PART II

Chapter 5

Environmental performance of the industrial sector

Spain's industrial sector has a smaller environmental footprint than most other European countries and is a leader in environmental management systems. However, as the economy recovers, environmental pressures are likely to increase. This chapter examines government and private sector initiatives to manage the industrial sector's impact on the environment. A selection of policies that aim to strengthen the environmental performance of businesses and to enforce compliance are reviewed. These include the use of economic instruments and environmental management systems.

Assessment and recommendations

The environmental performance of Spain's industrial sector has steadily improved since the turn of the century. Its environmental footprint is not as large as that in many other European countries; the industrial sector represents a lower share of output and is comprised of relatively more small and medium-sized enterprises (SMEs). Impressive progress was made in reducing water use, emissions of most air pollutants and waste generation. Energy consumption and material intensity decreased and were decoupled from economic growth. Environmental pressures were reduced due to the implementation of mandatory environmental requirements, investments in new technologies as well as the impact of the global economic downturn that hit Spain, and the industrial sector, particularly hard.

Despite this progress, industry contributes to pollution of air, water and land. In a few hotspots industrial pollution imposes significant costs on human health and the environment. As the economy begins to recover, some air emissions and waste generation have increased. Such trends are likely to continue, and may be reinforced by the policy objective of increasing the share of the industrial sector in the economy. To avoid this, it will be important for the Spanish government to ensure further integration of industrial and environmental policies, and to implement a robust system of environmental protection. Moreover, the government should take advantage of the economic opportunities that eco-innovation and an expanding environmental goods and services sector can provide.

Although economic and environmental policy frameworks are broadly aligned, and some mechanisms to manage trade-offs are in place, environmental objectives should be better integrated into industrial policies. Frequent use is made of financial incentives or tax breaks to promote more environmentally friendly practices in the industrial sector although these are generally less effective than environmentally related taxes and other policy instruments. More systematic *ex ante* and *ex post* policy evaluation would help address this challenge, and also help to foster better policy integration.

An OECD survey of firms suggested that regulatory compliance and cost savings were the most important drivers of environmental improvement in the industrial sector. Related to this, the implementation of the EU environmental *acquis* also provided the main impetus for improved environmental performance in the sector. The implementation of integrated permitting, and the reform of environmental impact assessment (EIA) and environmental liability regulations, were particularly important in this regard. The OECD survey suggested that the two main obstacles to environmental improvement from the perspective of firms were the cost of environmental improvements and accessing finance, which had become more difficult in recent years.

The relatively unco-ordinated implementation of environmental requirements together with the increased volume of environmental regulations has resulted in a regulatory environment that is complicated, burdensome and costly to both the

administration and industry. Although recent reforms have helped to streamline EIA and integrated permitting procedures, a recent OECD study suggests that environmental administrative requirements in Spain may be among the most burdensome in OECD countries in terms of influencing market entry and competition. Thus further efforts to streamline and simplify these requirements are needed, without compromising environmental ambitions. Reform of EIA and permitting are steps in the right direction. Given the decentralised nature of Spain's environmental governance, further efforts should focus on sharing information and good practices, capacity development and benchmarking of performance.

Spanish industry has become a leader in the adoption of environmental management systems (EMS). It is among the top three countries in terms of the number of certifications under the Eco-Management and Audit Scheme (EMAS) or ISO 14000. These high rates may be linked to requirements in supply chains and the benefits of regulatory relief associated with certification. While such systems can help to strengthen environmental management procedures, it is less clear that they result in improved environmental outcomes, particularly the ISO 14000 system. Spain is also very active in eco-labelling and corporate social responsibility (CSR) reporting; some sub-sectors, such as paper, aluminium production and the chemical sector, have engaged in voluntary agreements.

While information is neither complete nor consistent, evidence suggests that Spain's environmental goods and services (EGS) sector expanded since the early 2000s. There has been a significant increase in the number of patents for environmentally related technologies, particularly renewable energy. The EGS sector output reached 2% of GDP in 2011, about one-fifth less than agriculture's share (2.4% of GDP). Although there was a sharp decrease in employment in the manufacturing sector in the period 2004-12 (790 000), there was a small increase (60 000) in the energy supply and environmental industries. Increased environmentally related R&D in the manufacturing sector and support policies for renewable energy helped to drive these developments. Multiple agencies and programmes are available to support R&D. This creates opportunities and obstacles, and the transparency of, and access to, these programmes could be improved. More attention should be given to the needs of, and opportunities for, SMEs, which represent an important share of the industrial sector.

A more stringent environmental regulatory framework has been an important driver for the expansion of the EGS sector. The Green Public Procurement Plan, launched in 2008, also helped to stimulate demand for EGS. However, there appears to be relatively weak demand for EGS from the public and in the media, and a perception that such goods and services are more expensive. Further efforts should be made to improve public awareness and to strengthen demand for EGS.

Recommendations

- Continue to strengthen dialogue and co-operation between ministries responsible for industrial development and the environment, at both national and regional levels, with a view to better integrating these policies, including by: introducing explicit environmental objectives and evaluation criteria in industrial development programmes; and evaluating, *ex ante* and *ex post*, policy measures intended to improve the environmental performance of the industrial sector.

Recommendations *(cont.)*

- Further simplify and streamline environmental requirements, particularly for small and medium-sized enterprises, with a view to minimising administrative costs for business and public authorities without compromising environmental objectives.
- Develop a coherent national environmental inspection and compliance assurance strategy involving national and regional authorities, including a risk-based approach for targeting enforcement actions; apply sanctions that are proportional to the financial benefits arising from non-compliance.
- Establish more coherent and consistent environmental requirements and enforcement nationwide; in particular, reinforce the role of the Network of Environmental Enforcement Agencies (REDIA) in providing guidance, supporting capacity development, identifying and sharing good practices, and benchmarking performance of Autonomous Communities.
- Strengthen the capacity of Autonomous Communities to apply the environmental liability law and of the judiciary to adjudicate litigation.
- Further develop a strategy to reduce the potential risks to health and the environment in industrial pollution hotspots and industrial accidents.
- Improve co-ordination of industrial, innovation and eco-innovation policies across the government, between the central government and the regions, and between academic institutions and business sectors; regularly assess the results of measures to promote eco-innovation.

1. Economic and environmental trends

1.1. *Key trends in the structure and economic performance of the industrial sector*[1]

Once heavily reliant on agriculture, Spain has made significant progress in expanding and modernising its industries (Box 5.1). The sector developed particularly fast in the first half of the 2000s when Spanish economic and industrial growth was the strongest among OECD member countries. Although affected by the economic crises of 2009, industry accounted for 17.4% of gross domestic product (GDP) in 2013 and its value added has increased in absolute terms every year since 2000 with the exception of 2009. Manufacturing accounts for the lion's share of the total industrial sector composition. In 2012, it represented 89% of gross value added (GVA) and 77% of employment (INE, 2014).

The largest manufacturing sub-sectors are transport material, particularly manufacturing of cars and trucks; chemicals (including pharmaceuticals); metallic products; and food, beverages and tobacco (Figure 5.1). Among non-manufacturing sectors, the supply and distribution of electricity and gas, as well as environmental sectors (water supply, sanitation, solid waste management and soil decontamination), have been gaining a larger share. Between 2004-12, the combined industrial GVA rose from 13.2% to 22%.

After growing in the early 2000s, employment in the industrial sector has decreased every year of the last decade, dropping from 15.6% to 12.3% of total employment between 2004-12. The figure is more striking for manufacturing, which lost 790 000 jobs in the same period. However, not all industrial sub-sectors lost employment. For example, 60 000 jobs were created in the energy supply and environmental industries, which include water, sanitation and solid waste management.

Box 5.1. **Evolution of the industrial sector in Spain**

Spain's traditionally agrarian economy was not fundamentally transformed by the industrial revolution. However, after the 1936-39 Civil War, in its pursuit of economic self-sufficiency, Spain adopted an unsuccessful policy of industrial development based on state-owned enterprises, import substitution, tariff-based protection and barriers to foreign direct investment. The 1959 Stabilisation Plan, which marked the end of Spain's economic isolation, led to further development of the industrial sector, with a greater role for private and foreign investors. However, the industrial policy still guided industrial development, supporting "national champions" through subsidies and trade tariffs.

In the 1980s, further economic liberalisation led to the closing of non-competitive industries, including steelmaking and shipbuilding. Spain's entry into the European Economic Community in 1986 forced a refocusing of industrial policy from protection and subsidies to the promotion of competitiveness in the European and global context. The 1990s and early 2000s witnessed a more decisive globalisation of Spanish industry, while key elements of industrial policy included the privatisation of state-owned enterprises and investment in much-needed basic infrastructure. Since then, industrial policy has focused on horizontal policies that promote competitiveness, including promotion of research, development and innovation (R&D&I), opening access to foreign markets and improving product quality. Several measures focused on supporting small and medium-sized enterprises. Reforms led to an important increase in the sector's productivity and a growing contribution to economic growth and well-being of Spanish society. In the late 1990s and early 2000s, Spanish economic and industrial growth was the strongest among OECD member countries, and the share of the industrial sector in the economy increased to 18.5% of total GVA in 2004.

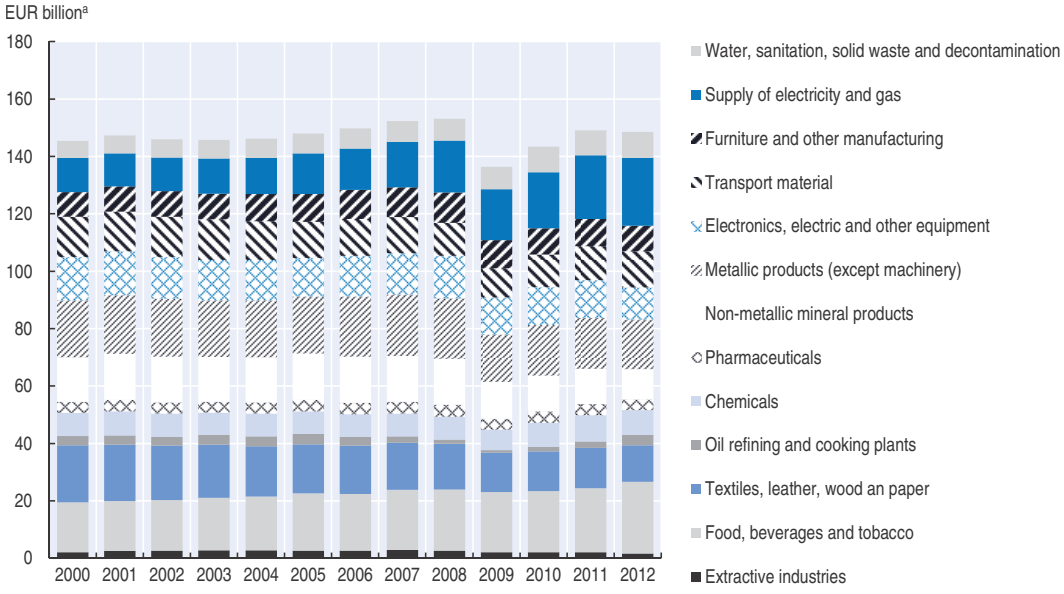
The economic crisis of 2008-09 heavily impacted the whole economy, including the industrial sector (Figure 5.2). The decline was led by manufacturing, which fell from 15.7% to 12.3% of GDP between 2004-09. Although the declining importance of industry was due in part to the relative strength of the construction and service sectors, this trend can also be attributed to deteriorating international competitiveness that deepened as the crisis continued. After Greece, Spain was the OECD member country that experienced the largest reduction in industrial production between 2010-12; a 7.9% decline in Spain, whereas the OECD average increased by 3.9%.

After a double dip recession, industrial production recovered with manufacturing contributing 13.3% of total GVA in 2013; the sector as a whole contributed 17.4%. In 2014, the Spanish government set ambitious plans to bolster the country's economic recovery through a stimulus package. The plans aim to encourage stronger investment in R&D&I and to "re-industrialise" the country. In the context of the EU target set in 2012, Spain wants to increase the industrial sector's share of the European economy from 16% to 20% by 2020.

Source: Espinosa de los Monteros and Boceta Álvarez (2005), EC (2012), INE (2014).

Spanish industrial enterprises, which are principally concentrated in Catalonia, Valencia, Madrid and the Basque Country, are relatively small. While large and medium companies represent 0.85% and 3.87% of enterprises in the European Union (EU), the corresponding figures for Spain are 0.47% and 2.82%.

Figure 5.1. **Structure and recent evolution of the industrial sector**



a) Gross value added at constant 2005 prices.
Source: INE (2014), "Aggregates by industry", *INEbase* (database); OECD (2014), *OECD Economic Outlook No. 95* (database).

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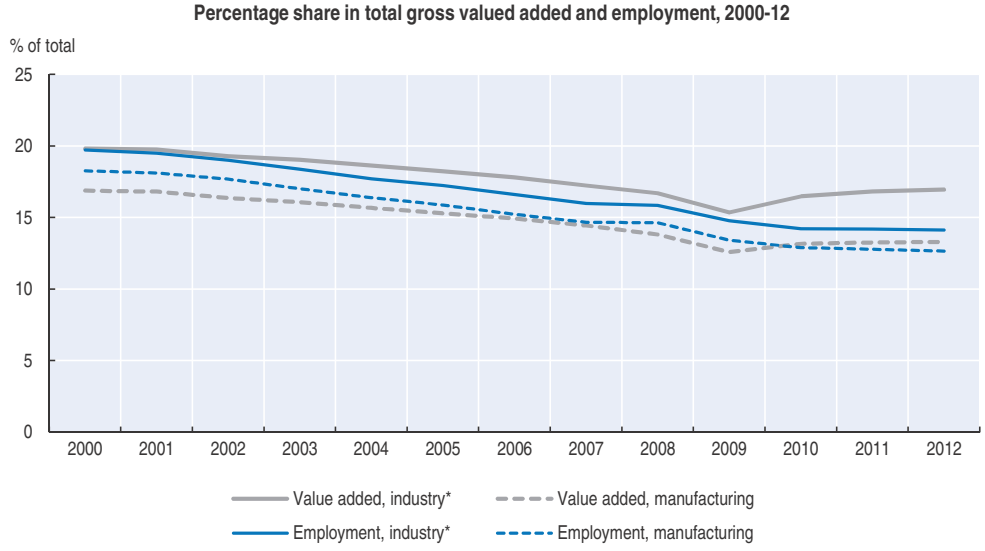
Figure 5.2. **Weight of the industrial sector in the Spanish economy**



* Excluding construction.
Source: OECD (2014), *OECD Employment and Labour Market Statistics* (database); OECD (2014), *OECD National Accounts Statistics* (database).

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Despite progress in innovation, the sector is still characterised by its low technological intensity. Many firms are specialised in low-tech manufacturing (e.g. food products and beverages, textiles and apparel). High value-added sectors such as high-tech manufacturing are still under-represented in terms of the number of firms, employment and value added.

1.2. Key trends in the environmental performance of the industrial sector

Compared to many other OECD member countries, industrial pollution in Spain is not a major environmental issue (Chapter 1). The environmental performance of the industrial sector has steadily improved during the last decade. Principal factors accounting for this success include the internationalisation of the Spanish economy, and stronger environmental regulatory and institutional frameworks, especially those stemming from the EU *acquis communautaire,* along with investment and innovation. More recently, implementation of the regulatory framework, investments in clean technologies and the prolonged economic downturn have led to a further reduction of emissions, effluents and waste. Overall, some key industrial sectors, such as chemicals production, have made important progress in reducing environmental impacts of their operations (Box 5.2).

Despite progress, industrial operations contribute to air, water and land pollution. Environmental problems related to historical pollution hotspots remain unresolved in a few cases. The expected economic rebound and planned re-industrialisation of the Spanish economy are likely to increase pressures on the environment.

Box 5.2. **Environmental performance trends in the chemicals sector**

The Spanish chemicals sector is one of the key pillars of the Spanish economy. Made up of nearly 3 400 companies with annual sales of around EUR 53 billion, the sector generates 10% of the country's gross domestic product (GDP) and provides more than 500 000 direct, indirect and induced jobs. The chemicals sector has become the second largest exporter: in 2010, exports exceeded EUR 25 billion and sales to foreign markets accounted for more than 40% of revenues. This industry is also a leader in R&D&I investments and environmental protection, accounting for 20% of national investments in this field.

During the last decade, the Spanish chemicals industry has progressively shifted towards products with greater added value. In the 1970s, basic chemicals made up 61% of the sector, compared with 36% today. Chemicals for health, meanwhile, account for 33% (up from 19% in 1977), while chemicals for final consumption account for 31% (compared with 20% in 1977). By sub-sector, pharmaceutical products account for 25% of the total, followed by plastic and rubber raw materials (15%).

The industry has also significantly increased its environmental performance. Between 1999-2012, for most pollutants, emissions or discharges per tonne of chemicals have been reduced by at least 50%. Greenhouse gas (GHG) emissions have been reduced by 37%, while some other emissions (nitrogen oxides, phosphorus) have been reduced by nearly 100%. The sector also achieved significant, albeit slower, progress in water consumption (-40%), energy consumption (-18%) and solid waste generation (-13%). Since 2006, progress has continued, particularly regarding air pollutants (with the exception of heavy metals), although at a slower pace as cost-effective solutions were progressively exhausted. Between 2006-12, reductions in waste consumption and solid waste generation have been above 12%. While the sector reduced energy consumption by 6.5%, reductions in GHG emissions per tonne of chemicals produced were close to 20%.

Source: ICEX (2011), FEIQUE (2013).

Emissions to air

The manufacturing sector remains an important contributor to air pollution. In 2012, it represented 67% of non-methane volatile organic compounds (NMVOC)[2], 50% of all sulphur dioxide (SO_2) emitted in Spain, 28% of carbon monoxide (CO), 19% of nitrogen oxides (NO_x) and 17% of $PM_{2.5}$.[3] The aggregated cost of industrial air pollution in Spain is estimated at EUR 6.5-10 billion per year or EUR 2.3-6 billion excluding CO_2 (EEA, 2011).[4] Sectors involving production processes and combustion used in manufacturing are responsible for around 25% of these costs. While these costs are significant, the aggregated damage cost of air pollution emissions per unit of GDP from Spanish industrial facilities (including power stations) are estimated to be among the lowest in the EU.

Emissions of all key air pollutants from industrial processes and industrial combustion decreased in the period 2000-12. The largest decrease was recorded in reducing SO_x (-45%), NMVOC (-31%), $PM_{2.5}$ (-29%) and NO_x (-23%). Emissions of CO were also reduced, but at a slower pace (-5%) (Figure 5.3). The emissions were decoupled from the industrial value added. Emissions per capita and per unit of GDP are below the OECD average for SO_x and in line with the OECD average for NO_x (Annex I.C).

Emissions of heavy metals have also decreased since 2000 (OECD, 2014a). Lead emissions have declined significantly; between 2000-11, Spain's share of those emissions within the EU dropped from 12% to 7%. Cadmium emissions declined 70%. While nickel emissions dropped over 60%, Spain still produced 19% of all EU nickel emissions, which in Spain mostly come from nickel mining and refining activities.

Emissions of the persistent organic pollutant (POP) hexachlorobenzene (HCB) declined, dropping over 97% between 2000-12, while emissions of the POP polycyclic aromatic hydrocarbons (PAHs) increased by 2%. Spain accounted for 19% of PAH emissions and over 18% of HCB emissions in the EU in 2011, the highest share of all EU member states (EEA, 2013).

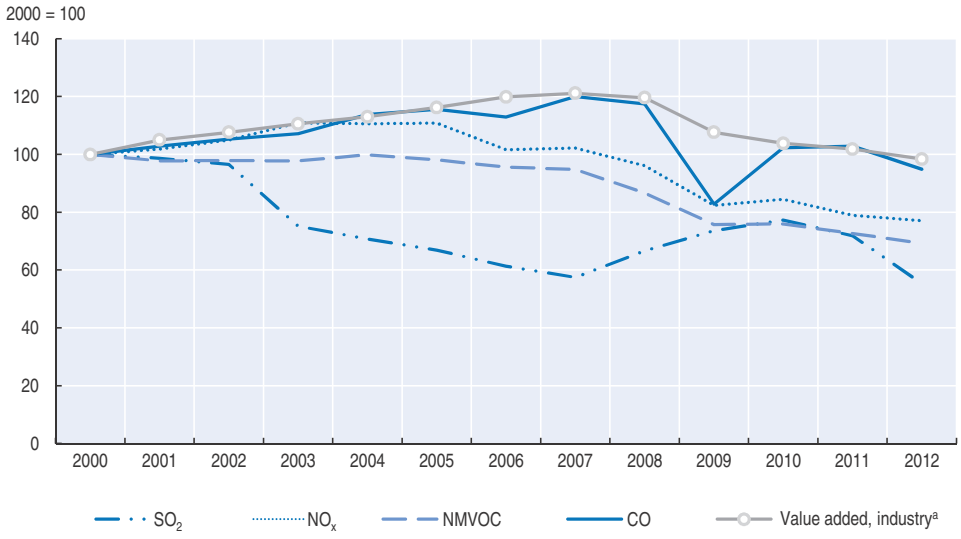
The industrial sector is the third largest source of greenhouse gas (GHG) emissions, accounting for 21% of the total. GHG emissions began declining in 2005 following major energy efficiency improvements of industrial operations and increased use of natural gas and renewable energy; in 2012, they were 16% below the 2000 level. Emission reductions, reinforced by the economic slowdown, started to increase in 2010 (Figure 5.3).

Water use and pollution

Spanish manufacturing has made impressive progress in reducing its use of water. Withdrawals decreased by 60% between 2000-10, with the fastest reduction occurring between 2003-08 (OECD, 2014a). Widespread concerns about the availability of water resources combined with the application of a levy on wastewater treatment (the so-called Sanitation Charge) applied by the Autonomous Communities (ACs) have led to significant investment in water efficiency in manufacturing.

Information on water pollution discharges in the industrial sector is scarce, however. One study in 2007 by the National Statistical Institute (INE, 2013) indicates that effluent discharges in the manufacturing sector corresponded to 56% of water used. Manufacturing industries treated 44% of effluents discharged and 25% of total effluents were internally reused or recycled. In terms of recipient bodies, about 35% of effluents were discharged into sewerage networks, 35% to the sea, 26% to surface waters and 4% to other sources.

Figure 5.3. **Air emissions from the industrial sector in 2000-2012**



Note: Air pollutant emissions from industrial combustion, industrial processes, and solvent and other products use.
a) Data include construction.
Source: OECD (2014), *Environment Statistics* (database); OECD (2014), *OECD Economic Outlook No. 95* (database).

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Solid waste

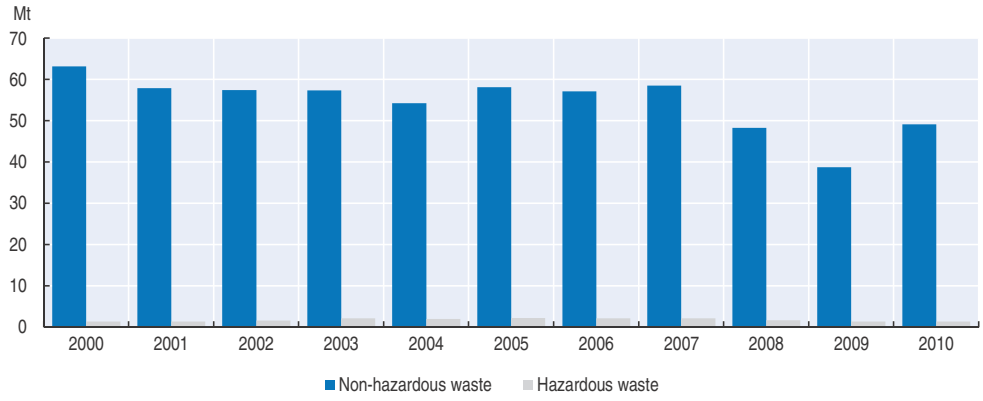
The industrial sector made some progress in reducing waste. Between 2000-07, the annual amount of non-hazardous waste generated by industry decreased by 7.4%, while in 2009 the decrease reached 39%. In 2010, the amount of industrial waste was 49.2 million tonnes, 22% less than in 2000 but 27% more than in 2009 (Figure 5.4). The overall decrease was driven by a decline in mostly non-hazardous waste generated by the extractive industries; this accounted for the biggest share of waste (24%), while the manufacturing sector generated 12% of the total.

The quantity of hazardous waste generated by industries nearly doubled between 2000-06, but decreased by 1% between 2000-10. Most hazardous waste is generated from manufacturing: 0.8 million tonnes comes from steelmaking and other metallic and non-metallic products, and 0.4 million from chemicals and rubber production (MAGRAMA, 2013b).

Energy consumption

Spain's industrial sector is the second largest consumer of energy after transport, accounting for around 23% of final energy demand. Between 2000-05, the sector's consumption increased along with the growth of gross value added, but then dropped sharply while the GVA continued to rise until 2008. Following the two years of economic crisis, the GVA recovered in 2010, while the sector's energy demand remained stable (Figure 5.5). Overall, the sector successfully decoupled energy consumption from the value of economic output. Industrial energy consumption was 17% below the 2000 level, while the sector's GVA increased by 4% in the same period.

Figure 5.4. **Waste generation by industry in 2000-10**



Source: MAGRAMA (2013), *Environmental Profile of Spain 2012*.

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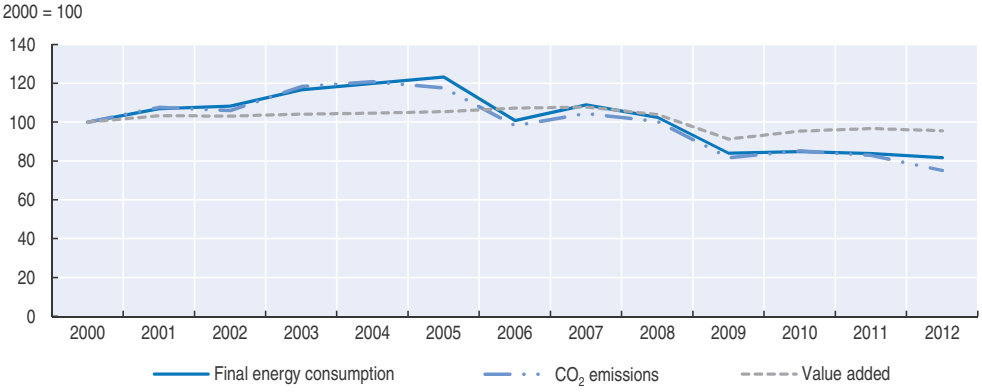
Figure 5.5. **Energy and CO_2 intensities in the manufacturing industry in 2000-12**



Source: IEA (2014), *IEA CO_2 Emissions from Fuel Combustion Statistics* (database); IEA (2014), *IEA World Energy Statistics and Balances* (database); OECD (2014), *National Accounts Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933183124

Material intensity

Overall, domestic material consumption (DMC) decreased by 14% between 2000-10 compared to a 7% decrease in DMC for the OECD average. The decrease was mostly due to decline in the construction sector, which accounts for more than half of DMC. However, the biggest reduction occurred with the use of industrial minerals (-45%) and metals (-32%), although they account for the lowest share of materials used by the Spanish economy (6% and 4% respectively) (Figure 1.7).

The reduction of DMC combined with economic growth resulted in a 49% increase in material productivity[5] in Spain between 2000-10, significantly higher than the OECD average of 27% (Chapter 1, Annex I.C). However, this relative decoupling occurred only recently: for most of the review period, DMC increased at a higher rate than GDP (Figure 1.7).

Industrial hot spots

Accelerated industrialisation of the country in the 1960s and 1970s resulted in a number of pollution "hotspots" where accumulated emissions exposed local populations to elevated health risks. In 2009, Spain hosted 12 of the 191 industrial facilities in Europe that generated the most air pollution (EEA, 2011).

Important pollution "hotspots" include the Algeciras Bay at the southern end of the Iberian Peninsula and the chemical poles of Huelva in Andalusia and Tarragona in Catalonia. Pollution is particularly heavy in Huelva, which is considered one of the most contaminated zones in the EU. The Algeciras Bay, which hosts large numbers of industrial operations, is considered to have the highest levels of hydrocarbon pollution in Spain. The Algeciras Bay, together with Huelva, experience the highest rates of death from cancer in Spain (Box 5.3).

Box 5.3. **Industrial pollution hotspots**

Bay of Algeciras, Andalusia

The area around the Bay of Algeciras is heavily industrialised with extensive petrochemical installations near San Roque (such as the CEPSA oil refinery and Acerinox stainless steel manufacturing plant), and ports in Algeciras and Gibraltar. Every year, more than 100 000 ships use the bay to cross the Strait of Gibraltar, including large-sized oil tankers. Oil bunkering activities also occur.

The area suffers from pollution by hydrocarbons. In 2007, a particularly serious sulphur release took place, as well as intermittent flaring episodes. In recent years, a small number of sinking, grounding and collision incidents resulted in oil spills. Responding to public protests against impacts on surrounding neighbourhoods, the environmental authorities of the Autonomous Community of Andalusia ordered an independent audit to investigate the incidents. In 2009, environmental organisations formed the Tripartite Forum to identify and implement measures to protect the bay.

Huelva industrial-chemical complex, Andalusia

A chemical complex, established in the 1960s close to the city of Huelva, comprises 14 different companies. Over 40 years of fertiliser production by one of the firms has generated 120 million tonnes of phosphogypsum – a waste product from phosphoric acid production that contains uranium and heavy metals. This waste has been stored in 30-metre high tailings and large ponds, covering 1 200 ha close to the town. The authorities also investigated the possible spreading of phosphogypsum on agricultural land as a means for pH correction of the soil. A number of studies to assess the level of pollution in Huelva showed elevated cases of cancer and other risks to inhabitants' health.

Over many years, several groups have demanded closure of the chemical complex, and several lawsuits have been launched against the fertiliser producer for breaching environment, public health and zoning regulations. In 2010, the European Commission demanded an end to the dumping of phosphogypsum at Huelva; the Supreme Court confirmed the National Court's decision to halt dumping. Since 2012, the plant has imported phosphoric acid, which eliminated the need to dump phosphogypsum. However, in 2014, Spanish authorities fined the fertiliser producer EUR 240 000 for failing to submit a restoration plan for phosphogypsum ponds.

Box 5.3. **Industrial pollution hotspots** *(cont.)*

Chemical industry in Flix, Tarragona, Catalonia

The electrochemical factory Ercros S.A., which began operations in 1897 in the Catalonian town of Flix, is the only industrial installation in Spain that has produced polychlorinated biphenyls (PCBs). Over time, about 700 000 tonnes of effluents containing mercury, cadmium and other toxic organochlorine components (such as hexachlorobenzene, PCBs and DDT) have been dumped in a reservoir in the Ebro river.

An evaluation of pollution impacts by the Environmental Department of the Catalan regional government found that mercury concentrations were up to 500 times higher and total concentration of PCBs was almost 80 times higher than in non-polluted areas. Additional studies show a high rate of premature births and deficient child development in the area.

In 1993, a court case began against Ercros, but the company was convicted only in 2003 for continuously polluting the environment. The court decision did not hold the company fully responsible for damages and the Spanish government committed over EUR 200 million for clean-up activities.

Source: Environmental Justice Atlas, *http://ejatlas.org/*.

2. Policy and institutional framework

2.1. Policy framework applying to the industrial sector

Economic and industrial policies

For most of the review period, there was no separate entrepreneurship policy document in Spain; industrial development has been part of horizontal economic development programmes, which promoted economic growth and employment. The National Reform Programme (NRP), adopted in 2005 to implement the EU Lisbon Strategy, included a number of measures to stimulate entrepreneurship. These included improving competition and regulation in product markets; strengthening efficiency of the regulatory framework and performance in research; development; and innovation.[6] The NRP did not explicitly set out to assess the environmental performance of industry. However, it had a number of specific programmes with environmental objectives. These included the Ingenio Plan[7], which was designed to step up environment-related research and development in the private sector.

Spain's response to the economic crisis of 2008-09 included the Integral Plan on Industrial Policy 2020 (PIN2020). This plan aimed to support the industrial sector more explicitly and bring coherence to the multitude of previously launched initiatives. To that end, it emphasised strengthening relations between industrial development and environmental policies (Box 5.4). In July 2014, the Agenda for Strengthening the Industrial Sector in Spain was approved. It includes several measures related to the protection of the environment, such as those linked to the National Energy Efficiency Fund (FNEE) (Chapter 3).

In 2013, the government announced an "Economic stimulus plan and support for the entrepreneur", which contained a number of measures to support the enterprise sector. These included lowering taxes for new firms and self-employed persons, and facilitating access to finance (Chapter 3). The "Spanish Strategy for Science, Technology and Innovation" and the "Spanish State Plan for Scientific and Technical Research and

Box 5.4. **Environmental issues in the Integral Plan on Industrial Policy 2020**

The Integral Plan on Industrial Policy 2020 (PIN2020), elaborated as part of Spain's Sustainable Economy Strategy, was launched in 2010 by the Ministry of Industry (Chapter 3). The plan provides a framework for government initiatives until 2020, aiming at increasing the share of industry in gross domestic product (GDP); adapting industrial policy to the new challenges and opportunities of the evolving global economy; improving the competitiveness of Spanish industry; and ensuring industry's contribution to a sustainable recovery of growth and employment. The plan, consistent with Spain's EU deficit-cutting objectives, aimed to refocus industry as the driver of economic growth, creating jobs and increasing competitiveness to implement the objectives of the EU's "Europe 2020 Strategy for jobs and smart, sustainable and inclusive growth".

The PIN2020 comprised an Action Plan 2011-15 that laid down 124 measures in 26 areas grouped into 5 priority policy areas. Four of the axes focus on horizontal measures: i) improving industry's competitiveness; ii) improving innovation and R&D; iii) improving SME growth and dynamism; iv) facilitating companies' orientation towards international markets; and v) strengthening strategic sectors. A fifth axis focuses on strategic industrial sectors. The cost of implementation was estimated at EUR 82.8 billion.

Although the plan emphasises the importance of policy coherence, links to environmental issues are only addressed indirectly in the horizontal axes. For example, one objective regarding competitiveness, which aimed to reduce energy costs, included measures for promoting energy efficiency. However, there were no measures targeting efficiency in raw materials or water. The objective of reducing logistical costs includes the promotion of rail transport, which is expected to generate positive environmental impacts.

The PIN2020 mentions the EU objective of reducing raw materials consumption through efficiency and recycling, but without specific measures to achieve it. Regulatory impact assessment is expected to address the impact of environmental regulations on industry. Some innovation measures explicitly target eco-innovation such as a line of credit for innovation (INNOCREDIT) and a venture capital programme (INNVIERTE).

Among the strategic sectors, environmental links are more explicit. For the vehicle manufacturing sector, measures focus on the development and production of cleaner cars (electric, hybrid, low emissions), as well as more energy efficient production. The industries focused on environmental protection (such as recycling); the production of equipment for renewable energy and energy efficiency are considered strategic. Measures related to the agro-food industry include the creation of a sustainability forum (Foro de Sostenibilidad del MARM) to discuss issues of sustainable consumption and production in the agro-food chain.

Innovation", adopted in 2013, sought to increase business R&D expenditure, ease transfer of knowledge between actors and foster smart specialisation at the regional level. In 2014, the Spanish government adopted ambitious new plans to bolster the country's economic recovery through tax cuts and a EUR 6.3 billion stimulus package to help the "re-industrialisation" of the country (Box 5.1).

In parallel, the Spanish government launched several initiatives to reduce administrative burdens on business, reinforce impact assessment for new regulations and strengthen regulatory management at the regional level. To revitalise Spanish business and boost its international competitiveness, Spain set ambitious targets that in some cases transcended those set by the EU. In one of the most notable examples, Spain aimed to

reduce administrative burdens by 30% at all levels of government by 2012. To achieve the target, the Council of Ministers created the Commission to Reform Public Administration (Comisión para la Reforma de las Administraciones Públicas, CORA) in 2012. Its mandate was to produce proposals to make public administration more austere, useful and effective. The final CORA report, completed in June 2013, recommended 78 actions by the central administration and 139 by the central administration and the Autonomous Communities.[8] With regard to environmental matters, the CORA report envisaged simplifying environmental processes for environmental assessment and environmental permitting (OECD, 2014b).

Environmental policies regulating industrial operations

Several reforms during the last decade have strengthened national environmental requirements. The most important changes occurred with regard to horizontal regulations, in particular environmental impact assessments, integrated environmental permitting and environmental liability. Key legal acts included: i) the 2007 implementing regulations to the Law on Integrated Pollution Prevention and Control (IPPC) (16/2002); ii) the 2013 Law on Environmental Impact Assessment; and iii) the 2013 Law on Environmental Liability. Those requirements have been translated into regional regulations with varying degree of stringency across Autonomous Communities.

In 2013, the OECD commissioned an industrial survey to analyse the relationship between environmental policy design and firm-level management and environmental performance in Spain. The survey attempted to compare the situation between 2006, just before the economic crisis started, and 2013. According to the survey, 67% of medium and large industrial firms considered the environmental policy regime to be more stringent in 2013 than in 2006; 41% considered that enforcement and compliance assurance by public authorities had become less flexible (Loureiro and Alló, 2014). Only 18% of surveyed firms indicated they had not carried out any environmental investment since 2006 (Box 5.5).

Box 5.5. **Environmental management at firm-level in medium and large Spanish firms**

Adoption of environmental management systems and practices. Most surveyed firms (76%) introduced an environmental management system and a further 10% are in the application process. More than 90% of firms have at least one person responsible for environmental issues. In most cases, these professionals belong to a department specialised in environmental issues (71%), while in less than 5% of cases they belong to senior management. A large majority of firms monitor the consumption of natural resources and energy (95%), solid waste generation (93%) and wastewater effluent (85%). However, only 56% gauge local or regional air pollution, and 55% measure soil contamination. The most widespread practices to help implement environmental management are internal and external environmental audits (85% and 83% of firms, respectively), environmental training programmes (82%) and written environmental policies or protocols (78%). Other practices include environmental accounting (55%), benchmarking environmental performance (47%), public environmental reporting (50%) and corporate social responsibility and sustainability reporting (46%). Only 19% of firms have a specific budget for environmental R&D. Around half of the firms altered production processes to improve environmental performance in the areas of natural resources (62%), solid waste generation (48%) and wastewater effluent (44%).

Box 5.5. **Environmental management at firm-level in medium and large Spanish firms** *(cont.)*

Technical measures. Actions across environmental themes vary widely – close to 85% of surveyed firms have acted in some way regarding natural resource use, while less than 38% of firms have done so for biodiversity and nature conservation. The proportion of surveyed firms that enhanced production processes to reduce pollution emissions and/or resource use vary from 62% for the use of natural resources to 15% for biodiversity and nature conservation. The proportion of firms that introduced end-of-pipe technologies to reduce pollution emissions or allow for resource recovery vary from 29% for wastewater effluents to 11% for global pollutants. Lastly, the proportion of firms that introduced changes in product characteristics vary from 14% for solid waste generation to less than 3% for wastewater effluents.

Environmental impacts. Around 60% of firms claim to have reduced consumption of natural resources and solid waste generation (per unit of output) since 2006. Among the surveyed firms, around half claim to have reduced wastewater effluents; around 40% said they reduced emissions of global pollutants, aesthetic effects (noise, smell, landscape), and local or regional air pollution; and around one-third said they reduced the risk of severe accidents.

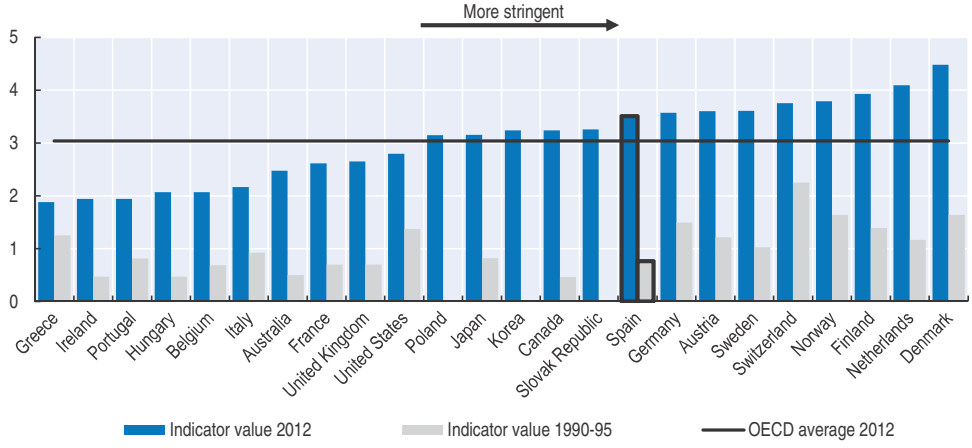
Motivations. Regulatory compliance is the most important driver of environmental management – 95% of the surveyed firms classify it as very important. Two-thirds of firms indicate that the environmental policy regime is more stringent (54%) or much more stringent (12%) than it was in 2006. About 42% of surveyed firms indicate that the level of environmental enforcement and compliance assurance has increased since 2006 (while 52% indicated that it has remained the same). Two-thirds of surveyed firms declare going beyond requirements – these firms are more likely to have multiple production facilities, headquarters located in a foreign country, annual sales above EUR 10 million and an environmental management system. Motivations, other than regulatory compliance, identified as very important include the prevention or control of environmental incidents (identified by 87% of firms), corporate image (69%), new product development (56%), demand from client companies (45%), cost savings (38%), new technology development (37%) and demand from final consumers (28%). In comparison with 2006, 62% of firms consider that cost savings are now a more important motivation, 42% indicate that corporate profile is now a more important motivation and about 30% indicate that new technology development and new product development are more important motivations. Cost reductions seem to be the most relevant driver for environmental improvements in the areas of natural resource consumption, waste generation and wastewater effluents.

Barriers. In 2013, 80% of surveyed firms identify the cost of environmental measures as a barrier for taking environmental actions, roughly the same as five years before. The proportion of firms identifying lack of access to finance as a barrier has increased (from 49-55% of firms). All other barriers seem to have improved, but 62% of firms still identify complexity of administrative procedures and 41% identify obsolete technical requirements of the legislation. The difficulty in choosing the right environmental measures is identified as a barrier by 37% of firms (down from 51%), and the lack of specific environmental skills by 25% (down from 42%).

Source: Loureiro and Alló (2014).

The stringency of policies increased in Spain more rapidly than in many other OECD member countries, largely as a result of a delayed and then accelerated harmonisation of environmental requirements with the EU legal framework. According to a recent OECD study, Spain's environmental policy can be classified as moderately stringent, just above the OECD average, and that this should not have detrimental effects on productivity (Figure 5.6) (OECD, 2014c). The same study suggests that Spain is the OECD country where environmental policies cause the highest burden to the economy in influencing market entry and competition. The major factors are direct impediments to competition (such as vintage-differentiated regulations and tax relief, and various subsidies awarded on the basis of historical performance), lack of coherent and consistent information, and lengthy, uncertain procedures, especially related to evaluation of both existing and new policies. While there are also administrative burdens in environmental permit and licensing (Figure 5.7 and Section 3), they are among the lowest in the OECD (OECD, 2014c).

Figure 5.6. **OECD environmental policy stringency indicator**



Source: Botta, E. and T. Koźluk (2014), "Measuring Environmental Policy Stringency in OECD Countries: A Composite Index Approach", *OECD Economics Department Working Papers*, No. 1177.

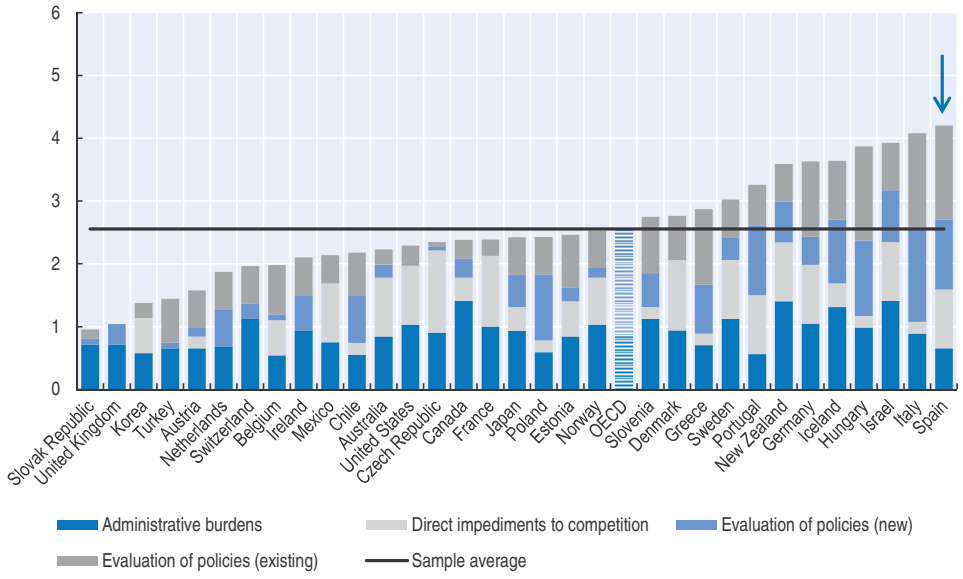
StatLink http://dx.doi.org/10.1787/888933183137

2.2. *Institutional framework*

Different ministries implement economic policies that affect the industrial sector. The Ministry of Industry, Energy and Tourism co-ordinates programmes of support for industrial competitiveness and re-industrialisation, including the PIN2020. The Ministry of Economy and Competitiveness is responsible for economic regulations and manages the national programme for research, development and innovation. The Ministry of Finance and Public Administration is responsible for fiscal policy; it includes incentives for R&D and innovation targeting SMEs, as well as a number of measures to promote their growth, job creation and liquidity. It also includes incentives for environmental investments. The Ministry of Agriculture, Food and Environment (MAGRAMA) plays an important role in regulating environmental performance of the industrial sector, mostly through regulations on environmental impact assessment procedures, environmental permitting, and compliance monitoring and promotion.

Several mechanisms exist to facilitate policy co-ordination between the economy, industry and the environment. Policy and regulatory proposals are systematically

Figure 5.7. **OECD indicator on burdens to the economy due to environmental policies**



Source: Kożluk, T. (2014), "The Indicators of the Economic Burdens of Environmental Policy Design: Results from the OECD Questionnaire", *OECD Economics Department Working Papers*, No. 1178.

StatLink http://dx.doi.org/10.1787/888933183145

discussed at the General Commission of State Secretaries and sub-Secretaries before being presented to the cabinet for approval. Since 2009, newly proposed regulations must undergo a regulatory impact assessment that considers policy impacts on prices, productivity, employment, innovation, consumers and SMEs. This process already helped ensure that new environmental regulations related to industrial activities reduced the compliance costs of the regulated community (Chapter 2). Since 2011, the Inter-ministerial Commission for Climate Change is in charge of developing and monitoring the implementation of climate change policies that are particularly important for the industrial sector.

Within the multilevel governance system of Spain, the regional governments at the Autonomous Community level play an important role regarding industrial and environmental policies, including legislation (through the regional parliaments), economic and environmental licensing and permitting, provision of industrial infrastructure and subsidies, and enforcement. In a recent survey, 76% of sampled industrial firms indicated that regional authorities are the most influential actors in the environmental management of firms, compared to 67% for national authorities (Loureiro and Alló, 2014).

The same survey also identified other stakeholders without a regulatory role that nevertheless influence environmental practices of industrial firms: commercial clients, neighbourhood and community groups, consumer groups, shareholders and investment funds. Banks and other lenders, industry associations and the media ranked among the less influential stakeholders (Table 5.1).

Table 5.1. **Influence of stakeholders on the environmental practices of environmental firms**

(% of respondents)

	Not important	Moderately important	Very important	Not applicable
National public authorities	5.13	25.64	66.67	2.56
Regional authorities	3.02	17.24	77.59	2.16
Commercial clients	13.96	43.24	37.39	5.41
Shareholders and investment funds	18.32	32.67	30.20	18.81
Banks and other lenders	43.75	25.52	10.94	19.79
Labour unions, employees	20.10	43.54	29.19	7.18
Industry associations	22.06	45.59	24.51	7.84
Environmental groups or organisations	21.46	45.37	26.34	6.83
Consumer groups	22.66	37.93	31.53	7.88
Neighbourhood/community groups	15.20	40.69	33.33	10.78
Media	25.49	39.71	23.04	11.76
Other groups or organisations	16.95	15.25	8.47	59.32

Source: Loureiro and Alló (2014).

3. Selected policies for strengthening environmental performance of enterprises

3.1. *Effectiveness and efficiency of the regulatory framework*

Environmental impact assessment

Environmental impact assessment (EIA) has been one of the key instruments to mitigate negative impacts of planned industrial projects. In Spain, EIA has been regulated since 1986, but the system was significantly reformed in 2001 and 2006 to bring EIA procedures in line with EU requirements. In particular, the reforms substantially extended the scope of projects subject to the compulsory EIA (Annex I) and those subject to discretionary EIA at the regional level (Annex II). The reforms also included stronger provisions for public participation in EIA procedures and incorporated EIA requirements into the transboundary context. In 2008, a consolidated text of the Law on Environmental Impact Assessment contributed to increasing the legal certainty for project promoters.

Unlike in other OECD member countries, the Spanish EIA law envisages penalties for implementing projects without a required EIA, before obtaining an Environmental Impact Declaration (Declaración de Impacto Ambiental, DIA) from the competent authority and for altering the project conditions established in the DIA. The levels of fines, which can range from EUR 24 000 to EUR 2.4 million, depend on the damage caused to the environment and/or human health, as well as the particular situation of the offender, such as its financial condition.

Since the reforms also made EIA compulsory at the regional level, most ACs issued their own laws and implementing regulations.[9] They were allowed to establish more restrictive thresholds or include additional types of projects for which EIA was required. Several regional EIA laws included provisions for compensatory and offset measures in EIA procedures. For example, Aragón required compensation for environmental damage in potential wind farm areas that are ecologically sensitive. In Navarra, a reduction in forested land required reforestation of an equivalent area.

A study commissioned by the Spanish Association for Environmental Impact Assessment indicated the number of EIA procedures every year increased from a few

hundred in the early 2000s to nearly 8 000 in 2007. The region-by-region data show significant differences in the number of EIAs – from 2 000 in Extremadura to 23 in Cantabria. This wide range was due not only to differences in the structure of economies, but also to the varying levels of regulation within the ACs (González Ubierna et al., 2011).

In many cases, EIA helped identify and reduce environmental impacts, especially for projects developed near nature protection areas. Over time, however, the business community raised concerns about shortcomings in the process, including unpredictability of results, complexity and delays. On average, an EIA required an estimated 3.4 years to be processed; almost 10 000 EIA case files accumulated in 2013 at various public administration services. Lack of uniformity in EIA across Spain led to different regulatory requirements, documentation and decisions in every region. This significantly increased application costs for promoters that planned investments in more than one community. Delays were also due to inadequate numbers of dedicated staff: the average number of EIAs per specialist in the regional environmental authority is about 30 per year, reaching 50 in some regions. These factors contributed to considerable delays in collecting and processing data, leaving a poor impression among applicants. Moreover, on numerous occasions, evidence suggests political interference in EIA decisions (González Ubierna et al., 2011).

To respond to these challenges and to the need for a clear legal framework, the Law on Environmental Assessment (21/2013) was approved in December 2013. The new law combines legislation on strategic environmental assessment and environmental impact assessment, as well as simplifies administrative procedures. By detailing EIA procedures and making it unnecessary for ACs to issue implementing regulations, the new law is expected to ensure common application of EIA across Spain.[10] The new legislation limits standard EIA to four months. It also requires higher quality, standardised documents from the project proponents and provides clearer *ex ante* notification regarding technical requirements.

The MAGRAMA estimated the new law will stimulate employment by creating close to 80 000 jobs and generate an additional EUR 1 billion from new economic activities. However, its implementation requires additional efforts at the national and regional level. This includes wider use of information and communication technologies, increased resources for processing and monitoring of the EIAs, and the creation of a "one stop shop" for all environmental procedures (AEIA, 2013).

Integrated environmental permitting

The 2002 Integrated Pollution Prevention and Control (IPPC) Law harmonised the Spanish legal framework with the EU IPPC Directive (96/61/EC). It required operators of large industrial installations, around 4 500 covered by Annex I of the IPPC Directive, to obtain an integrated permit (*autorización ambiental integrada* – AAI). Emission limits in the permits were based on best available techniques (BAT) and had to take into account local environmental conditions. To help licensing authorities and companies determine BAT, the European IPPC Bureau of the Institute for Prospective Technology Studies at EU Joint Research Centre in Seville organised an exchange of information between experts from EU member states, industry and environmental organisations.

The introduction of the AAI started late in Spain as some executive regulations were issued only in 2007 and harmonisation was completed in 2012. Only 596 permits were

issued in 2005, a number that increased to around 1 200 in 2007; AAI advanced rapidly so that nearly 4 000 permits were issued by mid-2008. Significant progress has been made since then. Around 10% of 6 100 large installations were awaiting completion of the procedure in 2011, four years after the deadline. The regional authorities, which are competent to provide the permits, publish their inventory of industrial installations with AAI, available for public information on the Spanish PRTR platform (*www.prtr-es.es*).

The integrated approach has had a positive impact since it brought together a range of permits that enterprises had previously to request separately. These include permits for the production and management of solid waste, for effluent discharges to inland waters or for effluent discharge in coastal waters. It has also enhanced understanding of regulatory demands from industries and helped regulate other industries for the first time. Some ACs introduced advanced approaches to simplify and accelerate authorisation procedures, such as integrating EIA and the AAI for large installations.

However, as with EIA, the industrial sector increasingly considered the AAI as a long and complex burden with both direct and opportunity costs (CEOE, 2012). Analysis by the Ministry of Public Administration in 2012 confirmed the proliferation of specific legislation by regional governments fragmented markets and increased the administrative burden for businesses. The study suggested that regulatory co-ordination and streamlining of the integrated permitting system could generate benefits for businesses in the range of EUR 1 billion in 2013-15 (CEOE-CEPYME, 2012).

Responding to these challenges, as well as to the changes at the EU level,[11] AAI procedures were reformed in June 2013. The new law and a number of implementing regulations tightened some requirements. For example, the changes reinforced implementation of the BAT to determine levels for industrial facility emissions and introduced new requirements to protect soil and groundwater.[12] However, it also introduced measures to reduce administrative burden and processing times.[13] The law also allowed applicants to request an amendment to the existing permit under a summary procedure when substantial changes have been made to the installations rather than having to apply for a new permit. It also established a limit of nine months for granting the permit. Finally, the law allowed for a single AAI for various parts of an industrial facility located on the same premises, even if such parts are operated by different title-holders/owners; previously, the facility required a sole owner.

Environmental liability

Spain has established an extensive system for covering potential environmental liabilities related to industrial operations. Since 2002, activities subject to IPPC, as well as waste management operators, have had to buy compulsory civil liability insurance for environmental pollution before obtaining environmental permits. Each AC determines the limit and scope of insurance cover.

The 2007 Environmental Liability Law (ELL) reinforced mechanisms to prevent and address the impacts of potential accidents with harmful consequences for the environment. The new law introduced provisions that ensure environmental damage remediation even in cases where an economic activity is in full compliance with the law (Box 5.6). To support application of the law, the Technical Commission on the Prevention and Remediation of Environmental Damage provides a framework for co-operation between the regions. It also develops support instruments such as an environmental

Box 5.6. **The Environmental Liability Law**

The Environmental Liability Law (ELL), adopted in April 2007, harmonised Spanish legislation with the requirements of the EU Directive on Environmental Liability in relation to the Prevention and Remediation of Environmental Damage (2004/35/EC). Before the ELL entered into force, the existing environmental legislation allowed the administration to order restoration or payment of damages when the operator was at fault. The law introduced strict liability for operators of activities listed in an annex of the ELL (also covered by Annex III of the EU Liability Directive). Subsidiary liability was also imposed on the managers and administrators of the legal person whose conduct has resulted in the liability of the latter. Furthermore, the law extends liability to the parent company.

The ELL goes further than the EU directive with respect to the coverage of scope and activities. It covers not only those species of fauna and flora that are protected by EC directives, but also those protected under national and regional Spanish legislation, in particular those listed as endangered species. As in the EU directive, the ELL extends environmental damage to species and habitats, water and soil, but also deals with damage caused by activities other than those listed in Annex III of the directive. Under the law, environmental organisations and owners of the land where the restoration is to take place have the right to trigger administrative action concerning restoration of the damaged environment.

By adopting the law, Spain became the eighth EU member state to introduce compulsory financial guarantees that cover the risk of environmental liability for operators included in Annex III. This risk is determined on a case-by-case basis by the public authorities with the maximum amount set at EUR 20 million. However, the maximum coverage does not affect total liability, which is unlimited. This means the operator remains liable and must bear the costs of reparation even in cases where the amount necessary to restore the environment is higher than the amount of the mandatory financial security. To cover outstanding liabilities, a Compensation Fund for Environmental Damage was established as part of the Consortium of Compensation of Insurances. The fund, administered and managed independently, will be financed via a surcharge on the premium for the insurance of environmental liability. Insurance companies will have to make monthly payments to the fund when the mandatory financial security system is in force.

Operators can comply with their obligation to have financial guarantees by: i) purchasing an insurance policy; ii) securing a financial guarantee from a financial entity authorised to operate in Spain (e.g. in a form of bond); or iii) setting aside a technical reserve through a self-owned fund. The guarantee must be maintained for the entire period of operation. Non-compliance with the guarantee is a serious infraction that can result in loss or suspension of the operator's authorisation up to two years and a fine of between EUR 50 000 and 2 million.

Some operators in Annex III are exempted from the guarantee obligation, including:

- Operators of activities likely to cause damage for which primary remediation is estimated to be less than EUR 300 000
- Operators of activities likely to cause damage for which primary remediation is estimated at between EUR 300 000 and 2 million but who show they are continuously certified with EMAS or ISO 14001 certification regimes
- Active users of phytosanitary products and biocides if these products serve agriculture and forestry purposes.

In 2009, additional regulations approved methods to assess damage in order to constitute the mandatory guarantee. The risk assessment must respect the national non-binding standard on risk assessment (UNE 150008:2008) or similar method, and be verified by an independent agent.

Source: Pedraza et al., (2013).

liability support software model (MORA). This helps put a monetary value on primary and complementary compensation costs; it also enables estimates of the extent of financial guarantees, as well as guidelines with criteria for repairing environmental damage.

The law has been infrequently applied in practice to date. In general, the law is only applicable for very serious cases. However, in the last two years, the number of ELL cases in Spain has increased. The ELL is a horizontal piece of legislation intended to complement sectorial legislation. The usefulness of the law has been demonstrated in certain cases, for example, when more than one natural resource is involved. To help competent authorities and to foster a more effective application of the law, a series of administrative and technical instruments have been developed. For example, guideline documents are being drafted for the determination of the magnitude of environmental damages in the context of ELL.

In 2014, the provisions of the liability law were simplified. Some low-risk activities were exempted from liability regimes, which reduced the burden on many SMEs. In addition, a new environmental damage index allowed the ranking of damage scenarios to simplify the determination of the mandatory financial guarantees. These revisions aimed to enable operators to carry out voluntary risk assessment and to cut red tape by shifting responsibility for determining the level of financial security to the operators. Around 10 000 of 320 000 operators covered by the law have already taken out voluntary insurance. An advisory body of the Council of State, estimated the changes would save the regulated community around EUR 160 million. However, the new law has been criticised for significantly reducing the number of operators required to arrange financial security and limiting the role of the state in risk assessment.

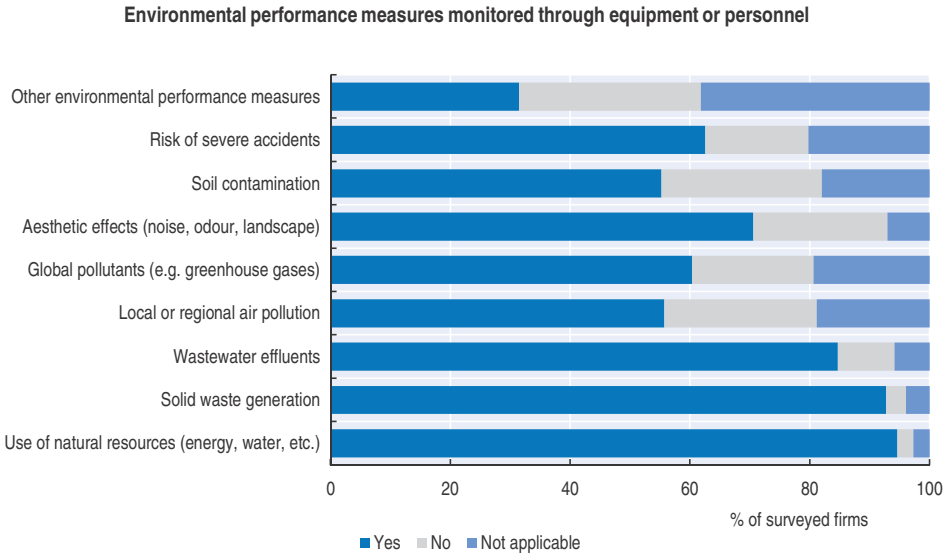
3.2. Environmental compliance and enforcement

Environmental compliance monitoring

The OECD survey of enterprises shows that over 90% of medium and large-sized firms (those with more than 100 employees) internally monitor use of natural resources (water and energy), releases of wastewater and solid waste generation; between 60-70% monitor aesthetic impacts (such as odour and impacts on landscape), noise levels, risk of accidents, local or regional air pollution, and soil contamination (Figure 5.8). The self-monitoring information has helped manage and reduce environmental impacts and related costs. It has also been used to inform authorities and the public about compliance with environmental requirements and pollution incidents.

Industry regularly presents results of self-monitoring related to emissions of air, water and soil pollutants, accidental emissions and external transfers of solid waste to the environmental authorities through a state register operational since 2001. Originally known as the European Pollutant Emission Register (EPER-Spain), the Spanish Register of Emissions and Pollutant (PRTR-Spain) collects environment-related information from over 6 000 industrial complexes in Spain.[14] All data above the PRTR thresholds are publicly available on the web (*www.prtr-es.es*).[15] At the regional level, some Autonomous Communities have their own PRTR websites (*www.prtr-es.es/conozca/Enlaces-interes-html#comunidadautonoma*). Competent authorities use the PRTR data to monitor compliance with environmental permits and to verify the information collected under national reporting schemes. The data are also used for designing specific policy instruments such

Figure 5.8. **Environmental self-monitoring by industrial firms**



Source: Loureiro, M.L. and M. Alló (2014), *Environmental Policy Tools and Firm-level Management Practices in Spain (2006-2014)*, OECD and University of Santiago de Compostela.

StatLink http://dx.doi.org/10.1787/888933183155

as environmental taxes or obligatory financial guarantees under the environmental liability legislation, as well as by different departments at national or regional level as a complementary tool to comply with the respective international reporting requirements.

The Working Group on PRTR, co-ordinated by the MAGRAMA, provides a platform for discussion and decisions concerning the scope, information requirements and models for transfer of information. For example, the group explores methodology and dissemination issues with representatives of industry and environmental organisations.

While the PRTR has been continuously expanded and improved, the administrative structure of the country and a growing number of reporting requirements have made monitoring complex and costly, both for government and industry. Recent discussions highlighted the need to further improve the system by, for example, increasing the number of common criteria for data gathering, and issuing sector-specific methodological guidance. There is also a need to digitalise information as some industrial activities (e.g. intensive farming) still send reports on paper to corresponding autonomous authorities (MAGRAMA, 2013c).

Environmental enforcement

Since industrial-related compliance assurance and enforcement are carried out at the sub-national level, the discretion of authorities varies substantially among Autonomous Communities. In principle, the regional administration inspects all permit holders periodically, but in some cases these responsibilities are delegated to the lower levels. For example, some municipalities (e.g. Zaragoza) have had historically strong environmental enforcement programmes. Meanwhile, Aragón has delegated authority to inspect compliance to *comarcas*, which are traditional communities of several municipalities. Other agencies can also carry out inspections. For example, eight river basin authorities (Water

Confederations) issue water abstraction and wastewater discharge permits and have the right to inspect permit compliance. In case of non-compliance, they can impose sanctions in accordance with the Water Law.

Several Autonomous Communities have strengthened their compliance assurance policies as part of the process of cutting red tape. For example, Navarra uses software to prioritise inspection on the basis of complexity, amount of pollution releases, location and the operator's environmental management system (Mazur, 2011). Responding to new inspection requirements of the EU Directive on industrial emissions, many regions (e.g. Andalusia, Basque Country, Castile-La Mancha, Madrid, Murcia, Navarra, La Rioja) have recently developed prioritised environmental inspection plans, subject to minimum national limits established in 2011 (MAGRAMA, 2013c). Even though regional authorities have complete discretion in monitoring compliance with their own regulations, fines for non-compliance must conform to national standards that define lower and upper limits for specific types of infringements (Mazur, 2011).

To support regional enforcement agencies and co-ordinate compliance assurance, Spain's Autonomous Communities established a State Environmental Inspection Network (REDIA) in 2008. The network, which brings together regional enforcement units and the national environment ministry, provides a platform to exchange best practices through projects of common interest (Box 5.7). Such a co-operation mechanism has been effective and its strengthening would be an excellent way to ensure national consistency in environmental enforcement. The network would benefit from additional financing and a permanent secretariat to facilitate operations; this could help better co-ordinate activities with the national-level enforcement agency responsible for nature conservation (SEPRONA), which usually has more inspection staff in the region than the ACs.

Box 5.7. **Networks promoting environmental compliance**

The REDIA network

Inspired by the European Union Network for the Implementation and Enforcement of Environmental Law (IMPEL), the environmental enforcement agencies of the Autonomous Communities created the Environmental Inspection Network (REDIA) in 2008. The REDIA allows regional environmental enforcement officials to identify and exchange experience on best practices through projects of common interest – from developing guidance documents to organising technical workshops. MAGRAMA representatives regularly take part in network activities.

The network is managed by an Executive Committee, which comprises representatives of five ACs on a rotating basis who elect a president. The committee prepares plenary meetings, technical sessions and workshops; elaborates annual work plans and annual activity reports; and selects projects for approval at plenary meetings. The committee also co-ordinates the REDIA's participation in other scientific/technical forums and in IMPEL activities.

Until now, the REDIA has focused its work on inspection. It has developed a protocol for developing environmental inspection programmes and common inspection criteria, as well as a tool for supporting systemic evaluation of environmental risks in industrial installations. It has also worked on damage assessment to inform implementation of the environmental liability law.

Box 5.7. **Networks promoting environmental compliance** *(cont.)*

Developing a coherent and consistent approach across different sub-national and local jurisdictions is a major challenge in terms of compliance assurance policy and the choice of specific tools. The REDIA Network provides a solid basis on which to strengthen the environmental enforcement system in Spain and its activities should be expanded. Some key priorities of the network could be:

- Joint environmental priority setting, priority-setting tools, guidance and training to promote risk-based inspection targeting
- Comparable enforcement policies (based on jointly developed guidance) and interagency co-ordination to identify proportionate and equitable responses to environmental violations
- Consistent methodologies to determine monetary penalties with the aim of removing the economic benefits of non-compliance – a crucial factor in restoring a level economic playing field across the regulated community and among regions.

An important prerequisite to evaluate the consistency of enforcement nationwide is accurate and complete information on the performance of sub-national and local enforcement authorities. The REDIA Network should develop a set of performance indicators and elaborate mechanisms for performance assessment and mutual support among the regions.

Green Entrepreneurs Network

Launched in 2011, the Green Entrepreneur Network (Red Emprendeverde) helps entrepreneurs create and expand companies or new lines of business in activities linked to the environment. The network is operated by the Fundacion Bioversidad, a public entity under the MAGRAMA, and co-funded through the European Social Fund.

The network is open to any entity concerned with green business, including entrepreneurs and investors, but it focuses on stimulating start-up and consolidating SMEs. The network, which currently has 4 300 members, provides counselling and training to help entrepreneurs develop business plans, incorporate new business lines related to green skills and sustainability, and foster environmental compliance. It provides specific information on eco-innovation, investment and also potential sources of funding. The "Green Business Network Web Platform 2.0", a tailor-made social network, helps in networking and best-practice sharing, as well as in the development of potential synergies among participating SMEs.

Emprendeverde regularly runs awareness-raising campaigns and has created its own annual award for green entrepreneurs who support sustainable economic activity, create jobs or eco-innovate to address environmental problems. The award is given in three categories: new entrepreneurial initiatives; new green product lines through existing enterprises; and new green product lines through existing enterprises (older than five years). Apart from special recognition, award winners receive additional dissemination and marketing. Previous winners, for example, have been singled out for improving the quality of surface waters in Bilbao and manufacturing portable water purification equipment. The 2014 editions of the award attracted 260 applications.

Source: Mazur (2011), *www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/medio-ambiente-industrial/inspeccion-ambiental/redia/*, *www.redemprendeverde.es/*.

3.3. Use of economic instruments

Environmentally related taxation

Although used less than in most OECD member countries, environmentally related taxes have played an important role in strengthening environmental management of Spanish industry. As in other countries, environmentally related taxes in Spain are dominated by those related to energy and transport (95%) (INE, 2011, Chapter 3). Payments from the manufacturing industry represent a small share of environmentally related taxes, accounting in 2011 for 7.9% (EUR 1.3 billion) of the total (INE, 2013). This share has been relatively stable, moving between 7.8-8.8% between 2008-11. In 2010, manufacturing industry paid about 6% of energy taxes and 33% of pollution taxes (INE, 2011).

Industrial operators have increasingly been charged environmentally related taxes at the regional level, which can be introduced by the ACs in the absence of national taxation (Table 5.2). Regional environmental taxes that apply to industrial producers include taxes on air pollution emissions, water use and pollution discharges, effluent discharges on coastal waters, and waste generation and storage. The most significant in terms of revenue, however, relate to water use and pollution.

The impacts of regional environmental taxation have been limited, mostly due to low tax rates, as well as weak connections between the tax base and actual environmental impacts, inequality in treatment and co-ordination problems between different governance levels, especially related to water use and pollution (González Laxe et al., 2006; Gago and Labandeira, 2013).

Table 5.2. **Regional environmental taxes that apply to industrial producers**

Environmental topic	Region (date)	Revenue in 2010 (million EUR)
Air pollution	Andalusia (2003)	3.8
	Aragón (2007)	2.5
	Galicia (1995)	2.1
	Murcia (2005)	0.6
Water use and pollution	Andalusia (2010)	Not applicable
	Aragón (2001)	34.7
	Asturias (1994)	26.7
	Balearic Islands (1992)	89.9
	Canary Islands (1994)	0.2
	Cantabria (2002)	25.9
	Catalonia (2003)	340
	Extremadura (2012)	Not applicable
	Galicia (1993 and 2008)	31.9 + 10.6
	Madrid (1993)	1.8
	Murcia (2002)	37.0
	La Rioja (2000)	7.4
	Valencian Community (1992)	199.6
Coastal waters	Andalusia (2003)	3.1
	Murcia (2005)	0.4
Waste	Andalusia (2003)	0.4
	Cantabria (2009)	1.3
	Extremadura (2012)	Not applicable
	Madrid (2003)	2.6
	Murcia (2005)	2.9

Note: There are other environmental taxes that do not apply to industrial manufacturing sectors. Dates refer to the year of approval of the relevant law. The revenue figures correspond to the total for all sectors (including households) subject to the tax, not just industrial sectors.
Source: INE (2011) and Economistas (2013).

3.4. Subsidies

The Spanish government has used public funds to support and stimulate environment-related investment via tax concessions or subsidised loans through a multitude of government programmes and legal instruments (Box 5.8). In some cases, these funding mechanisms have enabled private operators to make environment-friendly investments, mainly by lowering upfront costs and making the investment economically viable. However, in addition to being a cost to the budget, subsidies are generally not the most cost-effective instrument to achieve environmental objectives. Taxes that directly incorporate the cost of environmental damage into market prices are generally more efficient to tip the balance in favour of environmental investment; credit support (e.g. loan guarantee) is more appropriate to address capital market failures.

A key problem with government financial assistance is that some beneficiaries may invest without the support. As determining the exact subsidy needed to stimulate changes in investment decisions is difficult, subsidy programmes may result in extensive windfall benefits (Box 5.9). In addition, by targeting a limited range of "cleaner" technologies or activities, subsidy-based measures encourage firms and consumers to adopt the subsidised solutions even when other options are more effective. Thus, the overall environmental support policy towards the industrial sector would benefit from a thorough evaluation of its cost effectiveness. This review should include funds disbursed at both the national and regional levels, and consider the extent to which actual outcomes of subsidised investment projects meet expectations (or desired outcomes) and at what cost.

3.5. Business sector actions

Environmental expenditure by the industrial sector

Since 2004, the annual environmental expenditure of Spanish manufacturing industries has been above EUR 2 billion per year. Despite an increase in absolute level until 2008, expenditure as a share of the sector's gross value added has been relatively stable, oscillating between 1.6% and 2% (Figure 5.9). In the same period, there has been an evolution in the composition of environmental expenditure. Investments in pollution control equipment and installations have been decreasing since 2007, which may be attributed to efforts by the manufacturing industry in 2004-08 to comply with IPPC regulations. Current expenditures have been increasing every year of the period (except 2009): this may be partly attributed to the need to operate and maintain a growing stock of environmental protection equipment and installations. The share of current expenditure has grown from 60% to 76% of total environmental protection expenditure.

Environmental management systems

Spanish industry has become a leader in the adoption of environmental management systems (EMS), which help it manage environmental programmes in a comprehensive, systematic and documented manner. Between 2000-03, the number of companies registered under ISO 14001 rose from around 600 to 4 860, representing 15.7% of organisations registered in Europe and 7.5% of organisations registered in the world. By 2012, registrations reached an impressive 19 470, giving Spain the third highest number of certified companies in the world after China and Italy (Figure 5.10).[16]

Spanish companies are also certified under the EU's Eco-Management and Audit Scheme (EMAS). This includes the ISO 14001 requirements, but adds several elements such

Box 5.8. **Budgetary support to environmental investment**

Corporation tax concessions for environmental investment

The 2004 reform of the Law on Corporation Tax introduced a tax incentive for environmental investments – a 10% deduction in the tax payment of the company's expenses for environmental investments. Environmental investments were understood as those aimed at reducing air pollution emissions, reducing effluent discharges or promoting the reduction, reuse or adequate treatment of industrial waste. The environmental investments were required to help industry comply with environmental regulations, and had to be integrated into the framework of plans, programmes or agreements; environmental authorities had to issue certificates validating those requirements. The definition of environmental investments also included the acquisition of industrial or commercial vehicles that resulted in fewer emissions, as well as investments in renewable energies. Between 2007-10, the rate of the tax deduction was progressively reduced from 10% to 2%. In 2011, the Law on Sustainable Economy established the tax deduction rate at 8%. That same year, only 359 entities applied for the tax deduction for a combined amount of EUR 12 million; 744 entities were eligible for a combined amount of EUR 119 million (MAGRAMA, 2013b).

Subsidies to accelerate the uptake of environmental goods and services

Spain has several instruments to accelerate the uptake of environmental goods and services. At the national level, they include tax breaks for environmental investments as discussed above; subsidised loans for targeted environmental investments such as energy efficiency; and subsidised loans for general investments that include some premiums for environmental investments. At the regional level, most regional environmental taxes introduced by the ACs also include tax deductions for environmental investments ranging from 15-60% depending on the tax and the region (Lubián Silva, 2013). The effectiveness and efficiency of those instruments to improve environmental quality does not seem to have been evaluated.

Subsidised loans for energy efficiency investments

The 2011 Action Plan on Energy Savings and Energy Efficiency estimated the industry sector would need to invest EUR 806 million per year to achieve its objectives. The plan also envisaged the provision of public support of EUR 75 million per year in the form of grants, loans, guarantees and other instruments. Since 2013, industrial companies benefit from subsidised loans to finance investments in energy efficiency. The JESSICA-FIDAE Fund, which manages EUR 123 million for two years, will provide the subsidy component until April 2015. This fund is managed by the European Investment Bank and co-financed by the Spanish Institute for Energy Savings and Diversification (IDAE)* and the European Regional Development Fund.

* IDAE is an agency attached to the Secretary of Energy of the Ministry of Industry.

as stricter requirements on the measurement and evaluation of environmental performance, and compliance with environmental legislation. After Italy, Spain has the most EMAS-certified organisations (1 080) and sites (1 282). Industrial enterprises account for around half of this number; a large percentage are located in Catalonia (Figure 5.10). In 2012, Spain issued the fifth highest number of EU Ecolabel products, after Italy, France, the UK and the Netherlands (EC, 2012). The Spanish government supports Ecolabel certification by reducing the application fee for all companies that already have an eco-management and audit scheme in place.

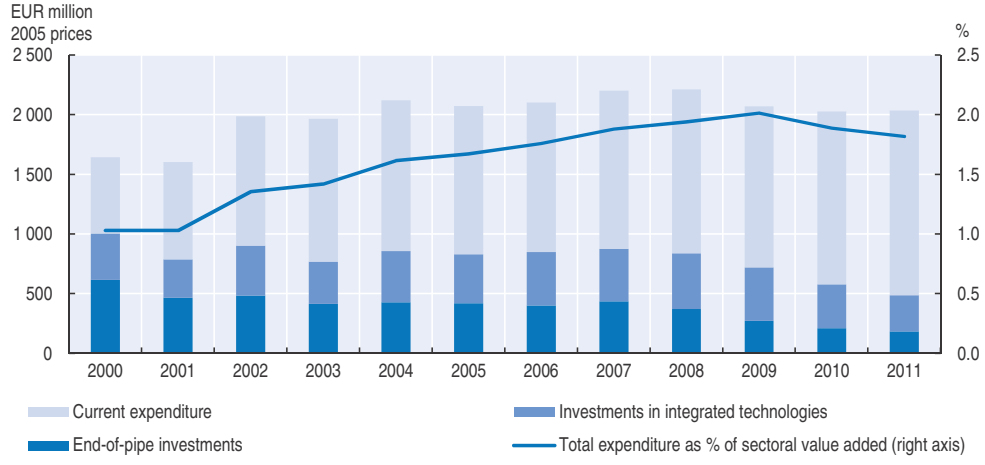
Box 5.9. **Windfall profits through sale of permits under the EU ETS**

The EU emissions trading system (EU ETS) covers the following sectors in Spain: oil refineries, metal, glass, ceramics, and pulp and paper. The average annual GHG emissions of those sectors in 2000-05 was 67.20 million tonnes of carbon dioxide ($MtCO_2$), representing 38.4% of total Spanish emissions covered by the EU ETS.

Similar to other sectors covered by the EU ETS, Spanish industry has been granted a number of emission allowances free of charge each year. Spanish authorities have allocated these free allowances based on the overall emissions ceiling of the country, historical emissions from each sector, and expected growth of emissions. For 2005-07, the industrial sector covered by the EU ETS was allocated allowances for 70.34 $MtCO_2$ per year on average; this increased to 73.92 $MtCO_2$ for 2008-12. The economic crisis reduced industrial activity and electricity demand, resulting in a decrease in GHG emissions across the EU. As a result, at the start of Phase 3, the EU ETS had a surplus of almost 2 billion allowances. Some industrial facilities have benefited from the sale of their free allowances instead of investing in emission reduction technologies. Some analysts put the revenue generated from free allowances at EUR 300 million in 2009 (Escribano, 2009). In addition, given the electricity generation sector will not have free permits during the 2013-20 phase of the EU ETS, Spanish authorities have allocated EUR 1 million to compensate some electricity-intensive industries exposed to carbon leakage for the expected increase in electricity prices.

During the third phase, the impacts of the EU ETS on the environmental performance of Spanish industry are expected to be stronger. As fewer allowances will be free, industry will have to pay directly for allowances. Indirectly, they will also be affected by the expected rise of electricity prices.

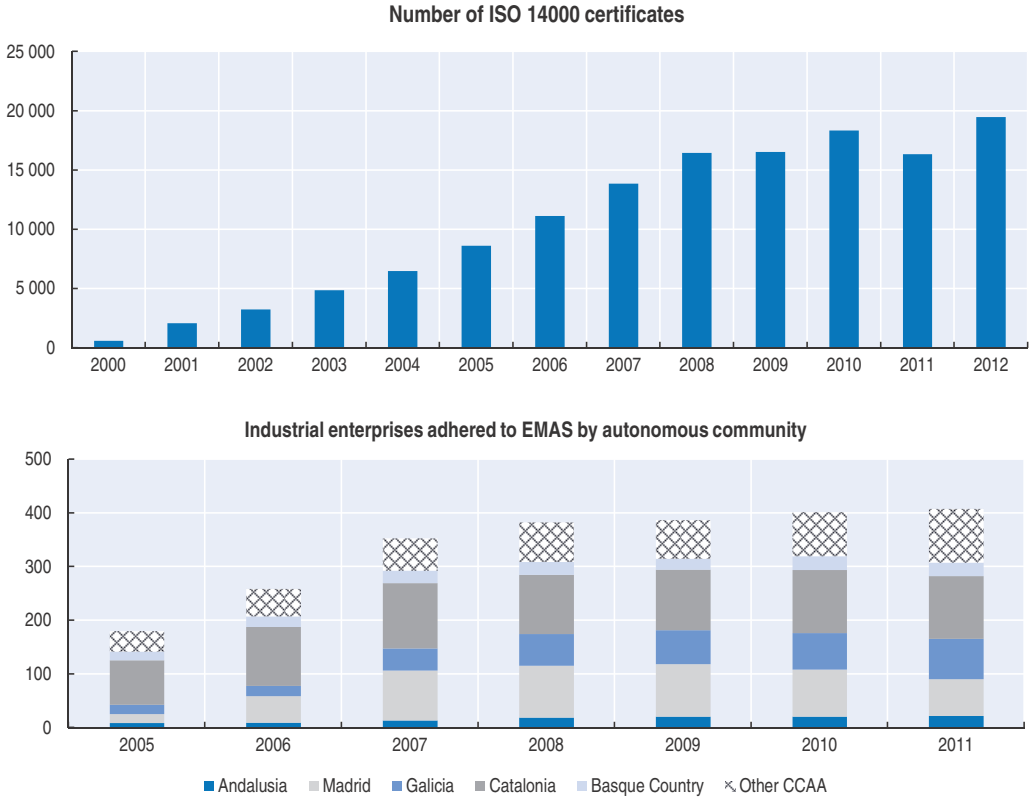
Figure 5.9. **Environmental protection expenditures of the manufacturing industry**



Note: Data refer to investments and total current expenditure (including payments to specialised producers of environmental protection services). Includes expenditure on i) pollution abatement and control covering air protection, waste and wastewater management, protection and remediation of soil and groundwater, and other environmental protection activities; and ii) biodiversity and landscape protection. Excludes expenditure on water supply.
Source: INE (2013), *Survey on Industry Expenditure on Environmental Protection. Year 2011;* OECD (2014), *OECD Economic Outlook No. 95* (database); OECD (2014), *Environment Statistics* (database).

StatLink http://dx.doi.org/10.1787/888933183169

Figure 5.10. **Industrial enterprises adhered to ISO and EMAS certification schemes**



Source: MAGRAMA (2014), *Environmental Indicators Bank* (database).

StatLink http://dx.doi.org/10.1787/888933183176

The Ministry of Agriculture, Food and the Environment has actively promoted the implementation of EMAS through a number of measures, including providing funds from the European Regional Development Fund (2007-13) for such initiatives. In addition, no fees are charged for processing the EMAS registration and a discount is applied to fees associated with eco-labelling in the EU (30% discount for companies with EMAS and 15% discount for ISO 14001). Through the "BRAVE" project, industries with an EMAS system are subject to a simplified inspection and monitoring of the Integrated Environmental Authorisation. Finally, in the context of the Environmental Liability Law (see Box 5.6), certain operators may be exempted from the obligation to provide the mandatory financial guarantee if they show they are continuously certified with EMAS or ISO 14001.

EMS have become attractive to Spanish firms as they enable them to integrate procedures and processes for training of personnel, monitoring and reporting of specialised environmental performance information to internal and external stakeholders. Certified companies became recognised through the supply chain; they benefited from some relief from regulatory oversight systems, such as the exemption of EMAS and ISO-certified firms from compulsory financial guarantees (Box 5.6).

However, concerns have also been raised about the consistency and quality of accreditation and certification, especially concerning the ISO 14000 series. The certificate has been criticised for not specifying mechanisms or targets to encourage companies to reduce the amount of their pollution. In fact, researchers examined atmospheric pollution

emissions from 126 Spanish companies, from a range of sectors regulated under Spain's IPPC law and listed on the Pollutant Release and Transfer Register (Gomez and Rodriguez, 2011). The findings revealed no significant difference in atmospheric pollution emissions between those companies with ISO 14001 certification and those without. In effect, ISO 14001 allows companies to appear to take their environmental responsibilities seriously without requiring significant changes to operations. This suggests companies use the standard because of external pressures, either from customers and other stakeholders, or because of legislative requirements. Although the researchers caution their work includes only a sample of industries, these findings suggest more analysis is needed to demonstrate the actual effects of ISO 14001 certification on companies' environmental performance.

Corporate social responsibility

Spanish companies have become leaders in corporate social responsibility (CSR) reporting. In 2009, CSR reporting in Spain accounted for 22.6% of European country reports to the Global Reporting Initiative (van Wensen et al., 2011). In 2011, a survey of 144 large enterprises (including 47 industrial enterprises) found that 83% publish a CSR or sustainability report; 23% integrate the CSR into their annual report; and 42% have information verified by independent experts (CES, 2011).

Since 2008, emphasis has shifted from the environment towards employment creation, in line with the broader impact of the economic crisis on CSR activities. However, environmental protection, energy and resource efficiency still rank high among CSR programmes in Spain. Spanish companies have created the Club for Excellence in Sustainability that publishes reports on state-of-the-art CSR in Spain; and, in 2008, the government created a pioneering State Council on Corporate Social Responsibility (Olcese, 2013). Most recent CSR reports follow the Global Reporting Initiative (GRI) guidelines to the fullest extent (GRI, 2014). Since 2009, approximately 35 of Spain's largest companies by market capitalisation have participated in the Carbon Disclosure Project, disclosing their climate change management strategies (CDP, 2012).

With Spanish firms representing 874 of 6 117 active companies in the UN Global Compact, Spain represents one of the largest networks within the initiative. The Global Compact is a policy initiative for businesses that promotes responsible behaviour in the areas of human rights, labour, environment and anti-corruption. With their membership, companies commit to 10 principles, including a precautionary approach to environmental challenges; promoting greater environmental responsibility; and developing and diffusing environmentally friendly technologies. Spain's Global Compact network has developed separate reporting on progress with implementing the Compact's principles for small and large companies, developing a special reporting tool for SMEs. In 2013, it launched an online platform, Compactlink, to allow greater interaction among network participants, which includes online training, a self-assessment tool and discussion groups (UNGC, 2013).

In addition, the number of Spanish companies included in the FTSE4Good Index Series criteria, which assesses CSR performances of publicly listed companies, has increased markedly since 2007. Since 2008, a specific sustainability index has been developed for companies in the Spanish IBEX35 stock market index, the FTSE4Good IBEX Index (FTSE, 2008). However, the impact on corporate performance is unclear: stock market performances of companies with a greater commitment to CSR do not appear to differ greatly than those without such a commitment (FTSE, 2011).

Voluntary approaches

Although Spain does not have a strong tradition of voluntary approaches, industry has taken a number of initiatives to achieve environmental objectives beyond legal requirements. Over 60% of the Spanish chemical sector is part of the Responsible Care programme, an initiative launched globally in 1985 and implemented in Spain since 1993. In 2005, the environment ministry and ASPAPEL – the association of pulp and paper industries – undertook one of the most significant voluntary initiatives of the past decade. Their agreement established a reference framework to determine emission limit values. By expressing values in per unit of production terms rather than in concentration terms, the framework sought to create incentives for adoption of best available technologies. ASPAPEL members committed to reduce emissions, phase out the use of Cl_2 in whitening processes and produce annual certified reports. In return, the environment ministry committed to certify investments used to implement the agreement so they could benefit from fiscal incentives for environmental protection. The authorities also agreed to develop a reference framework for the environmental licensing process by liaising with ACs and basin authorities.

Other voluntary approaches included the agreement signed in 2008 by the MAGRAMA and regional governments of Asturias and Galicia with aluminium producers ALCOA Inespal and Aluminio Español. It focused on reducing emissions of fluorinated gases in aluminium electrolytic production. Another agreement with manufacturers of electrical equipment companies that transport and distribute electricity aimed to limit sulphur hexafluoride emissions.

Environmentally related R&D and eco-innovation

During the review period, the manufacturing sector increased environmental R&D and eco-innovation. Between 2004-06, total business expenditures in R&D of the sector increased from EUR 2.7 billion to EUR 3.4 billion, though they levelled off in 2006-10. Efforts to maintain R&D expenditure during the crisis led to an increase in the share of manufacturing within total business R&D, rising from 39.3% to 44.6% between 2008-10. Disaggregated data of expenditures in environmentally related R&D and eco-innovation are not available. However, other data show significant growth in the number of patents in environment-related technologies, particularly with respect to the renewable energies of wind and solar (Figure 3.8). Eco-innovation efforts by Spanish industry are partly driven by more stringent regulations and positive incentives to environmental investments introduced in the last decade discussed in previous sections.

Private sector funds account for around 80% of business R&D in manufacturing. Industrial enterprises can also access support for R&D and innovation from several programmes scattered through different ministries and public agencies. Public programmes that provide specific support for environmental R&D and eco-innovation include the INNPRONTA programme (which identifies energy, environment and climate change as one of its two priorities) and the EEA Grants programme.[17] The Spanish system for public support for R&D and innovation is characterised by a multitude of public agencies and programmes, and this also applies to public support for environmental R&D and eco-innovation. This makes it difficult to track total support for environmental R&D&I (FECYT, 2011). For example, the Strategic Action on Energy and Climate Change of the National Plan on R&D&I 2008-11 has been financed by various programmes of the Centre for Industrial Technological Development (CDTI) that include the Action Plan's objectives

among their priorities. In principle, the availability of different support mechanisms widens the possibility of accessing support. However, greater choice also makes it more difficult for industrial companies, particularly SMEs, to know their options for support and to apply for them. It may also increase administrative costs of managing the support programmes, as a share of the support allocated.

Many private companies state that eco-innovation is hampered by a lack of demand for environmental products in the domestic market (EC, 2013). While Spain could choose from a wide range of policy instruments to stimulate demand, demand-side innovation policies require increased policy co-ordination with sectoral and supply-oriented instruments. Currently, there is little co-ordination between policy instruments (Conchado et al., 2012). While public R&D support is monitored, results do not inform innovation policies. *Ex-ante* and *ex-post* evaluations, as well as annual questionnaires, assess the impact of public support for innovation, including employment benefits and the amount of corporate funding leveraged thanks to public R&D support. However, results are only used internally and not made available to the public. The monitoring of the innovation chain, therefore, stops before products have become competitive in domestic or international markets.

There is also a disconnect between institutions that conduct academic research, and the commercialisation of innovative products through companies, as well as between public and private researchers, and fundamental research and market needs in the field of eco-innovation (Conchado et al., 2012; Scarpellini et al., 2012). Technological centres that facilitate links between researchers with academic and commercial backgrounds; networks and partnerships between research institutes and private companies; and a better targeting of public support measures to facilitate commercial application of innovations could all help overcome the gap between fundamental research and commercialisation.

Since domestic firms are generally small, mechanisms to disseminate information about markets and stimulate awareness of business opportunities, particularly in Europe, should be promoted. Government R&D should be focused in areas where Spain appears to have the best comparative advantage. Large, long-term public procurement projects would help create demand for innovative, environmentally friendly products, as would implementation of an ambitious environmental agenda. Further efforts to stimulate dialogue and co-operation among the main players in the innovation system, including the financial sector and actors outside Spain, should be encouraged. All these efforts should also be supported by putting a price on pollution and removing environmentally harmful subsidies (through environmentally related taxes or emission trading systems), which should stimulate demand for eco-innovation.

Environmental goods and services sector

While information is neither complete nor consistent between different sources, evidence suggests that Spain's environmental goods and services (EGS) sector has expanded since the early 2000s. According to Eurostat (2013), EGS sector output reached EUR 46.7 billion in 2011. This is equivalent to 2% of Spain's GDP, comparable to that of agriculture (2.4% of GDP). Spain placed slightly below the average of 17 EU countries included in the Eurostat analysis.[18] Between 2007-11, EGS sector output increased by 6%, while GDP declined by 1.8%.

Between 2000-07, exports and imports of EGS increased by 56% and 45% respectively, but fell by several percentage points at the beginning of the crisis in 2008. In 2012, exports exceeded the pre-crisis values of 2007 for the first time, yet imports had not yet recovered. Spain's EGS trade balance reveals the dominance of renewable energy: in 2012, renewables made up 50% of the total value of EGS sector exports and 37% of its imports. Between 2006-12, imports remained at similar levels due to a 70% decrease compared to 2008. The trade balance between exports and imports of goods related to renewable energy was negative between 2000-11, and reached a peak deficit of EUR 6.5 billion in 2008. However, Spain reached a surplus of EUR 83 million in trade related to renewable energy in 2012. This is remarkable, given that both the EGS sector and the Spanish economy as a whole continued to experience trade deficits in that year.

A stronger environmental regulatory framework has been an important driver for the expansion of the EGS sector. This included stricter requirements for waste management, emissions of air and water pollution; and policies to combat GHG emissions and promote renewable energy. Policy uncertainty surrounding renewable energy support has had a negative impact on clean energy investments in Spain, which fell out of the top 10 countries in terms of investment volume in 2012 and 2013 (Pew, 2014, 2013, 2012, 2011). Previous research has underlined the importance of policy certainty in instruments such as feed-in tariffs for encouraging venture capital investments (Criscuolo and Menon, 2014).

According to a survey by the European Commission, 30% of SMEs decided not to offer green products and services due to insufficient demand from customers, which was higher than the EU average of 25% (EC, 2013). Their decision was mostly due to financial constraints enterprises face, combined with the view that environmentally friendly goods and services are more expensive. In the prolonged economic crisis, public support plays an important role in sustaining demand for EGS until private spending increases again. Spain's Green Public Procurement Plan, launched in 2008, is an example of policies that can stimulate demand.[19] Spain also launched an Action Plan for Energy Savings and Efficiency in the Buildings of the State Administration to promote energy savings and efficiency, as well as the associated goods and services. The plan aims for energy savings in 2012 in buildings owned by the national government, with the 2012 target of 9% mostly met; the 2016 target is 20%. Under the plan, 3 793 audits identified energy savings, although implementation of projects is hampered by lack of finance and broader difficulties with developing an energy services industry (Bobbino, Galván and González-Eguino, 2013). Current policies also emphasise cost savings over rewarding innovative products and are thus likely to have a limited effect on innovation.

Notes

1. The industrial sector includes extractive industries; the manufacturing sub-sectors; electricity, and gas supply and distribution; and water supply, sanitation and solid waste management. To a large extent, this chapter will focus on the environmental performance of manufacturing.
2. Including solvents.
3. The sector is also responsible for emitting other noxious air pollutants such as nitrous oxide (11% of the total), ammonia (less than 4% of the total) and methane (less than 2% of the total) (MAGRAMA, 2013a).
4. The methods used estimate the damage costs resulting from the air pollutant releases reported by nearly 10 000 individual facilities to the European Pollutant Release and Transfer Register (E-PRTR). The pollutants examined were regional air pollutants (ammonia, nitrogen oxides, particulate

matter (PM_{10}), sulphur dioxide and volatile organic compounds), heavy metals (arsenic, cadmium, chromium, lead, mercury and nickel), organic micro-pollutants (benzene, PAHs and dioxins and furans) and carbon dioxide (EEA, 2011).

5. Defined as the amount of economic wealth generated per unit of material used.

6. Other pillars of the programme included: enhancing macroeconomic and budgetary stability; developing transport networks and infrastructure; improving human capital; and pursuing social dialogue with the object of ensuring the labour market functions more efficiently.

7. The Ingenio 2010 plan aimed at aligning Spain with the strategy of the EU to reach 3% of the GDP invested in R&D by the year 2010 and to improve the "government-R&D centres-enterprises" axis.

8. The commission organised its proposals in four areas: i) reducing administrative duplication; ii) promoting regulatory simplification; iii) improving service delivery and shared services; and iv) strengthening institutional capacity of administration. These proposals were generated by senior civil servants from key areas of the central government, who also received suggestions from citizens through an electronic box and from an advisory council with representation of unions, the private sector and academia.

9. See *www.eia.es/nueva/legislacion_autonomica.html*.

10. The law set a deadline of one year for all Autonomous Communities to adapt their regulations to the new Law on Environmental Assessment.

11. The IPPC Directive was replaced by the Directive on Industrial Emissions (2010/75/EU).

12. For example, where the activity involves the use, production or release of relevant hazardous substances with the possibility of soil and groundwater contamination, the operator must submit a baseline report to the competent authority before starting an operation. In cases where the installation has caused significant pollution of soil or groundwater compared to the baseline, the operator must take all necessary measures to return the site to the original state.

13. Until 2013, a permit had to be renewed every eight years at the request of the facility's owner. However, a possibility for an *ex officio* revision by the competent authority will continue to be applied when any of the circumstances established under law arise.

14. EPER-Spain was implemented as part of the European Pollutant Emission Register, the Europe-wide register that provides easily accessible key environmental data from industrial facilities in EU member states. In 2006, it was replaced by an improved European Pollutant Release and Transfer Register (E-PRTR). The register contributes to transparency and public participation in environmental decision-making. It implements for the European Community the 2003 PRTR Protocol to the UNECE Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

15. The PRTR contains information on 115 pollutants, more than 86 required by the PRTR Protocol, and also on off-site transfer of waste. The data are presented separately for each facility and at aggregated levels such as by industrial activity or pollutant/waste. The register also makes available the complete inventory of facilities that report to the register, as well as reference documents such as relevant legislative acts and methodological guides.

16. After China and Italy, Spain is also the third country in the world with the highest number of companies certified by the ISO 9001 quality management certificate.

17. EEA Grants is a co-operation programme financed by Norway, Iceland and Liechtenstein. In addition to financing Spanish industry, it provides funds to 14 other EU countries. It supports environment and climate change exclusively.

18. EU15, Poland and Czech Republic comprised the 17 countries in the study. The Spanish government conducted a pilot analysis of the EGS sector in 2008 through its National Institute of Statistics (INE, 2011). This study followed an earlier Eurostat (2009) methodology and questionnaire, focusing on selected sectors for which data were available, or that had political priority in Spain. Therefore, total output in 2008 was estimated at only EUR 31.1 billion. This corresponded to a gross value added of 1% of GDP in that year (INE, 2011). The main sectors covered by the study were waste and wastewater management, renewable energy and organic agriculture. A number of areas, such as sustainable construction, desalination, R&D for environmental protection and the production of biofuels, were not included (INE, 2011).

19. The Plan aimed to green 50% of public procurement by 2010. The First General Report on the State of Green Procurement, released in 2011, found overall satisfactory implementation, but did not provide a specific assessment of the 2010 objective.

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