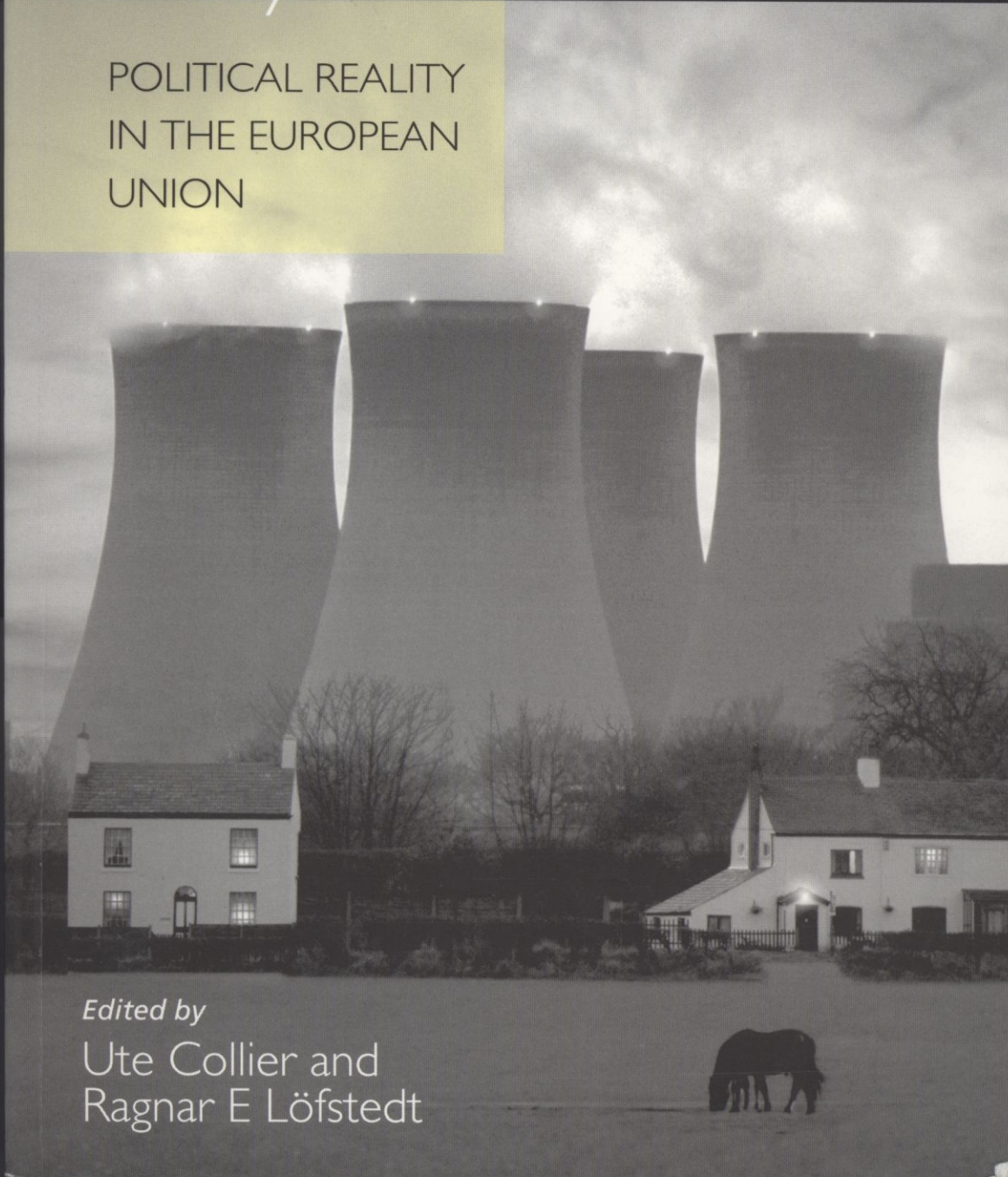


Cases in Climate Change Policy

POLITICAL REALITY
IN THE EUROPEAN
UNION



Edited by

Ute Collier and
Ragnar E Löfstedt

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Chapter 9 | SPAIN: FAST GROWTH IN CO₂ EMISSIONS

Xavier Labandeira Villot¹

INTRODUCTION

The possibility of human-induced climate change processes has caused considerable public concern in Spain during the past few years. Persistent climate extremes, with large areas in southern Spain suffering drought and heat waves, actions by the environmental movement and increasing media attention have raised the issue to a pre-eminent position. In fact, Spain may suffer more from climate change than any other EU Member State. Climate scenarios for Spain indicate that a doubling of CO₂ concentrations in the atmosphere may lead to large increases in temperature (of around 2.5°C in the annual average), generalized decreases in rain and soil humidity and greater variability between and within years. These phenomena will be felt particularly in central and southern Spain. Other worrying effects include an increase in the frequency of severe storms in the Mediterranean and a general sea level rise that would affect the Spanish coastline and its multiple islands. Also, three of the most current pressing environmental problems, desert advance, soil erosion and water scarcity, are likely to worsen due to global warming.

The former Spanish government reacted to domestic pressures and the process of international commitment by stating that climate change constituted one of its main concerns and the most serious challenge for its environmental performance. Nevertheless, there is no real climate change policy at the moment in Spain, although a climate change strategy is being developed. It is true that there are public policies in place that may have effects on climate change processes, but they have been designed with other objectives in mind.

At the time of writing (June 1996), the new government has been in

¹ The author gratefully acknowledges the assistance of all those officials who gave their time and insight during the interviews carried out for this study.

office for just a few weeks, so it is not yet possible to offer an assessment of its actions or projects. However, an analysis of its manifesto (Partido Popular, 1996) indicates that there will be few variations from the strategies and objectives pursued so far on these issues, the most significant change being the creation of a separate Ministry for the Environment.

In this chapter an attempt is made to provide an analysis of the opportunities and constraints for the introduction and development of effective climate change policies in Spain. A description of the current level and sources of greenhouse gas emissions, focusing on CO₂, is followed by a presentation of current public policies that are relevant for climate change. Finally, comment is made on the possibilities for action in the future based on the analysis and comments from different public sector departments and individuals.

SPANISH GREENHOUSE GAS EMISSIONS

Spain is the EU's fifth largest CO₂ emitter, and hence one of the Member States particularly important for emission reductions. A serious and comprehensive assessment of Spanish greenhouse gas emissions has been carried out only relatively recently. The 1990 inventory of emissions using CORINE-AIR methodology was the first attempt and the most up-to-date figures, from 1993, are shown in Table 9.1.

Table 9.1. 1993 Inventory of Spanish CO₂ Emissions

Emitting sector	Emissions (ktonnes)	Emissions (%)
Electricity generation	65,790	24.4
Nonindustrial combustion plants	29,481	10.9
Industrial combustion processes and plants	64,432	23.9
Industrial processes without combustion – total	15,611	5.8
Cement	11,105	4.1
Transport – total	63,480	23.5
Road transport	50,206	18.6
Urban car use	13,878	5.1
Buses and lorries	13,444	5.0
Others	31,198	11.5
Total	269,992	100.0

Source: MOPTMA, 1994

Table 9.1 indicates that Spanish CO₂ emissions largely come from a few activities and economic sectors. Electricity generation alone accounts for one quarter of all emissions, roughly the same amount as transport. Another 20 per cent is emitted both by the industrial sector and by residential and

industrial combustion plants. In short, more than two thirds of Spanish CO₂ emissions come from energy related processes.

As far as CH₄ emissions are concerned, decreasing coal production will reduce some of the emissions related to coal mining (20.6 per cent of the total). Most of the remainder is related to waste disposal sites (19.3 per cent), cattle farming (26.4 per cent) and forests (21.4 per cent). Economic development will encourage waste production with a probable increase of emissions from waste disposal sites. Agriculture and forestry are also the largest culprits of N₂O emissions. In these areas, the possibilities for N₂O and CH₄ abatement seem to be limited. Finally, there is a clear trend towards increasing emissions of the precursors of tropospheric ozone (O₃), another greenhouse gas, as a result of transport expansion.

Figure 9.1 shows the evolution of Spanish energy related CO₂ emissions during recent decades. According to OECD data there has been a clear growth in emissions, with an increase in the absolute and relative weight emissions of the transport sector and a simultaneous decrease of emissions from industrial activities. The rise in CO₂ emissions was especially significant between 1988 and 1992 due to the extensive growth in the Spanish economy. However, CO₂ emissions decreased in 1993 for the first time since the early 1980s due to the harsh recession (Figure 9.2).

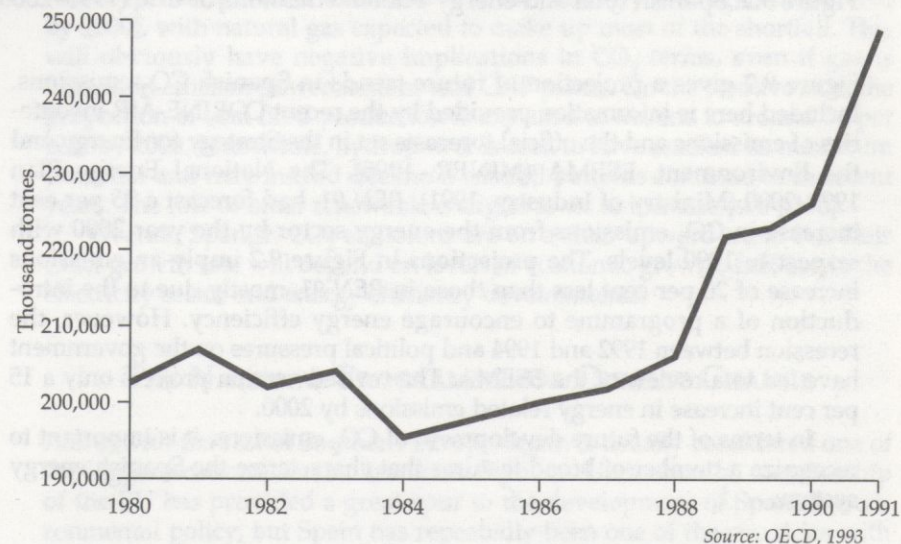


Figure 9.1: Energy-related Spanish emissions of CO₂ (1980–1992)

In terms of per capita emissions, Spain, with 5.69 t CO₂ per capita, lies well below the EU average of 8.46 t. This low figure is the result of two factors – a warm climate and a low level of economic development. However, the gap between Spain and the EU average is decreasing. In fact, the EU as a whole seems to have been stabilizing per capita emissions since the 1970s, while Spain has observed a continuous and strong increase during the past 30 years.

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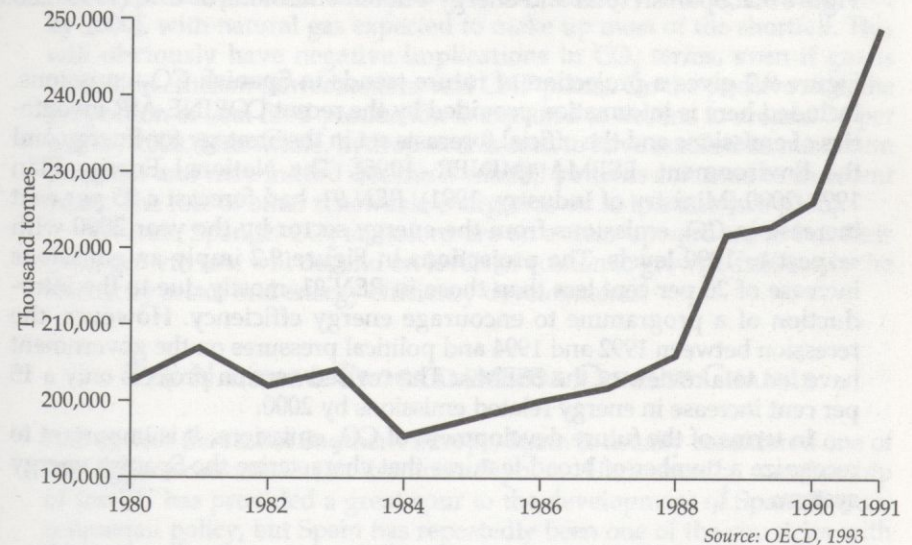
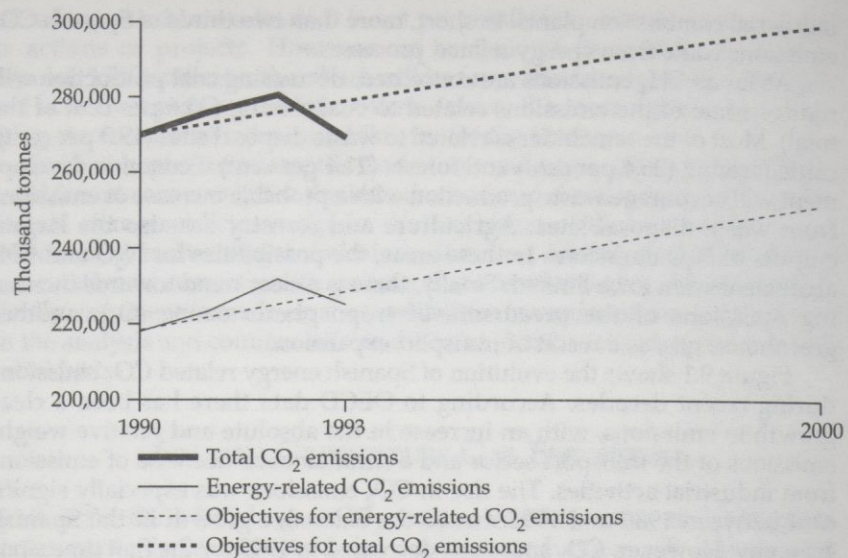


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Source: MOPTMA, 1994; MINER, 1995

Figure 9.2: Spanish total and energy-related emissions of CO₂ (1990-2000)

Figure 9.2 gives a projection of future trends in Spanish CO₂ emissions. Included here is information provided by the recent CORINE-AIR inventories of emissions and the official forecasts set in the Strategy for Energy and the Environment, ESEMA (MINER, 1995). The National Energy Plan 1991-2000 (Ministry of Industry, 1991), *PEN 91*, had forecast a 25 per cent increase in CO₂ emissions from the energy sector by the year 2000 with respect to 1990 levels. The projections in Figure 9.2 imply an emissions increase of 20 per cent less than those in *PEN 91*, mostly due to the introduction of a programme to encourage energy efficiency. However, the recession between 1992 and 1994 and political pressures on the government have led to a review of the ESEMA. The revised version projects only a 15 per cent increase in energy related emissions by 2000.

In terms of the future development of CO₂ emissions, it is important to recognize a number of broad features that characterize the Spanish energy system:

- There is less effort put into energy efficiency measures than in most EU countries, with unfavourable energy intensity ratios (final energy/GDP).
- Spanish fossil fuels have poorer environmental and energy qualities than those imported.
- There is high dependence on fossil fuels for electricity generation, with decreasing hydro generation due to severe drought, and stabilization of nuclear generation after the 1984 moratorium.

- Natural gas is in the process of attaining a substantial position within the Spanish energy system.
- There seems to be little use of price policies to achieve energy consumption reductions, owing to the rigidity of the market.

The evolution of Spanish consumption of primary and final energies is clearly related to economic performance and thus shows a remarkable rise in the late 1970s and late 1980s and the opposite in the early 1980s and since 1992. There is an increasing gap between primary and final energy consumption, a symptom of the inefficiencies of the Spanish energy sector. The values of two indicators of energy efficiency, the relationship between primary and final energy and the consumption of energy per unit of GDP, show the possibilities for efficiency improvements in Spain. These have followed a path of negative evolution since the early 1990s and do not perform well in comparison to the European averages.

Electricity generation in 1994 was dominated by coal (39 per cent) and nuclear power (34.4 per cent), with hydropower supplying another 17.5 per cent (IEA, 1996). Since the oil price shocks of the 1970s, Spain has embarked on a large oil substitution programme in electricity generation, focusing on coal and nuclear power. However, because of the nuclear moratorium the role of nuclear power is to decline over the coming years (eg to 23 per cent by 2000), with natural gas expected to make up most of the shortfall. This will obviously have negative implications in CO₂ terms, even if gas is burned in efficient power stations and CHP plants. On the positive side, the proportion of coal fired production is expected to decline to around 34 per cent by 2000. Meanwhile, hydropower is seen to have reached its maximum potential and may indeed decline if rainfall patterns continue as in recent years. The role of other renewable energies is set to increase (see p156).

Overall, Spanish CO₂ emissions are on a clear upward trend but their exact growth rate will depend on levels of economic growth, fuel use in the electricity sector and energy efficiency developments.

THE NATIONAL PROGRAMME FOR CLIMATE CHANGE

Along with the rest of Southern Europe, Spain is usually considered one of the laggard countries in environmental policy. Undoubtedly, membership of the EU has provided a great spur to the development of Spanish environmental policy, but Spain has repeatedly been one of the countries with the worst implementation record for EU environmental directives (Aquilar, 1993). To some extent this is excusable. Spain, as a relative latecomer to the EU with its accession in 1986, has had to take on board a large body of EU environmental legislation without having been able to influence its development. In addition, according to Aquilar (1993), there is a feeling of resentment against an environmental policy that is seen as chiefly a response to the ecological problems of the Northern Member States.

However, as already mentioned, the climate change issue has clear negative implications for Spain itself and in recent years there have been

signs of environmental issues being taken more seriously in Spain. Some regions and local authorities have been proactive (see pp158–161) on various environmental policy issues. Also, Spain has argued successfully for the possibility of using the EU cohesion and structural funds for environmental improvements, which has reduced the financial burden on the Spanish government for complying with EU environmental legislation.

However, in the case of climate change, despite the potential negative effects for the country itself, Spain has again been dragging its feet. When the EU discussed the target of stabilizing overall emissions of CO₂ at 1990 levels by the year 2000, Spain, together with the other cohesion countries, argued that it must be permitted to increase emissions rather than to pursue the stabilization objective. Spain insisted on the EU ratifying the FCCC as a bloc in order to allow it to do this, while still signing the convention. This stance was justified on the basis of Spain's lower per capita emissions and the below average level of economic development of Spain compared to other EU countries. Spain's stance is thus similar to that taken by developing countries in the global negotiations on emission reductions. The Spanish position takes for granted that the EU target is designed to balance out the expected growth in emissions from some of its Member States by the reductions in emissions from other Member States.

Initially, the Spanish government announced that it would limit emission increases to 25 per cent above the 1990 level. However, as it became clear that, because of a much lower than expected economic growth, emissions would grow at a slower rate, emission increases of only 13–15 per cent were considered more reasonable and now the government commitment is to a 10 per cent increase of CO₂ emissions between 1990 and 2000. However, it is unlikely that the Spanish government will agree to actual emission reductions post 2000 and it will expect to continue to 'free ride' within a general EU target, with reductions to come from the more developed EU Member States.

Spain ratified the FCCC on 21st December 1993, at the same time as the EU. The first Spanish communication to the Convention was prepared by the Secretary of State for Environment and Housing (SEMAV) of the Ministry for Public Works, Transport and the Environment (MOPTMA), with an outline of the different policies in place against climate change and a picture of Spanish emissions of greenhouse gases (MOPTMA, 1995). The SEMAV was also responsible for coordinating the National Climate Programme (PNC), which defined the application of different actions towards a better understanding of the climatic system and its relations with the different economic and social sectors.

The PNC was formulated by the National Climate Commission, an interministerial body with coordinatory functions and including representatives from the MOPTMA, the Ministry of Industry and Energy and the Ministry of Economy. The National Climate Commission must coordinate all actions concerning climate change in accordance with international criteria and must inform the government on the measures to be implemented. Most of these schemes and government bodies are, however, likely to experience significant changes with the recent creation of a Ministry for the

Environment by the new conservative government. In principle, the creation of a separate ministry should result in a greater emphasis being given to environmental issues because previously they were just one of many functions of MOPTMA.

The PNC places a particular emphasis on the potential effects of climate change on the country. According to FCCC guidelines the national reports should stress scientific and impact issues; they are also supposed to provide strategic proposals for government policies in the field. However, the current version of the PNC appears to describe the main lines of action without considering the real implementation issues. Effectively, climate change policy is seen to be largely related to Spain's environmental priorities, ie desertification, waste management, water management, biodiversity management and quality of the urban environment. It has not influenced energy and transport policy to any significant extent, and in these areas the programme mainly consists of measures which had already been agreed on for other reasons. None of the measures have been quantified in terms of their likely impact on CO₂ emissions, hence it will be difficult to evaluate their progress. The main actions with a CO₂ emission relevance are reviewed in the following sections.

ENERGY MEASURES

The Energy Policy Background

Energy policies have always constituted the backbone of Spanish industrial policies. A strategic area, it has been regulated strongly and directed by multiannual programmes, the National Energy Plans (PEN), of which the *PEN 91* is the most recent. The PENs set the basic framework for public and private actions in the sector, determining the direction and extent of public energy policies and their constraints. As indicated above, *PEN 91* is overoptimistic in its forecasts of the level of economic activity and is correspondingly inaccurate in forecasts of the main energy requirements. However, the Spanish energy domain can be characterized using the *PEN 91* together with the more realistic official updates.

In general, current Spanish energy policies do not consider environmental issues in a serious way. Environmental effects, particularly greenhouse gas emissions, seem to be subordinate to actions the priority of which is to research ways of reaching an energy capacity 'able' to facilitate the levels of economic development comparable with those of the wealthiest EU societies. Nevertheless, the *PEN 91* for the first time includes environmental protection among a number of different and sometimes contradictory objectives, namely:

- cost minimization;
- diversification;
- use of national resources;
- environmental protection (including CO₂ emission limitation).

PEN 91 presumes the continuation of the nuclear moratorium as it was implemented by the first socialist government in 1984 after years of strong public opposition to nuclear facilities.² The decision to keep or to cancel the moratorium is purely political, although the manifesto of the current ruling party states clearly that the moratorium will be maintained. Another constraint and an issue that may have influence on Spanish CO₂ emissions is the preferential system to encourage the use of Spanish coal, a policy designed to assure employment in large mining areas in the north of the country. The two mechanisms to foster consumption of Spanish coal currently in operation are minimum consumption quotas and subsidies to prices. These preferential systems are also considered by *PEN 91*.

The main aim of *PEN 91* is to reduce the use of primary energy per unit of GDP. It also considers introducing cleaner energy alternatives, such as renewables and natural gas, to enable diversification, efficiency, environmental protection and the use of national resources. To achieve the *PEN* objectives, the Savings and Energy Efficiency Plan (PAEE) has been developed by the Institute for Energy Diversification and Savings (IDAE) to attain these aims through four programmes:

- Energy savings, with actions in industry, transport and services. It attempts to minimize consumption of fossil fuels and electricity.
- Substituting oil and coal powered by natural gas powered facilities.
- Cogeneration to foster joint production of heat and power. Cogeneration is assumed to optimize energy use industrial processes.
- Renewable energy to encourage the introduction of alternative energy sources as a way of confronting climate change problems and contributing to long term security and diversification of energy supply.

Between 1991 and 1994, PAEE projects have achieved an approximate reduction of 4,500,000 tonnes of CO₂ emissions. The degree of compliance with the objectives for the year 2000 is high for cogeneration (80 per cent) and renewables (50 per cent), but much lower for savings and substitution (less than 20 per cent).

A CHP Boom

Within a very short period of time, Spain has become one of Europe's leaders in the development of CHP, which now meets almost 6 per cent of Spain's total electricity demand. This development has been government led, with the initial impetus provided by an energy conservation law of 1980, which lays down a legal framework that introduced tariff incentives. Later on, in 1986, information programmes, advisory services and third party financing arrangements provided by IDEA became important (COGEN, 1995). The *PEN* set a cogeneration target of 2222 MW_e for 2000, an increase of 76 per cent from the 1263 MW_e installed in 1990. The target had already been exceeded by the end of 1995, with 2656 MW_e installed. While

most of the installed capacity is in the industrial sector, there is a growing application of cogeneration technologies to individual buildings (eg hospitals and hotels). The distribution of projects by industry shows that cogeneration is being used mainly by refineries, paper producers and textile industries. The distribution of projects by fuels shows that natural gas is involved in more than 60 per cent of the projects.

Some electricity utilities have become active in promoting CHP, in the form of investment and joint ventures, mainly because of the attractive rates of return offered. However, at the same time they have been opposed to the fact that CHP has introduced greater competition in the market. New legislation introduced in December 1995 has modified the tariff system for CHP surplus electricity, thus reducing the commercial attractiveness of CHP, in particular to larger plants. Buyback rates have been reduced and new definitions applied to the concept of surplus electricity. There appears to have been little consideration of the CO₂ benefits of CHP systems; its development remains driven by other considerations.

Neglect of End Use Energy Efficiency

Developments of end use efficiency are not very encouraging. The National Climate Programme does mention limited measures in this area, such as the application of existing laws on thermal insulation, but these have not been respected in the past. Some improvements in energy efficiency have occurred in industry in conjunction with the PAEE. However, as already mentioned on page 151, energy efficiency has not been a priority in Spain, resulting in an upwards trend in energy intensity. The public sector budget for improving end use efficiency has seen severe cut backs in recent years. Spending fell by 43.7 per cent between 1992 and 1993 and a further 33.8 per cent between 1993 and 1994. Most cut backs have affected the programmes for the commercial and industrial sectors. At the same time, electricity utilities have shown little interest in this area.

There are some signs of improvement. The Ministry of Energy is encouraging electricity producers to carry out DSM projects and has provided 5000 million pesetas for this thus far. Furthermore, in April 1995 the government decided to increase the funding for the PAEE energy efficiency measures. For the period 1995–2000, 106 billion pesetas are to be available (IEA, 1996). The programme will focus on buildings and the transport sector.

To some extent there has been a natural incentive for energy efficiency investments. Spanish electricity prices have been heavily regulated traditionally and in general are higher than in other European countries. The Spanish economic expansion of the 1980s and the monopolistic conformation of the electricity system induced a significant gap between domestic and international electricity prices. This may have encouraged efficient patterns of electricity demand and use (although the evidence here is limited considering the worsening figures for energy intensity), but price divergences could also have had a negative effect on industrial competitiveness and may render difficult the introduction of parallel climate change policies. Top of the agenda of the new government is to deregulate the electricity generating

2 It stopped all future nuclear developments, except those in a very advanced stage.

industry, with the aim of lowering energy prices through competition. Hence, any previous incentive for energy efficiency is likely to be reduced.

A Positive Outlook for Renewables

Spain has a considerable potential for renewable energy sources and limited fossil fuel reserves, factors which are in principle beneficial to the development of renewable energies. The climate conditions make wind and solar sources feasible for energy production. While the highest wind speeds experienced on mainland Spain are restricted to 2.6 per cent of the land area, over three quarters of the land area experiences favourable wind speeds in the band 5–6 m/s (European Commission, 1994). There is also unexploited potential for hydropower, although the remaining sites for large head hydropower would be environmentally difficult and costly to develop. However, there is potential for small head hydropower plants. Furthermore, biomass and municipal solid waste fired capacity could be developed. Solar collectors and PVs are obviously favoured by the climatic conditions but have suffered from high costs.

Currently, renewables account for 5.17 per cent or 4.94 Mtoe of Spain's 95.54 Mtoe primary energy consumption. Similar to most of the nations reviewed in this volume, hydropower is the largest renewable energy source, accounting for 2.4 Mtoe or 49 per cent of the total renewables contribution of 4.94 Mtoe, closely followed by biomass with 2.39 Mtoe (48.4 per cent). In 1991 the PAEE called for investments in renewables which would lead to a yearly addition of 1.1 Mtoe by the year 2000. These investments would be spread across a whole series of different renewables, some of which are already close to (or even surpass) their initial year 2000 targets while others are far from achieving it. As in a number of other EU countries, wind power is turning out to be the most attractive renewable resource. IDAE has estimated a potential capacity of 2400 MW, with the greatest potential in the region of Galicia (MINER, 1994). Wind farms have surpassed their set targets of 38,200 toe/year to 110.3 per cent and so have PVs (437,100 toe/year – 112.4 per cent). Geothermal, on the other hand, has only reached 4.4 per cent of its target of 443 toe/year.

Increasingly, renewables are seen to play a large role in making many of Spain's islands more sustainable. The best example of this is the Canary Islands' autonomous administration which has put forward a six year plan (1996–2002) to increase the contribution of renewables seven fold from the current level of 15,486 toe/year to 121,000 toe/year. This goal would represent 3.6 per cent of the region's primary energy consumption.³ The possibility of using of the EU structural funds (Narbona, 1994) is becoming important for the development of renewable energies in Spain, especially at the regional level.

³ Renewable Energy Report, No 9, 17th February 1996, p 10.

TRANSPORT POLICIES

Almost one quarter of Spanish CO₂ emissions were caused by the transport sector in 1993, and most greenhouse effect precursors such as NO_x, CO or volatile organic compounds (VOCs) were emitted by these sources. This was mainly due to the considerable increase in mobility observed in Spain during the past 20 years, a trend found in most European countries. All predictions forecast a substantial increase of activity in this sector, with a simultaneous growth of its emissions.

Between 1972 and 1990, road transits more than trebled and air transits more than quadrupled, while railway transit remained stable. Figure 9.3 illustrates the fast growth in road based transport. Transport of commodities by road, road transport by coach and the use of suburban trains underwent a sustained growth. Other transport sectors, especially interurban railway, went through processes of stabilization or even decrease. Spanish public transport compares poorly with other European countries, with a railway system that shows severe signs of underinvestment.

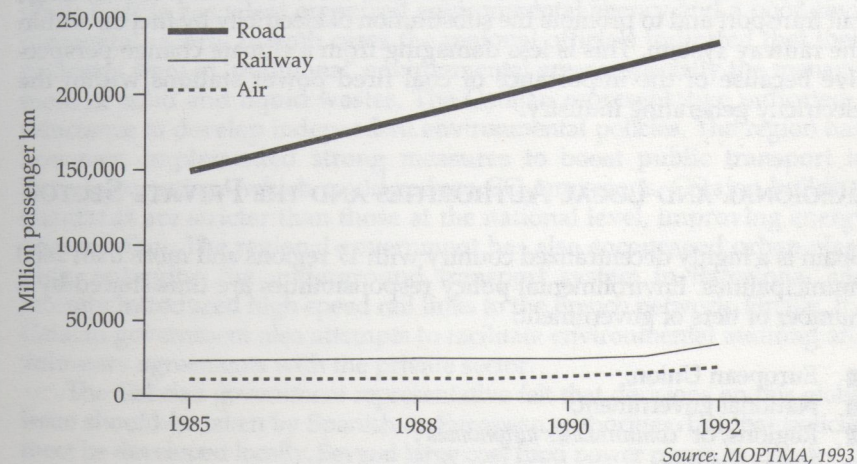


Figure 9.3: Passenger km by transport mode in Spain (1985–1992)

Transport policy over the past decade or so has been essentially road focused. In 1983, a major construction programme was launched under the General Plan for Roads, including the building of 5000 km of motorway. It is likely that continued Spanish economic integration into the EU, together with the predictable processes of economic growth, will cause a large increase in mobility. Existing trends and official actions indicate that almost all the projected increase in transit will be absorbed by road transport. This phenomenon may be strengthened by the general trend towards out-of-town shopping centres and office developments. This is already happening in places like Madrid, although its extension to other regions seems to be less remarkable than in other European countries.

Despite the worrying trends regarding the growth of CO₂ emissions from the transport sector, there are no meaningful policies aimed at abating greenhouse emissions from this sector or at climate change strategies in this field. Most government actions encourage rather than restrict greenhouse gas emissions from the transport sector (for instance, through public investments in roads or low fuel tax levels). In fact, the new government's manifesto is especially keen on the building of new motorways through a new Programme of Infrastructures.

There are, however, some policies aimed at improving public transport, which should lead to some reductions in CO₂ emissions from road traffic. For example, the Transport Plan for Large Cities (1990–1993) encouraged the modernization and improvement of public transport. There were investments in suburban railway infrastructures in Madrid, Barcelona, Seville, Valencia, Oviedo and Gijón. These railway developments included out-of-town parking spaces to reduce the number of cars entering the cities.

Other government investments include the metro systems in Bilbao and Seville. Madrid's metro is also being enlarged. There has also been a tax exemption for fuel oil used by railways since 1993 which aims to encourage rail transport and to promote the substitution of electricity by fuel oil within the railway system. This is less damaging from a climate change perspective because of the importance of coal fired power stations within the electricity generating industry.

REGIONAL AND LOCAL AUTHORITIES AND THE PRIVATE SECTOR

Spain is a highly decentralized country with 17 regions and more than 2000 municipalities. Environmental policy responsibilities are thus shared by a number of tiers of government:

- European Union;
- National government;
- Regions, or '*comunidades autónomas*';
- Municipalities.

The Spanish Constitution states that:

- The national government has full responsibility for the definition of basic environmental legislation, with a coordinatory function over the regions.
- Regions have full powers in the development of basic environmental legislation, management of environmental programmes and inspecting and penalizing activities.
- Municipalities have some local environmental responsibilities, usually coordinated and funded by the regional authorities.

'Comunidades Autónomas'

As at the national level, there are no specific climate change policies at the regional level. Unlike the national government, regional authorities do not even see the issue as relevant. Policies in other spheres may influence greenhouse gas emissions but in most cases they do not consider climate change problems at all. In addition, *comunidades autónomas* have little scope to legislate with respect to climate change. They have very few responsibilities in the energy sector as this is considered to be a national matter.

There have been a number of meetings on climate change between representatives from the national government (MOPTMA) and officials with environmental responsibilities from the regions. These meetings have been held by the coordinating body for national and regional authorities, the 'Regional Committee on Environment'. Regional representatives noted that these meetings were only designed to provide information on current national strategies and to comply with international commitments.

For this review, the author interviewed representatives from the Catalonia and Galicia regions. Catalonia has an environmental ministry, while Galicia has a less organized environmental agency and a poor environmental record. In both cases the regional officials indicated that their priorities were in 'traditional' environmental areas, especially the management of solid and liquid wastes. The Catalan representative indicated a reluctance to develop independent environmental policies. The region has, however, implemented strong measures to boost public transport in Barcelona, actions which could reduce CO₂ emissions. Catalan building standards are stricter than those at the national level, improving energy conservation. The regional government has also encouraged urban planning, enlarging the underground transport system in Barcelona, and recently introduced high speed rail links to the French network. Finally, the Catalan government also attempts to facilitate environmental auditing and voluntary agreements with the private sector.

The Galician government representative felt that decisions on this global issue should be taken by Spanish or European authorities, but that policies must be developed locally. Several large coal fired power plants are located in Galicia and the regional government has recently introduced an environmental tax on SO₂ and NO_x emissions. The tax, strongly opposed by the Spanish electricity industry, could have positive effects for CO₂ emissions but its very low rate suggests it is designed principally as a revenue raising instrument.

Transport policies in other regions along the lines of those adopted in Catalonia could foster a reduction of CO₂ emissions. However, efforts to develop road networks have had predictably negative impacts. Regional policies on energy efficiency and alternative energy sources have had more effect on overall CO₂ emission reductions. There are several regional organizations that deal with renewable energies and energy savings, for instance the Catalan Institute for Energy (ICE). The ICE works mainly in the industrial and transport sectors and has contributed to a significant expansion of cogeneration, biomass use, and small head hydropower capabilities in the Catalan industrial sector. It has also obtained good results with PV technology in rural electrification.

Local Authorities

Municipal governments are responsible for enforcing the basic legislation on atmospheric pollution. Local authorities are allowed to change emission limits as long as they are within the national legislation. In order to obtain information on the current state of climate change policies and future directions at the local level, the author visited the Barcelona, Madrid and Vigo municipalities. Barcelona and Madrid are the largest Spanish cities, each with a population of around 3,000,000. Vigo is the largest city in Galicia, with approximately 250,000 inhabitants. A representative from the environment department was interviewed in each place.

Vigo appears to be the least interested in climate change policies. The municipal officials indicated that this is an issue for authorities at higher levels. They did say that there is room for subsidiarity in policies against climate change as long as extra funding is made available by regional, national or European authorities. There is no climate change policy or strategy in Vigo, and even the effects from collateral policies are quite circumscribed.

Madrid has an intermediate attitude towards climate change – it attended the Berlin summit in April 1995 and intends to sign ICLEI's 'Heidelberg Declaration', committing itself to a 20 per cent reduction with respect to 1987 CO₂ emissions for 2005. Although Madrid has not developed a climate change strategy so far, there are some policies aimed at reducing CO₂ emissions and several municipal policies could have a contributory effect. Among the former could be included some basic lines of the General Urban Plan (PGOU), reconciling all urban enlargements with vigorous public transport schemes and setting tax exemptions for new buildings with significant energy savings and/or use of renewable energies. Policies with collateral effects comprise expansion of green areas (CO₂ sinks), encouragement of public transport (lanes for vehicles with more passengers, intermodal transport exchange centres and expansion of the underground), use of waste for electricity generation and municipal grants for the substitution of polluting and inefficient heating systems.

Finally Barcelona constitutes an interesting case, with a remarkable development of climate change policies and strategies. Barcelona attended the Rio (1992) and Berlin (1995) summits and signed ICLEI's 'Heidelberg Declaration' in September 1994. It is also the only Spanish city which is currently calculating an inventory of CO₂ emissions. Barcelona's head of the environmental programme indicated that subsidiarity should be fully applied to climate change policies. He considered that cities constitute a very important factor in attaining effective climate change strategies and demanded more legal responsibilities (eg through a Spanish Act for large cities) and more resources to execute those strategies. Policies in place include the introduction of significant savings in public lighting and the reduction of energy consumption from municipal surfaces and buildings (Ajuntament de Barcelona, 1994). The municipality has obtained these positive results after a general implementation of energy audits, and uses these savings to promote more energy efficiency. Actions in the transport sector

include an ambitious programme of intermodal exchange centres, a progressive introduction of natural gas buses and several municipal regulations to minimize transport requirements by promoting housing and economic activities in all areas of the city.

The Private Sector

In a setting where the lack of industrial competitiveness is perceived to be the cause of the Spanish malady, vigorous competition from other EU Member States and EU-induced environmental regulations appear to worsen the situation. With this background the attitude of the Spanish industrial sector towards environmental issues, and particularly towards climate change, can be summarized as follows:

- Spanish firms are reluctant to accept demanding environmental regulations because they see them as a threat to their competitiveness. They will not adopt voluntary environmental policies unless there are no conceivable possibilities of a financial or technical burden.
- When obliged to implement some environmental measures, Spanish industries expect support from the public sector.
- The Spanish industrial sector is especially opposed to any modification of energy prices for environmental reasons. These price changes are seen as very damaging to competitiveness, especially taking into account that Spanish energy prices are thought to be higher compared to those in other competitor countries.
- The industrial sector prefers to seek solutions to immediate pollution problems rather than to embark on climate change policies, considered to be a luxury for a country with comparatively low levels of economic activity and emissions. Free riding by other competitors is always in the mind of the Spanish industrialists.

CONCLUSIONS: ASSESSMENT OF CURRENT STRATEGIES AND FEASIBILITY OF FURTHER ACTION

Spain's exemption from the FCCC stabilization commitments through the informal EU target sharing arrangement informs and determines most Spanish actions in the area. In this chapter it is observed that Spain lacks a general climate change strategy, although some unconnected and partial measures do exist. This absence of a climate change policy is particularly noticeable in the area of transport.

Most Spanish policies with effects on climate change abatement have originated from the national government, and show poor coordination with regional and local bodies. These actions have been mainly implemented in the industrial and residential areas, with a strong public funding component. Voluntary agreements have also been a preferred option for both the regulated and the regulators. Economic instruments for climate change poli-

cies (markets and/or taxes) have not been considered at all.

At the present time there do not seem to be many options to implement climate change policies in Spain. In order to attain reductions in greenhouse gas emissions, both regulators and regulated consistently prefer voluntary agreements to regulatory interventions. The origin of this behaviour appears to be in the low (comparatively) levels of Spanish CO₂ emissions, together with the severe problems faced by many sectors of the Spanish economy. Consequently, the adoption of compulsory and ambitious measures to cope with greenhouse gas emissions looks unlikely. It is likely that future developments will follow similar lines to those observed to date, principally:

- Climate change commitments generally will be induced exogenously. Most official actions will aim at obtaining emission abatements from residential and industrial sources, while transport policies will be scarcely affected. Therefore, public intervention and instrument use will be limited in their extent and scope of application.
- Spanish authorities will favour consent-seeking attitudes from industry, to avoid sudden structural changes at even moderate costs to the Spanish economy.
- Climate change policies will rely on the copious Spanish and EU public grants to the private sector, allowing for easier transition processes. There might be some incompatibilities between these funding policies and the 'Polluter Pays Principle', although most actions will stress their R&D nature, with energy related rather than environmental objectives.
- Energy taxes or carbon permits will not be a prominent policy option. Their distributional and economic effects are likely to be high, and their environmental effectiveness may be reduced by the special features of the Spanish energy sector. There might be tax increases for automotive fuels, although these will mainly have revenue raising purposes and will not offset the negative effects that arise from other public policies in the transport field.

In the following concluding sections, we summarize the factors that may encourage a reduction or stabilization of emissions, as well as those which are likely to act as obstructive factors. The comparative strength of these factors and the level of future economic growth will determine the evolution of Spanish CO₂ emissions.

Enabling Factors

- There is room for clear improvements in transport and energy related emissions through:
 - modification of public policies in the field;
 - introduction of new market or institutional frameworks;
 - introduction of precise instruments aimed at energy efficiency and climate change abatements.
- Energy policies have been directed mostly at supply, with positive

effects arising from the extension of renewable sources and natural gas. By acting on the demand segment, there may be extra gains.

- There are good conditions for the use of renewable energies in Spain.
- There is a growing consideration and application of win-win strategies by the private sector.
- Policy developments for the residential field and urban planning actions are likely to be significant.
- There is increasing social awareness on the risks of human-induced climate change phenomena.

Obstructing Factors

- There is little official interest in the design and implementation of environmental policies.
- Coordination within and between levels of government seems to be fairly ineffective in regard to climate change policies.
- There is an increasing demand of transport and energy from the development processes of the Spanish economy. Transport figures seem to be particularly out of control.
- There are imperfect markets for transport and energy in Spain. This situation may induce costly results from the application of climate change policies.
- Spanish energy policies have to adjust to sociopolitical components, with the compulsory use of poor quality Spanish coals.
- Spanish energy markets display large demand rigidities, with little incidence of price policies.
- The nuclear moratorium and technological limits of renewable energies are likely to foster CO₂ emissions.
- Industrial sectors have shown poor environmental performances.

It has already been noted that Spanish society is increasingly concerned with global warming phenomena. Contemporary climate disfunctions are thought to be the first indications of acute climate changes that would severely affect Spain. The Spanish environmental movement has played a significant part in publicizing these concerns, with active policies to encourage social awareness. In fact, climate change constitutes a top priority for Spanish environmentalism. Although the status of the Spanish environmental movement is not comparable to that observed in other European countries, it has a growing influence and audience within Spanish society. It thus appears that Spanish authorities will face a growing pressure from the voting public and from the environmental movement. In the next few years this combined action may encourage a more active stance on the part of successive Spanish administrations.

Concerning future developments, it is likely that there will be few changes to current trends. Policies aimed at climate change abatement will usually follow EU requirements (regulations and directives), although the Spanish government will attempt to circumscribe most actions to areas outside transport and energy supply. Therefore, greenhouse gas emissions

will mainly depend on the evolution of the Spanish economy.

Overall, there appear to be few reasons for optimism for a stabilization of greenhouse emissions in Spain. Lax international commitments and internal realities will encourage climate change inducement rather than abatement. Although we have shown that there are enabling factors that favour the introduction of more determined policies, the obstructing factors are likely to impede any ambitious move. It is imperative that any sensible climate change strategy should include the removal of environment unfriendly policies, especially in the transport field, with a simultaneous introduction of institutional changes in energy markets. Economic instruments directed at reducing greenhouse gas emissions should be introduced at a second stage.

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