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Foreword

Over the last decade, Portugal has made important progress in protecting the environment and enhancing the quality of life of its people. This has been underpinned by the transposition of EU Environmental Directives, and financing from the EU Cohesion and Structural Funds. Indeed, Portugal's success in attracting and absorbing finance, and in effectively using it to establish environmental infrastructure and to build human and institutional capacities, provides many lessons for countries within and outside the EU.

Portugal is investing heavily to promote energy efficiency and renewable energy, and thereby reduce external energy dependence and greenhouse gas emissions, and boost long-term competiveness. This experience is very relevant for the preparation of a Green Growth Strategy that the OECD will present to the annual meeting of Ministers of Economy and Finance in May 2011.

This Environmental Performance Review *aims to provide further support to Portugal's environmental progress. It presents 28 recommendations, with special emphasis on the integration of energy and environmental policies and sustainable coastal zone management. Some of the key recommendations include:*

- *Streamlining and simplifying environmental regulations, while strengthening enforcement.*
- *Progressively shifting the burden of financing environmental expenditures from the state to the private sector, and engaging NGOs in a more constructive partnership.*
- *Broadening the use of environmentally related taxes, and phasing out tax exemptions and discounts for electricity and fuel use.*
- *Establishing a comprehensive framework for promoting eco-innovation and eco-industries, and the associated employment opportunities.*
- *Comprehensively assessing the economic and environmental impacts of renewable energy policy to ensure that it is environmentally effective and economically efficient.*
- *Making greater use of economic instruments in managing economically important but environmentally sensitive coastal zones.*

This Review is the result of a rich and co-operative dialogue between Portugal and other members and observers of the OECD Working Party on Environmental Performance. We are confident that this collaborative effort will be useful to advance the policy debate on how to tackle the shared and common environmental challenges that OECD members and their partners face.

Angel Gurría

OECD Secretary-General

Preface

The principal aim of the OECD *Environmental Performance Review* programme is to help member and selected partner countries to improve their individual and collective performance in environmental management by:

- helping individual governments to assess progress in achieving their environmental goals;
- promoting continuous policy dialogue and peer learning;
- stimulating greater accountability from governments towards each other and the public opinion.

The present report reviews the environmental performance of Portugal since the previous review in 2001. Progress in achieving domestic objectives and international commitments provides the basis for assessing environmental performance. Such objectives and commitments may be broad aims, qualitative goals, or quantitative targets. A distinction is made between intentions, actions and results. Assessment of environmental performance is also placed within the context of a country's historical environmental record, present state of the environment, physical endowment in natural resources, economic conditions, and demographic trends.

The OECD is indebted to the Government of Portugal for its co-operation in providing information, for the organisation of the review mission to Portugal (1-5 March 2010), and for facilitating contacts both inside and outside governmental institutions.

Thanks are also due to all those who helped in the course of this review, to the representatives of member countries participating in the OECD Working Party on Environmental Performance, and especially to the examining countries: Austria and France.

The team that prepared this Review comprised experts from reviewing countries: Mr. Marc Aviam (France), Mr. Jesús García Latorre (Austria); and members of the OECD Secretariat: Mr. Gérard Bonnis, Ms. Ivana Capozza, Mr. Brendan Gillespie, Mr. Krzysztof Michalak, Mr. Tappei Tsutsumi, Ms. Frédérique Zegel, and Mr. John Newman and Mr. Timothy Taylor (consultants). Ms. Carla Bertuzzi, Ms. Sylvie Dénaux, Mr. Shayne MacLachlan and Ms. Sarah Sentier (OECD Secretariat) and Mr. John Smith (consultant) provided statistical and editorial support during the preparation of the report.

The OECD Working Party on Environmental Performance discussed the draft *Environmental Performance Review* of Portugal at its meeting on 29 November 2010 in Paris, and approved the Assessment and recommendations.

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General notes

Signs

The following signs are used in Figures and Tables:

.. : not available

– : nil or negligible

. : decimal point

Country aggregates

OECD Europe: This zone includes all European member countries of the OECD except Estonia and Slovenia,[1] *i.e.* Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey and United Kingdom.

OECD: This zone includes all member countries of the OECD except Chile,[2] Estonia,[1] Israel[2] and Slovenia,[1] *i.e.* the countries of OECD Europe plus Australia, Canada, Japan, the Republic of Korea, Mexico, New Zealand and the United States.

Country aggregates may include Secretariat estimates.

Currency

Monetary unit: Euro (EUR).

In 2009, EUR 1.00 = USD 0.720

In 2010, EUR 1.00 = USD 0.755

Cut-off date

This report is based on information and data available up to 1 December 2010.

1. Slovenia has been a member of the OECD since 21 July 2010 and Estonia from 9 December 2010.
2. Chile has been a member of the OECD since 7 May 2010 and Israel from 7 September 2010.

Executive Summary

In the decade since 2000, Portugal's economy has enjoyed mixed fortunes: overall it has grown at a relatively slow rate, and GDP per capita remains low compared with OECD averages. Structural changes to the economy and increased environmentally related investment have also contributed to reducing environmental pressures. As a result, economic activity has generated relatively less pressure on the environment than in many other OECD countries. Environmental policies and institutions were consolidated and strengthened during the 2000s. The main challenges now are to implement environmental policies cost-effectively, and to promote a more coherent approach to environmental issues across all relevant sectors of public policy.

The Portuguese economy was badly hit by the economic and financial crisis. GDP fell by 2.5% in 2009, and the economy is projected to remain very weak in the following years. In 2009, Portugal adopted fiscal measures to stimulate the economy equivalent to 0.8% of GDP. Some 18% of the stimulus was environmentally related, the equivalent of 0.15% of GDP. Most of the additional "green measures" were related to the energy sector, with investment in the electricity grid and renewable energy the main components. While the fiscal stimulus helped to stabilise the economy, major cuts in public spending are being implemented to reduce the large budget deficit, which increased from 3% in 2008 to 9.4% in 2009. In this budgetary context, there are opportunities to reform environmentally related taxes and expensive and environmentally harmful policies so as to contribute to fiscal consolidation and to achieve environmental objectives.

In order to sustain its recovery from the economic and financial crisis, Portugal needs to boost productivity and improve the international competitiveness of its economy. Analysis suggests that environmental companies and related employment have increased in recent years, especially in the renewables, waste and water sectors. Wind and solar energy clusters are good examples of green development, merging power generation from renewable sources, production of the necessary technology and equipment, and job creation. The trade balance in environmental and renewable energy technologies has improved in the last few years, although Portugal remains a net importer of these technologies. Public and private research and development (R&D) spending, in particular environmentally related R&D, as a share of GDP remains very low. Employment in the environmental goods and services sector is still mainly composed of low-qualified workers, although the level of educational attainment in environmentally related areas has improved considerably. Portugal needs to further promote eco-innovation and improve workforce skills, with a view to enhancing productivity, international competitiveness and the growth prospects of its economy.

The importance of EU membership

Portugal joined the EU in 1986 and has benefited significantly from its membership. During the 2000s, a major effort was made to transpose Environmental Directives and to take advantage of financing opportunities provided by the Structural and Cohesion Funds. As a result, the quality of life has been improved, and substantial investments have been made in environmental infrastructure, particularly drinking water, wastewater treatment, waste management and, more recently, clean energy technologies. Portugal has also used EU funds effectively to build capacity in its environmental and other institutions.

Over the programming period 2000-06, total investment in environmental infrastructure was EUR 7.9 billion or 0.8% of GDP, the highest share in the EU 15. The EU contribution to environmentally related investments was over EUR 2.3 billion, equivalent to 9% of the EU funds allocated to Portugal. In the programming period from 2007-13, EU funding allocated for improving the environment, promoting sustainable growth and combating climate change represents 23% of the total available EU contribution. Despite this funding, significant additional public funds would be necessary in the near future if ambitious goals with regard to environmentally related infrastructure are to be achieved. Financing operation and maintenance costs will also be a challenge.

During the 2000s, Portugal began to play a more active role in the EU and to influence policy development, for example maritime affairs. During its EU Presidency in 2007, Portugal helped lay the foundations for European policy on water scarcity and drought. It also promoted policies to tackle climate change and biodiversity. However, Portugal needs to assume more of the responsibilities associated with EU membership. For example, official development assistance (ODA) represented 0.23% of its gross national income (GNI), well below the minimum DAC-EU donor target of 0.51%, and the UN target of 0.7%. Assistance for environment and water and sanitation represented about 1% of total ODA, reflecting the low priority attached to these areas in Portuguese development co-operation.

Environmental policies have been consolidated and strengthened

Transposition of the major EU Environmental Directives has significantly strengthened Portugal's environmental policy framework and related institutions. However, the enactment of so many laws and regulations in the 2000s initially resulted in the business community facing a complex set of environmental requirements. The situation has improved since the introduction in 2006 of the government-wide Better Law-making and *Simplex* Programmes that aim to enhance the quality of laws, reduce administrative burdens on business, and provide easier access to legislation through electronic publication of regulations and law codification. Nevertheless, further efforts are needed to streamline and simplify environmental requirements and reduce compliance costs. Appropriate staffing arrangements are also needed for this purpose. At the same time, the business community should be encouraged to play a more proactive and strategic role on environmental issues.

Portugal has developed a comprehensive system of environmental information, broadened public participation and expanded access to justice. However, implementation of some of these measures has sometimes followed the letter rather than the spirit of the law.

Participation by citizens in decision-making is limited by a weak non-governmental organisation (NGO) movement. Access to justice is limited by lengthy court proceedings and the difficulties that courts encounter when adjudicating on environmental issues. Portugal has been questioned by the European Commission on several occasions regarding its environmental impact assessment (EIA) procedures for transport, energy and tourism related projects. Further steps should be taken to support NGOs' constructive participation in environmental decision-making and to strengthen procedures for stakeholder dialogue.

Structural change, fuel switching, investment and better policies have helped to reduce most forms of air pollution. Emissions of key air pollutants (SO_x, NO_x, NH_3 and CO) have declined while the economy has grown, albeit slowly. Portugal is on track to meet its national and international targets in these areas. Emissions of toxic pollutants have also been reduced. Local air pollution incidents related to ground ozone concentrations still occur in large cities, with potential impacts on the health of the population.

The share of the population with access to drinking water and wastewater infrastructure has expanded significantly, often with support from the EU and matching national funds. The water sector has been restructured, has been made more competitive, and is now overseen by an effective regulator. As a result, water services are delivered more efficiently. The quality of drinking water and coastal waters is high. However, significant investments in wastewater treatment are still required to meet EU requirements. Water and wastewater tariffs are being designed to further cover both capital investments and operations and maintenance costs, in compliance with the recommendation of the Waste and Water Regulation Authority (ERSAR) and existing legislation. River Basin Management Plans should be prepared to facilitate integrated management of water resources.

Good progress has been achieved in managing waste, particularly the control of illegal dumping, which had previously been an important problem. All municipalities have established effective waste collection systems for mixed waste. An efficient system of waste treatment infrastructure is in place, including for hazardous waste. Several waste streams are covered by Extended Producer Responsibility schemes, and efforts have been made to connect these schemes with markets for recovered and recycled resources. Waste generation has continued to increase, although more slowly than economic growth and private consumption. Tariffs for municipal waste collection have only been applied in some municipalities, and often they do not provide sufficient incentives for waste reduction.

Portugal has made much progress in reformulating the legal and strategic planning framework for nature and biodiversity management. New management tools have been implemented and new sources of finance mobilised, both domestically and from the EU. Monitoring of species has been strengthened. Despite these efforts, biodiversity loss has continued. Two-thirds of freshwater fish, one out of three birds, and one out of four mammals are threatened, which is high by OECD standards. Habitat deterioration is also of concern. The extent of protected areas is comparable to the OECD average. Portugal has designated 22% of its land area as part of the *Natura 2000* network. A key challenge is the creation of more marine protected areas.

Meeting the post-Kyoto targets for reducing greenhouse gas (GHG) emissions will be challenging

Under the EU Burden Sharing Agreement, Portugal's Kyoto Protocol target is to limit GHG emissions to an increase of 27% in 2008-12 compared to 1990 levels. In the period from 2000-05, these emissions increased despite sluggish economic growth. They decreased from 2005, primarily due to a switch from fossil fuels to natural gas and renewable energy sources. This was reinforced by measures taken to comply with a number of energy and climate related EU Directives, including those concerning the Emissions Trading System (EU ETS), as well as by the economic recession. In 2008, emissions were about 3% above the assigned target for 2008-12. While the Kyoto target remains achievable, including through participation in international carbon markets, the challenge will be to sustain the recent emission decrease once economic growth resumes with a view to achieving Portugal's targets to 2020.

Energy and climate policies are closely related

Portugal's climate and energy policies are closely intertwined. Their co-ordination and monitoring was significantly strengthened by the establishment of the Executive Committee of the Climate Change Commission in 2006. Historically, Portugal has been highly dependent on imports of oil and coal. In recent years, it has sought to diversify its energy supply by switching to gas and further developing renewable energy. In 2009, renewables accounted for 21% of primary energy supply and 38% of electricity production, far above the OECD Europe averages. Hydro is the major source, although wind power has increased rapidly due to support policies. Support for renewables is primarily in the form of feed-in tariffs, tax benefits and investment subsidies. These policies should be assessed to ensure that they do not overlap with the EU ETS, and that the overall mix of policies to reduce greenhouse gas emissions and improve energy security is cost-effective. Portugal has pursued an active renewables support policy and met its ambitious national target to provide 45% of gross electricity consumption with renewables in 2010.

Portugal's energy and climate policies depend heavily on hydropower. With less than 50% of hydro capacity currently exploited, there is potential for further development. The planned construction of new dams would also accommodate further growth in wind generation by allowing storage of the electricity produced. However, the cumulative environmental impacts of the dam-building programme should be further assessed, especially impacts on water flows and on ecosystems. Further steps are also needed to address non-economic barriers to the development of renewable energy, including further streamlining of permitting procedures and the development of grid capacity. Transparency and stakeholder dialogue will be important in building consensus on future developments.

The adoption of the 2008 National Energy Efficiency Action Plan was an important step to address the rising consumption of energy, particularly in the commercial and residential sectors. However, it is unclear whether the funds required to implement the Plan will be available, and whether the measures selected will achieve the energy-saving target at least cost. In view of the different incentives to reduce GHG emissions in sectors within and

outside the EU ETS, there is scope to broaden demand-side management measures and to establish energy prices that better reflect environmental costs.

Transport is Portugal's largest end-use sector and is expected to continue to grow. Vehicle taxation based on CO_2 emissions and vehicle scrapping programmes have created strong incentives to use more efficient vehicles. However, efficiency gains may be outweighed by the increased scale of vehicle usage. There is scope to address emissions from the transport sector through broader use of economic instruments such as road pricing, parking fees and congestion charges. Portugal has developed ambitious plans to promote electric vehicles. The success of these plans will depend on the timely development of the electricity network and metering infrastructure, as well as the further development of renewable energies. An ambitious biofuels programme is unlikely to achieve its 2010 target of 10% of transport fuel. This programme is more expensive than other GHG abatement options, and there are questions about its net environmental and economic benefits.

Coastal zone and marine management are important and difficult challenges

Portugal's coastal zone is one of the country's greatest assets and is home to 76% of the population. It is vital for transport and trade, contains some of the most valuable natural habitats and heritage sites, and is a favourite tourism and leisure destination. However, erosion and flooding exacerbate problems associated with rapid urbanisation and the shrinking of areas important for nature protection and biodiversity conservation. In addition, there is the longer-term threat of a rise in sea level due to climate change.

Over the last decade, Portugal has significantly strengthened its planning framework for the management of coastal zones and the underlying information base. Building on the historic concept of a "public maritime domain", nine Coastal Zone Management Plans were adopted in 2005 covering the entire length of the continental coast. The *Litoral 2007-13* programme has further prioritised the actions defined in these Plans, with a focus on areas where people and buildings are most at risk. Four *Polis Litoral* schemes, launched in priority areas in 2006, provide an innovative basis for effective coastal zone management, particularly in the improvement of beaches and prevention of erosion. The National Strategy for Integrated Coastal Zone Management, adopted in 2009, sets out a 20-year timeframe for sustainable development of coastal areas, encompassing coastal planning policies in both marine and terrestrial zones. Coastal zones are also among the strategic sectors of the National Strategy for Adaptation to Climate Change.

Despite the elaboration of these often-innovative plans, implementation should be reinforced. It needs to be underpinned by a further strengthening of the underlying information systems and analytical capacities. Implementation could also be strengthened by wider use of economic instruments such as charges for construction permits, taxes on second homes, tax incentives for brownfield remediation in coastal zones, a nature tax on building permits, and a capital gains tax for the sale of agricultural land to developers. Instruments like these could provide better incentives for spatial planning and to finance infrastructure and the acquisition of fragile and threatened land for nature protection and biodiversity conservation. However, the application of such instruments needs to be embedded in strengthened mechanisms for co-ordinating water, coastal and marine management, both horizontally and vertically. More co-ordinated implementation of the

different instruments for territorial management is needed, including better coherence in the implementation of the National Strategic Plan for Tourism, particularly in nature conservation and biodiversity protection areas.

Portugal has actively contributed to the development of European maritime policy, including the Marine Strategy Framework Directive of 2008. This Directive aims to achieve good environmental status for Europe's marine waters by 2020. Portugal, which was among the first European countries to establish an institutional framework for a maritime strategy, has adopted a National Ocean Strategy to develop sea-related activities and protect marine natural resources through an integrated maritime affairs policy. Again, the need to establish a solid information base that will support the application of appropriate policy instruments, and to co-ordinate among the many institutions involved, are the main obstacles to achieving these ambitious policy goals.

PART I

Sustainable Development

PART I

Chapter 1

Developments since the 2001 Review

This chapter presents key characteristics of the Portuguese economy and society, the evolution in this area since 2001, and its impact on Portugal's natural entities. Also examined are trends in managing pressures on the environment, including emissions of air and water pollutants, and generation of industrial and municipal waste. There has been notable progress in the state of Portugal's environment, which includes an improvement in the quality of air in urban areas and Portugal's contribution to addressing the global climate change challenge, the advancement in the quality of inland and coastal water, as well as changes to natural habitats and biodiversity. This chapter also describes the development of the framework for environmental and sustainable development policies, including the institutional structure and set-up at the national and sub-national levels and a number of policy initiatives launched during the review period.

1. Main features of economic and social development in the review period

1.1. Economic development

The *Portuguese economy is relatively small* compared to that of most OECD countries. GDP per capita remains well below the OECD average.[1] Since joining the EU in 1986, Portugal has undertaken a wide range of reforms to liberalise its economy and open it to foreign trade and investment. These reforms have paid off in terms of GDP growth, which rose from below 60% of the OECD average in 1986 to close to 70% in 2000. Thus, Portugal entered the 2000-09 review period with *significantly improved living standards,* closer to those of the more developed OECD economies (OECD, 2008a).

During the review period, nonetheless, the *Portuguese economy experienced chequered development*. Overall, it grew much more slowly than the OECD average, which translated into reduced environmental pressures (Table 1.1). The economic downturn, beginning in 2001, evolved into a protracted period of slow growth, with real GDP growth averaging less than 1% per year from 2000 to 2005.

Consequently, the income gap has widened relative to the OECD and EU 15 averages. The recovery that started in 2005 gathered momentum during the next two years, due in part to renewed efforts to carry out macroeconomic and structural reforms (Box 1.1) (OECD, 2008a). In 2008-09, Portugal was badly hit by the *global financial crisis* and the economy contracted before recovering slowly in the second half of 2009 (OECD, 2010a). The country still faced a large budget deficit in 2010 and was required to make major cuts in public spending (Chapter 2).

Since 1989, Portugal has received *significant EU funding* under the Structural Funds (for regional policy implementation) and the Cohesion Fund (for national policy implementation). These transfers, averaging 6% of GDP per year under Community Support Frameworks (CSF I, II and III), have helped finance a large number of physical and human capital projects, with an important focus on transport and environmentally related infrastructure (Chapter 2).

1.2. Social development

Portugal's estimated *population* is 10.6 million (2009), a moderate 4% increase compared with 2000. Population density (115 per km^2) is high compared with the OECD average (33.9 per km^2) and distribution across regions is uneven (Figure 6.3). Between 1995 and 2006, population density increased markedly in urban (particularly coastal) regions and in intermediate regions next to urban areas. The share of the population living in predominantly urban regions is above the OECD average (50%, compared with 47% in 2004) (OECD, 2008b).

Portugal has the fourth-highest level of *regional disparities* in terms of GDP in the OECD. Inequality in income distribution, although becoming less pronounced, remains relatively high compared with the OECD Europe average.[2] The risk of poverty is higher in Portugal

(18% of the population had a net monetary income below 60% of the average income in 2008) than in other EU countries (where the average is 16%). The two largest urban areas, Grande Lisboa (population 2.6 million) and Grande Porto (1.6 million), generate 43% of national GDP and are home to 40% of the population. Regional disparities in GDP are closely linked with the pattern of regional specialisation: there is more total employment in the services sector in urban regions than in rural and intermediate ones (OECD, 2008b).[3]

Despite spending a slightly higher share of GDP on health (9.9%) than the OECD average, per capita spending is below the OECD average (USD 2 150 in 2006 – the latest year

Table 1.1. **Socio-economic trends and environmental pressures**

	Portugal 2000-09 (% change)	OECD 2000-09 (% change)
Selected economic trends		
GDP[a]	5.0	14.5
Private final consumption[a]	12.1	18.8
Agricultural production	–6.0	..
Industrial production[b, c]	–7.7	10.3
Road transport[d, e]		
Freight transport*	7.7	..
Passenger, private car**	6.8	..
Vehicle stock***	21.9	15.0
Energy		
Total primary energy supply	–3.3	–1.2
Total final consumption of energy[c]	–0.8	2.5
Energy intensity	–8.0	–13.7
Renewable energy supply	31.6	22.2
Selected social trends		
Population	4.0	6.2
Life expectancy at birth[f]	2.9	..
Ageing index[c, g]	11.5	18.9[d]
Poverty rates[h] (40% median income)	7.4	5.7
Standardised unemployment rates[c]	95.2	–2.1
Selected environmental pressures		
Pollution[c]		
CO_2 emissions from energy use[i]	–11.8	1.2
Emissions of SO_x	–64.4	–28.1
Emissions of NO_x	–12.6	–18.4
Resource use		
Water abstractions[d]	3.9	–1.3
Municipal waste per capita[c]	9.1	5.5
Material intensity[i, k]	2.7	–8.2
Nitrogenous fertiliser use[c]	–12.8	–3.1
Pesticide use[j]	5.7	..

a) Based on values expressed in USD at 2005 prices and PPPs.
b) Mining and quarrying, manufacturing, and production of electricity, gas and water.
c) To 2008.
d) To 2007.
e) Based on values expressed in: * tonne/km; ** passenger/km; *** passenger cars in use.
f) To 2006.
g) Number of persons over 65 years old per hundred persons under age 15.
h) Share of population with an income under 40% of the median income, after taxes and transfers. Mid-2000s.
i) Sectoral approach; excluding marine and aviation bunkers.
j) To 2005.
k) Domestic material consumption (DMC) per unit of GDP.
Source: OECD, Environment Directorate; OECD-IEA (2010), *Energy Balances of OECD Countries*; FAO, *FAOSTAT Database*.
StatLink http://dx.doi.org/10.1787/888932375908

Box 1.1. **Structure of the economy**

During the 2000s, the structural changes in Portugal's economy that were launched in the 1990s continued. Services became the most vigorous sector, with public services, retail and distribution, tourism, transportation, communications and financial services showing strong growth over the decade. The services sector currently accounts for 74% of GDP. It is also the country's largest employer, having overtaken the traditionally predominant manufacturing and agriculture sectors. The services sector provides jobs for almost 60% of the working population. Within this sector, tourism has developed significantly, representing approximately 5% of the wealth generated in Portugal.

Industrial production (including manufacturing, construction and energy production) decreased during the review period and accounts for 24% of GDP and 29% of employment (Table 1.1). The manufacturing industry has undergone significant changes. In a sector once highly dependent on traditional industries such as textiles, footwear, ceramics, cork, ship repair and food and beverages, new industries (including automobiles and auto components, electronics and pharmaceutical goods) have become more important.

Agriculture's contribution to the economy has been declining for some time: its share in GDP and employment has been reduced by half since 1990 (Table 1.1). It is now at 2.3% of GDP and 10.6% of total employment. The agro-forestry sector's share of total export value is around 12%. Farming accounts for about 40% of total land use and over 70% of total water abstraction. Crop yields and livestock production in Portugal are well below the EU average due to low agricultural investment, limited mechanisation, limited fertiliser use and a fragmented land tenure system. While there has been a major shift from crop production to livestock production, with the volume of the latter increasing by 7% compared to a reduction of almost 5% in the former, crop products still account for nearly 60% of the total value of agricultural output. Horticultural products, olive oil and wine constitute over 40% of total agricultural output. The area of pastureland has increased by over 60% since 1990, while arable and permanent cropland has declined by almost 25%. Nearly 40% of total farmland is currently pastureland. Portugal's long coastline and the abundance of fish in its waters have long favoured development of the *fishing industry.*

Primary energy supply in Portugal increased significantly between 1990 and 2009 (by 42%, or 2% per year), but this trend was reversed during the review period (Table 1.1). By 2009, the share of natural gas, introduced in the primary energy supply in 1997, in total energy supply reached 18% (remaining below the EU 27 average). Fossil fuels, mainly oil and coal, represented 47% and 12% of TPES in 2009. Domestic energy production is based entirely on renewable energy sources, mainly hydro, wind and biomass. Its share (including waste) of total energy supply in 2009 was 21%, significantly above the EU 27 average. Portugal's dependence on imports to provide energy (about 80% by 2009) is much higher than the EU 27 average.

Freight transport in Portugal is dominated by road, which carried over 90% of all freight in 2008. Portugal has been undergoing an extensive infrastructure upgrade, with major investments in communications and transport facilities and networks. In particular, the highway network has been significantly improved with the support of EU funding.

available – compared with the OECD average of USD 2 964 in that year). Nonetheless, *citizens' health status* has improved in line with that of other OECD countries. Life expectancy at birth in 2006 was 79.3 years, very close to the OECD average (79.4 years), due to improvements in living conditions, public health interventions and progress in medical

care. As in other OECD countries, the infant mortality rate has fallen significantly over the past decades. It was 3.4 deaths per 1 000 live births in 2007, compared to 24.2 per 1 000 in 1980. Portugal has been ageing continuously as a result of a decline in fertility, from 1.56 in 2000 to 1.36 in 2006 (far below the OECD average of 1.65), and increased longevity (OECD, 2010b).

Expenditure on educational institutions as a percentage of GDP (5.6% in 2007) is in line with the OECD average. However, the achievements of 15-year-old students as measured by the OECD Programme for International Student Assessment (PISA) are well below the OECD and EU averages, and the share of those who drop out without completing upper secondary education is well above the OECD average.

2. Key environmental pressures

Portugal is the *westernmost country of mainland Europe*. Its 92 000 km^2 of territory is surrounded by the Atlantic Ocean to the west and south (1 000 km coastline) and by Spain to the north and east (1 200 km frontier) (Box 1.2).[4]

Box 1.2. **Physical context**

Topographically, mainland Portugal is divided by its main river, the Tagus. North of the Tagus, the terrain is mountainous and rises to 1 991 metres. South of it are the hills and small massifs of Alentejo and the limestone plateaux, plains and lagoons of the Algarve. Average temperatures and rainfall are consistent with the gradual transition from an oceanic climate in the north to a Mediterranean one in the south (14°C and 1 160 mm in Porto, 16°C and 600 mm in Lisbon, 17°C and less than 400 mm in Faro in the Algarve).

The major rivers (Douro, Tagus, Guadiana, Minho) cross the Spanish border. The rivers flowing exclusively within Portugal are shorter and irregular (Vouga, Mondego, Sado). Portugal's Exclusive Economic Zone (EEZ), 1.7 million km^2 of seabed where Portugal has special rights to explore and to exploit marine resources, is one of the largest in Europe. The EEZ associated with the mainland covers 327 667 km^2 (there is a 953 633 km^2 EEZ around the Azores and one of 446 108 km^2 around Madeira).

In 2008, agriculture occupied 38% of the national territory even though this amount has decreased by 13% since 1990. Pastureland and meadows occupy over 50% of agricultural land, with the rest divided into arable land (around 30%) and permanent cropland (around 20%). Forests and other woodland cover 38% of the total land area, a 4% increase since 1990. In the northern mountains pine, oak and other coniferous trees are prevalent, while eucalyptus is common in the coastal regions. Vegetation in the southern region is more varied and includes stone pine and cork oak. Unlike the oak forests, a large proportion of pine and eucalyptus has been planted to supply the pulp and paper industry.

Portugal has a diverse natural heritage due to its geographical location and geophysical features, including dune habitats, rocky cliffs, and marshes in estuary and lagoon systems. Estuaries provide shelter for numerous bird populations, which use them as migratory stations, wintering areas and breeding grounds.

Mineral resources include significant deposits of copper, silver, tin and tungsten as well as uranium. Portugal does not have any crude oil or natural gas. It depends on imports to meet most of its energy requirements. The leading domestic energy resource is hydropower, which (along with other renewables) produces more than 40% of the country's electricity.

2.1. Atmospheric emissions

Traditional pollutants

Emissions of *sulphur oxides* (SO_x) decreased by 64% between 2000 and 2008, well above the average in the OECD as a whole (–28%) (Figure 1.1). The decrease in emissions of *nitrogen oxides* (NO_x) was smaller (–13%), but it reversed an increasing trend observed in the 1990s. Although Portugal's SO_x and NO_x emission intensities (emissions per unit of GDP) have improved dramatically, by about 70% and 20% respectively, and have been decoupled from GDP growth and fossil fuel supply, they remain higher than the OECD Europe average. Emissions of *non-methane volatile organic compounds* (NMVOCs) have decreased by 22% and those of *ammonia* (NH_3) by 20%.

Emissions of carbon oxides (CO) decreased by 30% overall during this period, with the largest reduction (over 50%) in the transport sector. Emissions of *suspended particulate matter*, generated to a large extent by fossil fuel combustion and industrial processes, stabilised during the review period following increases in the 1990s. Emissions of *heavy metals* showed varying trends. Lead emissions remained low following a dramatic reduction (–90%) and those of nickel and mercury were significantly reduced. Increased copper emissions are associated with road transport, while selenium and zinc emissions are generated by glass production (Chapter 3).

Air emissions of hazardous substances

Emissions of *dioxins* from the residential sector, combustion in the manufacturing industry and energy production have been reduced, mostly through decreased use of certain types of fuels, particularly wood and charcoal. Estimated emissions of *polychlorobiphenyls (PCBs)* have increased, mainly due to incineration of industrial waste. Emissions of *polycyclic aromatic hydrocarbons (PAHs)* from combustion in the manufacturing industry have also increased, representing more than 50% of total estimated PAH emissions (Chapter 3).

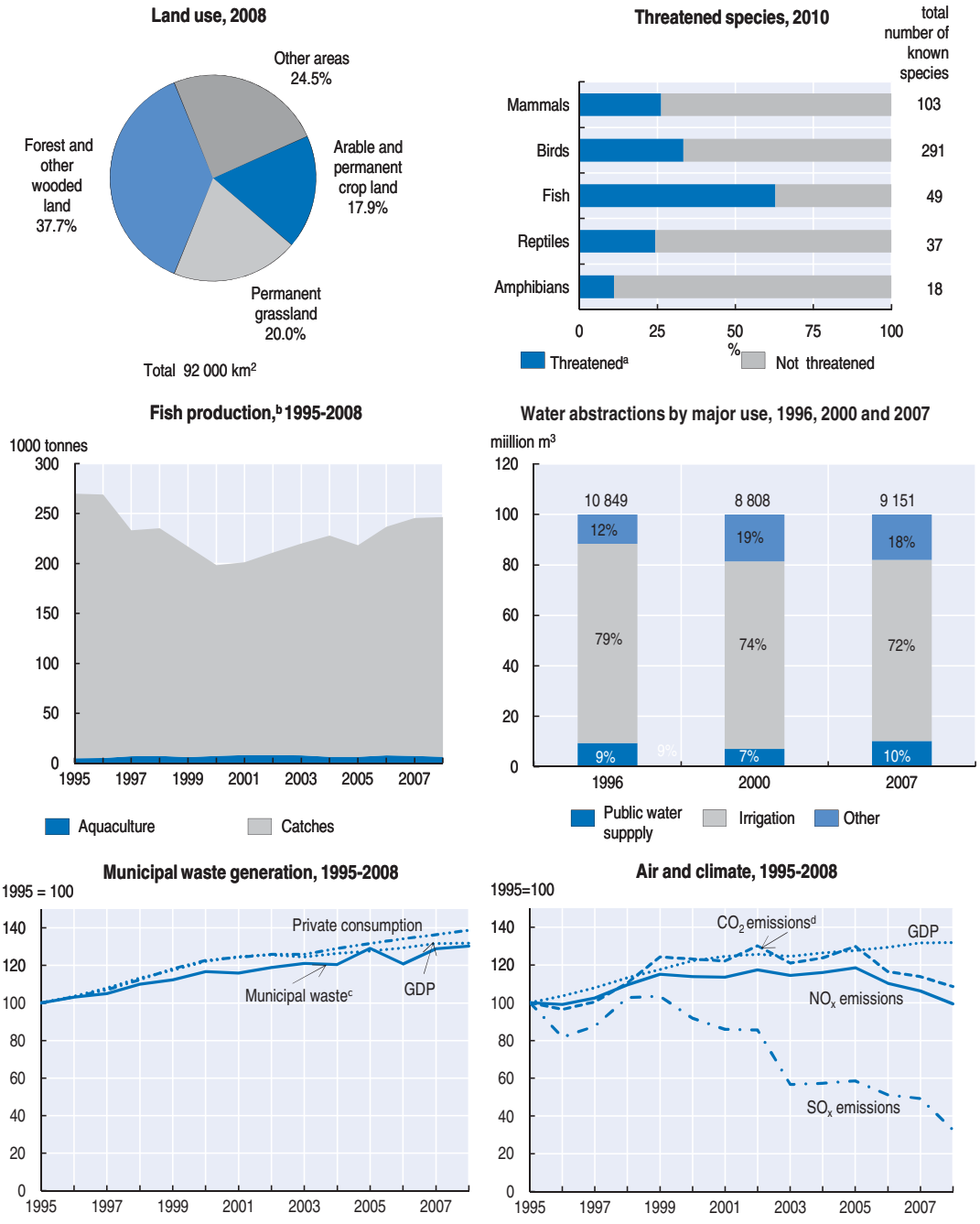
Greenhouse gas emissions

GHG emissions, excluding removals from land use, land-use change and forestry (LULUCF), decreased by around 3.5% during the review period but are still more than 32% above the 1990 level (Table 5.2). Emissions in 2008 were about 3% above the 2008-12 Kyoto Protocol target. National GHG emission projections show total emissions increasing by between 4 and 8% by 2020 (excluding LULUCF) due to increased emissions from energy production, industrial activities and transport. Energy related GHG emissions accounted for 70% of total emissions on average in 2000-08. Most of these were CO_2 emissions (Chapter 5).

2.2. Water

Water abstraction in Portugal increased over the review period. In view of both population and economic growth, intensity of water use and abstraction per capita have remained constant and are close to the OECD average. As Portugal is well endowed with water resources in the north, but experiences dry seasons in the south, an extensive programme for the construction of water reservoirs has continued during the review period with the aim of making more water available to the population and to economic sectors and increasing electricity production (Chapter 5).

Figure 1.1. **Selected environmental indicators**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.
b) Fish catches and aquaculture in inland and marine waters, including freshwater fish, diadromous fish, marine fish, crustaceans, molluscs and miscellaneous aquatic animals. Catches exclude marine mammals, crocodiles, coral, pearls, sponges and aquatic plants.
c) Waste collected by or for municipalities, waste directly delivered and separate collection for recycling by the private sector. It includes household, bulky and commercial waste, and similar waste handled at the same facilities.
d) Emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.
Source: OECD, Environment Directorate; OECD-IEA (2010), *CO_2 Emissions from Fuel Combustion*; OECD (2010), OECD *Economic Outlook No. 87;* FAO, *FAOSTAT Database.*

StatLink http://dx.doi.org/10.1787/888932375376

Substantial reductions of *nitrogen and phosphorus loads* from agriculture have contributed to water quality improvements and a decrease in nutrient concentrations. However, pesticide use has not been reduced and is still much higher than the average for the OECD or OECD Europe. Despite some progress, household effluent still exerts pressure on water quality. The *share of the population connected to sewerage* increased from 64% in 1998 to 78% in 2008. The *share not connected to public wastewater treatment plants* was still nearly 30% in 2008, despite improvements in the connection rate (55% at the beginning of the review period).

The quality of *coastal bathing water* was good before 2000. Measurements during the review period show further improvement. Although *river water quality* has also improved, it is poor in 40% of rivers. Unsatisfactory water quality in *reservoirs* is a cause of concern. More than 40% of stations are classified as eutrophic, with the highest percentage in the Tagus (64%) and Sado and Mira (57%) basins. Analyses in 2005 showed that approximately 52% of surface water in continental Portugal *risked failing the environmental objectives of the EU Water Framework Directive,* with the highest risks in the basins of the Sado, Mira and Guadiana. Only 7% of groundwater was classified as at risk (Chapter 3).

2.3. Waste, material intensity and contaminated sites

The *amount of waste generated per year* doubled during the review period.[5] However, the 2008-09 economic downturn led to a drop in the total amount of waste generated, particularly *industrial waste*. A trend of relative decoupling of *municipal waste* generation from GDP and private consumption, which began in the 1990s, has continued for most of the review period. However, this trend was reversed in 2007 (Figure 1.1). About two-thirds of municipal waste continues to be sent to landfill, but this method of final disposal is better controlled since the closing of all uncontrolled waste dumps in 2002.[6] The *amount of waste, including hazardous waste, exported for treatment abroad* was increasing until 2009 when the trend was reversed with the opening of the integrated recovery and disposal centres. Overall, *material intensity*, as measured by domestic material consumption (DMC) per unit of GDP, remained stable over the review period in contrast to a decreasing trend in many OECD countries (Table 1.1). A number of *contaminated sites* still exist, posing a risk to public health and ecosystems and affecting the value of adjacent land (Chapter 3).

2.4. Nature and biodiversity

Biodiversity loss, primarily due to habitat deterioration, has continued. Two-thirds of freshwater fish, one out of three birds, and one out of four mammals are threatened, which is high by OECD standards (Figure 1.1). The extent of protected areas is comparable to the OECD average. Portugal has designated 22% of its land area as part of the *Natura 2000* network. Natural events, particularly forest fires and erosion of coastal areas, add to pressures on nature and biodiversity. The area covered by eucalyptus, an exotic species introduced in the 19th century, has expanded rapidly due to demand from the pulp and paper industry. Construction of the ten proposed hydropower-generating dams will put additional pressure on aquatic life**.** There are still few marine protected areas offshore (Chapter 3).

3. Framework for environmental and sustainable development

3.1. Institutional framework

Since the *Ministry for Environment and Spatial Planning (MAOT)* was created in 2000, it has been responsible for addressing environmental issues. The MAOT's mission is to define, implement and co-ordinate policy for the environment, spatial and land use planning, and cities covering air, water, waste, nature and climate change.[7] It has also been involved in the development of Portugal's National Strategy for Sustainable Development to 2015 (ENDS 2015) and its Implementation Plan, adopted in 2007, and has co-ordinated the implementation of the strategy since 2009. Between 2002 and 2009, the MAOT co-ordinated policies for regional development and the planning framework for use of the EU Cohesion Fund.[8] Following government restructuring in 2009, this responsibility was transferred to the Ministry of Economy, Innovation and Development.

The MAOT is supported by *several subordinate agencies*, including the Environmental and Spatial Planning General Inspectorate (IGAOT), the Portuguese Environment Agency (APA), the Water Institute (INAG), the Institute of Housing and Urban Redevelopment (IHRU), the Institute for Nature Conservation and Biodiversity (ICNB), the Water and Waste Services Regulation Authority (ERSAR) and the Portuguese Geographic Institute (IGP). In 2008, ten administratively and financially autonomous River Basin District Administrations (ARHs) were established to develop and implement River Basin Management Plans. Two national councils created in 1997 are advisory bodies to the MAOT: the National Council for Environment and Sustainable Development, and the National Council on Water.

The *Ministry of Economy, Innovation and Development (MEID)* is responsible for managing economic, industrial, energy, trade, tourism and services development, as well as regional development in mainland Portugal. The MEID's Directorate-General for Energy and Geology (DGEG) is responsible for the development and implementation of sustainable and secure policies related to energy and geological resources. In particular, DGEG promotes and participates in the development of legal and regulatory frameworks related to energy production, transportation, distribution and consumption.

The *Ministry of Public Works, Transport and Communications (MOPTC)* co-ordinates and implements policies in the areas of construction, public works, transport (including air, river, maritime, land) and communications. The *Ministry for Agriculture, Rural Development and Fisheries (MADRP)* defines and implements policy for agriculture, food processing, forestry, rural development and fisheries with a view to sustainable development, environmental protection, and ensuring the quality and safety of food production. It is also responsible for national and EU funding for agriculture, forestry, rural development and fisheries.

Implementation of national policies at the sub-national level is supported by five *Regional Development and Co-ordinating Committees* (CCDRs). Portugal's 308 self-governing *municipalities* play an important role in licensing, supervising and enforcing national regulations and land-use planning, as well as delivering public services to citizens and businesses (including water supply, sewerage, municipal waste management and municipal landscaping).

3.2. Key environmental and sustainable development initiatives

In Portugal, environmentally related initiatives have been closely linked with *national development plans*. During the review period these included the 2000-06 National Plan for Economic and Social Development, the 2005 National Action Programme for Growth and Jobs (PNACE) and the 2006 National Programme for Spatial Planning Policy (PNPOT). Several topic- and media-specific plans elaborated under these overarching plans also focussed on environmental issues. Planning development was closely linked with the EU funds provided by the Operational Programme of the third Community Support Framework in the period from 2000-06, and the National Strategic Reference Framework (QREN) for the period from 2007-13. These two documents were crucial in regard to matching national and EU funding for plans' implementation.

The adoption in 2007 of the *National Strategy for Sustainable Development to 2015* (ENDS 2015) and its Implementation Plan (PIENDS), developed in line with the European Sustainable Development Strategy, was aimed at orchestrating and monitoring implementation of various governmental strategic planning instruments, particularly the PNACE and PNPOT (Chapter 2).

4. Policy initiatives

4.1. Environmental initiatives

Air and climate

During the review period, efforts to reduce emissions and impacts of *traditional air pollutants* have continued. The 2004 National Emissions Ceilings Programme (PTEN), updated in 2006, defines a national strategy for compliance with the 2010 reduction targets for sulphur dioxide (SO_2), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs) and ammonia (NH_3) according to targets established by the EU National Emissions Ceiling (NEC) Directive.[9] The 2008 National Programme for Reducing Emissions from Large Combustion Plants (PNRE), covers reduction targets in key sectors, including electricity, oil refining and petrochemicals, and pulp and paper. Objectives and targets related to air quality have been harmonised with the requirements of the EU Air Quality Framework Directive (96/62/EC) and its four Daughter Directives (Chapter 3) and included in the Air Quality Improvement Plans developed for large agglomerations, including Greater Lisbon and Greater Porto.

Portugal's commitments to address *climate change* were elaborated in the 2001 National Strategy on Climate Change, which had three main components: *i)* the National Climate Change Programme (PNAC); *ii)* Portugal's participation in the European Union Emissions Trading System (EU ETS); and *iii)* implementation of measures under the flexibility mechanisms of the Kyoto Protocol.

The *PNAC* became Portugal's main strategic instrument for complying with GHG emission reduction commitments in the context of the Kyoto Protocol and the EU burden-sharing agreement. The Kyoto target requires a 27% increase in GHG emissions by 2008-12 compared with 1990. A revised version of the PNAC approved in 2006 contained measures to be taken in the key sectors of energy, transport, housing, industry, agriculture, forestry and waste. It was complemented in 2008 by a new set of policies and measures (New 2007 Measures) that included: an objective of increasing the share of electricity production from renewable sources from 39 to 45% by 2010; the launch of new natural gas combined cycle power plants to increase capacity from 2 160 to 5 360 MW between 2006

and 2010; and an increase in the share of biofuels used as vehicle fuel in Portugal from 5.75% to 10% in 2010.

In the context of the *EU ETS*, the National Allocation Plan for Emission Allowances for 2005-07 (PNALE I) committed Portugal to accomplishing the remaining mitigation efforts using the Kyoto Protocol flexibility mechanisms (50%) combined with new policies and measures (50%). The National Allocation Plan for 2008-12 (PNALE II) provided updated GHG allocation information on a sectoral basis, including the electricity generation sector, refineries, cogeneration, cement, ceramics, glass, pulp and paper, ferrous metal production and combustion installations. The *Portuguese Carbon Fund (FPC),* an operational instrument designed to finance activities under the Kyoto mechanisms, was approved in 2006 with an endowment of EUR 348 million (Chapter 5).

Water

The adoption of the *National Water Plan* and *15 river basin plans* in 2001 launched a process of re-assessing water availability and use, as well as the main pressures and challenges brought about by socio-economic development. The plans established sets of goals and measures, a timescale for their enforcement, and mechanisms for implementation and assessment. Adoption of the Water Law incorporating the provisions of the EU Water Framework Directive in 2005 stimulated the creation of five mainland River Basin District Administrations (ARH) together with River Basin Management Plans (PBH).

The purpose of the *National Plan for the Efficient Use of Water* (PNUEA), approved in 2005, was to promote better water use, especially in the urban, agricultural and industrial sectors, contributing to the minimisation of water scarcity risks and improving environmental conditions in water systems.

Portugal has drawn up two consecutive plans for expanding *water supply and sanitation infrastructure*. The objectives of the 2000-06 and 2007-13 Strategic Plans for Water Supply and Sanitation (PEAASAR I and PEAASAR II) include: *i)* ensuring universal, reliable and high-quality water supply and sanitation service; *ii)* making the water sector sustainable and improving management efficiency; and *iii)* better protection of the environment (Chapter 3).

Waste

Following extensive efforts undertaken before 2000 to ensure safe landfilling of municipal waste and the closing of unregulated municipal waste dumps, Portugal's policy has focussed on creating an incentive framework for *waste reduction and development of adequate infrastructure for waste treatment and recovery*. The Strategic Plans for Municipal Solid Waste (PERSU I 1997-2006 and PERSU II 2007-16), together with the 2003 National Strategy for the Reduction of Biodegradable Municipal Waste Going to Landfills (ENRRUBDA 2003-16) and the Intervention Plan for Municipal Waste (PIRSUE 2005-06), have established targets for reducing the amount of municipal waste subject to landfilling (to 23% of total waste), as well as targets for composting of the organic fraction (25%), incineration (22%) and recycling (25%). The plans have also emphasised the need to develop appropriate infrastructure and equipment to support separate waste collection and separation, including collection and sorting centres and the development of Extended Producer Responsibility schemes for specific waste streams.

The 2003 National Plan for the Prevention of Industrial Waste (PNAPRI) established specific additional goals for waste reduction and increased recycling and recovery, including the objective of Portuguese *self-sufficiency in managing hazardous waste* through the construction of two centres for Integrated Recovery and Disposal of Hazardous Waste (CIRVER) and co-incineration in cement kilns. In 2009, waste reduction efforts were reinforced by the Programme for the Prevention of Municipal Waste, a Strategy for Refuse-Derived Fuel and the Strategic Plan for Hospital Waste (PERH) (Chapter 3).

Biodiversity

The *National Biodiversity and Nature Conservation Strategy,* adopted in 2001, has served as the national strategic framework for pursuing the policy goals of the Convention on Biological Diversity and the EU's goal of halting biodiversity loss by 2010. It focusses on: *i)* conserving nature and biodiversity; *ii)* promoting sustainable use of biological resources; and *iii)* contributing to the objectives of the international co-operation processes in the nature conservation area. The Strategy has been supported by, among others, the sectoral *Natura 2000* Network Plan (PSRN 2000) and the Protected Areas Land Management Plans (POAP). The 2008 Nature Conservation and Biodiversity Act enhances the creation of local, regional and private protected areas to complement the National Network of Protected Areas. It establishes the Fundamental Network for Nature Conservation (RFCN) and the National System of Classified Areas (SNAC). The 2001 Strategy will be updated in line with the EU communication to be adopted in 2011 following the tenth Conference of the Parties to the Convention on Biological Diversity held in October 2010 in Nagoya, Japan (Chapter 3).

4.2. Initiatives integrating environmental concerns into sectoral policies

During the review period, *environmental objectives have become more explicit* in strategies related to the country's overall economic and social development, while environmental considerations have become drivers for strengthening the performance of sectors including tourism, energy and transport and increasing Portugal's economic competitiveness on the European and world markets.

Energy and transport

The key environmentally related objectives of Portuguese *energy policy* include increased use of renewable energy sources, increased use of natural gas, and improved energy efficiency. Operational goals and measures for these objectives were presented in the 2005 National Energy Strategy and the 2008 National Energy Efficiency Action Plan (PNAEE), which integrated energy and climate change goals and measures derived from several previous strategies and frameworks.

The Ministry of Environment and Spatial Planning, the Ministry for Public Works, Transport and Communications, and the Ministry for Internal Administration formed the *Environment and Transport Steering Committee*, which pursued implementation of the Sustainable Mobility Project, aimed at the development and consolidation of Sustainable Mobility Plans covering private and public transport infrastructure in 40 selected municipalities. The purpose of the 2009 Electric Mobility Plan is to create the necessary conditions for large-scale use of electric vehicles and develop adequate infrastructure (Chapter 5).

Environmental and social policy integration

Environmental and health integration have been strengthened through the Environment and Health Action Plan 2008-13 (PT-NEHAP). The PT-NEHAP launched a number of initiatives to improve the effectiveness of policies to prevent, control and reduce health risks related to environmental factors, promote integration of knowledge and innovation, and thus contribute to Portugal's economic and social development. The Strategy for Education for Sustainable Development has focussed on designing and introducing educational support materials (Chapter 3).

The *Polis Programme*, created in 2000, has contributed to improving the quality of life in cities through slum eradication, urban renewal, improvement of public spaces, and strategic urban development. This programme, continued through the Policy for the Cities (POLIS XXI 2007-13), demonstrated positive relations between environmental improvement in urban areas and improving the attractiveness and competitiveness of urban centres that are increasingly the engine of local and regional development. Building on this experience "Polis Litoral" (the Integrated Operations Renewal and Improvement of Coastline Programme) was launched in 2008. *Polis Litoral*, which covers 150 km of seafront and 220 km of lagoon and estuary banks, aims to rehabilitate coastal zones, link economic activities in the coastal areas with the preservation of natural resources, and protect people and infrastructure against natural hazards.

The *National Programme for Spatial Planning Policy (PNPOT)*, adopted in 2007, defined a territorial development model for Portugal. It includes conservation and enhancement of biodiversity; resources, natural landscape and cultural heritage; sustainable use of geological and energy resources; and prevention and mitigation of natural and man-made hazards.[10] The PNPOT presents a comprehensive action plan for territorial and urban development with a sustainable development perspective, focussed on sectoral policy co-ordination and an integrated approach (Chapter 6).

Coastal zone management, marine and tourism strategies

The *Maritime Spatial Management Plan* and the *National Ocean Strategy,* adopted in 2006, launched a number of protection activities in maritime areas and better management of marine resources, in conjunction with coastal zone management. The 2009 National *Coastal Zone Management Strategy* establishes a 20-year vision and 20 strategic measures to protect the integrity of coastal areas through better co-ordination of housing and infrastructure development, protection against natural pressures such as coastal erosion and floods, and protection of environmental and landscape values. Environmental objectives have been introduced in the *National Strategic Plan for Tourism* as a stimulus to strengthen the quality of sectoral services, increase the range of tourism destinations, strengthen their competitiveness *vis-à-vis* destinations in other countries, and ensure territorial cohesion (Chapter 6).

Notes

1. GDP in 2009 was estimated at USD 244 billion, or USD 22 923 per capita (at current prices and PPPs).
2. The Gini index is significantly higher (0.37 in 2007 after taxes and transfers) than the OECD average (0.31).

3. However, unemployment increased from 4% of the labour force at the beginning of the decade (significantly lower than the EU average at the time) to 9.5%, slightly higher than in the Euro area in 2009. Self-employment continues to account for a large share of total employment.
4. Excluding the Azores and Madeira.
5. The trend before 2004 should be treated with caution, as waste classification in Portugal was subject to changes following the requirements of the EC Regulation on waste statistics (2150/2002).
6. Uncontrolled dumping accounted for almost 75% of total municipal waste generation in 1995.
7. The Ministry's activities related to spatial planning are co-ordinated by the Directorate-General for Spatial Planning and Urban Development (DGOTDU). The Department of Foresight and Planning and International Affairs (DPP) carries out economic analysis of environmental policies and modelling and co-ordinates international relations.
8. During this period, the Ministry (then the Ministry for Environment, Spatial Planning and Regional Development, MAOTDR) prepared a framework for matching national resources with EU cohesion funds through the 2007-13 National Strategic Reference Framework (QREN).
9. The NEC emission reduction targets for 2010 were: 160 kt for SO_2, 250 kt for NO_x, 180 kt for NMVOCs and 90 kt for NH_3.
10. There are 11 specific objectives, such as developing environmental and natural resource knowledge and information systems; defining and implementing a National Strategy for Soil Protection; promoting planning and development, as well as sustainable management, of forestry and forest areas; and integrated water management, including coastal and marine components.

Selected sources

The government documents, OECD documents and other documents used as sources for this chapter included the following:

FAO (Food and Agriculture Organization) (2010), *FAOSTAT Database,http://faostat.fao.org/*.

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PART I

Chapter 2

Greening Growth

Following a period of modest economic growth, Portugal entered a sharp recession in 2008-09 and its public finances deteriorated significantly. The anti-crisis stimulus package included several environment-related measures, such as support for energy efficiency, renewable energy technologies, and investment in electricity and smart grids. Reforming the tax system, further expanding environmentally related taxes, and removing environmentally harmful tax concessions and subsidies could help fiscal consolidation without hampering economic recovery. Public funds, including those from EU sources, continue to account for about two-thirds of total environmental expenditure. Nonetheless, private environmental investment, eco-industries and related employment have increased in recent years. Portugal needs to further promote eco-innovation and improve its workforce skills, with a view to enhancing productivity, international competitiveness, and the growth prospects of its economy.

Assessment and recommendations

Following a period of rapid economic expansion in the 1990s, Portugal's economy grew modestly for much of the 2000s, and in 2008-09 entered a sharp recession as a consequence of the global economic downturn. The government responded with the adoption of a stimulus package to support household income, economic activity and employment. *Environment-related measures accounted for some 18% of the anti-crisis package* or 0.15% of GDP. Support for energy efficiency, renewable energy technologies and investment in electricity and smart grids constituted the core of the "green" stimulus measures. This reflects Portugal's priority of reducing external energy dependence and domestic greenhouse gas emissions, thereby improving overall competitiveness. The fiscal stimulus has helped to stabilise the economy in the short term. However, unemployment is projected to remain at a record rate of 10%. The country's public finances have deteriorated significantly, so fiscal consolidation will be a priority for the next few years.

Reforming the tax system, expanding environmentally related taxes and removing environmentally harmful tax concessions and subsidies could help fiscal consolidation without hampering economic recovery. As recommended by the 2001 OECD Environmental Performance Review, Portugal has made progress in *expanding the use of environmentally related taxes*, by introducing waste and water taxes, a tax on inefficient light bulbs, and CO_2 emission-based vehicle taxes. Revenue from environmentally related taxes increased during the review period and reached 8% of total tax receipts, well above the OECD average. This revenue is partly allocated to specific funds managed by several authorities, and earmarked for environmental purposes. This can reduce the flexibility of fiscal decisions and, therefore, overall efficiency of revenue allocation. The 2010-13 Stability and Growth Plan foresees strengthening environmentally related fiscal measures with a view to better maintaining their incentive function and to help improve fiscal sustainability.

However, *excise duty exemptions* apply to different uses of energy products and categories of users. *Reduced value added tax rates* are extensively used and apply, among others, to energy use in households and for agriculture. Many of these exemptions have been applied for several years with the objective of supporting poorer segments of the population and weaker economic sectors. Also, for social reasons, many municipalities that directly provide water and waste services do not pass on to consumers the water and waste taxes. However, such measures are usually a costly way to pursue equity objectives; they entail tax revenue losses, distort competition and investment decisions, and, by lowering end-use prices, can reduce incentives to use energy and natural resources efficiently. These disadvantages can be avoided, and social objectives achieved more efficiently, by providing targeted support to the affected groups. In the long-term, phasing out energy-related tax concessions is a more cost-effective way of reducing energy consumption than providing tax credits and other forms of support to households and businesses for investing in energy efficiency and renewable energy equipment.

The role of the business sector in financing *environmental expenditure* has increased during the review period, mostly with investments in end-of-pipe technologies. Nonetheless, the public sector continues to account for about two thirds of total environmental expenditure. EU funds have been a major financial source for public environmental investment. About 15% of available *EU funds* in the 2007-13 programming period have been allocated to environmental infrastructure, including renewable energy sources and energy efficiency. This also reflects an increased emphasis on more innovative sectors and on more advanced solutions to traditional environmental management issues. Programmes for allocating and using EU funds have been increasingly based on sound analysis of investment needs and identification of adequate progress indicators. They have contributed to improving environmental performance and administrative capacity in Portuguese regions. However, additional investment will be necessary in the near future if the ambitious goals for environment-related infrastructure are to be achieved. In the long term, the necessary resources, including those required for operating and maintaining environment-related facilities, will need to be provided through a more extensive involvement of the private sector and a well designed system of user charges.

Analysis suggests that *environmental companies and related employment* have increased in recent years, especially in the renewables, waste and water sectors. The wind and solar energy clusters represent good examples of green development, merging generation of power from renewable sources, production of the necessary technology and equipment, and job creation. However, the trade balance in environmental and renewable energy technologies remains negative. The share of R&D, in particular *environment-related R&D*, in public expenditure remains very low. Employment in the environmental goods and services sector is still mainly composed of low-qualified workers. Portugal needs to further promote eco-innovation and improve its workforce skills, with a view to enhancing productivity, international competitiveness and growth prospects of its economy.

Recommendations

- Analyse *how environmentally related taxes could contribute to fiscal consolidation*, whilst offsetting reductions in more distortionary taxes on labour and corporate activity.
- Continue to *broaden the use of environmentally related taxes* by introducing other such taxes (*e.g.* on air pollutants and pesticides), and by linking a component of fuel taxes to the carbon content of fuels.
- Review the current array of *tax exemptions and discounts*, with a view to phasing out those that are costly and environmentally harmful; ensure that the *water and waste management taxes* are passed on to final users; provide *targeted support* for those households adversely affected by energy, water and waste prices.
- Progressively *decouple environmental expenditure from EU funding*, including through private investment and well designed user charges for environmental services.
- Develop and implement a *comprehensive framework for promoting eco-innovation and employment in eco-industries*, including increased public support for R&D, improved co-operation among competent authorities and with universities, the private sector and financial institutions, and investment in higher education and training; and green the jobs in the strategic sectors of the economy.

1. The environment as a driver for economic growth?

Portugal is a relatively small economy. Since joining the EU in 1986, it has undertaken a wide range of reforms aimed at *economic liberalisation and greater openness to foreign trade and investment*. It experienced a prolonged period of growth, with increases in GDP above the EU average for much of the 1990s. This allowed Portugal to catch up with the living standards of more developed OECD countries. The convergence process ended during the first half of the 2000s with a period of sluggish growth. GDP per capita has remained at roughly three-quarters of the OECD Europe average (Figure 2.1).

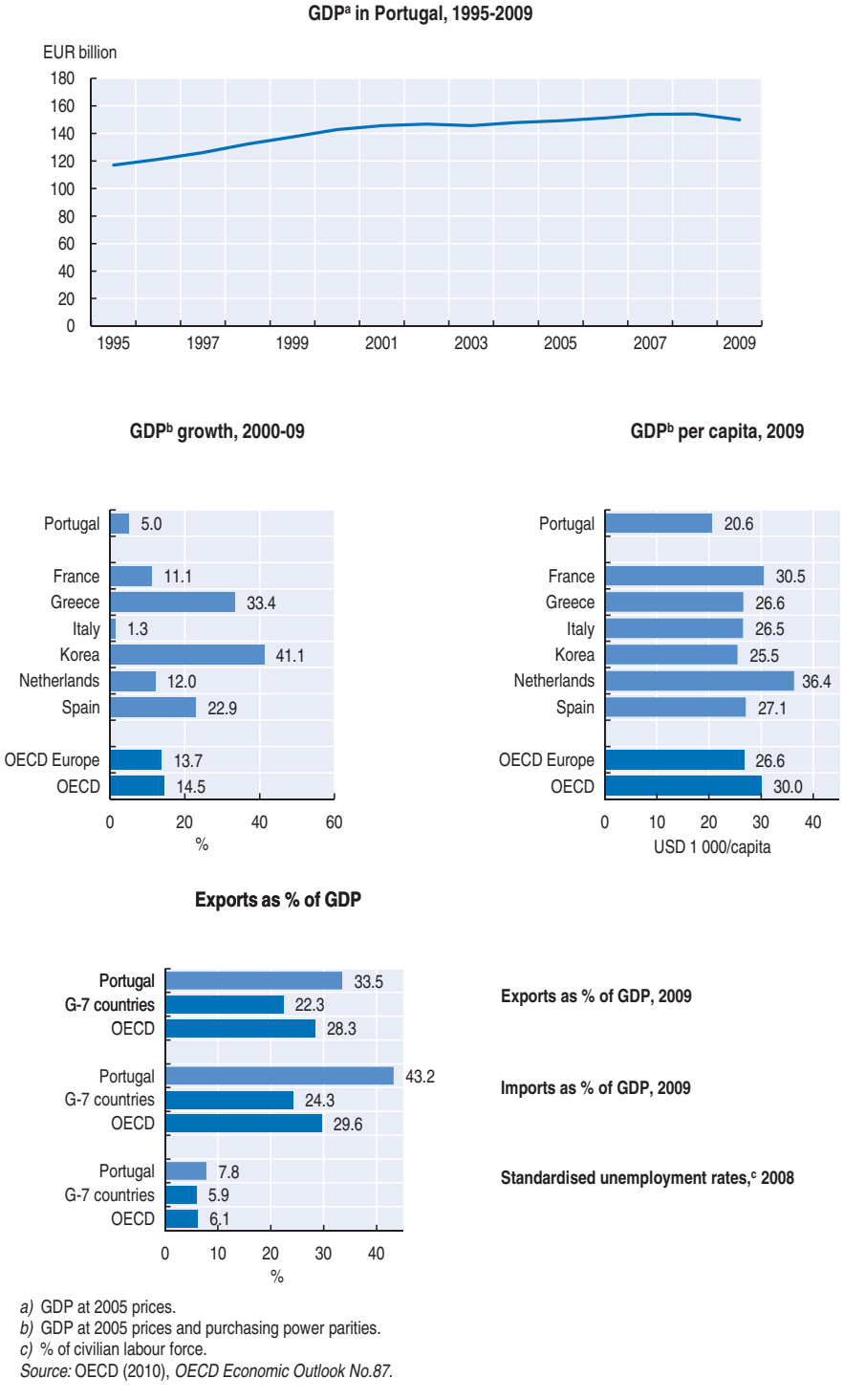
Portugal has become a *diversified and increasingly service-based economy*. Growth in trade and foreign direct investment has played an important role. High- and medium-high-technology industries, such as transport equipment, electronics and pharmaceuticals, have progressively gained importance. The automotive industry has become the second largest export sector, after textile and clothing. Tourism accounts for half of service exports. However, the Portuguese economic structure is still characterised by a relatively large primary sector and a majority of low-skill and low-productivity manufacturing activities, such as textiles, ceramics, cork, food and beverages.

Following a rebound in economic activity in 2007 and a period of structural reforms and fiscal consolidation, the Portuguese economy *entered recession in late 2008 as a consequence of the global economic crisis*. GDP fell by 2.5% in 2009, and the economy is expected to be very weak until 2012. The crisis had a severe impact on employment. The rate of unemployment, which rose from 7.8% in 2008 to 9.5% in 2009, is expected to remain above 10% during the next few years (OECD, 2010a). The crisis is also likely to exacerbate the imbalances of the economy: over-reliance on consumption, weak growth in labour productivity and insufficient wage moderation have brought about a loss of external competitiveness. The fiscal deficit climbed from 3% in 2008 to 9.4% in 2009 (OECD, 2010a). Fiscal consolidation and structural reforms to improve overall productivity are therefore essential to foster investor confidence, ensure access to external financing and prepare for future growth (OECD, 2010b).

In 2008, Portugal launched a series of measures to support household income and small and medium-sized enterprises (SMEs), amounting to about 0.4% of GDP. In 2009, in the framework of the European Economic Recovery Plan, it launched its *stimulus package* (*Iniciativa para o Investimento e o Emprego*), comprising measures additional to the ordinary state budget amounting to EUR 1.3 billion or 0.8% of GDP. This compares to an OECD average of 2% of GDP. The 2009 stimulus consisted mainly of additional spending (0.5% of GDP). The overall economic stimulus included cuts in direct and property taxes, faster value added tax (VAT) refunds, a temporary increase in social and employment support, increased public investment (*e.g.* in the broadband network), subsidies to promote energy efficiency and use of renewable energy sources, and other forms of support for economic activity, especially for SMEs.

Some *18% of the 2009 stimulus package was environmentally related*, equivalent to 0.15% of GDP. All additional "green measures" targeted the energy sector. This reflects the priority given by Portugal to reducing external energy dependence and domestic greenhouse gas emissions, thereby improving overall competitiveness (Ministry of Finance and Public Administration, 2009) (Box 2.1). Investment in the electricity grid was the main energy related measure. Measures such as fiscal incentives for energy efficiency and renewables in buildings can be (and were) promptly executed, with a potentially rapid impact on the

Figure 2.1. **Economic structure and trends**



a) GDP at 2005 prices.
b) GDP at 2005 prices and purchasing power parities.
c) % of civilian labour force.
Source: OECD (2010), *OECD Economic Outlook No.87.*

StatLink http://dx.doi.org/10.1787/888932375395

economy and employment. Such measures have a high potential to create or maintain employment in the construction sector, as well as secondary employment in downstream industries.

Box 2.1. **"Green" measures included in Portugal's fiscal stimulus package**

- Installation of solar panels and microgeneration units (miniwind): support for installation of 300 000 m^2 of solar thermal panels in residential buildings and 12 500 miniwind power plants in residential and commercial buildings. This measure was intended to strengthen the industrial clusters for manufacturing products using these technologies, with indirect impacts on other industrial sectors such as machinery and electric equipment. At the end of 2009, 255 000 m^2 of solar panels were ordered as a result of this fiscal support, representing a total value of EUR 95 million. This measure was extended to 2010 (entailing installation of an additional 120 000 m^2), with a view to gradually phasing it out.
- Improvement of energy efficiency in public buildings, *e.g.* hospitals, universities and public offices. This measure was expected to have a positive impact on the construction, metals manufacturing, machinery and energy auditing sectors, as well as contributing to a reduction of the public administration's energy bill. In 2009, 80 buildings were selected for an overall investment of EUR 40 million. Additional public investment of EUR 38 million was planned in 2010.
- Energy transport infrastructure: a measure bringing forward planned investment in the electricity grid and interconnection with Spain. This measure was expected to stimulate sectors such as metals manufacturing, machinery, electrical equipment and construction.
- Investment in smart grids, with the goal of connecting 10% of domestic electricity customers. Smart grids allow consumers to monitor and optimise their electricity consumption, as well as improving overall service and energy efficiency. This measure was expected to create a cluster for the manufacture of related equipment, with a strong impact on the construction sector. State support helped to launch the pilot phase in 2009.

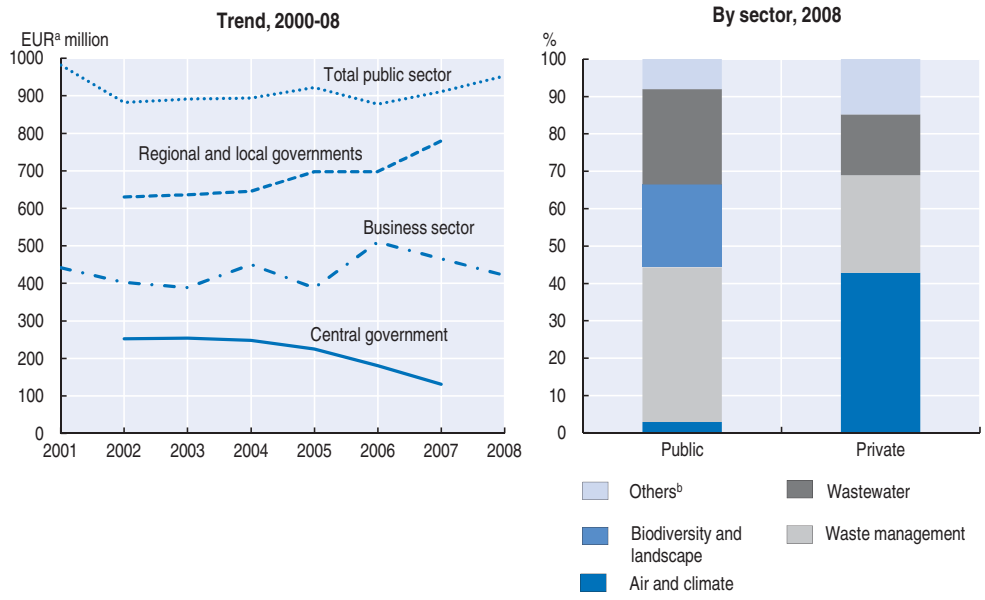
Source: Ministry of Finance and Public Administration.

The fiscal stimulus has contributed to *stabilising the economy* in the short term. In view of the deterioration of the country's public finances, in 2010 the government moved towards fiscal consolidation to reduce the budget deficit to 2.8% of GDP by 2013. The *fiscal consolidation programme* is mainly based on cuts in public spending, reduction of tax expenditure and extension of the privatisation plan. Some major investment projects, such as the Lisbon-Porto and Porto-Vigo high-speed railway lines, have been postponed. The 2010-13 Stability and Growth Plan foresees strengthening environmentally related fiscal measures as a means to improve fiscal sustainability (Section 3).

2. Environmental expenditure and financing

Public and private environmental expenditure decreased by about 3% in real terms between 2001 and 2008, but its share of GDP remained stable at nearly 1%. Public expenditure declined by 7% during the same period (Figure 2.2). The public sector continues to account for about two-thirds of total environmental expenditure. Public expenditure has been progressively decentralised from the central government to the regional and local governments, which account for 85% of public environmental expenditure, although with substantial financial transfers from the state budget. Local authorities continue to have little fiscal autonomy. Waste management, wastewater

Figure 2.2. **Environmental expenditure**



a) At constant 2005 prices.
b) Includes: soil and groundwater, noise, radiation, R&D, and other environmental protection activities.
Source: INE; MAOT; OECD (2010), *OECD Economic Outlook No.87;* OECD calculations.

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treatment and biodiversity made up the vast majority of public environmental expenditure in 2008. Waste management alone accounted for over 40% of such expenditure during this period. Growing attention to biodiversity has resulted in biodiversity conservation representing an increasing share of public expenditure. On the other hand, air pollution control, including climate change mitigation, has accounted for a very minor share, although this share has been rising since 2008 due to increased use of the Portuguese Carbon Fund (Figure 2.2).

In contrast, *private environmental expenditure grew* by over 5% in the same period, reflecting the increasing role of the private sector in financing activities related to pollution prevention and control, as well as in managing environmental infrastructure and services (particularly in the waste and water sector). Yet, less than half of enterprises carried out environmental protection activities in 2008 (INE, 2009). Investment by industry (including electricity production and distribution) grew by 2% in real terms between 2004 and 2007 before sharply decreasing the following year, mainly due to the economic crisis. Environmental investments in the electricity production and distribution sector grew six-fold between 2004 and 2007. Participation in the EU ETS and the requirements of the EU directives on large combustion plants and on integrated pollution prevention and control (IPPC) have driven investments in this sector. This is indicated by the dominance of investment in controlling air and GHG emissions, which account for nearly 90% of environmental investment in the electricity industry. Air and climate are the key investment areas for most industrial sectors, followed by wastewater and waste management (Figure 2.2). Waste management is the main operating cost for most industrial activity, followed by wastewater management. *Environmental investment by industrial companies* is concentrated in the electricity and water industries (60% of total environmental investment by industry) and in energy intensive sectors (refined petroleum

products, non-metallic minerals, pulp and paper). Overall, investments in end-of-pipe technologies have been prevalent, as opposed to so-called "integrated" investments.[1]

Financing and EU funds

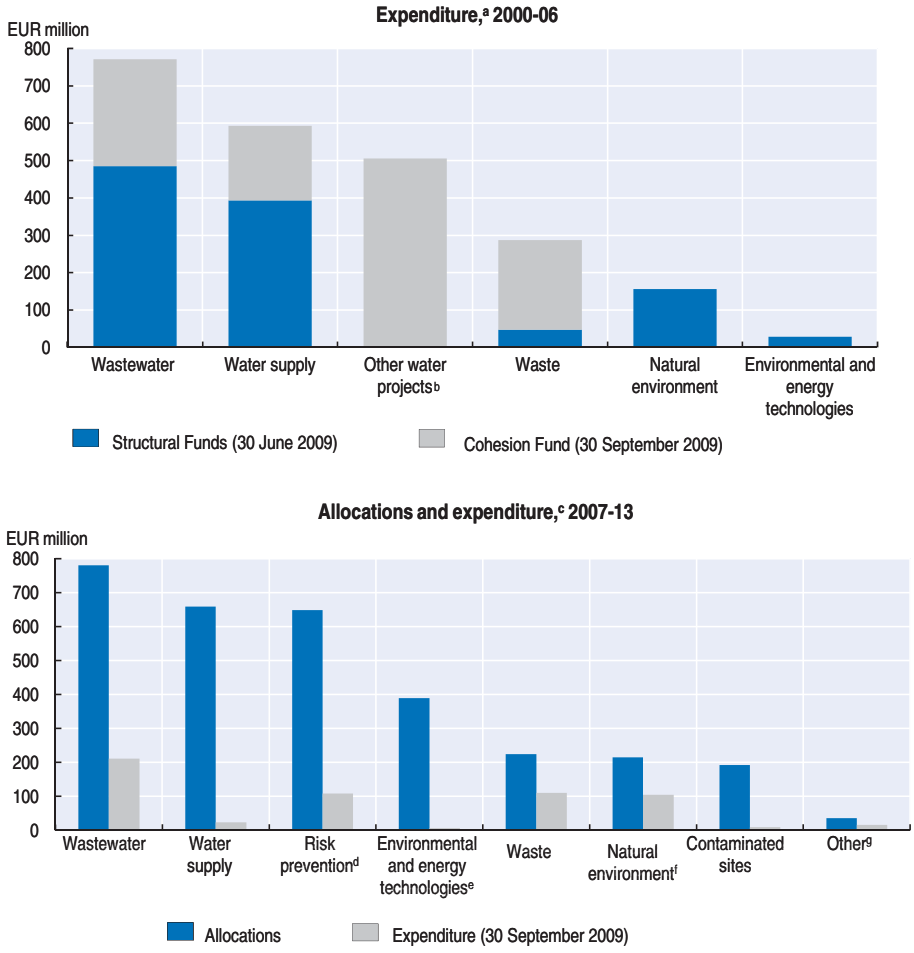
Portugal has been a *major beneficiary of EU funding*. EU transfers (adjusted for purchasing power parities) fell from over EUR 300 per capita in the programming period 2000-06 to about EUR 260 per capita in the period 2007-13, although remaining the highest in the EU 15. Transfers from the Structural and Cohesion Funds amounted to about 60% of total public capital expenditure in Portugal (EC, 2007).

EU funding has been an important source of financing of public environmental investments. During the *programming period 2000-06*, total investment in environmental infrastructure was EUR 7.9 billion or 0.8% of GDP, the highest share in the EU 15.[2] Public funding, including national and EU funds, accounted for over 80% of financing, some 40% of which was covered by EU funds. Loans by the European Investment Bank accounted for an additional 16% of public investment (EC, 2010). In the same period, the EU's contribution to environmentally related investments was over EUR 2.3 billion. This is equivalent to 9% of the EU funds (Structural and Cohesion Funds) allocated to Portugal. The water sector received the vast majority of these funds, followed by the waste sector (12%) and nature protection (7%). A minor share was spent to promote environment-friendly technologies in businesses (Figure 2.3).

For the *programming period from 2007-13*, over EUR 5 billion in EU funding has been allocated to improving the environment, promoting sustainable growth and combating climate change, representing 23% of the total available EU contribution (excluding national co-financing). These objectives are pursued through direct investments in environmental infrastructure and tying aid to other projects, such as financial assistance to enterprises, to meet specified environmental criteria. Over EUR 3 million (about 15% of available EU funds) has been allocated to environmental infrastructure, including renewable energy sources and energy efficiency. This represents marked growth in the share of funds earmarked for environmentally related investment compared to the previous programming period, reflecting higher policy priority. The water sector (especially wastewater treatment) remains the highest investment priority, absorbing 46% of the EU contribution to environmental infrastructure expenditure. Compared to the previous period, more attention has been given to preventing natural and industrial risks and to environmental technologies, including clean energy technologies, whereas a lower share of funds has been earmarked for waste management (Figure 2.3). Overall, there is increased emphasis on more innovative sectors, such as renewables, and on more advanced solutions to traditional environmental management issues, such as tertiary wastewater treatment and biological waste treatment.

Portugal has been among the *best performers in managing EU funds*, including for environmental projects. Overall, the allocation and use of such funds has been based on a sound analysis of investment needs and identification of adequate progress indicators. EU funds have contributed to improving quality of life and developing environmental infrastructure and administrative capacity in Portuguese regions. As in many other countries, the main tangible results of EU funding with regard to the environment has been the increasing number of households connected to wastewater treatment systems and drinking water supply, as well as improved waste management (EC, 2010). However, at the end of the 2000-06 programming period, infrastructure gaps remained and additional

Figure 2.3. **EU funds for environmental investments, 2000-06 and 2007-13**



a) Expenditure on air quality and noise pollution is negligible and is excluded.
b) Includes mixed water supply and wastewater projects and the Alqueva multipurpose water project.
c) Includes Structural Funds and the Cohesion Fund.
d) Includes other measures to preserve the environment and prevent risks.
e) Includes support for renewable energy sources and energy efficiency.
f) Includes promotion of biodiversity and nature protection (including Natura 2000), promotion of natural assets, protection and development of natural heritage.
g) Includes air quality, integrated pollution prevention and control and clilmate change mitigation and adaptation.
Source: Instituto Financeiro para o Desenvolvimento Regional; Observatório do QREN; OECD calculations.

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investment was still called for to ensure strict compliance with the EU environmental *acquis*. Investment needs for the water and waste sectors in the period from 2007-13 were estimated at EUR 3 billion and EUR 1 billion, respectively (EC, 2006). Despite significant contributions from EU funds, overall public funding is likely to be insufficient to cover such demanding investment needs, especially when Portugal's strained public finances and the projected slow economic recovery are taken into account. Moreover, consideration should be given to the means required to operate and maintain environmentally related facilities. According to some estimates, the challenge of financing current environmental expenditure is almost as large as that of financing annual investment expenditure (EC, 2010). In the long term, the necessary resources will need to be provided through more

extensive involvement of the private sector and more efficient application of user charges – especially in the waste and wastewater sectors, where cost recovery has remained low.

3. Environmentally related taxes

Portugal's *tax revenue to GDP ratio* increased during the review period as a consequence of the government's fiscal consolidation policy. It was 35.2% in 2008, in line with the OECD average. The overall tax structure has broadly stabilised since 2000. Compared to that of many other countries, the Portuguese tax mix tends to rely more on consumption taxes owing to the large share of consumption in the economy (OECD, 2010b). In 2008, taxes on goods and services, including those on energy and transport, accounted for about 37% of total tax revenues, considerably above the OECD average (nearly 32%).

As in all OECD countries, *environmentally related taxes* largely coincide with taxes on energy use and vehicles. Revenue from environmentally related taxes (in real terms) increased by 16% between 2000 and 2007.[3] It accounted for 2.6% of GDP and 7.2% of total tax receipts in 2008, above the corresponding shares in the OECD as a whole (Figure 2.4). The role of environmentally related taxes has increased since 2000. However, revenue from fuel taxes was exceptionally low in 2000 due to a decrease in the excise duty on transport fuels to compensate for increased oil prices (Figure 5.7). Overall, revenue from environmentally related taxes has stabilised at a level below that of the late 1990s, both in absolute terms and as a share of GDP and total tax receipts (Figure 2.4). As explained below, reduced revenue from vehicle taxation in the 2000s is the main factor underlying this trend.

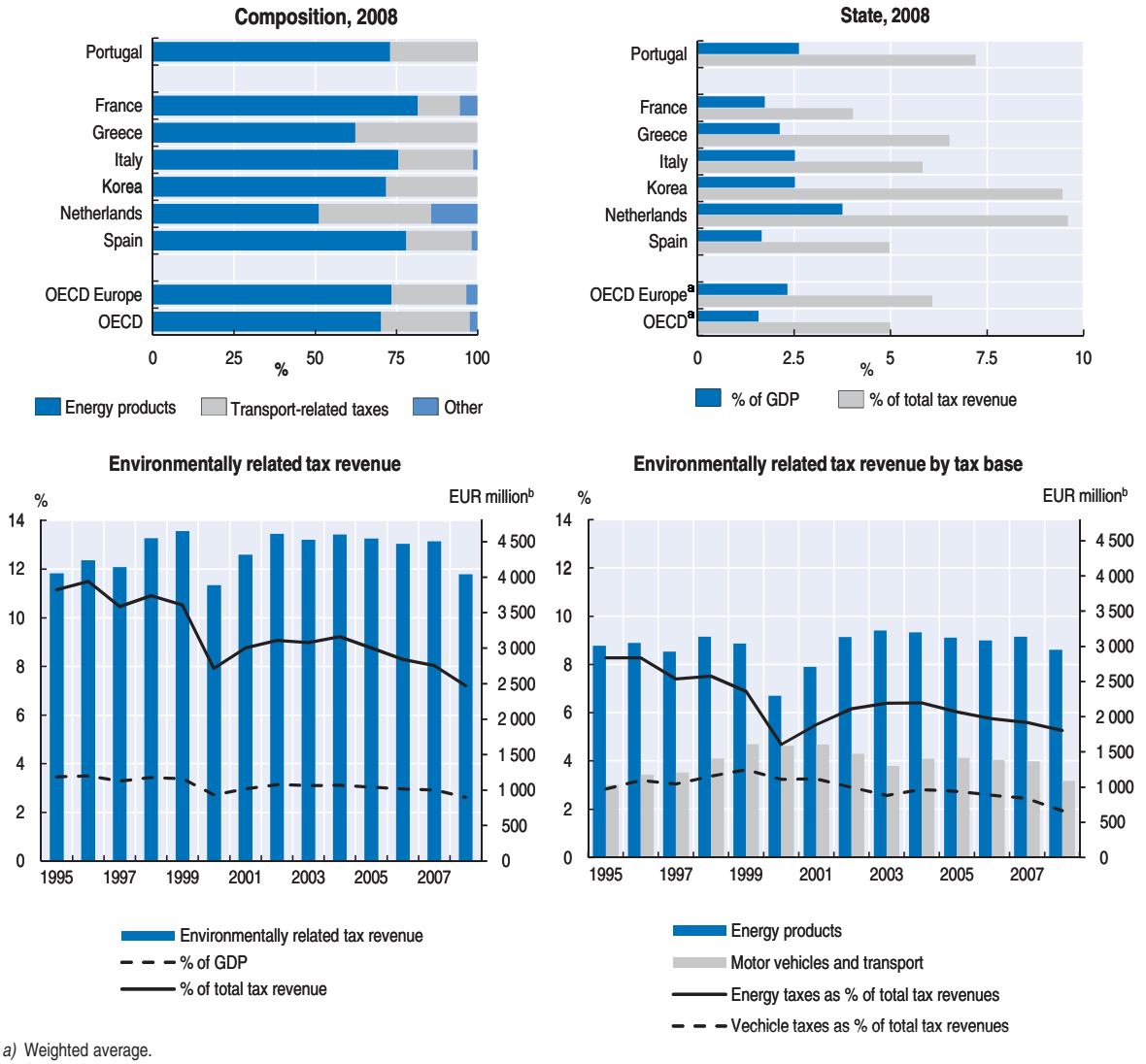
Taxes on energy products

Excise rates on energy products generally exceed the minimum levels required under EU legislation. In particular, tax rates on transport fuels are relatively high compared to those in many OECD Europe countries and were repeatedly adjusted for inflation during the review period (Chapter 5). As a result of this rate increase and heavy reliance on road transport, Portugal collects more fuel taxes as a percentage of GDP than most other OECD countries (OECD, 2010b). Fuel taxes account for 73% of environmentally related tax revenue, in line with the OECD Europe average (Figure 2.4). A share of the revenue from excise duties on energy products is earmarked for the Forest Fund and the Portuguese Carbon Fund.

Vehicle taxation

Vehicle taxation has long been an important source of revenue for the Portuguese government. Following the 2007 reform, both the *registration tax* on vehicle purchases and the annual *circulation tax* are now differentiated on the basis of CO_2 emission levels and cylinder capacity, with the former gradually becoming more important. The rates were redesigned in order to shift part of the tax burden from the registration tax to the annual tax. Since 2000, a discount has applied to the registration tax when a new vehicle is purchased at the same time an old one is scrapped. The registration tax has been linked to CO_2 emission levels since 2009. While these taxes are theoretically less efficient than fuel taxes and road charges in reducing emissions, they have proved effective in changing the composition of the car fleet towards new and more fuel-efficient cars (Chapter 5). Together with the stabilisation of car sales since 2003 and loss of revenue due to the *car scrapping incentive* (Section 4), this has resulted in lower revenue from vehicle taxation and, ultimately, has reduced total revenue from environmentally related taxes (Figure 2.4).

Figure 2.4. **Environmentally related taxes**



a) Weighted average.
b) Constant 2005 prices.
Source: OECD/EEA database on instruments for environmental policy; OECD (2010), *OECD Economic Outlook No. 87.*

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Other environmentally related taxes

Portugal has made progress in using taxation as an instrument in sectors other than energy and transport. A *tax on inefficient light bulbs* (paid by manufacturers and retailers) has been in force since 2007. The revenue is used to finance the Energy Efficiency Fund and the Portuguese Carbon Fund (Chapter 5). The *local property tax on buildings*, both residential and commercial, is reduced when renewable energy source equipment and solar panels are installed.

Waste related taxes were introduced in 2007. They include a tax on licensing of waste management activities and a *waste management tax*. The latter is calculated per tonne of waste disposed or treated by operators of waste management activities (Chapter 3). Tax rates are higher for waste disposed in landfills than for waste that is incinerated. The rates increase by 50% if the disposed waste is recyclable. This tax is expected to be an incentive

to divert waste from landfill towards more efficient management and treatment. The tax receipts are collected by the Portuguese Environment Agency (APA) and the Regional Co-ordination and Development Committees (CCDRs). The revenue is earmarked for financing these authorities' activities and supporting the activities of waste management operators.

In 2008, Portugal introduced a *water resource levy* on water abstraction and discharges. The abstraction levy is calculated per cubic metre of water withdrawn. The rates differ according to category of use. The discharge component is calculated on the basis of the quantity and type of the discharged pollutant (total nitrogen, total phosphorous, total oxidants) (Chapter 3). The water resource levy is paid by licensed operators and the revenue is shared among the Water Resource Protection Fund, the Water Institute (INAG) and the River Basin District Administrations. It is earmarked to partially cover water management costs and improve the efficiency of water use and the quality of water resources and ecosystems.

Both the waste management tax and the water resource levy paid by licensed operators should be passed on to final consumers through charges for waste, water and wastewater services. However, owing to social acceptability concerns, *many municipalities that directly provide water and waste services do not pass the water and waste taxes on to consumers*, weakening the incentive for households and businesses to save water and reduce waste generation and wastewater discharges.

Assessment

Portugal needs to *streamline its tax system* to come to grips with urgent and potentially conflicting objectives: raising tax revenues to cope with the high fiscal deficit, while promoting economic growth. The 2010 OECD Economic Survey of Portugal recommended moving away from labour taxation towards less distortive taxes, such as those on consumption and property (OECD, 2010b).[4] Broadening the use of indirect taxes on consumption of goods and services that are potentially harmful to the environment can also contribute to these goals. Such taxes would generate revenue that could help the government with fiscal consolidation and/or be used to partly reduce taxes on households and businesses, thereby promoting economic growth. Their regressive nature should be addressed through targeted social benefit schemes.

As recommended in the 2001 OECD Environmental Performance Review, Portugal has made *progress in developing the use of economic instruments* in the provision of environmental services, and in strengthening the guidance function of environmentally related taxes with regard to transport (Reference II), through the introduction of waste and water taxes, and restructuring of vehicle taxation on the basis of CO_2 emissions. While there are no current plans for a comprehensive "green tax reform", the 2010-13 Stability and Growth Plan foresees strengthening environmentally related fiscal measures with a view to better maintaining their incentive function and helping improve fiscal sustainability (Box 2.2). However, some of the planned measures consist of tax credits and other forms of fiscal incentives that could increase government spending and prove a costly way to pursue environmental objectives (see also Section 4). Portugal could consider introducing other taxes (*e.g.* on air pollutants, pesticides and packaging materials) and restructuring existing taxes to better reflect environmental externalities (*e.g.* linking a component of fuel taxation to fuels' carbon content) (Chapter 5). Fiscal consolidation and economic recovery objectives could be achieved more efficiently if Portugal allowed greater flexibility in the use of revenues from environmentally related taxes, which are now partly earmarked to specific funds.

Box 2.2. **The role of environmentally related fiscal measures in Portugal's fiscal sustainability plan**

Portugal's Stability and Growth Plan 2010-13 foresees:

- introducing a fiscal incentive for purchases of electric vehicles by businesses, while discouraging purchases of conventional fuel-powered vehicles, and the provision of electric vehicles as benefit-in-kind to employees;
- extending tax credits for the purchase of energy-efficient equipment;
- extending the excise duties on energy products to electricity, as required under EU legislation;
- revising the vehicle registration tax by annually reducing the CO_2 emission categories by 5g/km, so as to maintain the revenue-raising ability of the tax and better link it to development of the car market;
- rationalisation of tax expenditure related to excise duties on energy products, linking fiscal benefits and exemptions to more rigorous environmental criteria;
- rationalisation of tax expenditure related to vehicle taxes, linking fiscal benefits and exemptions to more rigorous environmental criteria. In particular, the car scrapping tax incentive was limited to the purchase of vehicles with CO_2 emissions up to 130g/km in 2010 (compared to 140g/km in 2009) and is restricted to the purchase of electric vehicles from 2011.

Source: Ministry of Finance and Public Administration.

4. Tax expenditure and subsidies

The Portuguese tax system is characterised by *extensive tax expenditures* (*e.g.* tax credits, allowances and exemptions), which narrow tax bases and hence require higher than otherwise tax rates (OECD, 2010b).[5] Excise duty exemptions apply to different uses of energy products and categories of users (Chapter 5). In addition, reduced value added tax (VAT) rates are used extensively. The reductions apply, among others, to heating oil and diesel used in agriculture, household consumption of natural gas and electricity, oil and gas exploration and development activities, equipment for the generation and use of energy from some renewable sources, pollution control equipment, agricultural inputs and machinery, waste collection and water supplies. VAT reductions on energy use in households amounted to over EUR 620 million in 2004 (Kosonen and Nicodème, 2009). This was the equivalent of 0.4% of GDP, compared to 0.07% of GDP in the EU 15.[6] Many of these exemptions and the reduced VAT rates have been applied for several years on the grounds that they support vulnerable segments of the economy and population. However, this rationale has become weaker. Such tax expenditures represent lost revenue for the government, distort competition and investment decisions, and (by lowering end-use prices) can reduce incentives to use energy and natural resources efficiently.

Portugal provides several *environmentally related tax discounts* to both households and businesses. Households can claim tax credits for, among others, the purchase of houses meeting energy efficiency standards, energy-efficient renovation work, installation of energy-efficient equipment, microgeneration units and solar panels, and purchases of electric vehicles. Electric vehicles are also exempt from registration and circulation taxes and stamp duties. Similarly, businesses can benefit from tax credits or special depreciation rates on investment costs for improving energy performance and purchasing fuel-efficient

vehicles. A car scrapping programme has been in force since 2000, providing large discounts on the vehicle registration tax (limited to electric vehicles from 2011).

Overall, the *tax expenditure for energy and vehicle related incentives* has increased during the last few years, reaching EUR 145 million in 2008 (Table 2.1). Environmentally related tax credits account for a minor part of household and corporate income tax. However in 2008, tax expenditure on vehicles made up about 16% of vehicle tax revenue, up from 5% in 2006, and exemptions from energy taxes represented 9% of the respective revenue. Tax expenditure linked to the *car scrapping programme* steeply increased between 2006 and 2009, reaching EUR 51 million or 7.2% of registration tax receipts in 2009.[7] It represented the largest fiscal benefit for the purchase of goods. The Ministry of Finance has estimated that limiting the tax rebate to the purchase of cars with low CO_2 emissions in 2010 reduced the amount of lost revenue to about EUR 28 million, or 3% of registration tax receipts. The OECD has recommended considering the impact of such tax expenditure on the government's budget, which is particularly important at a time of economic recession, and broadening the tax base by reducing allowances and deductions (OECD, 2010b). Tax expenditures are frequently a costly way to pursue equity objectives. They may even be regressive, *i.e.* benefiting higher income earners most. Portugal should assess such expenditure in terms of potential negative impacts on the environment. Similarly, tax credits and allowances to encourage environment-friendly purchases and investment are less cost-effective in reducing environmental impacts than charges on the activities that generate such impacts, although they can be helpful in addressing other market failures or barriers (*e.g.* lack of information, difficult access to credit) and in stimulating related economic sectors at times of crisis.

Table 2.1. **Energy- and vehicle-related tax expenditure,[a] 2006-08**
(EUR million)

Fiscal benefit	2006	2007	2008
Oil and energy tax (ISP), *of which:*	240.1	261	226.8
Coastal and inland waters navigation, including fisheries	26.7	26.9	24.8
Agricultural machinery	62.3	74.3	70.9
Heating	69	60.7	43.3
Biofuels	30.5	50.1	45.4
Tax on motor vehicles, *of which:*	59.6	95.5	143.8
Diplomats, nationals of other EU countries, nationals of third countries, etc.	24.9	35.1	24.5
Passenger motor cars with hybrid engines	1.6	1.8	
Car scrapping incentive	7.4	18.8	44.8
Reduction of particles emissions		13.1	47.4
Personal tax, *of which:*	5.8	6.6	7.4
Renewable energy equipment	5.8	6.6	7.4
Total	**305.5**	**363.1**	**378**
of which, environmental protection incentives	45.3	90.4	145

a) Excludes revenue losses due to reduced VAT rates.
Source: Ministry of Finance and Public Administration.

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Energy subsidies

In addition to the above mentioned energy related tax expenditure, Portugal provides various forms of *financial support to the energy sector*. These include investment subsidies,

co-funded under EU funding mechanisms, for the development of electricity and natural gas infrastructure and networks (IEA, 2009). Government support to finance infrastructure development should be progressively phased out once liberalised energy markets are mature. Attention should be focussed on providing a good investment environment through stable policy and regulatory frameworks. Business and household investments in energy efficiency equipment also benefit from direct support in the framework of the National Energy Efficiency Action Plan, and electricity produced from renewables is supported through a favourable pricing policy (feed-in tariffs) (Chapter 5). The costs and benefits of such support should be regularly assessed, taking into account the policy objectives for which it is provided and the incentives faced by energy operators within the EU ETS, with a view to gradually eliminating unnecessary, costly and distorting forms of subsidisation.

Subsidies to agriculture and fisheries

Support to agriculture in Portugal follows the rules of the EU Common Agricultural Policy (CAP). Support to EU farmers (as measured by the OECD Producer Support Estimate, PSE) declined on average from 33% of farm receipts in 2000-02 to 23% in 2007-09, broadly in line with the OECD average. Direct aid to farmers has been progressively untied from agricultural production and input use: 44% of EU support to farmers in 2007-09 was based on output and input quantities, the forms of support that most encourage production, compared to about 65% in 2000-02. Direct aid to farmers is also conditional on meeting specified environmental standards (cross-compliance) and adoption of good farming practices (defined as levels of environmental quality to be achieved at farmers' own expense). Expenditure on agri-environmental measures in Portugal continued to rise in the 2000s, accounting for around 25% of expenditure funded by the European Agricultural Fund for Rural Development in 2008 (Vojtech, 2010).[8]

However, Portuguese *farmers benefit from a number of reductions in input costs*, with implications for the environment. A tax concession on diesel fuel provided for tractors and farm machinery was equivalent to EUR 70 million in tax revenue foregone in 2008 (Table 2.1). Concessional VAT rates apply to a range of agricultural inputs and equipment. Water use for irrigation benefits from a reduced water resource levy. In the case of private irrigation projects, farmers pay the full operating and capital costs, although investment in irrigation equipment has been increasingly financed by both national and EU funds with variable non-recoverable contributions. Farmers who benefit from public irrigation projects are not charged for any part of the capital expenditure on infrastructure outside the farm, but they pay an average 90% of the maintenance and distribution costs (Garrido and Calatrava, 2010).

The EU Common Fisheries Policy provides the framework for Portugal's *support to fisheries*. Government financial transfers (GFTs) to the fishing industry fell in the last decade (by 8% between 1997 and 2007). GFTs averaged about EUR 20 million per year in 2005-07, or about 10% of the value of the total catch from capture fisheries, in line with the EU average. Direct aid to fishers represented a minor part of total support to fisheries (OECD, 2010c). Portugal provides subsidies to fishers for fleet reduction (scrapping of vessels) and renewal of existing fishing vessels, *e.g.* to improve safety and working conditions, promote use of more selective and environment-friendly gear and increase fuel efficiency. In this respect, renewal of the fishing fleet might be accelerated more cost-effectively by phasing out the excise duty exemption on fuel used in the sector (Table 2.1).

This is shown by increased efforts at the OECD level to improve technology and change skipper behaviour in response to the 2008 fuel price shock (OECD, 2010c). Aid is not linked to production or to investment in new vessels, which have the greatest potential to reduce fish stocks. However, as in other EU countries, productivity gains due to renewal and modernisation of the fleet are likely to have offset measures to limit fishing efforts (Chapter 4).

5. Promoting eco-innovation and environment-friendly products

5.1. *The innovation and eco-innovation policy frameworks*

Very open to foreign trade, Portugal has been losing competitiveness and faces a decline in the world market share of most of its traditional export sectors. There is a need to boost growth in productivity. *Promoting innovation* could make a substantial contribution and help restore competitiveness. In particular, developing *eco-innovation* potentially has very beneficial economic effects:[9] it could create new sources of economic growth by fostering development of new sectors and new knowledge. It could also increase the efficiency of Portugal's economy and its adaptability to structural change, thereby easing the transition towards a greener economy. Fostering eco-innovation requires the implementation of structural reforms to foster general innovation capacity, as well as targeting R&D and technology promotion efforts in specific environment and climate related fields.

Portugal's *institutional and legal framework for innovation* has long been characterised by the centralisation of institutions and policies and a division between R&D and industrial policies, which are the responsibility of different ministries and a number of agencies and institutions.[10] Strategic planning, co-ordination and co-operation among these bodies have often been inadequate (Simões and Godinho, 2006).

In an attempt to overcome this science-industry divide, in 2005 the government launched the *Technological Plan* as an agenda to promote innovation, social change and modernisation.[11] The Ministry of Economy, Innovation and Development (MEID) is in charge of supervising the Plan. Follow-up, evaluation and co-ordination mechanisms have been put in place to strengthen the Plan and improve its effectiveness. The Innovation Agency is responsible for promoting university-industry R&D consortia and supporting the creation of new technology-based firms (*e.g.* by providing seed capital). The Small and Medium-sized Enterprises and Innovation Support Institute focusses on promoting innovation in SMEs and manages several targeted financial schemes, including those co-financed by the EU Structural and Cohesion Funds.

The Technological Plan represents a step towards a *coherent innovation policy* and has helped bridge the gap between the responsible government institutions. It has led to the introduction of several measures and projects for modernisation and innovation promotion, many of which are internationally recognised and considered good practices (Gomes and Telha, 2010). Regulatory improvements aimed at curbing bureaucracy and extending e-Government have also contributed to a more innovation-friendly environment (Simões and Godinho, 2006). Portuguese universities participate in several relevant international partnerships in science, technology and higher education.

Despite the progress made, improving weak co-ordination among companies, universities, and research and governmental institutions remains a major challenge. Most Portuguese companies are SMEs that are not yet able to compete in international markets and often lack motivation to innovate (Gomes and Telha, 2010). The public sector and

research institutions are therefore essential in stimulating companies to be more innovatory and promoting improvement in their competencies.

Like most OECD countries, Portugal has mainly used its environmental policies to promote sustainable manufacturing and eco-innovation, without building coherence or synergies with other policies. It only recently started to *integrate environmental concerns in its innovation and industrial policies*, although not in a systematic manner. A framework is needed for eco-innovation to produce green technologies and solutions, as well as to adapt to a changing competitive environment and help achieve ambitious environmental and socio-economic goals simultaneously.

5.2. Research and industrial performance

Portugal has long lagged behind the OECD average with regard to *innovation performance*. For example, the number of triadic patents per capita remains significantly below the OECD average. To a large extent, this reflects the relatively *low educational level of Portuguese workers*, which has been a major cause of their low productivity relative to that of workers in richer OECD countries (OECD, 2010b). Despite substantial improvement in educational attainment from one generation to the next, in 2008 the proportion of the working-age population (25-64 years old) with at least tertiary education was about 14%, or half the OECD average (OECD, 2010d).

In the last few years, the strong commitment to research and innovation embodied in the 2005 Technological Plan, the increase in public R&D spending, and use of fiscal incentives have helped Portugal make progress towards catching up with more advanced economies. Its *government R&D budget* has significantly increased, reaching 1% of GDP, the second-highest percentage among OECD countries. R&D spending grew faster than GDP in the 2000s, reaching 1.5% of GDP in 2008. This is an improvement compared with less than 1% during the first half of the 2000s, but *R&D intensity* remains below the OECD and EU 15 averages (2.3% and 2%, respectively). Involvement of the private sector has increased considerably: the share of R&D financed and carried out by the business sector, while still below the EU 15 average, grew from 28% in 2000 to about 50% in 2008.

The total number of *R&D personnel* increased by over 15% between 2006 and 2007, a much higher increase than in previous years and higher than that in the EU 15 (about 4% per year). It was also higher than the rate of increase in total employment. The share of R&D personnel in total employment increased from 4.3 to 9.5 per thousand between 2000 and 2008, although it is still below the EU 15 average (about 12 per thousand).[12]

A growing percentage of firms have carried out *product and non-technical innovation*. Exports of high- and medium-high-technology manufactured products (such as transport equipment and electronics) increased faster than other exports in the 2000s, accounting for some 43% of Portugal's exports of manufactured goods in 2007 (OECD, 2009). In 2007, Portugal's technology balance of payments was positive for the first time. However, high-tech entrepreneurship is relatively weak. The number of firms using R&D as a strategic competitive tool is very small. Even in these cases, a lack of complementary competencies appears to hinder performance (Simões and Godinho, 2006).

Gross domestic expenditure on R&D for environmental purposes increased by 46% (in real terms) between 2000 and 2007, although its share in overall R&D expenditure decreased, reaching 4.4%.[13] In particular, R&D for environmental purposes in the business sector has steadily increased since 2005, a trend corresponding to growth in most other types of R&D.

Institutions of higher learning carry out the largest share of environmentally related R&D (about 40% in 2007), followed by business (34%) and governmental institutions (15%). The government budget for environmental R&D has increased since 2000, with a period of acceleration since 2005, confirming the linkages between increased R&D activity and a stronger policy and financial effort. Environment accounted for about 4% of the government R&D budget in 2008.

Public funding for energy R&D has fluctuated significantly since 2000, but it started to increase more steadily in the last few years.[14] Renewable technologies, especially wind and solar, are the dominant energy research areas, accounting for 42% of the total government energy R&D budget in 2008. Energy efficiency accounted for about 7% (Chapter 5). The government has supported the creation of strategic R&D and industrial clusters for key technology development activities, such as wind and solar power (Box 2.3).

Box 2.3. **The wind and photovoltaic power and technology clusters**

In 2005, the government launched two large-scale public tenders to award new interconnection capacity for future wind farms. The aim was to create a wind energy, R&D and industrial cluster, so as to maximise the benefits from the wind investment and generate economic growth and employment opportunities in less developed areas. Higher scores were given to candidates offering discounts on feed-in tariffs, but the negotiation of additional proposals and commitments by promoters was also allowed, giving rise to private initiatives for R&D, know-how transfer and the development of domestic products.

The first tender concluded in October 2006: 1 000 MW of installed capacity was awarded, with an additional 200 MW in capacity upgrades. The budget for this process was EUR 1 750 million. It led to the creation of approximately 1 700 direct jobs and 4 500 indirect ones. In addition, the winning first-phase tender has already contributed EUR 35 million towards the establishment of a national R&D fund to support innovation and research in the field of renewable energies. During the second tender, concluded in September 2007, an additional 400 MW was granted, followed by a further 200 MW in capacity upgrades in 2008. The bids resulted in the installation of a large on-shore wind farm and an industrial facility in the Viana do Castelo region.

Before this new tendering process, the rapid growth in wind installed capacity was stimulated almost exclusively by imports of technology and equipment. In 2009, Portugal started to export wind technology components and covered 90% of its imports (Figure 2.5). It is likely to become a net exporter of wind turbines, besides producing most of the components that will be installed in Portugal.

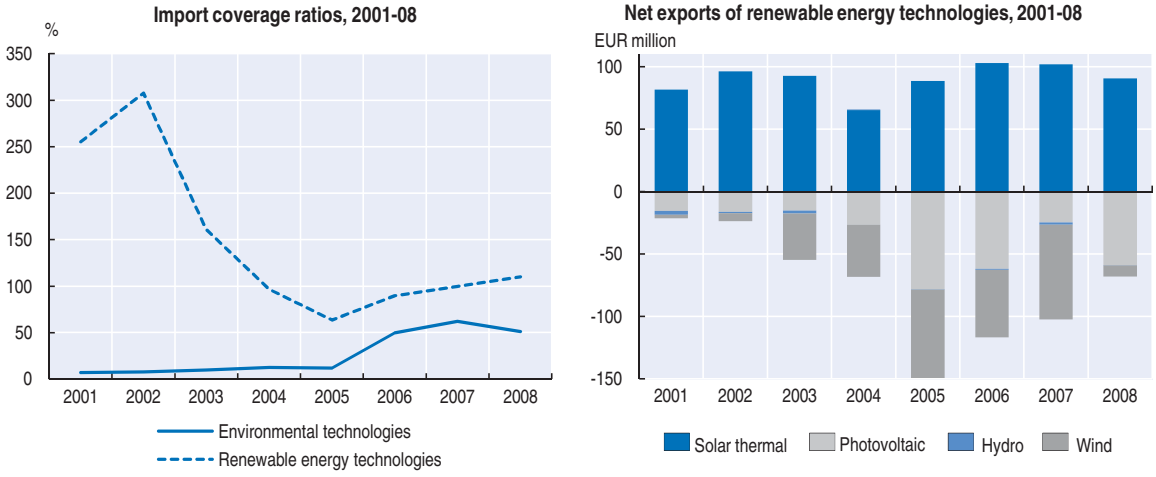
The Moura Photovoltaic Power Station is one of the world's largest photovoltaic power parks. The Alentejo region is among the sunniest regions in Europe, but also one of the most economically depressed. Construction of the power station here took place in two stages, the first completed in 2008 and the second scheduled for completion by 2010. The entire project required an investment of EUR 250 million. In combination with the power plant, a solar panel factory began to operate in the same municipality to produce panels for the second stage of construction. Its future production will be targeted at the international market. The factory has the capacity to produce 24 MW of solar panels annually. Portugal started to export photovoltaic panels in 2007. In 2008, the photovoltaic import coverage ratio reached 47% (compared with 1% in 2005).

Source: IEA (2009); INE (2009).

The *trade balance for environmental and renewable energy technologies* has improved in the last few years. The import coverage ratio for exports of environmental technologies (air, waste and water) has increased markedly since 2005, reaching 51% in 2008 (Figure 2.5). Exports of air pollution control equipment have greatly contributed to this increase. Portugal has long been a net exporter of solar thermal technology.[15] The rapid increase in installed photovoltaic and wind power capacity since the introduction of the feed-in tariff system has resulted in growing imports of the related technologies and a decline in the renewables trade balance (Chapter 5). It was not until 2008 that the renewable trade balance became positive, owing to the start of production and export of photovoltaic and wind technologies in the associated industrial clusters (Box 2.3). Overall, however, Portugal remains a net importer of environmental and renewables technologies (Figure 2.5).

Progress has also been made in *eco-innovation*. For example, the number of products produced in Portugal and awarded the *EU ecolabel* increased from 2 in 2000 to 17 in 2010, with more than half having been awarded during the last three years. The 2007 *national strategy for Green Public Procurement* requires that 50% of public contracts for the procurement of selected products and services (on the so-called "priority list") include environmental criteria by 2010. The adoption of this strategy has probably stimulated the development of new environment-friendly products.

Figure 2.5. **Trade in environmental and renewable energy technologies**



Source: Eurostat (2009), *Comext Database*.

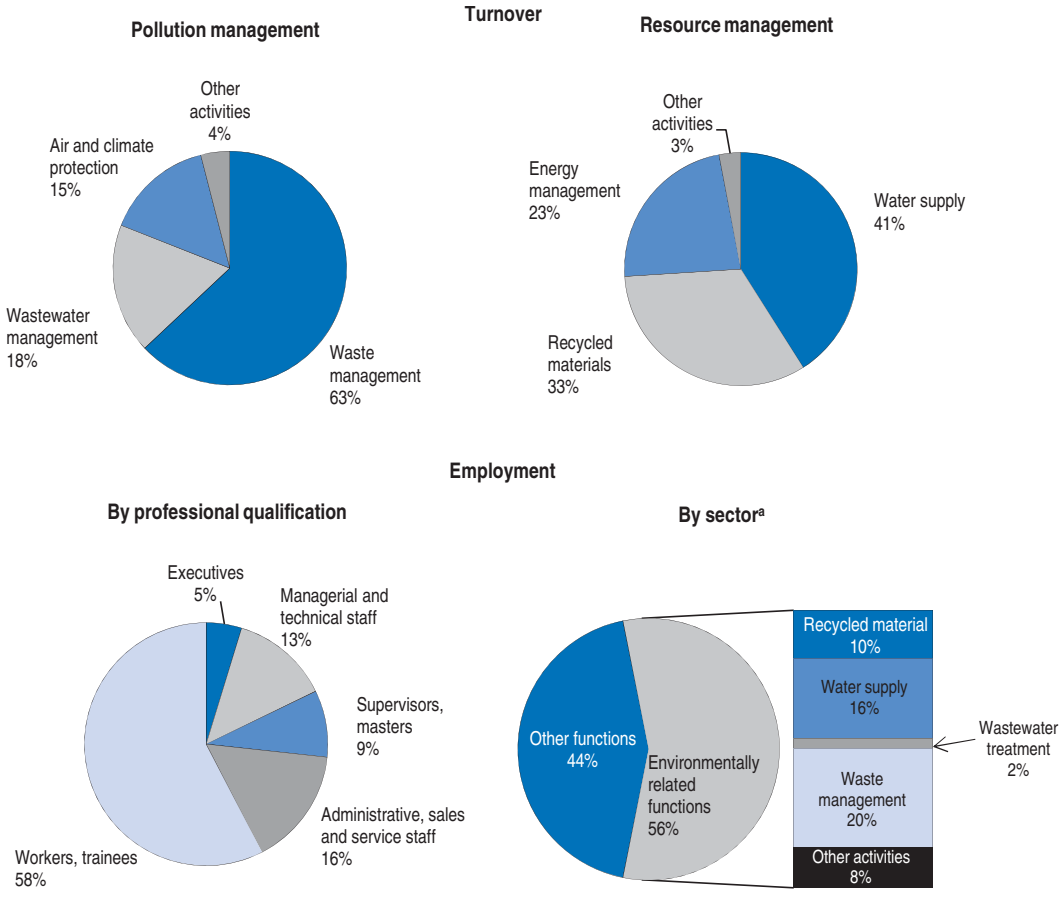
StatLink http://dx.doi.org/10.1787/888932375471

6. Expanding environmentally related markets and employment

In 2008, Portugal's National Statistics Institute (INE) started to collect and provide information on the *environmental goods and services (EGS) sector*, which includes the production of goods and provision of services whose main goal is environmental protection. Notwithstanding the limited time series data available, there is some evidence that the EGS sector has grown in recent years: its turnover increased by about 10% (in real terms) between 2007 and 2008 despite Portugal entering recession in late 2008.[16] This sector represented about 3% of GDP in 2008.

Pollution management activities, such as air protection and waste and wastewater management, accounted for nearly 60% of the EGS sector's turnover in 2008 and grew by about 20% compared to the previous year. Waste management (collection and treatment of waste) made up nearly two-thirds of the pollution management industry's turnover, followed by wastewater treatment (Figure 2.6). *Resource management activities*, including water supply, recycled materials and energy management, remained virtually stable during this two-year period. Water supply accounted for over 40% of turnover, followed by recycling (Figure 2.6).

Figure 2.6. **Turnover and employment in the environmental goods and services sector, 2008**



a) Data refer to 2007.
Source: INE.

StatLink http://dx.doi.org/10.1787/888932375490

Most EGS companies provide pollution and resource management services, which account for 80% of the sector's turnover. The remainder mainly consists of the manufacture of environmentally related products. The manufacture of environmental equipment accounts for a marginal share of turnover: it mainly comprises production of equipment for air pollution control, accounting for 13% of the turnover of companies in the air pollution branch.

Most products and services produced by Portugal's EGS sector are sold on the domestic market. The business sector is the main customer, accounting for over 60% of domestic turnover, followed by public administration (about 20%). Exports, which increased by 18% between 2007 and 2008, were mostly sent to other EU countries.

Overall, the industrial sector has increasingly invested in environmental protection (Section 2). *Many industries have also started to profit from environmental protection activities*, especially from the sale of waste and recycled materials. For example, the metal and transport equipment industries produce large amounts of valuable waste and materials. The establishment of an online waste exchange platform in 2009 was expected to contribute to further development of the recycled materials sector and enhancement of waste recovery (Chapter 3).

Employment in the EGS sector decreased by 2% in 2008 compared to the previous year. Little more than half of those employed in eco-industries actually carried out environmentally related functions, most of which were concerned with water supply and waste management (Figure 2.6). The sector is characterised by *low-skill employment*: 58% of employees were unskilled workers and trainees in 2008, and most of them were employed in waste collection. This is despite an increase in the number of graduates in environmentally related subjects, who accounted for nearly 7% of total graduates in 2005-06 (Lobo, 2010). Overall, environmentally related jobs account for a relatively low share of employment in Portugal's industrial sector (including industries other than EGS). Less than 12% of employees carry out environmental protection functions during more than half of their working hours. Environmentally related functions account for a larger share of employment in the textile and pulp and paper industries than in others.

Notes

1. End-of-pipe technologies are defined as those used to treat, handle or dispose emissions and discharges (water and waste) from production at the end of the production process. Integrated investments, also called cleaner technologies, are investments in new or modified production facilities designed so that environmental protection is an integral part of the production process, reducing or eliminating emissions and discharges.
2. Environmental infrastructure includes projects related to water supply, wastewater, waste, air and noise.
3. In the period 2000-08, revenue from environmentally related taxes increased by 3.8%. However, the level in 2008 was exceptionally low due to the economic recession.
4. Several studies show that with regard to a given level of taxes, a higher incidence of direct taxes (especially on business activity) relative to indirect taxes is detrimental to economic growth (Jones and Tsutsumi, 2008).
5. Tax expenditures are defined as provisions of tax law, regulation or practice that reduce or postpone revenue for a comparatively narrow population of taxpayers relative to a benchmark tax. They may take a number of different forms: allowances, exemptions, rate relief, tax deferral, and credits.
6. Revenue losses due to reduced VAT rates in Portugal are among the highest in the EU (OECD, 2010b).
7. In 2007, administrative procedures to benefit from the tax rebate were simplified. This, together with the reform of vehicle taxation, determined an acceleration of car sales.
8. Agri-environmental payments provide support to farmers for undertaking farming practices designed to achieve specific environmental objectives that go beyond the requirements of environmental regulations.

9. Eco-innovation can be defined as the implementation of new, or significantly improved, products (goods and services), processes, marketing methods, organisational structures and institutional arrangements that lead to environmental improvements compared to relevant alternatives.
10. The Ministry of the Economy, Innovation and Development is responsible for support to entrepreneurial development and investment, including innovation. The Ministry for Science and Higher Education is in charge of higher education and research policy.
11. The Technological Plan focuses on three priority areas: education and lifelong learning ("knowledge"), acceleration of scientific and technological development ("technology"), and mobilisation of all science and innovation actors in order to promote industrial R&D and technology transfer and attract foreign investments ("innovation").
12. This change could also be due to improved data availability and survey methodologies.
13. Allocation of expenditures to specific objectives is determined on the basis of managerial intentions at the time of commitment of the funds. Given the uncertainty associated with basic R&D, this may be difficult to do with confidence.
14. There is considerable uncertainty about the exact breakdown, as statistics are not systematically collected.
15. The solar thermal category includes "instantaneous gas water heaters", which are not always used in association with solar panels.
16. These data include pollution and resource management activities, as well as other activities such as energy production, construction and engineering.

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PART I

Chapter 3

Implementation of Environmental Policies

Portugal has developed a comprehensive environmental planning and programming framework that encompasses the EU requirements. This chapter outlines the evolution of this mix of environmental policy instruments, including regulatory, economic and information-based measures. Portugal's extensive system of environmental enforcement and compliance promotion is examined, along with the efforts made in promoting public participation in environmental decision-making and opening up access to information and justice. Progress has been noted in the improvement of air quality, particularly in urban areas, reducing pressures on inland and coastal waters, strengthening the management of water supply and sanitation systems, and improving waste management efforts, including the reduction, appropriate treatment, and safe disposal of hazardous waste. This chapter also examines the steps taken to strengthen nature protection and biodiversity conservation.

Assessment and recommendations

Portugal has developed a comprehensive environmental planning and programming framework which largely corresponds to EU requirements. Several framework laws were enacted including the 2005 Water Law, the 2006 Waste Law, and the 2008 Nature Law. These were complemented by a large number of regulations, and supported by an extensive reform of environmental institutions. Regulatory instruments are now supported by a wider use of economic instruments. Enforcement relies more on a risk-based approach and compliance promotion. Environment-related initiatives have been closely linked with national development plans. A growing number of inter-ministerial mechanisms have been introduced to increase policy coherence and enhance implementation.

Environmental policy has been largely driven by the need to transpose EU Directives and to disburse EU structural and cohesion funds. The scale and pace of these changes has made it difficult to ensure that high quality projects were identified and implemented, that consultation with the public and local authorities was conducted according to the spirit rather than the letter of the law, and that sufficient capacity for policy implementation was developed, particularly at the local level. The enactment of so many laws and regulations in a comparatively short period of time also resulted initially in the business community facing a complex set of environmental requirements, though this has now improved. Further efforts are needed to reduce the administrative costs of complying with environmental requirements and to alleviate concerns about their impact on competitiveness. At the same time, the business community should be encouraged to adopt a more strategic and proactive approach to environmental issues. The staffing arrangements of environmental institutions at all levels should be carefully assessed to ensure that they are sufficient to achieve policy objectives in a way that minimises the administrative costs of compliance, and reduces uncertainty, for the business community.

Portugal has developed a comprehensive, policy-relevant system of environmental information. Provisions for public participation and access to justice have been strengthened in line with EU requirements. However, practice has fallen short of the policy goals. Public participation in decision-making is still limited by a weak NGO movement. Access to justice is affected by lengthy court proceedings and difficulties that courts encounter when adjudicating on environmental issues. Project proponents sometimes submit environmental impact assessment (EIA) dossiers with inadequate project information and which do not consider alternative options. Portugal has been questioned by the European Commission on several occasions regarding EIA procedures related to transport, energy and tourism-related projects.

Air management

Various factors have helped to reduce air pollution: restructuring of the economy, relatively slow growth, fuel switching, timely transposition of EU Directives followed by

investment in air pollution reduction equipment in the energy sector, and the extension of the public transport systems and alternative modes of transport. Specific air quality improvement plans were prepared for large agglomerations. These efforts resulted in the absolute decoupling of emissions of key air pollutants (SO_x, NO_x, and NH_3, CO) from economic growth. Portugal is likely to meet the NEC and Gothenburg targets, as well EU air quality requirements. Emissions of toxic pollutants were also reduced. However, emissions of particulate matter continued to increase, and emissions of NMVOC were not reduced as fast as expected. Local air pollution incidents related to ground ozone concentrations still occur in large cities, with potential impacts on health of the population.

Water management

Portugal has taken steps towards more integrated water management by strengthening the system for registering water users and by establishing river basin district administrations. The next step should be to complete river basin management plans. The share of the population with access to drinking water and wastewater infrastructure has expanded significantly, driven by financial support from the EU and matching national funds. The process of establishing multi-municipal bodies for more efficient water supply and sanitation has been completed. The water sector has been opened up to competition and participation of the private sector. Its operations are now overseen by a professional, well-equipped regulator. These developments have helped increase the efficiency of service delivery. The quality of coastal waters now meets EU requirements (with an increased number of Blue Flags awarded and only sporadic cases of beach closures which had been common in the past). Drinking water quality improved significantly with only 2% of samples not meeting required health standards. However in 2007, 50% of inland waters were still at risk of not complying with environmental objectives by 2015 due to pollution from insufficient treatment of household, industrial and commercial wastewater, effluents from livestock and diffuse agriculture pollution. Significant investments in wastewater treatment are still required to meet EU requirements. Water and wastewater tariffs will have to be well designed to cover both capital investments and operations and maintenance costs.

Waste management

All illegal dumping sites were closed by 2002 and a monitoring programme was established. All municipalities established effective waste collection systems for mixed waste, and many have systems for the collection of recyclable waste. Municipalities are linked to an efficient waste treatment and disposal infrastructure network, including for hazardous waste, which, since 2009, has been treated in specialised facilities, bringing Portugal closer to meeting its objective of self-sufficiency in treating this type of waste. Several streams of waste are covered by Extended Producer Responsibility schemes for which most of the recovery targets have been achieved. Efforts have been made to link these schemes with markets for recovered and recycled materials. However, municipal waste generation has continued to increase, though not as fast as economic growth and private consumption. Tariffs for municipal waste collection have been applied in some municipalities, but they often do not provide strong incentives for waste reduction.

Nature and biodiversity

Portugal made much progress during the review period in reformulating the legal and strategic planning framework for nature and biodiversity management. Some relevant achievements have been made on aspects such as land subject to agri-environmental measures, minimisation and compensation measures, and emblematic species and habitat recovery. The extent of protected areas using the IUCN categories is comparable to the OECD average and Portugal has designated 22% of its land area as part of the *Natura 2000* network. New sources of finance were mobilised, both domestically and from the EU. Monitoring of species was strengthened and an assessment made of the conservation status of *Natura 2000* sites (2001-06). Despite these efforts, biodiversity loss continued, as in most European countries. Two-thirds of freshwater fish, one out of three birds, and one out of four mammals are threatened, which is high by OECD standards. Habitat deterioration due to fragmentation, agriculture intensification and land abandonment has been the major driver of biodiversity loss. There are still few marine protected areas (MPAs) offshore but a significant part of the coastal waters (130 000 ha) has been included in the *Natura 2000* network. The extension of *Natura 2000* is under way. It is expected that five new MPAs will be designated in 2010. Sea use planning would facilitate delineation of MPAs, and the forthcoming maritime spatial management plan should also help.

Recommendations

- Continue to simplify and streamline environmental requirements and reduce associated administrative costs of compliance, particularly for small and medium-sized enterprises; assess the staffing arrangements needed to support an efficient, effective and transparent environmental regulatory system at all levels of government; develop a strategy, with supporting instruments, to address serious non-compliance with environmental requirements.
- Establish an effective framework, with supporting capacity, for *ex ante* and *ex post* economic evaluation of environmental policies; use this framework to strengthen priority- and target-setting, and to identify cost-effective policy instruments; strengthen Strategic and Environmental Impact Assessment procedures.
- Support NGOs to play an expanded and constructive role in environmental decision-making; strengthen mechanisms for stakeholder consultations; further develop environmental curricula at all levels of education, and for key professional groups such as decision-makers and judges.
- Strengthen measures to reduce emissions of tropospheric ozone precursors and particulate matter from transport and industry; evaluate air quality improvement plans in large agglomerations in order to strengthen air pollution reduction efforts.
- Complete River Basin Management Plans; develop a realistic and affordable finance strategy to achieve the target of connecting 90% of the population to public wastewater treatment.
- Speed up the introduction of household waste collection charges to provide incentives for better waste management.
- Make payments for *Natura 2000* sites conditional on the achievement of specific nature protection and biodiversity outcomes, particularly in the context of agriculture and fisheries policies; consider introducing a tax on pesticides based on toxicity.
- Designate more marine protected areas as part of sea use planning, taking into account implementation of the regulations regarding *Natura 2000*, and the marine environment, and post-2010 EU Biodiversity Strategy targets.

1. Strengthening the environmental policy mix

1.1. *Reforming administrative instruments*

Reforming the institutional set-up

The *Ministry for Environment and Spatial Planning (MAOT)* was the main governmental body responsible for defining and co-ordinating environmental, spatial planning and urban development policies during the review period. However, the institutional setting of the agencies under its supervision was subject to significant adjustment as part of the Programme for Restructuring the Government's Central Administration (PRACE). The purpose of this programme, launched by the central government in 2005, was to increase the coherence and efficiency of public administration.

The key development, following an *extensive evaluation of MAOT agencies,* has been the merging of the Environment Institute and the Waste Institute, which resulted in the creation of the Portuguese Environment Agency (APA) in 2007. The APA is the principal body responsible for monitoring and implementing environmental policies with regard to climate change, air pollution and air quality, noise reduction and waste management.[1] In the area of nature protection and biodiversity conservation, reorganisation of the Institute for Nature Conservation and Biodiversity (ICNB) has included the establishment of five new Regional Departments for Management of Classified Areas (DGACs). In 2009, the Institute for the Regulation of Water and Solid Waste (IRAR), responsible for regulating water and waste services, was reorganised into the Water and Waste Services Regulation Authority (ERSAR). This body's regulatory coverage has been broadened to include all water supply, wastewater and municipal waste management operators, irrespective of their management or ownership models.

Other agencies with a role in carrying out environmental policies have also been reorganised and strengthened, including the National Institute of Housing and Urban Redevelopment (IHRU), which develops and regulates housing policy; the Water Institute (INAG), which is in charge of water and coastal zone policy development; and the Environmental and Spatial Planning General Inspectorate (IGAOT), which carries out and co-ordinates compliance assurance and promotion with regard to environmental, spatial planning and nature conservation legislation.

During the review period, the MAOT established a number of *mechanisms for co-ordinating policy development and implementation with other ministries*. Examples include: a working group on economic instruments for environmental policy, established between the Ministries of Finance and Environment; and an Environment and Transport Steering Committee that pursued implementation of the Sustainable Mobility Project. Such arrangements, which have facilitated more frequent interactions between the MAOT and other government agencies, could be extended to additional sectors.

The institutional framework at the sub-national level has also been adjusted, particularly concerning water management. In 2007, the water management responsibilities of the *Regional Development and Co-ordinating Committees (CCDRs)* were transferred to five administratively and financially autonomous River Basin District Administrations (ARHs), which are in charge of developing and managing River Basin Management Plans (PBHs) consistent with the provisions of the EU Water Framework Directive.[2] Parallel with the creation of the five ARHs, River Basin District Councils were established to provide a mechanism for stakeholder consultation and reviewing of progress. The CCDRs continue to complement the MAOT's licensing activities, focussing on

non-hazardous waste management operators, monitoring and management of air quality, and assuring compliance of certain activities with regard to environmental impacts. They also support local municipalities and their associations in policy implementation. The forest administration, under the Ministry of Agriculture, Rural Development and Fisheries, has also been reorganised to respond better to major challenges, such as forest fires.

Municipalities are more engaged in reviewing licensing and enforcement procedures than they were in the past, in line with the central government's policy of simplifying regulations. Under laws enacted in 2003, they may collaborate formally through the creation of *metropolitan areas and inter-municipal associations*. However, as experience with inter-municipal associations has been varied, the 2003 laws are under revision with a view to increasing collaboration among municipalities and, in particular, rationalising public infrastructure projects and developing management capacities (OECD, 2008a). The 2007 Local Finance Act introduced measures to further expand municipalities' competencies and increase their revenues.

Development of the legal framework

The *1987 Environmental Framework Law* remains the main legal act establishing environmental principles, policy objectives, and measures for implementation of environmental policies. During the review period, a significant number of laws and regulations were enacted in order to harmonise the Portuguese legal system with EU requirements. Several laws (*e.g.* the 2005 Water Law, the 2006 Waste Law and the 2008 Nature Law) introduced comprehensive frameworks for environmental media. A large number of regulations introduced specific management requirements under existing framework laws. Several cross-cutting laws were also introduced, such as those on environmental impact assessment (EIA) and integrated pollution prevention and control (IPPC) (introduced in 2000), prevention of major accidents (*Seveso II*) (introduced in 2001 and revised in 2007), environmental offences (2006), strategic environmental assessment (SEA) (2007) and environmental liability (2008).

Many regulations enacted during the last decade have led to *growing complexity in the legal system* overall, particularly with regard to the environment. Concerns have been expressed by decision-makers and business about the regulatory burden and its effects on the competitiveness of the Portuguese economy. Responding to these concerns, in 2006 a government-wide Better Law-making Programme (*Legislar Melhor Programme*) was initiated to enhance the quality of laws and reduce administrative burdens on business. For example, formal requirements were introduced under which parliamentary services must prepare detailed technical notes justifying each draft bill.[3] These efforts were supported by the *Simplex* Programme, which concentrated on providing easier access to legislation through electronic publication of regulations and law codification (OECD, 2009).

Environmental authorities responded to these initiatives by developing a comprehensive *online register of environmental regulations* that includes EU primary and secondary regulations, as well as judicial and administrative decisions. The first steps were also taken towards *ex ante* impact assessment. Procedures now include the *Simplex Test*, which is used to assess expected administrative costs of planned regulations (OECD, 2009). Growing importance is attached to involving stakeholders and the public in the policy-making process. The *Simplex* Programme is being extended to cover municipalities (*Simplex Autárquico Programme*).

Reforming environmental permitting and licensing

Significant reform of the traditionally complex and burdensome *system of environmental permitting and licensing* was launched in 2000 with the introduction of IPPC permitting for large installations. The first integrated licenses for installations listed in Reference I of the EU's IPPC Directive were issued in 2001. By 2009, 481 such environmental permits had been issued (IPPC permits were required for a total of 577 installations by 2007). Permitting procedures have been simplified: the APA is the only competent national authority for IPPC permitting, and installations may use accredited private entities to prepare permit requests (GLG, 2009). A new system for accelerated licensing of potential *projects of national interest (PINs)* has been in force since 2005. Covering large investment projects with a value of more than EUR 25 million, or those directly providing at least 100 jobs, it is concerned with strategic areas such as territorial planning, the environment, new technologies and energy. Safeguards have gradually been introduced to ensure that projects are energy-efficient and environmentally sustainable.

A further step towards simplifying the regulatory process and strengthening its effectiveness was taken in 2008 with the adoption of a law that established the *Regime of Industrial Activity (REAI)*. Requirements for obtaining a permit are differentiated according to operations' size and environmental impacts. While those that pose higher environmental risks[4] must obtain a permit from the APA or other competent authority, small and medium-sized installations are now required to submit a declaration to relevant national or regional authorities. Companies that have up to 15 employees and use a limited amount of thermal and electrical power are merely required to register with local authorities (Aicep, 2010).[5] These changes were designed to make administrative requirements consistent with the risks of a particular regulated facility. The new procedures have eliminated some administrative steps, shortened the time needed for final decisions to be taken, and put in place arrangements that could lead to more effective enforcement.

Since a number of permits continue to be issued separately by various agencies, *integration of environmental licensing with various legal schemes* has also been strengthened. Co-ordination of permit approval and assessment when the operation of an industrial facility requires various permits (*e.g.* for construction or urban development) is aimed at preventing duplication of work and contradictory decisions. It also provides for joint inspections by relevant authorities. Dedicated tools, such as online license and permit catalogues, have been introduced to facilitate licensing procedures. The catalogues provide comprehensive information regarding licenses and permits and enable a search to be made for detailed procedural requirements. The development of the legal framework also brought about an improved relation between the EIA and strategic environmental assessment (SEA) frameworks, land use planning and the licensing procedures. These tools have introduced greater transparency and better communication between public administration entities and the regulated community.

The national framework for *prevention of major accident hazards* (*Seveso II*) introduced new obligations for operators in order to prevent major accidents. These include annual audit reports on the Safety Management System performed by qualified auditors for upper-tier establishments, and land use planning mechanisms concerned with the risk of major accidents that apply to all establishments.

1.2. Fostering compliance

Enforcement mechanisms and their effectiveness

The *Environmental and Spatial Planning General Inspectorate (IGAOT)* is the main body carrying out and co-ordinating compliance assurance and promotion with regard to environmental, spatial planning and nature protection legislation. Since 2006, it has also exercised financial and administrative control of the operations of agencies subordinate to the MAOT. Enforcing nature protection regulations is the responsibility of the *Service for Nature and Environmental Protection (SEPNA) of the National Republican Guard*.[6] The IGAOT and the SEPNA are authorised to carry out inspections, investigate non-compliance and initiate administrative offence procedures. They also function as law enforcement bodies, as set out in relevant legislation.

The activities of the IGAOT and the SEPNA are co-ordinated with those of *other competent authorities*. For example, the IGAOT carries out inspections and applies enforcement measures to implement the EU Large Combustion Plant, Waste, and Hazardous Waste Directives, while the SEPNA works with the National Institute of Nature Conservation to impose sanctions for violations of legislation related to the EU Birds and Habitats Directives.[7] The National Authority for Civil Protection (ANPC), part of the Internal Administration Ministry, is responsible for preventing collective risks and serious accidents, protecting cultural and environmental assets, and rescuing and assisting people in danger. If specific legislation does not designate a competent authority, regional or local authorities where the offence took place are responsible for acting in cases of non-compliance, in co-operation with the IGAOT.

The approach to compliance assurance in Portugal has traditionally been based on *numerous checks, controls and inspections*. While this approach is still used, the implementation of Portugal's administrative simplification programme has stimulated a shift towards selecting enforcement actions based on potential risks of non-compliance and environmental impacts. In 2008, following the development of an extensive database of regulated installations and inspection activities (GESTIGAOT), the IGAOT developed a risk assessment tool that uses several criteria to establish the frequency and types of inspections of the IPPC installations. These criteria include the size and complexity of an installation, its proximity to urban areas and valuable ecosystems, air and water emissions and waste discharges, compliance behaviour, and the operator's management attitude. The GESTIGAOT helps to harmonise inspection reporting. Changes are continuously being made to update and fine-tune the risk-assessment tool, *e.g.* as additional hazardous substances are added to the risk criteria. Data are updated after every inspection, as well as through European Pollutant Release and Transfer Register (E-PRTR) reports from the APA.

The *number of inspections increased during the review period,* mainly due to reinforcement of the IGAOT's investigative powers and broadening of the scope of its operations. Routine inspections accounted for 90% of the total (IMPEL, 2009). In most cases, these inspections are planned in advance but are not announced. The remaining 10% are non-routine and associated with pollution incidents, complaints and institutional requests (*e.g.* by the MAOT or the Public Prosecutor). Compliance assurance campaigns targeting a specific area or industrial sector are also frequent.[8] A growing number of compliance assurance actions are carried out using postal notifications, which allows assessments of compliance by non-priority installations to be performed on the basis of written documentation provided by

operators. The main advantage of postal notifications is that a large number of installations can be targeted, enhancing inspectors' capacity to investigate operators that are not in compliance or that did not provide information by this means (IMPEL, 2009).

There are clear (and strict) procedures for responding to *emergencies and complaints*. A 24-hour public hotline is available for reporting environmental accidents. It is operated by the SEPNA, which co-ordinates emergency response and launches investigations. Operators are also required to notify the IGAOT when an accident or incident takes place using forms available on the IGAOT website. Different forms are available for *Seveso* sites, which are subject to stricter requirements. All cases are registered and categorised by type and their status is tracked. The information is used for risk assessment and planning of future activities.

Enforcement capacity building has increased. A number of training sessions were launched to promote application of the 2001 EU Recommendation on Minimum Criteria for Environmental Inspections in the Member States. Since 2002, annual environmental awareness training courses have targeted SEPNA officers under a collaborative agreement between the MAOT and the Ministry of Internal Administration. Meetings of networks of inspectors from the national and local level take place for the purpose of sharing experience and developing good practices, including on assuring compliance by *Seveso* installations.

A recent *review of the IGAOT's operations* suggested that some improvements in inspection planning, such as a shift to a greater number of non-routine inspections, could introduce more flexibility in reactions to potential risks and complaints by various authorities and the public (IMPEL, 2009). It was also suggested that introducing multi-annual planning and objective-setting to monitor the development and impacts of environmental improvements over a longer period would enable more effective comparisons and facilitate assessments of environmental outcomes that are difficult to analyse over a single year. The IGAOT took several suggestions into account in its 2010 activity plan, and some objectives are multi-annual (IMPEL, 2009). Although more joint and multipurpose inspections are being carried out in response to complaints about the administrative burden and the need to gather adequate evidence, more could be done to focus inspections on the most important permitting conditions and to carry out joint inspections with the participation of relevant authorities.

Non-compliance responses

Enforcement authorities may use *a wide spectrum of administrative and criminal non-compliance measures* to address violations of environmental regulations, including fines and the limitation or deprivation of the rights of the responsible party. The Environmental and Spatial Planning General Inspectorate (IGAOT) may also take interim measures, such as confiscating equipment that could have been used to commit the offence, requesting the deposit of an amount corresponding to the estimated maximum fine, temporarily suspending an activity, or preventively closing an installation. These measures are taken by competent judges where there is a serious risk of damage (Milieu, 2004). In some cases (*e.g.* with regard to hazardous waste disposal or damage to nature) the offender may be required to restore the damaged environment to its baseline condition.[9] National legislation transposing the *Seveso II Directive* authorises the competent authority to make a list of the sanctions applied available to the public, at the cost of the offender, as a means of deterring non-compliance. Where there is no valid permit or violation of a permit

condition has been confirmed, authorities can charge the operator for expenses related to the inspection.

A party responsible for a violation can also be liable to *criminal prosecution*, without prejudice to the application of further sanctions resulting from the procedure for administrative offences. Criminal prosecution may result in imprisonment for up to three years and the imposition of additional fines. If pollution has endangered human health or the cultural heritage, the period of imprisonment will be up to eight years (if caused through a fault) or five years (in cases of negligence). Both individuals and legal persons may be charged with criminal offences. Criminal procedures are usually initiated by the Public Prosecutor (on his own, or following a complaint or notification), but the victim and/or environmental NGOs can request that such a procedure begin (Milieu, 2004).

Traditionally, violations of environmental law have been subject to general administrative sanctions. A major step towards *linking environmental non-compliance with specific sanctions* was taken in 2006 when legislation was enacted establishing specific minimum and maximum fines for different types of environmental offences. The highest possible level reaches EUR 2.5 million for very serious offences (Avosetta, 2009).[10] The actual amounts of fines may be determined by a number of factors, including the seriousness of the offence, the party at fault, this party's economic situation and the economic benefits resulting from the offence. Together with a fine, the competent authority may also impose further sanctions whose application will depend exclusively on the seriousness of the offence and the fault of the party in question. The new law broadens the previous law's scope. For example, both negligent acts and failed attempts to prevent environmental damage have been made punishable. The new law also widens the range of further sanctions by introducing the possibility of a loss of fiscal benefits, measures requiring restoration of the environment to its state before the damage occurred, and making the condemnation public.

In the context of simplifying regulations and reducing administrative burdens, a *2009 amendment to the 2006 law lowered some minimum fine levels,* especially for minor violations; introduced the possibility that a fine could be reduced by 25% when there is a return to compliance; and recategorised some offences as subject to administrative procedures.[11] This amendment also removed the possibility that the administration could adjust the level of fines on a yearly basis. The justification for these changes was that they introduce "realism" concerning administrative sanctions and protect SMEs from excessive administrative and economic burdens (Avosetta, 2009).

In practice, *cases of non-compliance are pursued mainly through administrative procedures*. Notices of violations were the means most commonly used for administrative enforcement actions until 2003. Due to inadequate human resources and a growing number of offences, these notices have become less frequent although they are still the most commonly used administrative enforcement action.[12] Administrative fines have increased significantly and are the type of penalty most commonly used.[13] In 2007, out of 4 000 cases initiated, around 2 700 resulted in administrative sanctions and 345 in administrative warnings, while 45 were sent for criminal prosecution (IGAOT, 2008). Sanctions imposed by inspectors are frequently appealed. Around half of all administrative fines were appealed in 2007, and around half of the appeals were confirmed by the courts (some with the amount of the fine adjusted).

Overall, Portugal's environmental enforcement system has been oriented towards *sanctions imposed through administrative procedures as a means of preventing damage and ensuring compliance*. Criminal prosecution has rarely been used. In dealing with violations of environmental laws, administrative procedures have proved more efficient. Administrative enforcement was more effective in the mid-2000s. Today there are enforcement problems and the number of pending cases has increased in the last few years. In 2008, a backlog of nearly 7 000 cases had not been addressed due to incomplete documentation and appeals (IGAOT, 2009). The collection of fines is also a problem. For example, in 2008, fines imposed amounted to around EUR 14 million but only half were collected. Revision of the level of fines in 2009 was a step towards preventing future backlogs. Further adjustments of administrative procedures, better targeting of enforcement actions to focus on serious violations, and expanded compliance promotion campaigns that target specific sectors could help address non-compliance more effectively. The number of inspectors working for the MAOT and in the regions is increasing, but there are still not enough of them to address all cases of non-compliance.

2. Promoting environmental democracy

Provision of, and access to, environmental information

Provision of environmental information was strengthened during the review period. The Portuguese Environment Agency (APA) has become the key government body responsible for collecting, maintaining and disseminating environmental data and carrying out an integrated analysis of the results of implementing policies and measures. The annual State of the Environment (SoE) reports, produced by the APA, are presented to the Parliament to support discussions of the national budget. These comprehensive reports describe the state and trends in individual environmental policy areas, identifying the economic context and the main pressures and describing policy responses. SoE reports not only evaluate the effectiveness of past environmental policies, but also examine future perspectives and assess the distance remaining to meet targets. The MAOT's analytical unit carries out comprehensive analysis and develops scenarios of relations between economic and environmental factors, which are available to the public. In 2008, the Environment Agency compiled a report on progress in environmental protection and spatial planning during the previous 20 years.

Since 1999, the *use of indicators* in environmental reporting has become widespread. A 2007 publication on a system of sustainable development indicators (SIDS) presented environmental topics in the wider context of sustainability, reflecting efforts to integrate environmental concerns in sectoral (*e.g.* energy, transport, agriculture, tourism and industry) policy.

Approaches to environmental reporting are undergoing review, based on other countries' best practices and a survey of users in Portugal. APA's current plans are focussed on developing a national environmental information system (SNIAmb) based on the most recent information and communication technology, in line with the EU's Shared Environmental Information System (SEIS) concept (APA, 2008). The purpose of this system is to provide decision-makers at all levels (from local to European) with close-to-real-time environmental data, allowing them to make informed and timely decisions. The system is also intended to simplify mandatory monitoring and data communication and reduce the administrative burden of environmental reporting.

In 2008, several portals were launched with *online access to information on a wide number of environmentally related issues*. For example, the APA's information portal was renewed, providing access to a number of electronic databases including full access to environmental impact assessment proceedings (past and ongoing), water resources, monitoring of enforcement of national and European laws concerned with water and air quality (Online Database on Air Quality), industrial licensing, and a list of facilities covered by procedures related to preventing and responding to serious industrial accidents. A search engine for existing environmental laws (SIDDAMB) was re-launched in a more user-friendly version. Other services include a portal on Spatial and Urban Planning and the National System of Territorial Information (SNIT), launched by the Directorate-General for Spatial Planning and Urban Development (DGOTDU), and services furnishing information on environmental health, such as the quality of drinking, bathing and thermal waters, radiation and biocides, from the Directorate-General for Health (APA, 2008).

In addition to the analytical and statistical reports accessible on its Internet site (*www.apambiente.pt*), the MAOT produces *a number of awareness raising publications*. The Internet version of the SoE report allows direct access to a database of environmental indicators. Production of a limited number of focussed reports with key indicators is supported by more extensive reports covering specific media and other topics. A new newsletter (INDICARE) has been launched for a wide spectrum of users. It compiles the main news, reports and events related to indicators and sustainable development at national and international levels. Various platforms for presenting environmental information contribute to the transparency and efficiency of processes of communication and access to information by the public.

Access to environmental information, public participation, and access to justice

Portugal ratified the Aarhus Convention in 2003. Since then, it has made progress in ensuring that the public is able to exercise the rights set out in the Convention's three "pillars". A *2006 law on access to environmental information and the conditions for its provision* has strengthened access to the already well-established system for dissemination of environmental information to the public.[14] The purpose of this law is to ensure that all citizens are given access to information without having to invoke a personal or direct interest, except when documents contain confidential information. This law also requires that costs related to the reproduction of documents correspond to the costs of the materials used (and the service provided) and are not excessive. Citizens who benefit from judicial support are not required to pay these costs. The Commission on Access to Administrative Documents, an independent public entity chaired by a judge of the Supreme Administrative Court, evaluates complaints submitted by interested parties and issues decisions concerning the general implementation of this law (Avosetta, 2009).

In 2007, detailed provisions were set out to ensure *public participation in the environmental assessment of sectoral plans and programmes*. Several public discussions took place on key strategic documents such as the National Sustainable Development Strategy, River Basin Management Plans, the National Climate Change Programme, the National Environmental and Health Action Plan, the National Forestry Strategy, the National Strategy for Rural Development and the National Strategic Plan for Tourism.

NGOs consider that the government's approach to requesting their opinions is too selective, and that the time allocated for discussions is too short. Therefore, they use *other methods to exert pressure on the government to gain access to the decision-making process*,

including referring cases to the Ombudsman, an independent official nominated by the Assembly of the Republic. Citizens may complain to the Ombudsman when their rights, liberties and legitimate interests are threatened due to acts or omissions by public authorities. In 2008, several Portuguese environmental organisations wrote to the President of the European Commission (EC) concerning the government's plans to build 12 new hydroelecric plants (EEB, 2008). Although the National Programme for Dams with High-Hydropower Potential was submitted to a strategic environmental assessment with a public participation period (and, subsequently, each project was submitted to an environmental impact assessment with a public participation period), the NGOs argued that Portugal had many other options for more cost-effective and less environmentally damaging ways to reduce greenhouse gas emissions that were not identified in the 2005 Energy Strategy. This strategy did not include strategic environmental assessment. The NGOs also urged the EC to ensure that Portugal's dam-building programme was in compliance with the EU Water Framework Directive (ENDS, 2010).

In Portugal there are no obstacles preventing *access to justice on environmental matters*. The concept of *actio popularis* is recognised in the 1976 Constitution and its scope has gradually enlarged. A 1998 law concerning environmental NGOs clearly states the conditions under which this right may be exercised. For example, NGOs (whether or not they have a direct interest) may submit a complaint or accusation and initiate the legal actions necessary for the prevention, correction, suspension or cessation of actions and omissions by public and private entities that represent, or may represent, a cause of environmental degradation. It is also possible for them to initiate legal actions to enforce civil liability with regard to environmental hazards, function as an observing party in criminal processes related to the environment, and monitor the process of compliance with penalties. Except in cases of malicious litigation, this law exempts NGOs from payment of any court fees (Avosetta, 2009).

Various laws give wide access to the courts, but *there are not many environmental lawsuits*. Even if NGOs are exempt from court fines, lawyers' fees have to be paid. NGOs consider this severely limits their access to justice. Legal procedures also tend to be lengthy. Often the cases are stopped because legal requirements have not been met (*e.g.* time periods have expired, notifications have been issued, certain proofs or evidence are inadmissible) (Avosetta, 2009).

Environmental impact assessments (EIAs)

Procedures for environmental impact assessments of projects that may have significant environmental impacts were revised in 2000 and again in 2005. As required under EC regulations, EIAs in Portugal involve multi-stage procedures that are to be undertaken prior to project development. EIA procedures begin with the submission of an environmental impact study (EIS) by proponents of projects. The EIS is subject to a non-mandatory screening to help focus on projects that present the greatest potential environmental risks (Russo *et al.*, 2010).

Several tools have been developed to enable adequate *public participation in EIA procedures*. They include notification that documents are available for consultation, through press releases and the print and other media, as well as letters to NGOs, universities, industry associations and others informing them about the EIA procedures. A database has been made available on the Internet to provide further information on EIA processes, including non-technical summaries of EIAs, executive summaries of

environmental conformity reports concerning environmental impact declarations, and proposals for defining the scope of public consultations. The results of decisions on projects under evaluation are also made available on the Internet. Help desks and clarification meetings (in which projects' proponents, project consultants and the Evaluation Committee participate) respond to inquiries by citizens directly affected by projects (APA, 2008).

There are *very few negative EIAs* in practice, but many projects are subject to conditions imposed on the operator to reduce environmental impacts. EIA procedures are well-regulated, but are sometimes circumvented. The most common practices include splitting projects up into a number of smaller ones; understating environmental impacts or failing to address cumulative impacts; and disguising a project's true nature. In several cases, no alternatives have been considered or EIAs have been prepared after a project began. The EC has questioned Portugal on several occasions concerning its alleged failure to use appropriate procedures for energy, transport and tourism related projects. To avoid discrepancies between the conditions set out in an EIA and project implementation, a requirement for a further assessment of projects after their implementation was recently introduced.

3. Progress in air, water, waste, nature and biodiversity management

3.1. Air management

Atmospheric emissions

During the review period, Portugal made important progress in reducing emissions of key air pollutants and meeting related targets. Emissions of *sulphur oxides* (SO_x) decreased substantially, by 64% between 2000 and 2008, well above the average reduction in the OECD as a whole (–28.1%) (Table 1.1). Reductions in the energy sector and in combustion in manufacturing industry (–74% and –58%, respectively) were especially significant, as they account for a large share of total SO_x emissions (Table 3.1).[15] The decrease in emissions of *nitrogen oxides* (NO_x) was smaller (–13%), but an increasing trend observed in the 1990s was reversed. Although SO_x, and NO_x emission intensities (emissions per unit of GDP) improved significantly (by about 70% and 20%, respectively) and were decoupled from GDP growth and fossil fuel supply, they remain higher than the OECD Europe average (Figure 3.1). Portugal is still among the OECD countries with the highest SO_x and NO_x emissions per unit of TPES, due to the large share of oil in the fuel mix for both electricity generation and transport.

Emissions of *non-methane volatile organic compounds (NMVOCs)* decreased by 22%, with the most significant reductions occurring in the transport sector (–63%) and solvents use (–9%) (Table 3.1). Emissions of *ammonia* (NH_3), consisting of direct soil emissions (38% of the total), emissions from manure management systems (47% of the 2008 total), emissions from decomposition of municipal and animal waste, and emissions from road transport, decreased by 20%. Decreases in emissions of both NMVOCs and NH_3 continued trends recorded before 2000.

These reductions allowed Portugal to *meet the 2010* SO_x *and* NH_3 *reduction targets* established under the EU National Emission Ceilings (NEC) Directive ahead of schedule (106 kt of SO_x emissions in 2008, well below the target of 160 kt; and 50 kt of NH_3 emissions in 2008, again well below the 90 kt target). It is also on track to meet NO_x and NMVOCs

Table 3.1. **Atmospheric emissions by source, 2000-08**

1 000 t

		SO_2	(%)	NO_x	(%)	NMVOCs	(%)	CO	(%)
Power stations	2000	154.6	*51.7*	59.1	*19.8*	0.6	*0.3*	2.6	*0.4*
	2008	39.1	*36.7*	37.6	*14.4*	0.8	*0.5*	2.2	*0.4*
Industrial combustion	2000	117.7	*39.4*	70.8	*23.8*	11.6	*5.0*	41.0	*5.9*
	2008	49.8	*46.8*	72.0	*27.6*	13.1	*7.2*	29.7	*5.9*
Non-industrial combustion	2000	6.9	*2.3*	20.4	*6.8*	20.4	*8.8*	248.1	*35.8*
	2008	1.6	*1.5*	13.9	*5.3*	20.5	*11.3*	252.0	*50.4*
Industrial processes	2000	13.6	*4.5*	3.7	*1.2*	32.3	*13.9*	59.5	*8.6*
	2008	11.9	*11.2*	4.3	*1.6*	33.3	*18.4*	52.6	*10.5*
Mobile sources	2000	6.1	*2.0*	141.9	*47.6*	74.1	*31.9*	318.3	*45.9*
	2008	4.1	*3.8*	130.6	*50.2*	26.7	*14.7*	143.2	*28.6*
Solvents	2000	–	–	–	–	83.6	*36.0*	–	–
	2008	–	–	–	–	76.5	*42.1*	–	–
Miscellaneous	2000	–	–	2.1	*0.7*	9	*4*	23.5	*3.4*
	2008	–	–	2.0	*0.8*	11	*6*	20.3	*4.1*
Total	**2000**	**298.9**	***100.0***	**298.0**	***100.0***	**232.0**	***100.0***	**693.1**	***100.0***
	2008	**106.4**	***100.0***	**260.5**	***100.0***	**181.6**	***100.0***	**500.1**	***100.0***
Change 2008/2000			*–64.4*		*–12.6*		*–21.7*		*–27.8*

Source: Inventory submission to the UNFCCC, April 2010.

StatLink http://dx.doi.org/10.1787/888932375946

emission reduction targets (261 kt of NO_x emissions in 2008 *vis-à-vis* the 250 kt target, and 182 kt of NMVOCs emissions in 2008 *vis-à-vis* the 180 kt target).

Emissions of *carbon oxides (CO)* were reduced by 28% overall, with the greatest reduction (55%) in the transport sector. However, emissions from non-industrial combustion increased, with this source accounting for about 50% of total CO emissions in 2008 (Table 3.1).

Emissions of *suspended particulate matter*, largely generated by the energy industries, industrial processes and transport, stabilised during the review period following increases in the 1990s.

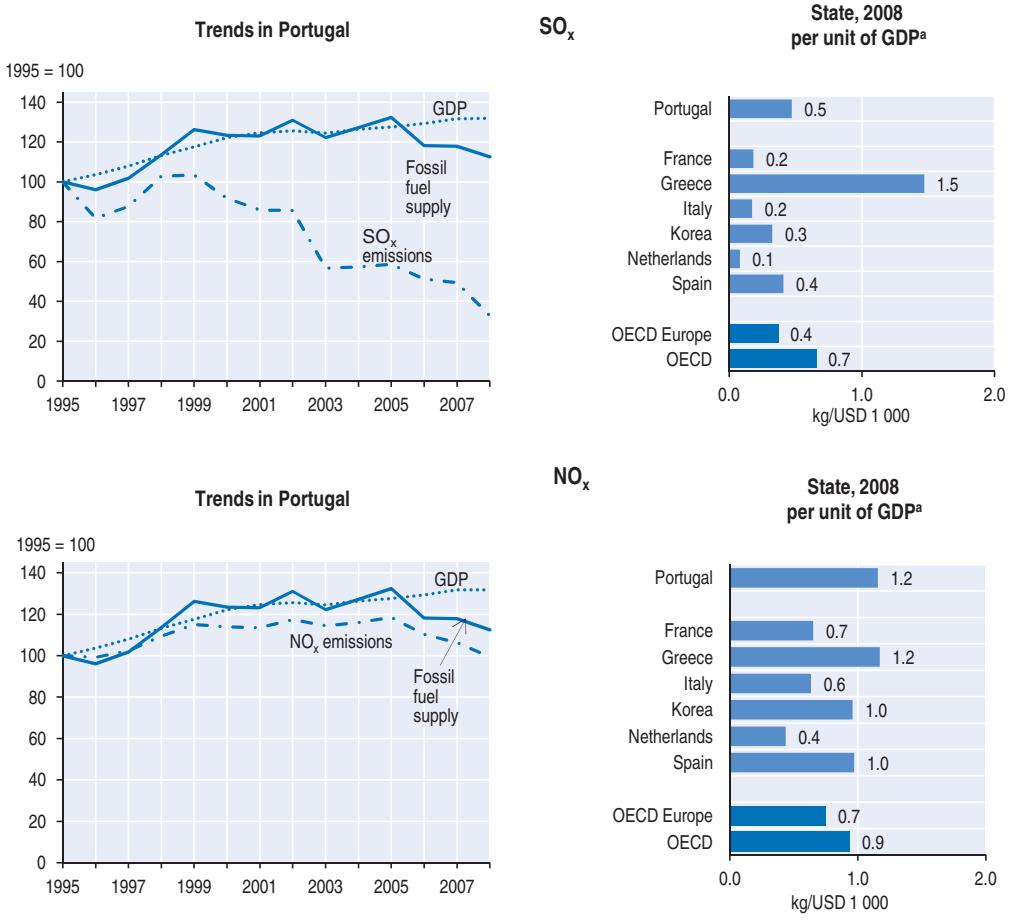
Emissions of *heavy metals* showed varying trends: lead emissions remained low after a dramatic reduction (–90%) in the late 1990s following the phase-out of leaded gasoline; nickel and mercury registered significant reductions related to the amelioration of fuels and to fuel switching in public power and heat generation facilities and industrial facilities. Increased copper emissions are associated with growth in road transport, while those of selenium and zinc are related to glass production.

Emissions of *dioxins* from the residential sector, from combustion in manufacturing industry and from energy industries were reduced, mostly because certain types of fuel, particularly wood and charcoal, were used less. Estimated emissions of *polychlorinated biphenyls (PCBs)* (mainly due to incineration of industrial waste) increased, as did emissions of *polycyclic aromatic hydrocarbons (PAHs)* from combustion in manufacturing industry, representing more than 50% of total estimated emissions.

Ambient air quality

Reduced emissions of most pollutants led to better ambient air quality in urban areas. Exceedances of the limit values for *sulphur dioxide* (SO_2) (hourly and daily) occurred only sporadically (*e.g.* in 1 out of 20 zones in 2008) and were not persistent.[16] Although annual average concentrations of *nitrogen dioxide* (NO_2) showed an increasing trend, they remained

Figure 3.1. **SO_x and NO_x intensity**



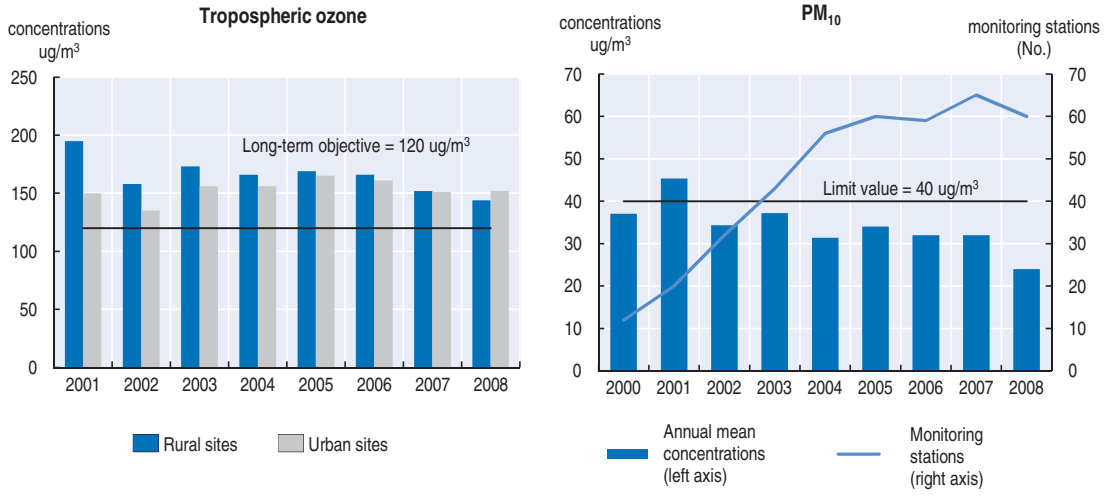
a) GDP at 2005 prices and purchasing power parities.
Source: OECD, Environment Directorate; OECD-IEA (2010), *Energy Balances of OECD Countries*; OECD (2010), *OECD Economic Outlook No. 87.*

StatLink http://dx.doi.org/10.1787/888932375509

within the hourly mean limit values. There was also a slight decrease in the number of stations with exceedance of the NO_2 annual mean limit value: four stations in 2007 (two in Lisbon, one in Porto and one in Funchal) and three stations in 2008 (one in Lisbon, one in Porto and one in Braga). Annual average concentrations of *ozone* (O_3) (formed from reactions of NO_x and VOCs in the presence of oxygen and sunlight) exceeded the long-term objective of 120 μg/m^3 during the review period (Figure 3.2). In 2005, the number of days (69) with exceedances of the information threshold of 180 μg/m^3 was the highest since 1995. There were fewer in 2006 (46) and 2007 (20). The areas with the highest number of exeedances in 2007 were the Norte Interior and Vale do Ave.

Annual concentrations of *particulate matter*(PM_{10}) showed decreasing trends (Figure 3.2), exceeding the limit value of 40 μg/m^3 only in 2001. In 2008, of the 19 monitoring zones that met the criteria for efficiency quality at monitoring stations, daily levels of PM_{10} were exceeded in five, including Lisboa Norte, Lisboa Sul, Porto Litoral, Aveiro/Ílhavo and Zona Influência Estarreja. In 2010, the European Commission launched infringement proceedings against Portugal and five other EU Member States because they failed to comply with EU air quality standards for PM_{10}.[17]

Figure 3.2. **Annual mean concentrations of tropospheric ozone and PM_{10}, 2000-08**



Source: Portuguese Environment Agency; Regional Development and Co-ordinating Commissions.

StatLink http://dx.doi.org/10.1787/888932375528

With regard to *heavy metals and organic compounds,* only concentrations of nickel and benzo(a)piren exceeded the limit values in two out of five, and one out of six, designated zones, respectively in 2008 (De Leeuw et al., 2009).

Since 2001, a comprehensive *Air Quality Index (IQAr)* has been used to communicate air quality information to the public.[18] The index has shown generally satisfactory air quality in Lisbon. The number of days rated "good" remained relatively constant, while the number of "medium" and "poor" days fell. However, the results also point to some problems still existing in areas with higher population densities or with industrial activities, such as Vale do Ave, Vale do Sousa, Zona de Influência de Estarreja, Setúbal, Aveiro/Ílhavo and Porto Litoral, where the number of days classified as medium, poor or bad is still significant.

Air quality in urban areas is also influenced by *natural events*. Extreme forest wildfires in the summer of 2003 contributed to unusually high air pollutant concentrations, registered at several National Air Quality Monitoring Network stations. In this period, there was a notable increase in the number of hospital admissions and deaths related to respiratory and cardiovascular diseases, either as a direct consequence of the concentration of the wildfire smoke or in connection with heat waves. Portugal is one of the European countries with the most days in which deposition of dust from North Africa can significantly affect air quality: in 2004, out of 54 days when the limit value and margin of tolerance for PM_{10} (50 $\mu g/m^3$) were exceeded, there were effects on as many as 36 days (the number of days allowed is 35 per year). In 2008, out of ten stations that recorded exceedance of the daily limit value for PM_{10}, seven exceedances were due to dust deposition.

Policy measures in air pollution management

During the review period, the *air emission and quality monitoring system* was strengthened. Portugal is now covered by the Air Quality Monitoring Network, comprising 77 stations that continuously measure concentrations of CO, NO_2, SO_2, O_3, PM_{10}, $PM_{2.5}$ and

benzene (C_6H_6). They are located in urban and rural areas affected by industrial or traffic related emissions. Measurement campaigns are also carried out to evaluate concentrations of heavy metals and hazardous substances. Managing environmental air monitoring networks is the responsibility of the Regional Development Co-ordination Committees (CCDRs) in co-operation with the Portuguese Environment Agency (APA). Since 2004, installations subject to industrial permitting are required to carry out self-monitoring of air emissions and report to the CCDRs and to the APA.

Progress in reducing emissions of key air pollutants from the industrial and energy sectors was achieved mostly through *fuel switching and efficiency improvements in energy transformation*. Fuel switching was particularly important with regard to the increasingly wide use of natural gas and renewable sources (especially wind) for: electricity generation; the installation of combined cycle thermoelectric plants using natural gas; progressive installation of cogeneration units; and more electricity imports (Chapter 5).

Fuel substitution and structural changes in the industrial and energy sectors were supported by strengthening Portugal's *regulatory framework for air management*. The 1996 EU Air Quality Framework Directive, which defined the legislative framework and set out the key elements of air management policy, was transposed into national law in 1999. This was followed by the definition of air management areas under the jurisdiction of the CCDRs. The subsequent Daughter Directives were transposed in 2002 (1999/30/EC and 2000/69/EC), 2003 (2002/3/EC) and 2007 (2004/107/EC). In compliance with other EU directives, the National Emissions Ceilings Programme (PTEN) was adopted in 2004 (and revised in 2006) and the National Programme for Reducing Emissions from Large Combustion Plants was adopted in 2006. These programmes guided the implementation of measures to reduce emissions of SO_2, NO_x, VOCs, particulate matter and NH_3 in key industrial sectors. For example, a decrease in SO_x emissions was accelerated in 2008, when completion of new desulphurisation systems at two large energy plants resulted in a 44% reduction compared with the previous year. Improved environmental permitting for large installations, compliance assurance measures, and the introduction of stricter laws regulating the quality of fuels, particularly residual fuel oil, have stimulated air pollution reductions by industry.

Pollution reduction in large urban areas, such as Greater Lisbon (Lisbon and the Tagus Valley) and Greater Porto, was guided by Air Quality Improvement Plans developed to identify the main pollution sources and measures needed to meet PM_{10} and NO_2 air quality limit values. The plan for Lisbon gave priority to shifting passenger travel from private vehicles to light rail, buses, and the recently expanded Metro, as well as introducing access charges for entering the centre of Lisbon by car (differentiated according to the number of passengers). Other measures included designation of high occupancy lanes of highways, and renovation of taxis and the solid municipal waste collection fleet.

Despite improvements in the transport sector, *local air pollution incidents* related to ground level ozone concentrations still occur in large cities and are combined with high levels of particulate matter from the growing number of diesel powered vehicles. The combination of these pollutants poses a threat to human health. The planned introduction of electric vehicles and further improvements in urban public transport should be continued in order to reduce health effects. The Air Quality Improvement Plans prepared by large agglomerations should also be assessed regularly to guide further air pollution reduction efforts. In parallel, transport infrastructure development should be supported by

enhanced legislative provisions for closer integration of travel and spatial planning, including at early planning stages. Co-ordination should aim to control urban sprawl by requiring that good public transport connections be provided for significant housing developments in cities and towns.

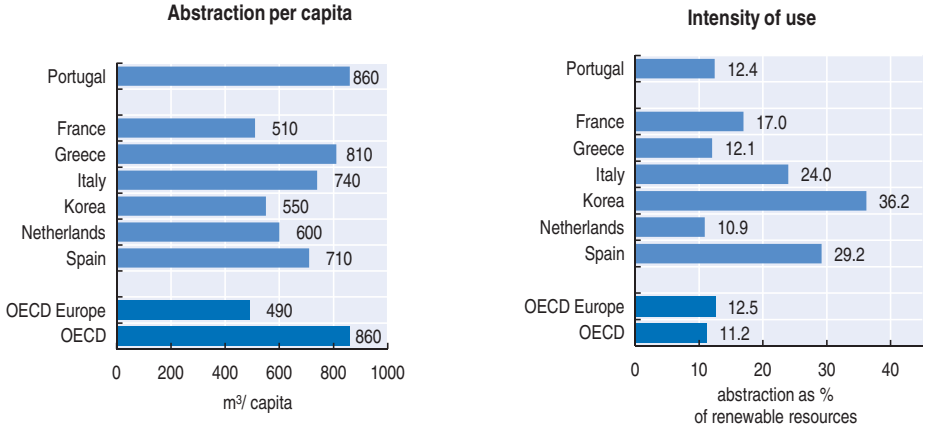
3.2. Water management

Water use and quality

Portugal is *well-endowed with water resources* in the north, but shortages during the dry season prevail in the south. An extensive programme for constructing water reservoirs continued during the review period, with the aim of securing water availability for the population and economic sectors as well as producing electricity (Chapter 5).[19]

Following a significant decrease in water use during the 1990s, *water abstraction* in Portugal increased from 8.8 billion m^3 in 2000 to an estimated 9.1 billion m^3 in 2007 (Figure 1.1). The agriculture sector is the largest user, although its share in total water consumption has fallen. Use of water by urban water supply systems increased, while use by industry remained at a level similar to that in 2000 (Figure 1.1). When population and economic growth are taken into account, intensity of water use and abstraction per capita remained constant, with both indices close to the OECD average (Figure 3.3).

Figure 3.3. **Freshwater use, 2007**[a]



a) Or latest available year.
Source: OECD, Environment Directorate.

StatLink http://dx.doi.org/10.1787/888932375547

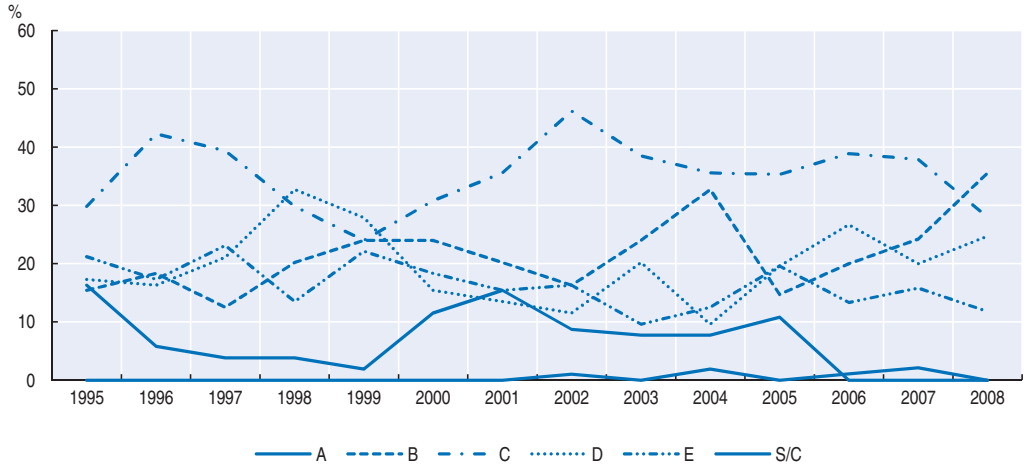
Domestic water use remained stable and is low by OECD standards, at 169 litres per person per day in continental Portugal in 2008. Higher consumption (almost 400 litres per person per day) is recorded only in the southern region of the Algarve, mostly due to tourism. In 2008, around 65% of the population provided with drinking water was served from surface water supplies and 35% from groundwater. However, groundwater is the source of as much as 78% of drinking water in Sado and Mira, 66% Minho and Lima and 44% in the Vouga, Mondego, Lis and western river basin districts.

The quality of Portuguese *rivers* demonstrated some improvement during the review period. According to criteria describing river water quality in five classes, the share of the total length of the country's rivers with "good" and "reasonable" quality increased, from

24% for both classes in 1999, to 36% "good" and 28% "reasonable" in 2008. The share in the "bad" and "very bad" classes fell from 22% and 28% in 1999 to 12% and 25% in 2008, respectively (Figure 3.4). Only a small share of the total length was classified as "excellent". River quality varies across the country: water quality in the Mira, Cávado and rivers of southern Portugal is good, while a greater share of the length of the rivers in the centre, including the Lis, Vouga, Ave/Leça, Tagus, Douro and Guadiana, has "very poor" water quality.

Figure 3.4. **Freshwater quality, 1995-2008**

% of each class at all monitoring stations



Source: Water Institute.

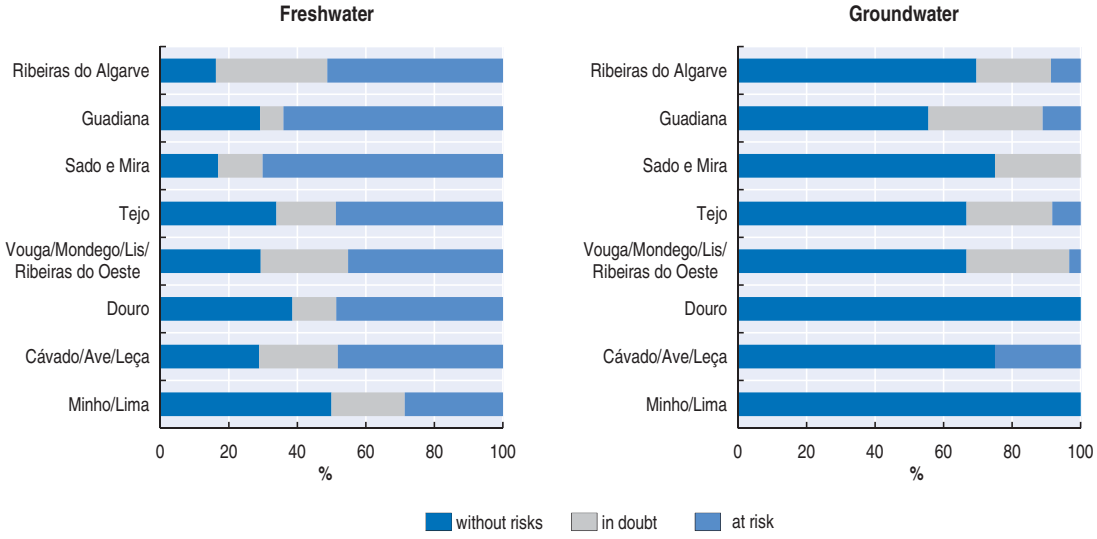
StatLink http://dx.doi.org/10.1787/888932375566

The percentage of *water reservoirs* with eutrophic conditions showed increasing trends in the early 2000s.[20] Although the trend stabilised after 2004, water quality in reservoirs remains a cause of concern. In 2006-07, water was reported to be eutrophic at over 40% of stations, with the highest percentage in the Tagus (64%) and the Sado and Mira (57%) river basin districts (APA, 2008).

The *quality of coastal bathing water* was already good before 2000. Measurements showed further improvements during the review period. Almost 99% of coastal bathing waters, measured at 430 locations, were in compliance with mandatory values in 2008. This was an increase compared to fewer than 90% in the late 1990s. The rate of compliance with the more stringent guide values also increased, reaching nearly 90% at 390 locations. The number of beaches awarded blue flags increased from 130 in 2005 to 160 in 2008. Only sporadic beach closures were recorded, although they were common before 2000. Unlike coastal bathing waters, compliance rates for the *quality of freshwater bathing waters* were low at the beginning of the review period, with about half of locations failing to meet mandatory values. Quality gradually improved, with fewer than 5% not in compliance with mandatory values in most years after 2004 (with the exception of 2006). The share of bathing water in compliance with more stringent guide values fluctuated between 42% and 58% from 2004 to 2008. Since 2006, only a few locations have had to be closed during the bathing season, mostly due to organic pollution and algal blooms (EC, 2009).

An analysis carried out in 2005 showed that approximately 52% of surface water in continental Portugal was *at risk of failing the environmental objectives of the EU Water Framework Directive*. The highest risk was in the river basin districts of Sado and Mira and Guadiana. Only 7% of groundwater was classified as at risk (Figure 3.5).

Figure 3.5. **Freshwater and groundwater pollution risk potential, by hydrographic region, 2005**



Source: Water Institute.

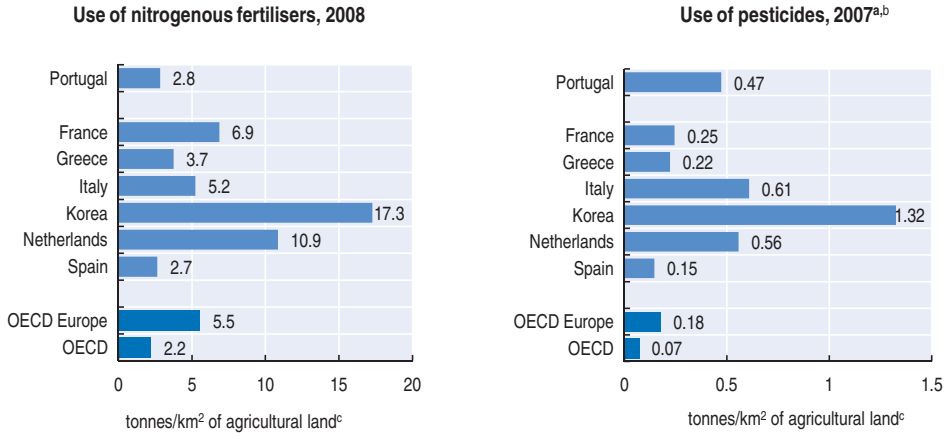
StatLink http://dx.doi.org/10.1787/888932375585

Main pressures and policy responses

Several measures have been taken to address *agricultural pollution*, one of the key contributors of concern during the review period. Compulsory pollution discharge limits for farms in areas designated as nitrate vulnerable under the EU Nitrates Directive cover 6% of farmland in eight different areas. The discharge limits are combined with payments to farmers that are conditional on respecting the Directive with regard to improved fertiliser management practices (OECD, 2008b). Restrictions using farm chemicals are complemented by measures encouraging greater uptake of integrated environmentally sound farm management practices such as integrated pest management (IPM), *e.g.* through farmer training and demonstration projects. Emphasis has also been placed on improving livestock manure storage facilities, with 35-55% of investment costs covered by payments differentiated according to commodity and farm size (EUR 39-500 per hectare), and on the adoption of organic farming (EUR 70-688 per hectare) (OECD, 2008b).

Combined with structural changes in agricultural production, these measures led to a *decrease in fertiliser use*, particularly use of nitrogenous fertilisers, which was reduced by 35% between the late 1990s and 2006. This reduction helped to lower concentrations of total phosphorus and total nitrogen in rivers and lakes. The use of pesticides has not been reduced and is still much higher than the OECD and OECD Europe averages (Figure 3.6). However, the toxicity of pesticides has been reduced. Around 75% of them include low-toxicity fungicides, mainly to control mildew in vineyards. Despite progress since 2000, adoption of the farm practices necessary to reduce pollution is still needed, especially with

Figure 3.6. **Agriculture inputs**



a) Or latest available year. 2005 data for Portugal.
b) For many countries, sales are used as a proxy for pesticide use.
c) Arable area, permanent crop land and permanent grassland.
Source: OECD, Environment Directorate; FAO, *FAOSTAT database.*

StatLink http://dx.doi.org/10.1787/888932375604

regard to the use of pesticides where groundwater is a source of drinking water supplies (OECD, 2008b).

Household *effluents* continue to exert pressure on water quality. The share of the population connected to a public wastewater treatment plant increased during the review period, from 55% in 1999 to 71% in 2008. Connection rates vary from relatively high levels in the south (83% in Sado and Mira, 79% in the Algarve) to as low as 47% further north (Minho and Lima). The share of the population connected to public sewerage increased more slowly, from 75% in 1999 to 80% in 2008. Sewerage connection rates also vary between regions, with the highest in the south (90% in Sado and Mira and in Guadiana) and the lowest further north (53% in Minho and Lima). There are still cases of direct discharges coming from small domestic sewage drainage systems that are not linked to any treatment facility, or from improperly operated septic tanks. The seriousness of this problem is reinforced by operating deficiencies, inferior project design, lack of qualified staff to operate facilities, and lack of funding for maintenance or upgrading of the system.

Guided by the strategic plans for water and wastewater services, *PEAASAR I (2000-06)* and *PEAASAR II (2007-13)*, important measures were taken to complete consolidation of the "wholesale" water supply and sanitation systems (in the first period) and optimisation of the sector's environmental performance, clarification of the role of private enterprises and improvement of the organisation of the "end-users" service system (in the second period).[21] In 2006, *Águas de Portugal (AdP)* supplied "wholesale" water to 200 municipalities through 14 companies and provided "wholesale" wastewater treatment service to 186 municipalities through 16 companies.[22] The "end-users" service was still dominated by municipalities, but the number of corporatised municipal companies and concessionaries has been growing. In 2008, about 25 systems (29 municipalities with 1.8 million inhabitants, accounting for 17% of the population) privatised their water and wastewater services.[23]

The role of the Institute for the Regulation of Water and Solid Waste (IRAR), which *regulates water supply and wastewater service providers*, was strengthened during the review

period by enlarging its regulatory scope from only covering entities operated by the concessions, to all forms of management in order to ensure high-quality services and guarantee economic and financial stability within the sector (Box 3.1).

Box 3.1. **The evolution of regulatory oversight of water supply, wastewater and municipal waste management**

In 1997, the Institute for the Regulation of Water and Solid Waste (IRAR) was created as an autonomous authority under the supervision of the MAOT to regulate water supply, wastewater and municipal waste service operators. Financially independent, the IRAR was funded through a tax on regulated concessionaires, which was differentiated according to the amount of water or waste handled by the service provider.

The IRAR's main task was to ensure adequate protection of service consumers from poor service quality and excessive tariffs due to providers' natural monopoly. It regulated the sector at a structural level, which was limited at that time to state concession entities: state multi-municipal concessions (33), state delegations (only one operator) and municipal concessions (30). It did not regulate services provided directly by municipalities.

The IRAR was charged with several tasks at the strategic level (*e.g.* monitoring national strategies for the sector by assessing and reporting on their implementation) and the regulatory level (*e.g.* elaboration of proposals for new legislation and technical specifications in the sector). It monitored service providers' legal and contractual operations (*e.g.* carrying out analyses of bidding processes and concessions, contract alterations, reconfiguration and fusions of systems) and ensured that tariffs guaranteed efficient and socially acceptable prices without harming the financial sustainability of service providers. In addition, the IRAR analysed consumer complaints and assisted in conflict resolution between consumers and service providers.

In 2003, the IRAR's role was broadened to include the regulation of drinking water provided by the 400 entities that managed drinking water supply services. It was made responsible for evaluating the quality of water supplied to consumers, comparing the results with other entities and following up on non-compliance where necessary.

Since 2004, the IRAR has also regulated the quality of service provision through implementing an extensive system for the evaluation of performance by service providers and the establishment of performance benchmarks.

The IRAR was transformed into the Water and Waste Services Regulation Authority (ERSAR) in 2009, with increased regulatory responsibilities covering approximately 500 operators irrespective of their management model.

The share of the population connected to the *drinking water supply* reached 94% in 2008, with the highest rates in the Guadiana (100%) and Tagus (97%) regions and the lowest in the Cávado Ave and Leca (89%) and the Minho and Lima (88%) river basin districts. The legal reform of 2001 introduced requirements for evaluating water quality either at the tap (to supply "end-users") or the delivery point (for "wholesale" supply). Checks indicated significant improvement in water quality, with frequency of sampling reaching nearly 100% of the required minimum and compliance with the parametric values reaching 98%. Problems still exist in the interior, in areas where fewer than 5 000 inhabitants are served. Another problem relates to high losses in retail water supply. Estimated at an average 36% of water withdrawn, they can be as high as 60-70%.

Investment in rehabilitation of the water supply network, considered essential to reduce water losses, is one of three priority investment areas defined in PEAASAR II, with the target of losses amounting to not more than 20% in 2015.

Management reform was complemented with the introduction of new *water tariffs*. Water pricing is now applied throughout the country, generally with explicit metering and billing for water supply. The majority of Portuguese households (nearly 90%) are subject to a multi-part water tariff, consisting of a fixed connection charge and billing at a volumetric rate. There is also widespread use of increasing block tariffs, with the first block (typically up to 5 m^3) significantly cheaper than the rest. Wastewater charges are less well-developed, as they are either fixed (in 12% of municipal systems) or dependent on water consumption and other variables, *e.g.* property value. There is no charge for wastewater service in 20% of municipal systems. Specific pricing policies vary among municipalities, and several exemptions or price reductions are applied. The national average rate of financial cost recovery in the urban sector was 82% for water supply and 48% for wastewater (2008), with significant regional variations.

From 2000 to 2006, the *need for investment in the water and wastewater sectors* was estimated at EUR 4.2 billion, including EUR 2.4 billion for the "wholesale" segment. Actual investments were of the same order of magnitude, but with larger than planned funding for the "wholesale" segment (EUR 3.4 billion, or 77% more than had been planned). This was due to higher than estimated costs and more stringent environmental standards. Investments in an "end-users" system of water distribution networks and sewerage reached only EUR 0.9 billion, with many investments being postponed. The water and wastewater sector was expected to benefit from a further EUR 3.8 billion in investment during the period 2007-13. Average European funding of water and wastewater investment in 2000-06 was 63%, with this share expected to decrease to 50% (calling for greater self-financing of the programme) (GHK, 2006).

Despite progress, connection rate levels are still much lower than the OECD average. Meeting the *national targets of 95% of the population connected to drinking water supplies* (90% in each integrated system) and *90% connected to sewerage and wastewater treatment* (85% in each integrated system) was postponed until 2013. Increased co-ordination between "wholesale" and "end-users" systems will be important to ensure that collection, treatment and discharges are properly integrated. It is also clear that significant investment will be required in the next few years to meet targets that call for better cost recovery. New regulations introduced in 2009 provide clearer guidance on more effective and efficient water and wastewater tariffs. Consideration of the tariff equilibrium fund should help address cost-recovery problems, *e.g.* with regard to higher service costs in areas with low population density. Any action in this field cannot be separated from the development and application of efficient territorial planning instruments, so as to prevent current expansion of residential and industrial areas in a scattered and disorderly way that would make water and wastewater infrastructure planning difficult and costly.

Towards integrated water management

Consistent with the requirements of the EU Water Framework Directive (WFD) a process of identifying the qualitative and quantitative characteristics of Portugal's water resources and the main pressures was launched by drawing up 15 river basin plans in 2000 and adopting the National Water Plan in 2001. Preliminary goals were established, together with timetables for their achievement and implementation mechanisms. Development of

plans was delayed, but the process was reinvigorated by the adoption of the Water Law in 2005, which transposed the WFD into Portuguese law and strengthened the water resources planning process. Following adoption of the relevant legislation, five new River Basin District Administrations (ARHs) were created in 2007 as the main bodies responsible for water resources planning and the development of *River Basin Management Plans (PBHs)*. These Plans, yet to be finalised, will replace the River Basin Plans of 2000/01 and are expected to provide a better instrument for managing and protecting surface and groundwater resources. Important linkages are expected to be made with plans for the management of coastal areas.

There have been provisions on *licensing and charging for water use* (surface and groundwater) in regulations enacted since 1994. However, they have not been applied because of difficulties with the registration of water users. This situation improved following adoption of the 2005 Water Law. In 2007, the National Information System for Certificates of Water Resource Use became operational. In 2008, regulations introduced the Water Resources Levy (TRH) to stimulate more efficient water use and generate funds for environmental improvements (Box 3.2). It may be too early to assess the impact of the TRH, as its collection only began in the second half of 2008. A first analysis indicates that implementation is progressing well, despite the inherent difficulties when a tax is entirely new to taxpayers and is based on water use, which until recently was considered free – especially for industry and agriculture. Revenue increased between 2009 and 2010 due to efforts by authorities to strengthen water use registration.

3.3. Waste and materials management

Trends in waste generation and treatment

The *amount of waste generated every year* increased rapidly during the review period, from around 17 million tonnes at the beginning of the period to around 36 million tonnes in 2008.[24] In 2009, economic deceleration translated into a drop in waste generation to 29 million tonnes. This growth, and the recent drop, were due to changes in the amount of *industrial waste* generated. Industrial waste generation increased from around 13 million tonnes in 2002 to 31 million tonnes in 2008; it fell to 24 million tonnes in 2009 due to a reduction in the amount of waste generated in the construction and demolition sectors (which account for one-third of the total). Some decreasing trends were also observed in the energy and some industrial sectors, such as non-ferrous metals and pulp and paper. Around one-third of industrial waste is generated by manufacturing and another one-third by services. About half of industrial waste is recovered by industry, while the other half is landfilled (40%) or treated by various methods of elimination (9%).

The amount of *municipal waste* generated per year in mainland Portugal increased during the review period, from about 4 million tonnes in 2001 to 5.2 million tonnes in 2009. Although the amount per capita increased from 440 kg in the late 1990s to 511 kg in 2009 in the mainland, it remained below the OECD and OECD Europe averages. About half of municipal waste is biodegradable. A trend of relative decoupling of municipal waste from GDP and private consumption, which started in the 1990s, continued during the review period.

In 2009, as in 2000, a large share of municipal waste (around 62%) was *landfilled*. This share has remained far above the 23% target set out in the *PERSU I plan* for 2005. However, landfilling has been better controlled: all uncontrolled waste dumps were closed in 2002

Box 3.2. **The Water Resources Levy**

The Water Resources Levy (TRH) was introduced in July 2008 as a key instrument of national water management policy, in order to implement the polluter pays and user pays principles. It aims to address the growing scarcity of water resources and encourage changes in consumption habits. The TRH collects a rent for use of water resources by economic entities, helps cover the environmental costs of activities likely to have a significant impact on water resources, and recovers administrative costs related to planning, management and oversight of water quality and quantity. It applies to the licensed use of surface water (rivers, lakes, lagoons, the sea) and groundwater in the State Public Water Domain.

The TRH is collected on a yearly basis and has five components. One of the main components, a volumetric payment for water abstracted for private use, is differentiated according to the type of user and adjusted according to the water scarcity coefficient in a region. Another component is a payment for discharging, directly or indirectly, effluents that may have significant impacts (COD/BOD, nitrogen or phosphorus pollution). It is differentiated according to the pollutant and pollution load contained in the discharge, expressed in kilograms. Other components relate to the area of water withdrawal and some management costs. The taxable water volume equals total water withdrawn or diverted from public resources, not just the amount effectively used, so that losses or inefficient use are covered by the levy. For each component, there are reductions and exemptions related to small or special uses. The rate of the TRH is determined, based on self-monitoring or, failing that, the maximum values set out in water permits.

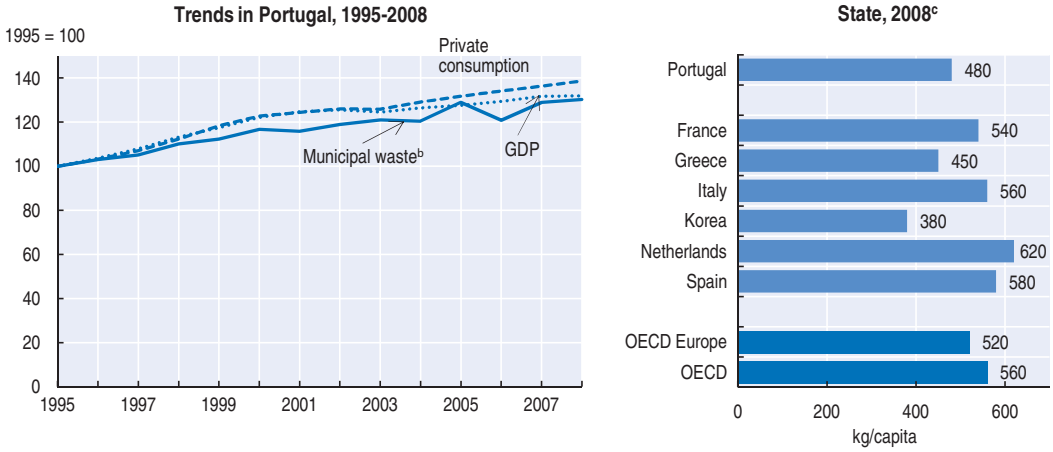
When the tax was introduced in 2008, it was estimated that the revenue would be some EUR 50 million per year. EUR 22 million was collected in 2009 for the second half of 2008 and EUR 33 million was expected in 2010 for the year 2009. The largest contributors are public water supply and sanitation services and thermoelectricity producers. Collection of the tax from these sectors has been facilitated by an almost complete existing register of operators. Other contributors include the pulp and paper industry and irrigation operators.

The revenue is an exclusive source of revenue for competent public entities managing water resources: 50% is allocated to the Water Protection Fund, 40% to the appropriate River Basin District Administration and 10% to the Water Institute (INAG).

(uncontrolled dumping accounted for almost 75% of total municipal waste generated in 1995) while the currently operating landfills are subject to analysis, monitoring, collection and treatment of leachate and biogas, and appropriate closure and after-care measures, as required by the EU Landfill Directive. Around 18% of municipal waste is incinerated, 8% composted and 12% subject to source separation. These shares have remained stable since 2000 (Figure 3.8) and are far short of achieving the differentiated, treatment-related targets set out in the *PERSU I plan*, which envisaged 22% of waste incinerated with energy recovery, 25% composted, and 25% subject to selective collection. Meeting the 2009 and 2016 targets for biodegradable waste diversion from landfills was postponed until 2013 and 2020.

The amount of *hazardous waste exported for treatment abroad* increased sharply, from 100 000 tonnes at the beginning of the review period to nearly 200 000 tonnes in 2008. Most is exported to Spain, with around 40 000 tonnes subject to recovery of materials, mainly metals recovery and refining of used oil, and 150 000 tonnes disposed in landfills (Figure 4.1). The amount of hazardous waste shipped for disposal fell in 2009 to

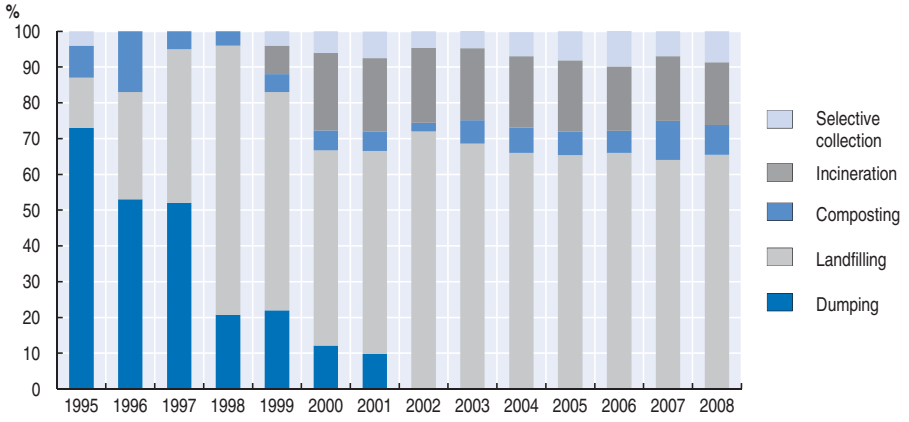
Figure 3.7. **Municipal waste generation**[a]



a) Includes Azores and Madeira Autonomous regions. In interpreting national figures, it should be borne in mind that survey methods and definitions of municipal waste may vary from one country to another. According to the definition used by the OECD, municipal waste is waste collected by or for municipalities and includes household, bulky and commercial waste, and similar waste handled at the same facilities.
b) Waste collected by or for municipalities, waste directly delivered and separate collection for recycling by the private sector. It includes household, bulky and commercial waste, and similar waste handled at the same facilities.
c) Or latest available year.
Source: OECD, Environment Directorate.

StatLink http://dx.doi.org/10.1787/888932375623

Figure 3.8. **Treatment of urban waste,**[a] **1995-2009**



a) Data refer to mainland Portugal.
Source: Portuguese Environment Agency.

StatLink http://dx.doi.org/10.1787/888932375642

63 000 tonnes, as two specialised facilities for hazardous waste treatment, the Centres for Integrated Recovery and Disposal of Hazardous Waste (CIRVER), were opened in Portugal in 2008. This brought the country closer to meeting the long overdue objective of self-sufficiency in hazardous waste treatment established at the beginning of the review period.[25] The amount of hazardous waste not subject to treatment in CIRVER facilities accounts for a small fraction of total hazardous waste generated in Portugal. Following the changes in the statistical methodology and data collection system in 2004, it is estimated that nearly 2.5 million tonnes of hazardous waste per year is generated by industry (APA, 2007). Although legal provisions encouraging hazardous waste treatment by

co-incineration in cement kilns exist, this type of treatment has been limited by public opposition.

A number of *contaminated sites* still exist in Portugal, posing a risk to public health and ecosystems. Contamination also has an impact on the value of land surrounding affected areas. The most sensitive sites are associated with abandoned uranium mines in the Alentejo region, the old industrial zones of Estarreja, Barreiro and Sines, and the former iron and steel mill at Seixal (with important amounts of waste containing heavy metals, oils and asbestos), as well as the area of old tanneries in Alcanena.

Waste management policy responses

A *new framework for waste management* was established in 2006 with the adoption of the Waste Law harmonising Portugal's legal framework with the EU Waste Framework Directive (2006/12/EC). This law defined key principles of waste management, including self-sufficiency, prevention and reduction, a hierarchy of waste management operations, and citizens' responsibility. Its scope comprises all waste management operations, including collection, transport, storage, sorting, disposal, treatment and recovery, and final disposal. The law and related regulations focussed, in particular, on regulatory and administrative simplification and increasing the effectiveness of waste management permitting. Institutional arrangements were also strengthened by making the Portuguese Environment Agency (APA) the main governmental body in charge of strategic waste planning, hazardous and industrial waste management permitting, issuance of technical standards applicable to waste management operations, supervision of waste management activities, standardisation of licensing procedures, and keeping track of developments at the international and community levels in the field of waste. The competences of the Regional Development Co-ordination Commissions were also strengthened with regard to the permitting of landfills for municipal and non-hazardous waste not covered by the industrial activity scheme.

Reform of regulatory and institutional frameworks was supported by the elaboration of comprehensive *waste statistics*. A Waste Registry and Information System (SGIR), initially developed in 2004 for online waste data registration, was transformed in 2007 into the Integrated Electronic Database on Waste (SIRER). There is now a uniform mechanism for waste registration and access to information about different types of waste, the Integrated Register System of APA (SIRAPA), which was launched in December 2008. The SIRAPA aligned this procedure with the requirements of the government *Simplex* Programme and helped meet reporting obligations under the EU Regulation on waste statistics (2150/2002/EC) and the EU Waste Directive. It also serves as a mechanism for providing updated information to the public. In the future, the database will enable real-time monitoring of waste collection, transport and management in Portuguese territory.

In parallel with the closure of around 300 identified illegal dump sites accomplished in 2002, and in line with the *PERSU I plan* adopted in 1997, there were important developments regarding *municipal waste collection and treatment*. One of the main reforms featured the transition from a system run predominantly by municipalities to the creation of pluri-municipal systems (in the form of regional inter-municipal and regional multi-municipal companies). While the former are managed by associations of municipalities alone, or in partnership with the private sector, the latter are based on partnerships between the state and the municipalities (public-public partnerships) (Marques, 2010). Similarly, as with the water and wastewater services, the operations of corporatised waste

companies were made subject to regulatory oversight by the IRAR/ERSAR to ensure the quality of the service provided and the equilibrium and sustainability of the sector (Box 3.1).

The new arrangements were aimed at improving the *effectiveness and efficiency of waste collection and treatment* by utilising economies of scale at the regional level (through provision of services for larger areas and sharing of facilities) and allowing mobilisation of adequate financial resources for municipal services (through waste charges). The first objective has been achieved in mainland Portugal, where waste management services are provided to the entire population by 24 pluri-municipal management systems – 12 inter-municipal and 12 multi-municipal (APA, 2010). The waste collection and treatment infrastructure has been further developed: in 2008, services were provided through 31 068 collection (drop-off) points, 33 sorting stations, 81 transfer stations, 9 organic recovery units, 2 incineration units with energy recovery, and 34 landfills.[26] However, cost recovery with regard to services provided by the municipalities remains challenging as a number of municipalities (11%) do not charge households for waste services. Of those that charge, 66% do so through water bills (22% use only fixed charges) and 8% charge on the basis of other variables (ERSAR, 2009). The price incentive for households to cover the cost of waste collection and treatment is consequently low. There is clearly scope for price increases, considering in particular that the average level of the waste bill for households seems to be less than 1% of average income (GHK, 2006).

In 2007, a *waste management tax* (TGR) was introduced as an instrument to make producers and consumers aware of the associated environmental costs and to stimulate waste reduction to meet domestic objectives with regard to waste management. The TGR is applied annually and differentiated depending on the type of treatment (waste deposited in landfills, managed by specific waste flow systems, or sent to the integrated centres for the recovery and disposal of hazardous waste, CIRVER, and incinerated or co-incinerated). The tax rate is 50% higher for waste fractions classified as recyclable.[27] The tax revenue increased from EUR 10 million in 2007 to EUR 12 million in 2008 and EUR 14 million in 2009, which reflected an extension of the tax coverage to new entities but was also due to the annual update of the amount charged per tonne of managed waste. The revenue is collected by the APA and shared with the CCDRs when they are the entity responsible for permitting of activities that aim to meet domestic waste related objectives. Although the waste management tax helped to increase the costs of landfilling and redirect some waste streams from final disposal, its role has been limited to revenue raising for waste management activities. In many cases, the tax has not been passed on to households through waste collection charges. Further evolution of waste collection and treatment services towards systems based on corporate arrangements and away from services provided directly by municipalities should increase the impact of the landfill tax.

A more stimulating effect was provided by the use of economic instruments in conjunction with *Extended Producer Responsibility (EPR) schemes* that manage specific waste streams, such as used batteries and accumulators (a scheme managed by a private operator, *Ecopilhas*, on behalf of battery and accumulator producers and importers), waste electrical and electronic equipment waste (operated by *AMB3E* and *ERP*), used oils (operated by *Sogilub*), end-of-life vehicles (operated by *Valorcar*), used tyres (operated by *Valorpneu*) and packaging (operated by *SPV, VALORMED* and *VALORFITO*). The surcharges introduced on products linked with various waste streams stimulated the meeting of most targets related to recovery and recycling of the waste streams under the EPR schemes. In

order to improve recovery and recycling of construction and demolition waste and waste cooking oils, specific regulations were promulgated in 2008 and 2009.

An important step in promoting *reuse of waste or recovered material as a secondary raw material* within the Portuguese economy, was taken in 2006 with the creation of the Organised Waste Market (MOR). The MOR is a voluntary system, which promotes exchange of information about waste materials available on the market and facilitates trading of these materials between economic entities. It is envisaged that all categories of waste (except hazardous) can be traded on the MOR after being sent for recovery operations. The 2009 regulations concerning the MOR established rules for transactions and their operators, as well as for monitoring of organised waste market management entities by the public administration. The MOR is supported by electronic negotiation platforms that are used to process waste transactions under sustainable and secure conditions (Box 3.3).

Box 3.3. **Organised Waste Market negotiation platforms**

The Organised Waste Market (MOR) negotiation platforms are electronic systems that support waste trading. Waste producers and operators have access to these platforms in order to initiate orders to buy or sell waste. Managed by private entities, the platforms ensure transparency, provide universal and equal access to all potential users, ensure the timeliness and accuracy of the information circulating within the system, and are subject to confidentiality regarding transactions. To be certified for operation, the negotiation platforms are required to:

- have mandatory management systems for information security, certified by ISO 27001 on information security management systems, or equivalent certification by an independent auditing entity accepted by the Portuguese Environmental Agency (APA);
- adopt measures to prevent access to the system by those without appropriate authorisation and qualification;
- be housed by secure servers with a high level of system operation and data storage security.

Negotiation platforms are financially self-sustaining, as they charge transaction and membership fees. The APA's authorisation allows the managing entity to use a logo, as well as the designation "Integrated Platform for the Organised Waste Market", in all media communications regarding its own activities.

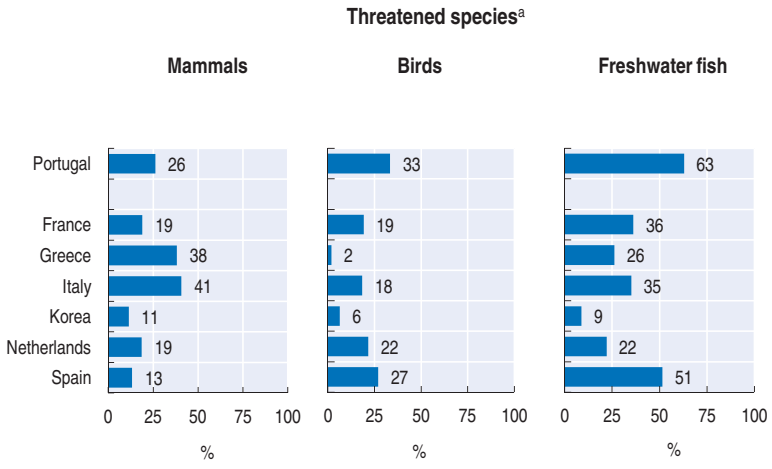
Contaminated sites related to abandoned mines and industrial activities in Seixal, Barreiro, Sines, Estarreja and Alcanena were identified as environmental priorities in the context of EU funding for the period 2007-13.

3.4. Nature protection and biodiversity conservation

Performance

The proportion of *species under threat* of extinction is high in the case of freshwater fish, birds and mammals (Figure 3.9). Included are the Iberian wolf and the Imperial Eagle. For freshwater fish, this poor performance can be attributed to poor and still deteriorating water quality in many sections of rivers (38% of monitoring sites) as well as, in some areas, increased intensity of water use (+ 4% in 2000-07 country-wide[28]). Recent monitoring does not give reason for optimism. According to a government assessment in 2008 of the status

Figure 3.9. **Fauna and flora**



a) IUCN categories "critically endangered", "endangered" and "vulnerable" in % of known species.
Source: OECD, Environment Directorate.

StatLink http://dx.doi.org/10.1787/888932375661

of preservation of species and protected habitats of European Community interest in Portugal, most natural habitats are in an unfavourable/inadequate state of preservation. The situation is particularly worrying for freshwater and migrating fish in the Mediterranean region, where populations and habitats of some endemic species register a regression. In contrast, the situation seems to have improved in more recent years (2004-08) for populations of common birds living in farmland and forestland.

The extent of *protected areas* using the IUCN protection categories is comparable to the OECD average. Much of Portugal is forested (38%)[29] and forest area increased by 3.6% between 1990 and 2008. There is a high risk of soil erosion on 11% of the territory.

Use of *nitrogen fertilisers* decreased by 40% in 2002-08 and is now low by OECD Europe standards (Figure 3.6). The national nitrogen balance (47 kg N/ha) is low compared to the OECD average (74 kg N/ha), although Portugal has designated eight vulnerable areas under the EU Nitrates Directive. In contrast, pesticide use is far above the OECD Europe average (Figure 3.6), having increased by 6% in 2000-05 although agricultural production fell by 4% during the review period.

Strategic planning

The 2001 *National Nature Conservation and Biodiversity Strategy* sets overarching biodiversity and nature conservation objectives, with a time horizon of 2010 (ICN, 2007). This strategy was assessed in 2009. Much remains to be done: 11% of measures have not been implemented, and 44% have been implemented only partially. The strategy will be updated in line with the EU communication to be adopted in 2011 following the Conference of the Parties (COP-10) to the Convention of Biological Diversity (CBD) held in October 2010 in Nagoya, Japan.

The *2008 Nature Conservation Act* enhances the creation of local, regional and private protected areas to complement the National Network of Protected Areas. It establishes the Fundamental Network for Nature Conservation (RFCN) and the National System of Classified Areas (SNAC). The SNAC is made up of the National Network of Protected Areas

(RNAP), the *Natura 2000* network, and other areas classified in the context of international commitments. The RFCN regroups the SNAC, National Ecological Reserves (RENs) and National Agricultural Reserves (RANs), as well as the public water domain, with a view to ensuring connectivity.

The 2007 National Spatial Development Policy (with a time horizon of 2025) and the 1999 Land Use and Urban Management Policy (revised in 2009), are key strategic frameworks for *enhancing biodiversity protection in land use management*. Pursuant to the latter, a second generation of municipal land use plans was initiated in 2002. From 2009, responsibility for municipal land use planning has devolved to municipalities: the Ministry for Environment and Spatial Planning (MAOT) no longer directly supervises the inclusion of nature protection areas (*e.g.* RENs) in municipal master plans although it retains its power to veto revisions to the plans.[30] While the RENs were primarily designed for flood control rather than nature protection and regulations over their use have not always been strictly enforced, this new institutional setting may reduce incentives to establish additional RENs. Uncontrolled building is a major issue in Portugal, where the government estimates that 3 200 illegal structures are located in protected areas, mostly in coastal areas. The proliferation of construction on beach-dune systems that has occurred in the past has been regulated and demolition orders implemented in recent years to protect these important buffer zones.

Legislation on alien species was enacted in 1999, ahead of that in other EU countries. There is an emphasis on freshwater waterways, exotic forest species, and exotic marine species in estuaries and coastal waters.

Many *other plans, strategies and policies* have significant impacts on nature conservation. With regard to water management, the national programme of dams expected to provide hydroelectricity (2007) foresees construction of ten new dams on Portuguese rivers (subject to environmental impact assessments). A national water plan was due in 2010, pursuant to the EU Water Framework Directive. In the area of sea management, there is a national strategy of the sea (2006). A maritime spatial management plan (POEM) is under development (Chapter 4). Portugal has a national strategy for integrated coastal zone management (ENGIZC) with a 20-year time horizon (Chapter 6). In the area of tourism management, nature tourism has been included in the 2007 National Strategic Plan for Tourism (PENT), while the 1999 nature tourism policy was given new impetus in 2009 with creation of the National Programme for Nature Tourism.

In 2007, the Nature Conservation Institute (ICN) became the *Institute for Nature and Biodiversity Conservation* (ICNB), with strengthened policy-making powers. Portugal has had five administrations serving different hydrographic regions since 2007.

Protected areas

The extent of *protected areas* increased only slightly during the review period, to nearly 8% of total land area (Table 3.2). The share of land area under protection is much higher (22%) when considering the *Natura 2000* network, a high proportion of which is on agricultural and forest land. Pursuant to the new Nature Conservation Act, a first local/regional protected area[31] was created in 2009 on a municipality's own initiative.

All national protected areas now have *spatial management plans*. Some of them are already subject to the review process. Environmental impact assessments are required for

Table 3.2. **Protected areas**[a]

Type of protected area	2000		2009		Comment
	% land area	number	% land area	number	
Natural park	6.0	12	6.2	13	
National park	0.8	1	0.8	1	
Nature reserve	0.7	9	0.6	9	
Protected landscape					
National	0.0	3	0.1	6	
Regional	0.1	3	0.1	6	
Subtotal	7.7	43	7.8	52	
Natura 2000					
Sites of Community Interest	–		17	60	
Special Protected Areas	–		10	40	
Subtotal			22	100	2 million ha[b]

a) Natura 2000 sites and other protected areas do not sum up as there is some overlap.
b) Excluding 130 000 ha of coastal waters (within the 12 nautical mile limit).
Source: MAOT.

projects in areas with specific regulation (*e.g.* traditional oak tree ecosystems or *montados*), as well as strategic environmental assessments for projects, plans and programmes that may significantly affect the integrity of *Natura 2000* sites. The aim is to control urban sprawl and tourism development in protected areas, but derogations may be granted in cases of projects of national interest (PINs), *e.g.* construction of highways, dams and tourist resorts. The government promotes mitigation banking[32] for new developments that are in protected areas or affect these areas.

Following a major fire in 2004, an innovative tool was developed to *combat forest fires*. It consists of delineating a Forest Intervention Area (ZIF) and grouping forest owners in the ZIF through a shared forest management plan. The Directorate-General of Forest Resources (DGRF) provides support for the establishment of ZIFs, which must be on a large scale (more than 1 000 ha).

A key challenge is the creation of more *marine protected areas*, including through the *Natura 2000* network. By 2009, protected areas and *Natura 2000* sites covered about 130 000 ha of coastal waters, including all estuaries and *rias*,[33] the most significant coastal lagoons, as well as a significant part of sand dune and rocky coastal area. Five new marine protected areas are being considered under the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention). Portugal is transposing the EU Marine Strategy Framework Directive (2008/56/EC). An action plan to protect the bottlenose dolphin in the Sado estuary was adopted in 2009.

Expenditure and financing

Total public expenditure on biodiversity and landscapes increased from EUR 132 million in 2002 to 244 million in 2007, a 13% annual increase. About half was co-financed by the EU, including through the LIFE Nature and INTERREG programmes.

In 2007, the EU started to co-finance the *Natura 2000* network (EUR 20 million per year) under the *Rural Development Programme* (PRODER), which covers the period 2007-13. However, the level of PRODER payments (EUR 200/ha/year) is often not sufficiently attractive to farmers and the EU regulation does not provide much space for improvement. Cross-compliance requirements are attached to the payments.

EU support for the *Natura 2000* network is only 3% of *total EU support to Portuguese agriculture* (Table 3.3). However, the single payment scheme has been gradually introduced since the 2003 reform of the Common Agricultural Policy (CAP) and has been subject to cross-compliance since 2005. Very few payments are still based on either quantity produced or acreage/headage. Apart from payments to *Natura 2000* sites, very few are based on specific environmental outcomes.

A *fund for nature conservation* was established in 2009, as provided by the new Nature Conservation Act. While its public budget allocation is still under discussion, efforts are being made to raise the level of private funding. In particular, developers must pay a one-off tax. For example, in 2009 the water company *Aguas de Algarve* paid EUR 6 million into the fund to offset the Odelouca dam's negative impact on the habitat of the Iberian lynx. It will be used to finance *ex situ* protection through the creation of a reproduction centre.

A *permanent forest fund* was established in 2004, financed by a surtax on consumption of oil products. The 2006 National Forest Strategy identifies six priority windows of financing (MADRP, 2006). Priority is given to multifunctional forest management,[34] indigenous species (*e.g.* oaks) in substitution for fast-growing ones (*e.g.* eucalyptus), marketing promotion of non-wood products (*e.g.* mushrooms, nuts, medicinal and aromatic plants) and private research. Other priorities are driven more by production than environmental criteria.

The *EU Business and Biodiversity (B@B) Initiative* was launched in 2007 during Portugal's EU Presidency. It aims to enhance business and financial sector voluntary engagement through a B@B platform. Fifty Portuguese firms participate on a voluntary basis.

Table 3.3. **EU and national support to Portuguese rural development**

EUR million

Pillar/Axis of the Common Agricultural Policy (CAP)	2000-06[a]	2007-13[b]	Comment
1st: Improving the competitiveness of agriculture and forestry	1 848	2 136	Includes investments in irrigation infrastructure
2nd: Improving the environment and countryside	1 515	1 809	
Mountainous and less favoured areas[c]	*405*	*741*	760 000 ha in 2007
Agri-environmental measures	*771*	*447*	220 000 ha in 2007 (6% Utilised Agriculture Area)
Afforestation of farmland	*339*	*300*	
Natura 2000 network[d]	–	*321*	45 000 ha in 2007
3rd: Quality of life and diversification of the rural economy + LEADER	220	493	Includes provisions for nature tourism[e]
Total	**3 583**	**4 438**	

a) European Agricultural Guidance and Guarantee Fund (EAGGF) and national co-financing.
b) European Agricultural Fund for Rural Development (EAFRD) and national co-financing. Planned allocation.
c) Areas where agricultural production is difficult (*e.g.* slopes).
d) Integrated Territorial Interventions (ITIs).
e) In addition, in 2007-13 the European Regional Development Fund (ERDF) includes EUR 20 million/year for nature tourism.

Source: EU and MADRP.

Notes

1. The APA issues environmental permits consistent with the provisions of the EU IPPC Directive. It is the national authority for environmental impact assessment, risk prevention and waste management. The APA also operates the National Environment Information System and the Environment Reference Laboratory. It supports environmental education, public participation and access to information.
2. The River Basin District Administrations are responsible for monitoring water quality, licensing the use of river resources and discharges, identifying and registering nature protection and drinking water intake areas, and coastal zone and estuary planning and management.
3. These notes include, for example, analyses of required compliance in formal, constitutional and international terms; a list of other relevant pending Portuguese and EU initiatives; and a summary of historical developments relevant to the issue.
4. Activities subject to one of the following: EIA, IPPC, prevention of serious accidents involving hazardous substances, and hazardous waste management.
5. Before 2008, small and medium-sized installations required separate permits for all operations involving risks of air, water, soil and noise pollution or waste generation. Licenses for industrial and agricultural installations were issued by the relevant administrations, with a mandatory requirement that they be approved by the environmental authorities. Permitting was preceded by a number of controls and checks by various administrative bodies.
6. In 2006, the staff of the National Forest Bodyguard (CNGF, also called the Forest Police), which had operated under the Directorate-General of Forest Resources (DGRF), was integrated into the National Republican Guard as the SEPNA. The SEPNA became a police force that assures compliance with environmentally related legislation, in particular on hunting, fishing, and non-compliance in the forestry sector (especially regarding the protection of some forest species, such as cork and green oaks, and the investigation of the causes of forest fires).
7. The SEPNA can also control activities regulated by environmental laws.
8. For example, the 2003 campaign along the river Ave in northern Portugal targeted textile companies. This campaign led to 160 prosecutions, resulting in the imposition of EUR 1 million in fines on operators that were not in compliance
9. If restoration to the baseline condition is impossible, the party responsible for the violation must pay compensation.
10. For example, fines for serious offences were set between EUR 17 500 and 22 500 for individuals, and between EUR 42 000 and 48 000 for companies. In the case of very serious offences, limits were set between EUR 32 000 and 37 000 for individuals and between EUR 500 000 and 2.5 million for companies.
11. For example, failure to respond to a formal notification is considered a "serious" violation rather than a "very serious" one, resulting in lower fines.
12. After a notice of violation was issued and the operator was notified, the operator had ten days in which to respond. If the operator did not comply, the IGAOT was authorised to take the necessary enforcement actions.
13. A varying percentage of the fines goes to the Environmental Intervention Fund, to be spent in cases where site remediation is necessary after a facility has closed and no other financial or legal alternative exists.
14. The law also harmonises Portuguese legislation with the EU Directive on public access to environmental information (2003/4/EC).
15. SO_x emissions were subject to significant interannual variability, associated with fluctuations in hydroelectric power generation (*i.e.* they were very dependent on annual variations in precipitation). For example, high precipitation levels and increased hydroelectric power production contributed to a subsequent reduction in SO_x emissions from thermal plants in 2003. Hydroelectric power production fell in 2004 and 2005, leading to increased fossil fuel consumption and, consequently, higher SO_x emissions.
16. Daily limit values were not exceeded more than three times in a calendar year.
17. In compliance with the new EU Air Quality Directive, which entered into force in 2008, Portugal requested additional time to meet the PM_{10} standard. However, the Commission rejected most of the notified air quality zones on the grounds that they did not meet all the conditions required by

the Directive. The Commission has decided to send a final written warning to three Member States that have not met the PM_{10} standard, including Portugal.

18. The IQAr, calculated for specified zones/agglomerations, is determined by the worst pollutant concentration measured at one or more monitoring stations. Pollutants considered in the calculation include NO_2, O_3 and PM_{10}. Values for CO and SO_2 are also used if they exist. Air quality is described in five classes: very good, good, medium, poor and bad. These classes are associated with five colours, ranging from green for very good to red for bad.

19. Hydropower is Portugal's leading domestic energy resource. Together with other renewables, it produces more than 40% of the country's electricity.

20. Water is considered eutrophic when the concentration of total phosphorus exceeds 35 mg/m^3 and dissolved oxygen is below 40%.

21. In the 1990s, several regulations were entacted that opened up possibilities for the creation of pluri-municipal systems for "wholesale" (bulk) production of water (withdrawal and treatment for human consumption), as well as wastewater treatment, excluding sewerage, to be operated under concessions, without competitive tender, by companies using a majority public ownership system. Management of "end-user" (retail) services, which included water supply to consumers and sewage collection, was opened up to various types of management, *e.g.* delegation or concession (subject to competitive tender), with the possibility of participation by a private partner chosen through public tender.

22. Águas de Portugal (AdP) is a national holding company established in 1993 with the objective of addressing the fragmentation of the water and wastewater sector and the development of pluri-municipal systems.

23. As of December 2009, 40 public tenders for public-private partnerships (PPPs) had been launched in the water sector, corresponding to more than 2.8 million inhabitants (27% of the total population). Of 30 contracts signed, 25 corresponded to a purely contractual PPP (concession) and 5 to institutionalised PPPs (mixed companies).

24. The trend before 2004 should be treated with caution, as waste classification in Portugal was subject to change following the requirements of the EC Regulation on waste statistics (2150/2002/EC).

25. CIRVER are integrated units that can optimise treatment conditions for specific types of hazardous waste and minimise treatment costs. They integrate seven waste management units: classification (including laboratory), sorting and transfer; stabilisation; organic waste treatment; recovery of contaminated packaging; soil decontamination; physico-chemical treatment; and hazardous waste landfill. They can therefore treat most types of hazardous waste, leading to waste reduction and recovery and subsequent re-use as raw material. All or part of the waste the centres cannot handle through physico-chemical and biological processes is stabilised or rendered inert before going to landfills. This enables a significant reduction in quantity and toxicity. The two centres are served by 326 transfer stations.

26. In 2002, there were 30 municipal waste management systems, 26 806 drop-off points, 26 sorting stations, 54 transfer stations, 5 units for organic waste valuation, 2 incineration units with energy recovery, and 37 landfills.

27. The minimum amount due is EUR 5 000 per entity treating waste.

28. Primarily due to an increase (by 18% in 2000-07) in intensity of use of irrigation water (litre/ha irrigated).

29. 31% of the OECD area is forested.

30. The six regional land use plans (currently under review) are not legally binding.

31. Douro estuary and Paúl de Tornada.

32. The creation or enhancement of similar ecosystems to offset the expected adverse impacts on ecosystems of infrastructure development.

33. All estuaries are state-owned in Portugal.

34. Such as enhancing eco-tourism, game habitats, fishing, and extensive grazing in forests.

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PART I

Chapter 4

International Co-operation

Portugal has been a forerunner of the European maritime policy. It has also influenced EU policy development on water scarcity and drought, climate change and biodiversity, but ensuring compliance with the EU Common Fisheries Policy remains a difficult challenge. Over the last decade, Portugal has ratified important international agreements aimed at preventing marine pollution from ships. Multilateral co-operation has been fruitful in preventing illegal movements of waste and trade in endangered species of wildlife fauna and flora. Joint management of shared river basins is a continuing challenge in Portugal's co-operation with Spain. Budget constraints bear on Portuguese development assistance, including for the promotion of the environment.

Assessment and recommendations

Portugal has actively contributed to the development of European maritime policy, including the Marine Strategy Framework Directive of 2008. It was among the first European countries to establish an institutional framework for a maritime strategy. In 2006, the Council of Ministers approved a National Ocean Strategy to develop sea-related activities and protect marine natural resources through an integrated maritime affairs policy. In 2007, an inter-ministerial commission on maritime affairs was created to co-ordinate the implementation of this policy and a stakeholder forum was launched. However, implementation of the National Ocean Strategy should be accelerated. Maritime spatial planning has begun but is proceeding slower than planned. Responsibility for maritime and coastal planning is scattered among various institutions, and synergies are difficult to create. Further efforts will be needed to improve knowledge of the marine ecosystem and better integrate biodiversity concerns in sectoral policies.

In line with the recommendations of the previous review, Portugal has ratified important international agreements to prevent marine pollution from ships and to allow more compensation in the event of an oil spill. Nonetheless, there is room for further progress on preparedness for incidents involving pollution by oil and by hazardous and noxious substances (HNS). Portugal is not a party to the 1996 Protocol to the London Dumping Convention, the Convention on the Control of Harmful Anti-fouling Systems on Ships, or the Convention for the Control and Management of Ships' Ballast Water and Sediments. It exceeds the target (under the Paris Memorandum of Understanding on Port State Control) of inspecting 25% of ships calling at its ports, but penalties for non-compliance are not usually imposed.

Since 2000, the size of the Portuguese fishing fleet has been reduced by 20% in terms of number of vessels, 12% in terms of gross tonnage, and 6% in terms of power. However, until 2003 significant public funding (including EU support) was devoted to building new ships. During the past ten years, it is likely that measures to limit fishing effort have been offset by productivity gains. Portuguese fishers continue to exploit some species that are beyond safe biological limits. Additional efforts need to be made to enforce compliance with the rules of the EU Common Fisheries Policy.

Portugal plays an active role in co-operative activities to prevent the transport of illegal waste. In recent years it has performed an increasing number of inspections in this regard with other European countries. It has also taken a major step towards fulfilling its 1999 commitment to become self-sufficient in waste treatment. Two hazardous waste treatment facilities began to operate in 2008. Progress in achieving the goal of reducing exports of hazardous waste has been mixed; shipments increased four-fold between 2001 and 2008, but fell by two-thirds from 2008 to 2009. Despite progress, Portugal needs to promote public participation in waste management in order to overcome "not in my back yard" type responses to waste treatment.

Since the previous review, Portugal has strengthened its legislative and regulatory framework to combat illegal trade in endangered species of wild fauna and flora. Legislation enacted in 2009 provides stiffer penalties, and there have been criminal prosecutions in cases of serious offences. Portugal co-operates with Brazil (as well as with Spain and other EU countries) on enforcement activities but its resources and skills are limited.

Co-operation with Spain on water has been strengthened in the framework of the Albufeira Convention, which went into effect in 2000. A Protocol to this Convention defining minimum quarterly and biannual flows from Spain to Portugal was signed in 2008. Under this Protocol, ecological flows will be maintained during the year taking into account seasonal variability. In 2009, the transboundary Gerês-Xurês Park was included in UNESCO's World Network of Biosphere Reserves. The two countries carry out joint projects to protect the Iberian lynx and the Imperial Eagle. They also co-operate in regard to the impacts of climate change on Iberian biodiversity. Significant efforts will still need to be made to develop joint management of shared river basins.

During its EU Presidency in 2007, Portugal contributed to laying the foundations of European policy on water scarcity and drought. It also promoted climate change and biodiversity on the EU agenda and in international fora.

Official development assistance (ODA) by Portugal reached USD 507 million in 2009, representing 0.23% of its gross national income (GNI). However, Portugal did not meet the EU target of 0.33% ODA/GNI in 2006, and the projection for 2010 (0.34%) is well below the minimum DAC-EU donor target of 0.51%. Achieving the objective of 0.7% in 2015 will be extremely challenging. The share of assistance for environment and water and sanitation in total ODA (about 1%) reflects the low priority given to these areas in Portuguese development co-operation compared to that in other DAC countries. However, imputed multilateral contributions with respect to water through EU institutions have increased notably. Several environmental projects have been implemented with the Portuguese-speaking African countries (PALOPS), including training programmes on inspections and impact assessment as well as activities concerned with reducing deforestation and mitigation of climate change. In 2010, in the framework of the Copenhagen Accord, Portugal pledged EUR 36 million of fast-start financing over 2010-12.

Recommendations

- Speed up *implementation of the National Ocean Strategy,* particularly actions on the protection and restoration of marine ecosystems; finalise and implement maritime spatial planning, in coherence with coastal zone management.
- Pursue efforts to *ratify and implement international agreements on the prevention of marine pollution,* including the 1996 Protocol to the London Dumping Convention as well as the Anti-fouling Systems and Ballast Water Conventions; improve capacity to respond to incidents involving pollution by oil and hazardous and noxious substances (HNS).
- Further *mainstream environment in Portugal's official development assistance*; honour the 2010 pledge made in the framework of the Copenhagen Accord to provide fast-start financing to developing countries.

1. Marine environment

1.1. *Objectives and institutional framework*

Portugal has a 1 187 km coastline.[1] Its *Exclusive Economic Zone* (EEZ) covers more than 18 times its terrestrial area.[2] In 2009, it submitted a proposal to the UN for the extension of its continental shelf. If this proposal is approved, the area under Portuguese jurisdiction will increase to about 2.1 million km^2, presenting new opportunities to exploit marine resources. The concept of "integrated marine policy" (IMP) has gained momentum in the Portuguese policy agenda, as well as in international forums. In 2007, the EU adopted an IMP (the "Blue Paper") with a view to enhancing sustainable development of sea-related activities. The environmental pillar of this IMP, the Marine Strategy Framework Directive, was adopted in 2008 with the aim of achieving good environmental status for Europe's marine waters by 2020. It requires EU countries: *i)* to develop marine strategies to protect and preserve the marine environment and prevent marine pollution; *ii)* to adopt an ecosystem-based approach to the management of human activities; and *iii)* to ensure the integration of environmental concerns in the different policies that have an impact on the marine environment. The Directive also calls for improved co-ordination through Regional Seas Conventions.

Portugal was among the first European countries to establish an institutional framework for a maritime strategy. The Task Group for Maritime Affairs, created in 2005, developed a *National Ocean Strategy* approved by the Council of Ministers in 2006 (Ministry of National Defense, 2006). This strategy seeks to develop sea-related activities while protecting marine natural resources through an integrated maritime affairs policy. It includes three pillars: knowledge, spatial planning, and promotion and defense of national interests. In 2007, an Interministerial Commission for Maritime Affairs (ICMA)[3] was created as a first priority action to co-ordinate, monitor and assess the strategy. A stakeholder forum was launched in 2008. In the same year, a regulation provided for the development of maritime spatial planning, a key tool to set priorities among competing human activities and manage their impact on the marine environment. The Water Institute (INAG) is in charge of co-ordinating this work, as part of a multidisciplinary team of representatives of the ministries involved in the ICMA. As the INAG has jurisdiction over the Public Maritime Domain,[4] it is expected to ensure the coherence of spatial planning across the land-sea boundary. While the pace of implementation has varied with respect to the various measures defined by the ICMA, overall progress has been slow. Maritime spatial planning is still at an early stage, although it was projected to be completed by 2009. Expertise in maritime and coastal planning is scattered among various institutions, and synergies are difficult to create. Knowledge of the seabed has greatly improved in order to establish the outer limits of the Portuguese continental shelf, but better understanding the marine ecosystem requires considerable investment. Biodiversity concerns still need stronger integration in sectoral policies (*e.g.* fisheries, tourism) to ensure the conservation or recovery of the good environmental status of the marine environment. New sites have been added to the list of coastal and marine protected areas, but their effective management is hampered by Portugal's lack of human and financial resources (Chapter 6).

1.2. *Pollution from ships*

Over the last decade, *maritime transport* of goods and passengers has increased along the Portuguese coastline, together with the risk of shipping related pollution. Pressures

include incidental, operational and illegal discharges of oil and hazardous substances, air pollution, waste discharges, releases of toxic substances in anti-fouling paints, and the introduction of non-indigenous organisms in ballast water. Portugal has an obligation to comply with the International Maritime Organization (IMO) environmental standards for shipping. As a party to the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), it is also committed to prevent and eliminate marine pollution from land-based and offshore sources.

Responsibility for *maritime safety and environmental protection* lies with the Institute of Ports and Maritime Transport (IPTM), under the Ministry of Public Works, Transport and Communications, and the port authorities under the Ministry of Defense. The IPTM regulates and supervises port and maritime activities and is in charge of co-ordinating the related sectoral plan. Port authorities are responsible for providing reception facilities for waste (oily waste, garbage and sewage) generated by ships, as defined by the 1973/1978 MARPOL Convention for the Prevention of Pollution from Ships and the related European Directive (2000/59/EC). The environmental impacts of port activities in Portugal are not yet well-documented. Under the Strategic Guidelines for the Port and Maritime Sector (Ministry of Transport, 2006) port administrations were to have published sustainability reports as of 2008. In that year, Sines was the only port with ISO 14001 environmental management certification. Although Portugal is a party to the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, it has not ratified the 1996 Protocol to the Convention, which is more restrictive. Since 2005, Portugal has reported the dumping of increased amounts of dredged material at sea due to port extensions. In 2007, 11 permits were issued to dispose of 2.6 million tonnes of dredged sediment. Quality standards are used to classify material for disposal, ranging from Class 1 (may be disposed of in the aquatic medium or in locations exposed to erosion, or used to feed beaches without restrictive norms) to Class 5 (should not be dredged).

In 2008, Portugal ratified the 1997 Protocol to the *International Convention for the Prevention of Pollution from Ships*, which limits SO_x and NO_x emissions from ships and prohibits deliberate emissions of ozone-depleting substances. NO_x emissions from international shipping have increased significantly in the OSPAR maritime area, and levels are expected to continue to grow with shipping traffic (OSPAR, 2009a). Portugal has not signed the 2001 International Convention on the Control of Harmful Anti-fouling Systems on Ships, but Directive 2002/62/EC bans the application of organotin anti-fouling paints on EU boats as of 2003 and on any boats after 2008. The presence and effects of the anti-fouling agent TBT in the marine environment continue to cause concern on the Iberian coast (OSPAR, 2009b). A study conducted in the Ria de Aveiro estuary (northwest Portugal), which is exposed to pollution from ports, dockyards and marinas, suggests the EU ban may have led to decreased TBT pollution after 2003 although recent inputs and high pollution levels were still being recorded in 2005 (Sousa, *et al.*, 2007). Shipping traffic increases the risk of introducing alien species in ballast water. However, Portugal has not signed the 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments (not yet in force).

In 2009, out of 2 669 individual ship calls to its ports, Portugal performed 836 inspections, exceeding its 25% inspection effort commitment under the Paris Memorandum of Understanding on *Port State Control*. During 62% of inspections, one or more deficiencies were found while 3% led to ship detention. A new inspection regime

targeting ships at risk will start in 2011. The European Commission recently formally requested Portugal to implement the Directive on port state control (95/21/EC), particularly in regard to imposition of penalties on ships that fail to meet EU safety standards. An inspection visit revealed that in practice Portugal does not impose penalties. Portugal adhered to the 1990 International Convention on *Oil Pollution Preparedness, Response and Co-operation* (OPRC) only in 2006. Under the national contingency plan (*Plano Mar Limpo*, 1993), the competent authority for marine pollution response is the Maritime Authority (Portuguese Navy, Ministry of Defense). Depending on the seriousness of spills, they are handled by port authorities, local or regional maritime authorities, or the Director General for spills with national impacts. No major event has occurred in recent years, but pollution incidents are still a concern. In 2008, 45 cases (mainly illegal discharges from ships) were registered, twice as many as in the previous year. One hundred alerts were relayed by the satellite-based monitoring system for marine oil spill detection and surveillance in European waters. Port authorities and the Navy have their own equipment for oil pollution response, but overall capacity is rather limited.

In 2006, Portugal ratified the *2000 Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances* (OPRC-HNS 2000). So far, it has not experienced an incident of this type. Portugal has not made any risk assessment aimed at marine transport of HNS, and it has no specific capacity to deal with these substances (EMSA, 2008). Portugal hosts the headquarters of (and co-operates with) the European Maritime Safety Agency (EMSA), established in 2002 to reduce the risk of maritime accidents and marine pollution from ships in European waters. The EMSA can provide at-sea oil recovery services from vessels based on the Atlantic coast, one of which operates from Sines. The 1990 Lisbon Co-operative Agreement for the Protection of the Coasts and Waters of the North-East Atlantic against Pollution provided the framework for co-operation between Portugal, Spain, France, Morocco and the EU in case of pollution accidents. This agreement did not enter into force due to a territorial dispute between Spain and Morocco over the borders in Western Sahara. An Additional Protocol settling the issue was recently approved by the parties, making it possible for the Lisbon Agreement to take effect.

In line with the recommendations of the previous review, Portugal has ratified international agreements to enable greater *compensation in the event of an oil spill accident*[5] (OECD, 2001). In 2002, following the sinking of the oil tanker *Prestige* off the coast of Galicia, no oil was reported to have come ashore in Portugal (although some clean-up operations at sea were carried out by Portuguese authorities). Under the 1992 Civil Liability and Fund Conventions, the Portuguese government claimed EUR 4.3 million in compensation in the Maritime Court in Lisbon. In 2006, the 1992 Fund made a payment of EUR 328 488, corresponding to 15%[6] of the final assessment (EUR 2.2 million). The government subsequently withdrew its claim (IOPCF, 2010). Portugal has not ratified the 1996 International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea (not yet in force).

1.3. Fisheries

Portugal is the *largest consumer of fish and seafood in the EU*, at 57 kg per person per year. Most of the domestic supply of fishery products is imported. The fishing industry represents only 0.3% of GDP and 0.6%[7] of employment, but remains important to

communities in less-favoured coastal areas that depend almost exclusively on fisheries and related activities.

In the framework of the EU Common Fisheries Policy (CFP), Portuguese policy seeks to provide *economically, environmentally and socially sustainable conditions for the* harvesting *of common biological resources*. The management system includes the establishment of annual total allowable catch (TAC) and quotas for some species and fishing areas, the application of technical conservation measures, and limits on fishing effort. A licensing system controls access to the industry, with acquisition, construction or modification of vessels requiring prior authorisation. To regulate this access for sardine fisheries (the leading species in terms of volume), several management measures were adopted including a weekend ban. For 2010, a decree order set a catch limit of 55 000 tonnes, of which 55% is allocated to members of producer organisations. For North Atlantic fisheries, a system of individual quotas that are internally transferable is in place for a group of 13 long-distance vessels, subject to previous authorisation from the administration.

Between 2000 and 2006, EU funding amounting to about EUR 190 million[8] was allocated to support *structural measures for fisheries and aquaculture* (EUR 270 million, including national public co-financing). The leverage effect on public and private investment largely exceeded the amounts anticipated for the end of the programmed period.[9] Public funding was mainly dedicated to developing aquaculture (23%) and building new ships (17%), while vessel scrapping accounted for 10%. Total eligible public expenditure under the Operational Programme for 2007-13 is EUR 325 million, with EU assistance of EUR 246 million.

In 2009, the *Portuguese fishing fleet* (the fourth largest fleet in the EU 27) was made up of 8 600 vessels with a total tonnage of 104 018 GT (the fifth largest tonnage). Some 1 300 vessels were registered in the Autonomous Regions of the Azores and Madeira. Most vessels are non-trawlers less than 12 metres in length, but those above 100 GT account for more than two-thirds of total tonnage. Since 2000, the overall fleet size has been reduced by 20% in terms of number, 12% in terms of GT and 6% in terms of power. As in other EU countries, measures to limit fishing efforts are likely to have been offset by productivity gains due to renewal and modernization of the fleet.

Total catches increased by 26% between 2000 and 2008, then dropped by 15% in 2009. Sardine, mackerel and horse mackerel are the *most important fish species* landed. In 2009, 21% of landings were from foreign waters, mainly the northwest Atlantic (redfish and Greenland halibut), the northeast Atlantic (cod off Norway and Svalbard, sardine and horse mackerel off Spain, redfish off Greenland) and the central Atlantic (blue shark). Several shared stocks exploited by Portugal continue to decline, for example Norwegian lobster and angler fish. A ten-year recovery plan[10] for southern hake and Norwegian lobster stocks was implemented in 2006, but so far has not been effective; fish mortality has not decreased and the TAC has been exceeded during every year of the plan (ICES advice 2010).

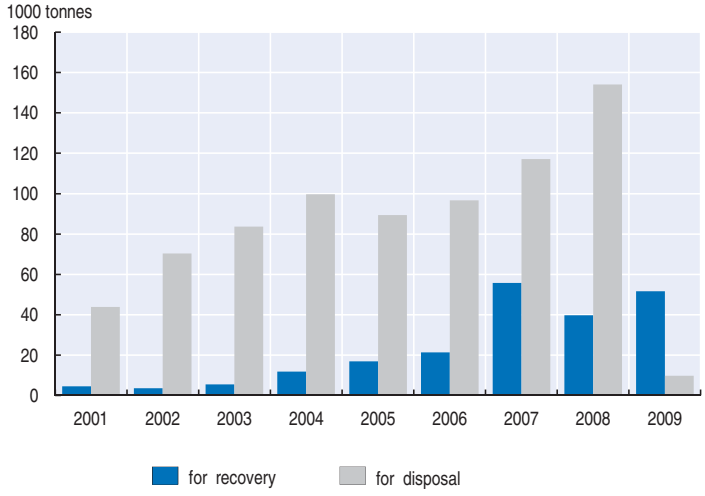
Compliance with CFP rules is a challenge for Portugal, as for other EU members. In 2006, it detected 1 352 serious infringements by fishers and other economic operators, 13% of the total number of such infringements in the EU (EC, 2008). Unauthorised fishing constituted 44% of all cases, followed by fishing without a license (19%) and use of prohibited fishing gear (14%). Of the overall number of infringements detected, 60% were sanctioned, in most cases through seizures or fines. Fishing licenses were rarely suspended. The rate of sanctions was lower than in other EU members, as were the average fines imposed. The

amount paid by the fisheries industry represented only 0.1% of fish landings. Since January 2010, new regulations have strengthened the EU's control and enforcement system.

2. Trade and environment

Portugal implements the EC Regulation on shipments of waste,[11] which applies the provisions of the Basel Convention concerning the control of *transboundary movements of hazardous waste* and the OECD Council Decision on the control of transboundary movements of waste destined for recovery operations [C(2001)107/Final]. Its exports of hazardous waste increased four-fold between 2001 and 2008, reaching nearly 200 000 tonnes in that year (Figure 4.1). Portugal was slow to develop its hazardous waste treatment capacity. Nearly ten years[12] after its commitment to self-sufficiency, two specialised facilities[13] started to operate in 2008. Although legal provisions encouraging hazardous waste treatment by co-incineration in cement kilns exist, this type of treatment has been limited due to public opposition. With the new facilities operating, the amount of hazardous waste shipped for disposal fell in 2009. Spain continued to be the primary destination of Portuguese waste exports, mainly for metals recovery and refining of used oil. In 2008, 31 000 tonnes of non-hazardous waste[14] (paper, metal, recovered plastics) was sent for recovery, mainly to Spain and China.

Figure 4.1. **Exports of hazardous waste, 2001-09**



Source: Portuguese Environment Agency.

StatLink http://dx.doi.org/10.1787/888932375680

Portugal actively collaborates with other European countries to *prevent illegal waste transport*. Within the framework of the EU Network for the Implementation and Enforcement of Environmental Law (IMPEL) cluster on transfrontier shipment of waste (TFS), it has performed an increasing number of inspections, some jointly conducted with Spain. Of 1 281 transport controls (inspections of containers, trucks, trains and documents) between October 2008 and June 2009, 68 concerned transboundary shipments of waste, of which 35% turned out to be in violation of the EC Regulation on shipments of waste (EC, 2009).

In recent years, there have been about 300 seizures of illegal wildlife products (mainly mammals, reptiles and birds) per year. In 2009, legislation was enacted to improve implementation of the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) and compliance with the related EU regulations. Under this law, fines ranging from EUR 500 to 2.5 million may be imposed depending on the severity of the offence. The Institute for Nature Conservation and Biodiversity (ICNB) was given formal responsibility for co-ordinating CITES enforcement, as part of a group including representatives of Customs, the Food and Safety Authority, the Veterinary Service, the General Public Prosecution Office, the Nature Protection Service of the National Guard, and regional administrative authorities. Since 2007, serious CITES offences have been subject to penal sanctions. Two criminal prosecutions for illegal trade in birds were mentioned in the 2007-08 Portuguese report to the Convention. Portugal co-operates with Brazil, Spain, the Netherlands and the United Kingdom to uncover illegal activities and investigate offences. However, CITES enforcement is often impeded by limited resources and expertise, while in practice, fines are often not imposed.

3. Bilateral and regional co-operation

Co-operation with Spain on *water* has progressed within the framework of the Convention on Co-operation for the Protection and Sustainable Use of Waters of the Portugal-Spain River Basins (*the Albufeira Convention*), which was signed in 1998. The Convention regulates use, quality and minimum flows and implements European law in the five main cross-border river basins. Information exchange has improved and a number of co-operative projects have been implemented, particularly in the Guadiana Basin. However, neither country met the EU Water Framework Directive's deadline for developing river basin management plans by 2009. In 2008, a new Protocol to this Convention was signed in order to define minimum quarterly and biannual flows from Spain to Portugal and maintain ecological flows during the year according to seasonal variability. The institutional setting has been improved with the creation of a joint permanent technical secretariat. An annex added to the Protocol specifies the exchange procedures for implementing strategic environmental assessment of cross-border effects. Portugal and Spain recently recognised the need to improve transparency between the two countries and to increase public participation in the development of management plans. Joint management of shared basins remains a challenge.

Portugal and Spain co-operate on *nature conservation and biodiversity*, with financial support from the EU. Further to the 19th Luso-Spanish Summit in 2003, a Memorandum of Understanding was signed between the countries' Ministries of Environment for co-operation on the Iberian lynx (*Lynx pardinus*) and the Imperial Eagle (*Aquila adalberti*). The Iberian lynx is classified as a critically endangered species by both countries and protected under the Bern Convention, CITES, and the EU Habitats and Species Directives. While the most recent information concerning this animal in the wild in Portugal dated from 2001, a radio tracking survey has shown that one adult male crossed the border from Spain to Portugal three times in 2010. Following a bilateral agreement in 2007 on a captive breeding programme (*ex situ*), 16 Iberian lynxes have been sent to the newly opened centre in the Algarve region, co-funded by the Algarve water company as a compensation measure for construction of the Odelouca dam. Notable success has been achieved in nature conservation with the Gerês-Xurés Transfrontier Park, which in 2009 was included in UNESCO's World Network of Biosphere Reserves (Box 4.1). Portugal and Spain are also

working jointly on the creation of the transboundary Tajo-Tejo International Park. The two countries co-operate on the protection of the *montados* ecosystem[15] through an Observatory for monitoring cork oak and holm oak stands created in 2003. In 2008, a joint research project ("Iberia Change") was launched to assess the potential impacts of climate change on Iberian biodiversity during the next 100 years. This project will help the two countries develop common strategies to mitigate these impacts.

Water, nature conservation, biodiversity conservation and climate change will continue to be priorities for co-operation between the two countries. Portugal is also looking at ways to share its experience in the areas of *water resources management, waste management* and *air* pollution with the Maghreb countries.

Water scarcity and drought, climate change, and biodiversity were the three environmental priorities of the Portugal's *EU Presidency* in the second half of 2007. In November 2006, a common agenda on biodiversity was agreed with Germany and Slovenia to ensure the consistency of the three countries' successive presidencies and prepare for the Conference of the Parties to the Convention on Biological Diversity (COP-9) in May 2008. Portugal has supported the development and adoption by the parties to the CBD of scientific criteria to identify priority areas for biodiversity conservation in marine areas beyond national jurisdictions. It has co-ordinated discussions at EU level regarding the Cartagena Protocol on Biosafety. Portugal has committed itself to, and laid the foundations for, European policy on water scarcity and drought. It was responsible for co-ordinating the EU position during the series of negotiations on climate change that culminated in the 2007 UN Climate Change Conference in Bali. The International Carbon Action Partnership (ICAP), a partnership of countries pursuing the development of carbon markets through implementation of cap and trade systems, was established in Lisbon in 2007.

Box 4.1. **Co-operation with Spain on nature conservation**

The Xurés-Gerês Transfrontier Park was created in 1997 through a co-operative agreement between Portugal's Institute for Biodiversity and Nature Conservation (ICNB) and the Xunta de Galicia (the executive branch of the Autonomous Community of Galicia, Spain), as part of broader co-operation by the Northern Portugal-Galicia Working Community. This park, which includes the Peneda-Geres National Park (northern Portugal) and the Baixa Limia-Serra do Xurés Nature Park (Galicia), covers areas included in the *Natura 2000* network. The region in which it is located is subject to oceanic and Mediterranean climatic influences. It contains rich forest and peatland ecosystems and a large number of endemic species.

Many cross-border activities are taking place, including the monitoring of important animal populations. A number of projects benefit from EU funding. For example, under the European territorial co-operation programme for cross-border co-operation between Spain and Portugal (POCTEP 2007-13) the Natura Xurés-Geres project (EUR 2 million, of which EUR 1.5 million is provided by the EU) seeks to establish a joint management plan for the transfrontier park, with a strong emphasis on monitoring and restoring species and habitats.

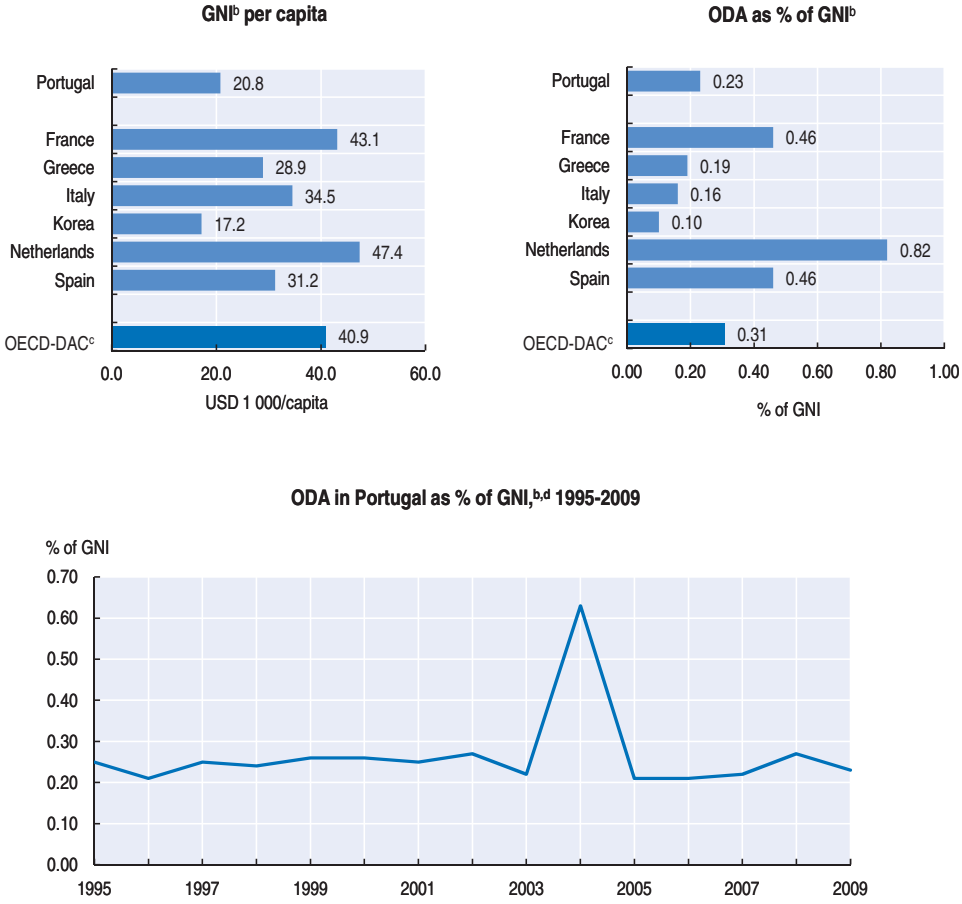
The park offers an excellent opportunity to promote tourism. Two airports (Porto and Vigo) provide easy access to tourists. A joint reservation and information centre is under development. The park was added to UNESCO's World Network of Biosphere Reserves in 2009. The reserve encompasses 11 municipalities in the two countries and covers 259 496 ha, of which three-quarters is in Portugal.

Source: Ministry of Environment and Spatial Planning.

4. Official development assistance

Between 2000 and 2009, Portugal's net *official development assistance* (ODA) decreased slightly, reaching USD 507 million in 2009 or 0.23% of its gross national income (GNI). During the last decade, aid volume fell in 2003 and 2009, following efforts to control the budget deficit, and surged in 2004 due to rescheduling of Angola's debt (Figure 4.2). Portugal did not meet the EU target of 0.33% ODA/GNI in 2006. The projection for 2010 (0.34%) is well below the minimum DAC-EU donor target of 0.51%. Although the government has reaffirmed its commitment to reach 0.7% ODA/GNI in 2015, in view of its current fiscal situation, this objective appears very challenging.

Figure 4.2. **Official development assistance, 2009[a]**



a) Preliminary data.
b) Gross national income in USD at current exchange rates.
c) Member countries of the OECD Development Assistance Committee.
d) 2004 data include the rescheduling of Angola's debt (USD 698 million or 0.5% of GNI).
Source: OECD (2010), *International Development Statistics Database.*

StatLink http://dx.doi.org/10.1787/888932375699

Consistent with the Strategic Vision for Portuguese Co-operation approved by the Council of Ministers in 2005, Portugal has concentrated its ODA in *Portuguese-speaking countries*: the five PALOPS (Cape Verde, Mozambique, Angola, Guinea-Bissau, and São Tomé and Principe), all located in sub-Saharan Africa, and Timor-Leste in south-east

Asia. However, these countries' overall share has decreased in recent years, absorbing 53% of total bilateral ODA in 2007-08 compared to 84% in 2002-06. The main reason for this change is the line of credit granted by Portugal to Morocco in 2008. With Cape Verde attaining the status of a lower-middle-income country in 2008, the share of aid to least developed countries (LDCs) in bilateral ODA has been cut by half since 2000. Multilateral ODA has increased significantly during the last decade in both share and volume. Contributions to the EC budget, the European Development Fund and the International Development Association make up the bulk of Portugal's support to multilateral agencies, which accounted for nearly half of total ODA in 2009.

Although sustainable development[16] is defined as a priority sector in the 2005 Strategic Vision, *environment is not considered a priority for Portugal's development assistance*. It has remained at around 1% of bilateral ODA since the beginning of the decade. Such assistance is mainly provided in the form of technical co-operation. A number of training programmes on environmental inspections and impact assessment have been conducted in the PALOPS. Examples of projects related to climate change include quantification of carbon stocks and sinks in the forests of Guinea-Bissau and development of a Climate and Sea Information System for sustainable development in Cape Verde, Guinea-Bissau, and São Tomé and Principe. During the period from 2001-08, Portugal contributed USD 15 million to the Global Environment Facility (GEF) and USD 8 million to the Montreal Protocol (OECD 2006, OECD DAC statistics).

*Assistance for water supply and sani*tation (including waste management) is also below the DAC average, at just above 1% of bilateral ODA in 2004-05. It decreased recently as infrastructure projects in the PALOPS were completed. Nonetheless, imputed multilateral contributions to the sector have notably increased, mainly through EU institutions (OECD/WWC 2008). Portugal has joined the EU Water Facility Initiative. Through conferences of environment ministers of Portuguese-speaking countries (2001, 2006 and 2008), Portugal is the lead country along with Brazil for co-operation on water management and Mozambique for climate change matters. Activities have mostly consisted of training courses, financing meetings and information exchange.

Portugal is currently *revising its co-operation strategy*, with a view to strengthening activities concerned with environment, particularly those related to climate change and renewable energies. A National Strategy for Adaptation to Climate Change was approved by the Council of Ministries in April 2010. It includes a specific objective on international co-operation encompassing stronger support for adaptation measures in those countries most vulnerable to climate change, particularly among the PALOPS. In 2010, in the framework of the Copenhagen Accord, Portugal pledged EUR 36 million in fast-start financing to developing countries for adaptation and mitigation activities over 2010-12.

Notes

1. Including the coastline of the Autonomous Regions of the Azores and Madeira.
2. A total of 1 727 408 km^2, comprising the Portuguese mainland (327 667 km^2) and the Autonomous Regions of the Azores and Madeira (953 633 km^2 and 446 108 km^2, respectively).
3. Including the Ministries of Foreign Affairs; National Defense; Internal Affairs; Environment and Spatial Planning; Economy, Innovation and Development; Agriculture, Rural Development and Fisheries; Public Works, Transport and Communications; Education, Science and Technology; and Culture. Also included are the Presidency Minister and representatives of the governments of the Autonomous Regions of the Azores and Madeira.

4. Extending from 50 metres inland to the outer limit of territorial waters.
5. The 1992 Protocol to amend the International Convention on Civil Liabilities for Oil Pollution Damage; the 1992 Protocol to amend the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage; the 2003 Protocol establishing an International Oil Pollution Compensation Supplementary Fund.
6. The maximum amount available for compensation under the 1992 Civil Liability Convention and the 1992 Fund Convention in respect of the Prestige incident is EUR 171.5 million. The figures submitted in May 2003 by the governments of Spain, France and Portugal indicated that the total amount of damage could be as high as EUR 1 billion. Under the 1992 Conventions, the Fund must treat all claimants equally. The Executive Committee therefore decided in May 2003 that the 1992 Fund's payments should, for the time being, be limited to 15% of the loss or damage actually suffered by the individual claimants as assessed by the 1992 Fund's experts.
7. Including employment in fishing, fish processing and aquaculture.
8. Through the Financial Instrument for Fisheries Guidance (FIFG) and the European Regional Development Fund (ERDF).
9. The EC allows the use of 2000-06 funds until June 2009.
10. Regulation (EC) 2166/2005.
11. (EC) 1013/2006 replaces (EC) 259/93.
12. The Industrial Waste Strategic Plan (PESGRI) was approved in 1999.
13. Centres for Integrated Recovery and Disposal of Hazardous Waste (CIRVER).
14. Shipment of non-hazardous waste to non-OECD countries for recovery is governed by Regulation (EC) 1013/2006, which stipulates that the European Commission shall send a written request to each non-OECD country seeking confirmation in writing that the waste may be exported from the EC for recovery in that country, and an indication of which control procedure, if any, would be followed in the country of destination.
15. An ecosystem that includes cork oak and holm oak forests where pigs feed.
16. Including education, health, rural development, environmental protection, and sustainable management of natural resources.

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PART II

Selected Issues

PART II

Chapter 5

Energy and Environment Integration

Portugal's climate and energy policies are closely intertwined. Portugal is highly dependent on imported fossil fuels, which has stimulated diversification of the energy mix. The increased use of both natural gas and renewable energy sources is the main reason for the decline in greenhouse gas emissions since 2005. The challenge will be to sustain this reduction once economic growth resumes, with a view to achieving Portugal's targets by 2020. Portugal has also actively supported energy efficiency and renewable sources, and it is poised to meet its ambitious renewable energy target. However, these policies should be assessed to ensure that they do not overlap with the EU Emissions Trading System, that energy prices reflect environmental costs, and that they are cost-effective. Portugal has introduced strong incentives to use more efficient vehicles and has developed ambitious plans to promote electric vehicles. Nonetheless, incentives to optimise decisions concerning car use could be further improved.

Assessment and recommendations

Portugal has made great strides in *mainstreaming environmental concerns, primarily air pollution and climate change, in its energy policy*. In the second half of the 2000s, Portugal streamlined and strengthened energy- and climate change-related goals and measures and began to make more extensive use of quantitative targets and indicators to track progress. It developed a comprehensive National Climate Change Programme (PNAC), a National Allocation Plan for Emission Allowances (PNALE) under the EU Emissions Trading System (EU ETS) and the Portuguese Carbon Fund (FPC) to meet its national Kyoto Protocol commitment. Portugal also reinforced inter-institutional co-ordination and monitoring of climate change actions, including the establishment of the Climate Change Commission's Executive Committee. Although Portugal's domestic policies largely reflect EU energy and climate policies, in some respects they are more ambitious and innovative.

Portugal is highly dependent on imported fossil fuels, which has stimulated *diversification of the energy mix*. The increased use of both natural gas and renewable energy sources is the main reason for a decoupling of energy supply and greenhouse gas (GHG) emissions from economic performance since 2005, as well as for a decrease in the energy, carbon and pollution intensities of the economy. Portugal's *GHG emissions* in 2008 were about 3% above its Kyoto Protocol target for 2008-12, which represents a significant decrease from the 2005 level. This target is expected to be achieved through national policies and measures as well as through the purchase of carbon credits on the international market. The challenge will be to sustain the recent emission decrease once economic growth resumes, with a view to achieving Portugal's targets to 2020. A government resolution, approved in late 2010, mandates the development of long-term, low-carbon national and sectoral roadmaps, and a national climate change plan to 2020.

Renewable energy accounts for a larger part of energy supply and electricity generation than in many other OECD countries. Portugal has established a more ambitious target for electricity from renewable sources than the EU target and is making good progress toward achieving it. Presently, wind and hydro are the most used renewable energy sources. Less than 50% of potential hydropower capacity is currently exploited; hydropower generation is set to increase following the construction of the new dams foreseen in the *National Programme for Dams with High Hydropower Potential*. These dams are also expected to accommodate further growth in wind generation by allowing for electricity storage. The Programme aims to contribute to meeting EU and domestic objectives on renewable energy generation and climate change, as well as to reducing Portugal's dependence on imported fossil fuels. Portugal should ensure that the dams' cumulative impacts are fully assessed, especially impacts on water flows and on ecosystems.

Support mechanisms for renewable energy use in Portugal are based on feed-in tariffs, tax benefits and investment subsidies. The *feed-in tariffs*, which are consistent with similar tariffs in other European countries, have largely been effective in stimulating development of renewable electricity sources, especially wind. The government has also supported the

creation of strategic R&D and industrial clusters for key technology development activities, including those related to wind, solar and wave power. However, the overall costs of Portugal's renewable support policy, and its interactions with the EU ETS, should be systematically assessed to ensure that the policy mix is cost effective. Further steps should be taken to reduce the impact of non-economic barriers (*e.g.* the lead time for permitting procedures) on the costs and effectiveness of renewable support policy. Grid capacity is a major obstacle to the further development of renewable electricity. Transparency and stakeholder dialogue will be important in building consensus on future developments.

Portugal set the ambitious goal of using 10% of *biofuels* to meet energy needs in transport by 2010, a decade ahead of the analogous EU target. While biofuel use has rapidly increased in the last few years, Portugal is still far from meeting this target. Using biofuels remains more expensive than other GHG abatement options and requires subsidies adding further pressures to the government budget. Portugal should continuously assess its biofuel policy, taking full account of impacts on land use, agricultural input use, water quality and biodiversity.

While much has been accomplished on the energy supply side, until recently less attention was given to *energy efficiency in the end-use sectors*. This is reflected in the still relatively high final energy intensity and rising total final consumption. Rapidly increasing electricity consumption in the residential and service sectors, including tourism, is a cause for concern. The 2008 National Energy Efficiency Action Plan (PNAEE) introduces some innovative practices, establishes intermediate and final targets for each measure, and identifies indicators of progress. However, it is unclear whether the budget required to implement the Plan will be available, and whether the measures selected will achieve the energy saving target at the least cost. Many PNAEE measures involve infrastructure investment and state subsidies in various forms, increasing pressure on Portugal's already strained public finances. On the other hand, several exemptions from excise duties and reduced VAT rates on electricity and fuel use could encourage wasteful consumption. The emission allowance allocation within the EU ETS has provided weak incentives to Portuguese industrial facilities, while requiring higher abatement efforts in the electricity sector. Consequently, there is scope to broaden demand-side management measures and to establish energy prices that better reflect environmental costs.

Transport is Portugal's largest energy end-use sector. Transport volumes and associated energy use and GHG emissions continued to increase during the review period, although at a much lower rate than in the 1990s. Additional growth in energy use is expected in the transport sector, as passenger and freight transport remains very dependent on road, and urban sprawl continues. The lack of adequate infrastructure, such as modal interchange platforms and integrated metropolitan mobility systems, limits possibilities for substantial modal shifts. Restructuring vehicle taxation on the basis of CO_2 emissions, and a ten-year vehicle scrapping programme, have created strong incentives to use more fuel-efficient vehicles. However, measures such as vehicle scrapping are expensive for the government and can encourage greater vehicle use, potentially offsetting gains in technical efficiency. Overall, rather limited efforts have been made on the demand side. Road tolls are not differentiated to take account of environmental impacts (*e.g.* by vehicle energy efficiency category). Tax rates on road fuels, while broadly in line with the European average, strongly favour diesel. There is potential to improve incentives to optimise car use (*e.g.* road pricing, parking fees and congestion charges). In 2009, Portugal launched the *Electric Mobility Plan* to encourage large-scale use of electric vehicles by 2020. It is one of the first countries to

develop and implement such an ambitious investment plan for electric vehicle use. The increase in the share of electric vehicles in the fleet and the achievement of the expected reduction in oil imports will largely depend on timely development of the electricity network and metering infrastructure, as well as on further growth of renewable electricity production.

Recommendations

- Extend the *monitoring of the climate and energy action plans* to the financial and economic costs of policy measures, with a view to assessing and improving overall cost-effectiveness.
- Strengthen efforts to ensure that *renewable energy projects are assessed in the framework of the country's energy strategy*, taking into account cumulative environmental impacts, alternative options, and the impacts of support measures on electricity tariffs; ensure the broadest possible public participation in environmental impact assessment procedures.
- Consider introducing a *renewable quota obligation system*, linked to tradable green certificates, for technologies that are close to being competitive with fossil fuels (such as on-shore wind or biomass); phase out all support schemes for renewable technologies as they become competitive with fossil fuels.
- Phase out *tax concessions for electricity and fuel use*, with a view to encouraging changes in consumption patterns and contributing to fiscal consolidation.
- Phase out the *vehicle scrapping programme* and introduce *better incentives for efficient private vehicle use* (*e.g.* road pricing and congestion charges); speed up implementation of plans for investment in urban public transport infrastructure and multimodal freight transport networks; and significantly upgrade integrated metropolitan mobility management, including integrated ticketing.
- Develop the *electricity network, metering infrastructure and smart grids* so as to accommodate the projected large-scale use of renewables, including in residential buildings, and of electric vehicles.
- Take further steps to *address rapidly increasing energy use in the service sector*, especially in tourism-related activities and housing (*e.g.* by extending to commercial businesses the energy audit and negotiated agreements currently used in the industrial sector).

1. Energy policy framework

The *main objectives of Portugal's energy policy* during the review period were (as they still are) securing energy supply, protecting the environment and maintaining economic competitiveness, with a view to reducing dependence on imported energy sources, particularly fossil fuels, and decreasing emissions of greenhouse gases (GHGs). Under the EU burden-sharing agreement to meet the EU Kyoto Protocol target, Portugal is committed to limit its GHG emissions to an average increase of 27% in 2008-12 compared with 1990 levels.

The *measures being used to pursue these objectives* are market liberalisation, promotion of the use of renewable energy sources and natural gas, and increased energy efficiency and innovation. For the most part, these measures have been at the core of Portugal's energy policy since the mid-1990s and of its climate change policy since the early 2000s. However,

they were insufficient to limit the rise in energy use and GHG emissions in the first half of the 2000s despite sluggish economic growth. This prompted the government to accelerate implementation in the second half of the decade, and to significantly strengthen objectives and the measures to be taken to achieve them. The need to comply with a number of energy related and climate related EU Directives during the same period, which also included the launch in 2005 of the EU Emissions Trading System (EU ETS) for greenhouse gas emissions, spurred action. Overall, EU energy and climate policies are pivotal in shaping Portugal's domestic policies, which are nevertheless more ambitious and innovative in some respects than those of the EU.

The operational goals of these policies, and the measures to achieve them, are set out in a number of *strategic documents* produced during the review period. With the release of the National Energy Strategy (2005, revised in 2010) and the revised National Climate Change Programme (2008), Portugal began to streamline and sometimes revise energy and climate change goals and measures found in some previous strategies and legislative acts.[1] A government resolution, approved in late 2010, mandates the development of long-term, low-carbon national and sectoral roadmaps, as well as a national climate change plan to 2020. The more recent strategic documents make extensive use of quantitative performance objectives and indicators to track progress. Targets and expectations associated with the main elements of Portugal's energy policies are shown in Table 5.1.

Institutional framework

As in many other countries, the *institutions in charge of developing and implementing energy policy* in Portugal include a line ministry (the Ministry of Economy, Innovation and Development), an implementation and support agency (the Agency for Energy), and the independent regulator for natural gas and electricity (the Energy Services Regulatory Authority). Portugal has taken an innovative approach to unbundling gas and electricity transport assets, with a unique entity (the National Energy Networks) in charge of grid planning, construction, operation and maintenance (IEA, 2009a). The Ministry of Public Works, Transport and Communications is responsible for most energy related and environmentally related transport initiatives. Municipalities play a strong role in implementing energy measures, especially those concerning energy efficiency and, more recently, micropower generation and transport (Box 5.1).

Portugal's attempts to *mainstream climate change issues in government policy* date to the late 1990s, with the establishment in 1998 of the Climate Change Commission (CAC). Representatives of several ministries take part in this Commission, which is co-ordinated by the Ministry for Environment and Spatial Planning (MAOT). The CAC prepared the National Strategy on Climate Change and the various versions of its implementation document, the National Climate Change Programme (PNAC). The main strategic document guiding Portugal towards meeting its Kyoto Protocol commitment, PNAC entrusts MAOT with the responsibility of leading and co-ordinating the development of programmes and actions to curb GHG emissions. In 2006, the government established the Executive Committee of the Climate Change Commission (CECAC), which has greatly helped strengthen the co-ordination and monitoring of climate change policies.[2] The CECAC is the designated national authority for the Kyoto Protocol flexibility mechanisms. It manages the Portuguese Carbon Fund and is responsible for international negotiations. The Portuguese Environment Agency assumes the role of UNFCCC co-focal point, is responsible for the annual GHG inventory report, and is the competent authority for the EU ETS.

Table 5.1. **Energy policy targets**

	Actual levels		Targets and expectations	
	2000	Latest data	Levels	References
Renewable energy ● Share of renewables in gross electricity consumption	*29.4%*	*44.5%* (2009)[a]	*45%* by 2010[b] *60%* by 2020	EU Renewable Electricity Directive (2001/77/EC); E4 Programme;[c] 2003 Portuguese Energy Policy Framework; 2010 New Energies Plan.
● Share of renewables in gross final energy consumption	..	*23.2%* (2008)	*31%* by 2020	EU Renewable Electricity Directive (2009/28/EC).
Biofuels ● Share of transport fuel (gasoline and diesel) consumption	..	*3.5%* (2009)	*10%* by 2010[d]	EU Biofuels Directive (2003/30/EC); PNAC;[e] PNALE II.[f]
Natural gas ● Electricity generation capacity	1152 MW	2 522 MW (2008)	5 360 MW by 2010	E4 Programme;[c] PNALE II.[f]
Demand-side management ● Average annual growth rate of electricity consumption	*5%* (1999-2000)	*2.2%* (2006-2007)	*3%* by 2010	E4 Programme.[c]
Cogeneration ● Electricity cogeneration capacity	1 050	1 518 MW (2009)	2 000 MW by 2010[g]	E4 Programme;[c] PNAC.[e]
Energy efficiency in the power sector ● Distribution losses as share of electricity supply	*9.1%*	*7.7%* (2009)	*8.6%* by 2010	E4 Programme;[c] PNAC.[e]
Total final energy consumption ● % savings vs. 2001-05 average	..	*1.8%* (2009)	*9.8%* by 2015	EU Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC); PNAEE.[h]
Greenhouse gas emissions without LULUCF ● Change from 1990	*+37.1%*	*+32.2%* (2008)	*+27%* in 2008-2012	Kyoto Protocol and EU burden-sharing agreement.
● Change from 2005 in non-ETS sectors	..	..	+1 in 2020	EU Effort Sharing Decision (406/2009/EC).

a) Corrected for a hydraulicity factor to take account of the variable hydrologic and climatic conditions that affect hydropower production. The uncorrected value is 35%.
b) Revised in 2008 from 39% by 2010 and supplemented by source-specific targets (power generation capacity goals). The target is based on the assumption that the same hydrologic and climatic conditions apply as in 1997 (the base year of Directive 2001/77/EC).
c) Energy Efficiency and Endogenous Energies Programme (2001).
d) Revised in 2008 from 5.75% by 2010.
e) National Climate Change Programme.
f) National allocation plans for the allocation of greenhouse gas emission allowances, 2008-12.
g) Revised in 2006 from an 18% share of power generation by 2010, as outlined in the E4 Programme.
h) National Energy Efficiency Action Plan (2008).
Source: OECD-IEA; UNFCCC; Eurostat; DGEG.

Box 5.1. **Energy management at local level: the case of Cascais**

In Cascais, a coastal town west of Lisbon, the municipal energy agency (a private, non-profit body created in 2007) has taken steps to promote rational energy use and the use of renewable energy sources, as well as to contribute to sustainable development and social cohesion.

Through the *Caça Watts project*, energy use audits are provided to local residents along with advice on how to save energy. Technicians visit customers to determine energy use patterns, excessive energy use points, and ways to reduce wasteful energy use and losses. They also conduct a solar thermal panel simulation to determine whether this equipment should be installed. These services are offered at a price that covers operational expenses, but that is much lower than if they were provided by the private sector.

Residents may benefit from guaranteed, discounted thermal solar technology (water heating systems). Local installers and sellers are engaged in partnerships to guarantee the quality of equipment and the transparency of procedures, ranging from feasibility studies to post-sales support. Customers are given a EUR 200 discount. Water is heated by approximately 2 600 hours of sun per year, among the highest levels in Europe.

Portugal has taken a wide-ranging set of actions to *implement the recommendations of the 2002 OECD Environmental Performance Review*, especially with respect to renewal of the vehicle fleet and the development of comprehensive plans addressing energy efficiency and climate change. However, further progress is needed on improving the modal split in passenger and freight transport and establishing appropriate energy price signals (Reference II).

2. Key energy trends

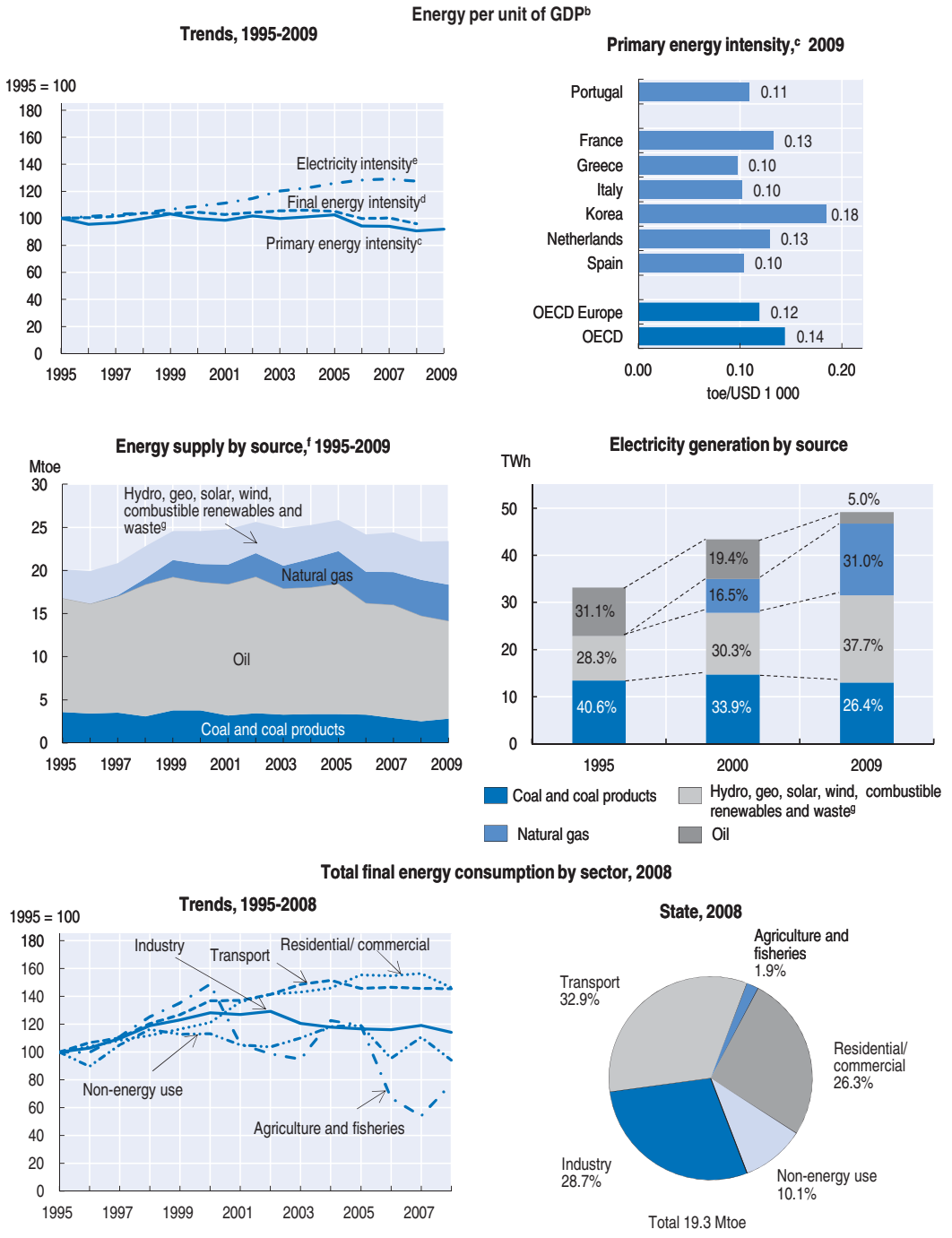
Portugal is *highly dependent on imported fossil fuels*, which has stimulated efforts to diversify and secure energy supply, especially with regard to encouraging the use of natural gas and renewable energy sources. Portugal is one of the few advanced countries where *primary energy production relies only on renewables* and has a long tradition of using them. Renewable energy sources averaged about 21% of primary energy supply and 38% of electricity generation in 2009 (Figure 5.1), far above the OECD Europe average (10.5% and 23%, respectively). Hydropower has long been the major domestic source of electricity. However, hydropower generation is subject to large annual variations linked to rainfall levels, which have caused major fluctuations in overall energy supply and carbon dioxide (CO_2) emissions. Investment in hydro capacity has slightly increased in recent years, whereas that in wind power has shown stronger growth, spurred by support schemes (Section 5). Overall, use of renewable energy sources has increased by 31.6% since 2000.

Portugal remains *dependent on coal and oil in the electricity generation sector*. The share of each in the electricity mix has decreased, owing to progressive use of natural gas and renewables, but remains higher than the OECD Europe average (Figure 5.1). Oil, mostly used for transport purposes, accounted for nearly half of Portugal's overall energy supply in 2009, compared to an average 35% in OECD Europe.

Total primary energy supply (TPES) fluctuated at around the same level throughout the review period as a result of unstable hydropower production and moderate economic growth in 2000-05. It was steadily coupled with economic performance until 2005, when it started to decrease despite a rebound in economic growth. Increased efficiency in the energy transformation sector (*e.g.* due to the installation of combined cycle gas thermoelectric plants) contributed to this decrease.[3] Consequently, *energy intensity*, as measured by TPES per unit of GDP, has begun to decline. This was after Portugal's energy intensity had grown between the 1990s and 2000s, in contrast to the trend observed in most other OECD countries. Nonetheless, delays in economic development and a relatively mild climate have kept Portugal's energy intensity lower than that in many other OECD economies when purchasing power parities are taken into account (Figure 5.1).

On the other hand, *total final consumption* (TFC) continued to increase, although at a lower annual rate than in the previous decade. It was 3.4% higher in 2007 than in 2000, before falling below the 2000 level in 2008 as a consequence of the economic recession. *Final energy intensity*, although decreasing since the mid-2000s (Figure 5.1), has remained above the OECD Europe average, reflecting the Portuguese economy's lower productivity and lower competitiveness and indicating that there is scope to improve energy efficiency in the end-use sectors.[4] Energy consumption by the service and, to a lesser extent, residential sectors dramatically increased between 2000 and 2007. Development of the tourism sector, including tourism housing (*e.g.* room and house rental), has significantly contributed to this growth. In particular, rapid increase in *electricity consumption* in these

Figure 5.1. **Energy[a] structure and intensities**



a) Excludes international marine and aviation bunkers.
b) GDP at 2005 prices and purchasing power parities.
c) Total primary energy supply per unit of GDP.
d) Total final consumption of energy per unit of GDP.
e) Electricity consumption per unit of GDP
f) Breakdown excludes electricity trade.
g) Includes non-renewable waste.
Source: OECD-IEA (2010), *Energy Balances of OECD Countries*; OECD (2010), *OECD Economic Outlook No. 87.*

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sectors (by about 38% between 2000 and 2007) and the consequent growth in electricity intensity are reasons for concern (Figure 5.1).[5] However, Portugal's energy end-use continues to be dominated by transport and industrial uses. The manufacturing sector includes energy intensive industries, primarily the cement industry. A slowdown in this sector (associated with that in construction) and in overall manufacturing production (Table 1.1), together with efficiency gains in some manufacturing sectors (*e.g.* pulp and paper, steel), have reduced overall industrial energy consumption.

Energy consumption by the transport sector, the vast majority of which is made up of road transport, greatly increased in the 1990s due to steady growth of vehicle fleets (in particular, with more powerful engines) and road travel volumes – reflecting GDP growth, higher family incomes and strong investment in road infrastructure. This growth slowed in the 2000s. Energy use by transport has been relatively stable since 2005 (Figure 5.1), as the total number of vehicles and distance travelled per vehicle have stagnated. Moreover, the average fuel efficiency of the vehicle fleet greatly improved during the review period while the shift from gasoline to diesel vehicles contributed to a stabilisation of CO_2 emissions (Section 4).[6]

3. Environmental impacts of the energy sector

Emissions of greenhouse gases and air pollutants from energy use

Portugal's GHG emissions (excluding removals from land use, land-use change and forestry, or LULUCF) were 78.4 Mt CO_2 eq in 2008, decreasing by around 3.5% during the review period but still more than 32% above the 1990 level (Table 5.2). Emissions in 2008 were about 3% above the assigned amount (76.39 Mt CO_2 eq per year) under the Kyoto Protocol. Furthermore, national GHG emission projections show total emissions increasing by 4 to 8% by 2020 (excluding LULUCF) due to increased emissions from energy production, industrial activities and transport (APA, 2010). However, these projections were elaborated

Table 5.2. **Greenhouse gas emissions, 1990, 2000, 2007 and 2008**

Mt CO_2 eq

Category	1990	2000	2007	2008	change, 1990 to 2007 (%)	change, 2000 to 2007 (%)	change, 2007 to 2008 (%)
Energy related emissions, *of which:*	40.38	59.44	56.98	55.48	*41.1*	*–4.1*	*–2.6*
Energy industries	16.01	21.08	19.80	19.21	*23.7*	*–6.1*	*–3.0*
Manufacturing and construction	9.26	12.03	10.77	10.22	*16.3*	*–10.5*	*–5.1*
Transport	10.11	19.18	19.59	19.29	*93.8*	*2.1*	*–1.5*
Other sectors, *of which*:	4.61	6.33	5.74	5.34	*24.5*	*–9.3*	*–7.0*
Commercial and institutional	0.75	2.21	2.44	1.88	*225.3*	*10.4*	*–23.0*
Residential	2.05	2.75	2.450	2.29	*19.5*	*–10.9*	*–6.5*
Fugitive emissions	0.28	0.73	1.01	1.33	*260.7*	*38.4*	*31.7*
Non-energy related emissions	18.91	21.87	22.89	22.9	*21.0*	*4.7*	*0.0*
LULUCF	4.47	–1.40	–2.64	–2.96	*–159.1*	*–88.6*	*12.1*
Total (excluding LULUCF)	**59.29**	**81.30**	**79.87**	**78.38**	***34.7***	***–1.8***	***–1.9***
Total (including LULUCF)	**63.76**	**79.90**	**77.23**	**75.42**	***21.1***	***–3.3***	***–2.3***

Source: Portugal's inventory submission to the UNFCCC (May 2010).

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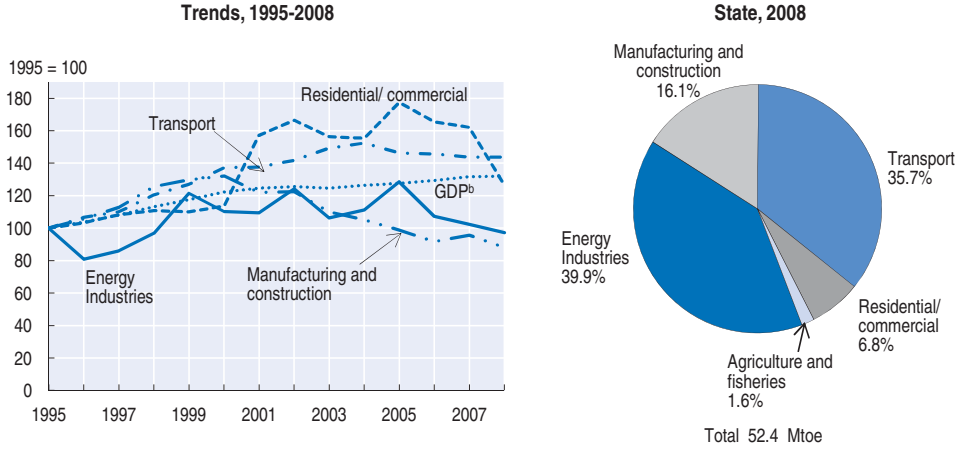
before the country entered the economic recession; the economy is expected to remain weak in the next few years, thereby bringing down energy demand and GHG emissions.

Energy related GHG emissions accounted for 70% of total emissions on average in 2000-08. CO_2 emissions made up the vast majority. Energy transformation and transport were the major sources of CO_2 emissions from fuel combustion, followed by the industrial sector (Figure 5.2). Energy industries were also responsible for about half the emissions of sulphur oxides (SO_x) and 18% of those of nitrogen oxides (NO_x) on average during the same period. Transport remains the major source of NO_x emissions (Table 3.1).

Figure 5.2. **CO_2 emissions by sector**[a]



a) Excludes international marine and aviation bunkers.
b) GDP at 2005 prices and purchasing power parities.
Source: OECD-IEA (2010), *CO_2 Emissions from Fuel Combustion; OECD (2010), OECD Economic Outlook No. 87.*

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Overall, *aggregate energy related CO_2 emissions* follow the trend of emissions from the energy industries, which in turn mostly depend on precipitation levels and hydropower generation. Historically, the Portuguese energy industries have complemented the fall in hydroelectric production with increased oil and coal burning generation, resulting in increased emissions of CO_2 and air pollutants in drier years. The increasingly-wide use of natural gas and renewable sources (especially wind) for electricity generation, improvements in fuel quality, efficiency improvements in the energy transformation sector, and more electricity imports were the main drivers of the reduction in SO_x and NO_x emissions from this sector since the early 2000s, and in GHG emissions in recent years, even under poor hydraulic conditions (Chapter 3).[7] Nonetheless, Portugal's SO_x and NO_x emission intensities remain above the OECD Europe average (Figure 3.1). Despite improvements in fuel quality, Portugal is still among the OECD countries with the highest SO_x and NO_x emissions per unit of TPES due to the larger share of oil in the fuel mix for both electricity generation and transport purposes.[8]

Energy related CO_2 emissions, after steadily increasing until the late 1990s, showed large annual variations and remained firmly coupled to economic activity in the first half of the 2000s (Figure 5.2). Emissions have decreased since 2005: in 2007 they were below the 2000 level in all end-use sectors except transport and services (Table 5.2). The economic crisis brought emissions from all sectors, and especially from the commercial sector, down

further in 2008. Emissions have largely followed the respective energy consumption patterns, with the sole exception of the residential sector (Figure 5.1 and Section 2). In that sector, CO_2 emissions were reduced despite increased energy use. This was due to decreased oil consumption in favour of natural gas and electricity, whereas oil still represents a large share of the fuel mix in the commercial and public sectors.

In 2005, the *carbon intensity* of the Portuguese economy – as measured by CO_2 emissions (from fuel combustion) per unit of GDP – and CO_2 emissions per capita, started to decline more consistently. CO_2 emissions per unit of TPES had already been declining since the early 2000s, mainly due to changes in the fuel mix. However, the carbon intensity of TPES remained slightly above the OECD Europe level until very recently. CO_2 emissions per capita and per unit of GDP have remained below their respective OECD Europe averages, and Portugal has shown greater reductions in carbon intensities since 2000 than many other European countries (Figure 5.3). This reflects delays in economic development and slower progress on reducing energy and carbon intensities in Portugal than in OECD Europe during the previous decade, as well as strengthened policy efforts in more recent years.

Other environmental impacts of energy transformation and distribution

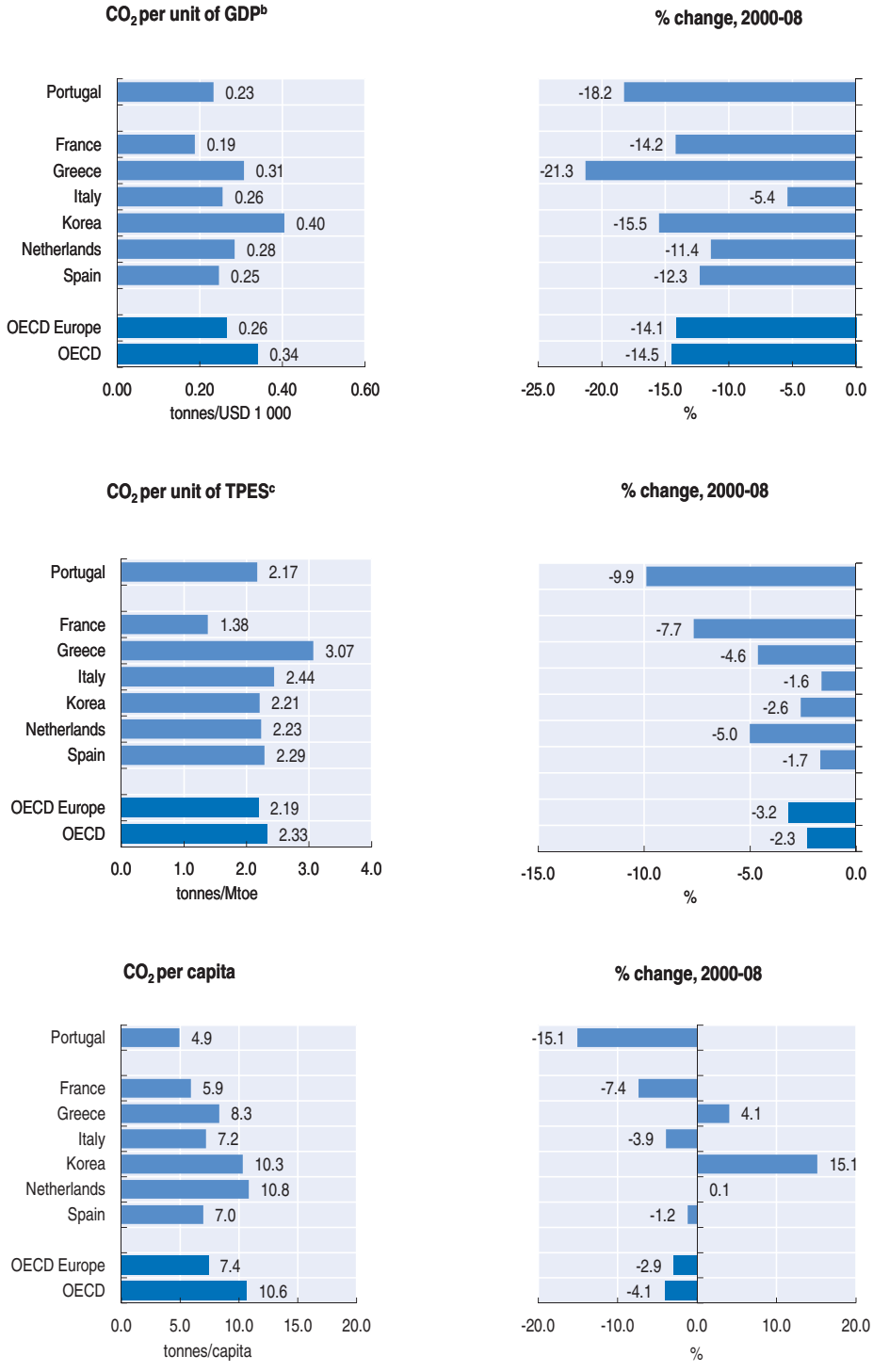
Energy generation, transport and distribution create several *pressures and impacts on land-use and the environment,* such as land fragmentation, damage to habitats and species, fuel spills, visual intrusion (*e.g.* power lines and wind farms), use of toxic materials in infrastructure, and the health effects of electromagnetic fields. Electric and gas utilities in Portugal have implemented several measures to mitigate these impacts (Box 5.2).

Some 12% of transmission grid facilities and 22% of the grid are in *protected areas*. The habitats of 46 bird species, many endangered or vulnerable (*e.g.* the Bonelli's eagle and the bustard), are affected by the electricity grid. One of the main threats to these species is flying into power lines. The development of the grid and the dismantling of old infrastructures are the main sources of *waste generation from electricity transmission* (REN, 2008). The majority of this waste is recovered, although only a negligible share is reused, suggesting that there is scope to improve management of waste with reuse potential. The expected further development of the grid will require careful planning, thorough environmental assessments, and the adoption of advanced practices to minimise environmental pressures and landscape disruption.

In addition to atmospheric emissions of GHGs and pollutants, thermal power plants discharge *pollutants (such as heavy metals) to water*. Overall, these discharges have remained within prescribed limits during the review period. However, water used to cool thermal power plants and discharged to superficial waters with a temperature differential can negatively affect aquatic ecosystems and fauna (Antunes *et al.*, 2003).

All crude oil imports pass through the ports of Porto and Sines. Sines is Portugal's major oil terminal, the site of its largest refinery and coal-fired power plant, and its only liquefied natural gas (LNG) terminal. The *Sines refinery and power plant* are the country's largest stationary sources of emissions of GHGs, SO_x, NO_x, NMVOCs and particulate matter. *Pressures on the marine environment* stem from the risk of oil spills, as well as from the intake of seawater for LNG regasification and subsequent discharges to the sea of cooler water and of chemical compounds.[9]

Figure 5.3. CO_2 emission intensities, 2008



a) Includes CO_2 emissions from energy use only; excludes international marine and aviation bunkers; sectoral approach.
b) At 2005 prices and purchasing power parities.
c) Total primary energy supply.
Source: OECD-IEA (2010), *CO_2 Emissions from Fuel Combustion*; OECD (2010), *OECD Economic Outlook No. 87*; OECD-IEA (2010), *Energy Balances of OECD Countries*.

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Box 5.2. **Environmental protection efforts in the electricity sector**

In 2002, the independent Energy Service Regulatory Authority (ERSE) introduced the Environmental Performance Promotion Plans (PPDAs). Initially limited to electricity transmission and distribution operators, these plans were extended to the gas sector in 2008. The PPDAs are voluntary plans submitted to the ERSE by the regulated companies. Each plan identifies the measures the operator intends to put in place to minimise the environmental impacts of its activities in the following three-year period. Operators report annually on the implementation of their plans. Related information is made public, so as to increase transparency and submit the plans to public scrutiny.

The costs of the PPDAs are included in the regulated tariff for the use of the transport or distribution infrastructure (paid by all customers). For each implementation period, the ERSE sets the maximum amount available for the PPDAs, which represents a cap on the overall environmental investment costs that can be passed on to consumers. The ERSE selects and approves the PPDAs on the basis of their economic costs and environmental benefits. For evaluating PPDAs in the electricity sector, ERSE is assisted by an evaluation panel including representatives of environmental NGOs, customers and electric companies. Only costs approved by the ERSE can be included in the tariff. This mechanism aims to prevent regulated energy companies, which face a price cap, from cutting investments in environmental protection to reduce their overall costs.

Between 2002 and 2008, the PPDAs cost about EUR 45 million in total. The impact on the tariff was negligible: about 0.5% of the monthly electricity bill for domestic customers (EUR 0.1/month). In the 2009-11 period, EUR 22 million has been approved in the electricity sector and EUR 1 million in the gas sector (ERSE, 2010).

Several actions have been implemented, including: environmental assessment studies, implementation of environmental management systems, environmental training, management of waste (*e.g.* light bulbs), noise minimisation, abatement of SF_6 emissions, landscape integration of power lines and other transmission facilities, and birdlife protection. Landscape integration (*e.g.* use of traditional building materials and local vegetation, underground cables) and birdlife protection (*e.g.* installation of anti-collision and anti-perching devices, installation of nesting platforms for white storks, compensation measures for the Bonelli's eagle) make up for the majority of the approved environmental costs of the electric utilities.

A system of electricity labelling (*Rotulagem de Energia Eléctrica*) was launched in 2008. Electricity suppliers in the retail market must provide in the bill and/or via internet information on the fuel mix from which the electricity they provide is generated and related environmental impacts in terms of CO_2, SO_2 and NO_x emissions per GWh and radioactive waste. Customers can easily compare the data of different suppliers using the ERSE website and freely switch supplier.

Dams used to produce hydropower can have significant adverse impacts on downstream water ecosystems and cause biodiversity loss, especially in the case of freshwater fish species. Impoundment of water in a dam exacerbates water pollution from agriculture and domestic and industrial wastewater (Chapter 3). In the early 2000s, all reservoirs were classified as at least moderately polluted. River Douro reservoirs were the most problematic. Overall, installation of hydropower facilities has required the flooding of nearly 22 000 ha, or about 1.9 ha per GWh of electricity generated (in a year of average hydropower productivity), although with great variability among plants. Wind power is

generally more land intensive, with an average 7.8 ha per GWh of electricity produced (Antunes *et al.*, 2003). This is in addition to noise, potential landscape disruption and disturbance of bird species. However, unlike large hydropower plants, the land occupied by wind farms can be used for other purposes and their environmental impacts are more easily reversible.

4. Energy efficiency

Energy efficiency policy in the late 1990s and the first half of the 2000s was driven by energy security concerns and focussed on the supply side, *i.e.* improving the efficiency of the energy transformation sector and promoting the switch to natural gas. This policy has had some positive effects since 2005, with a relative decoupling of TPES from economic performance and a resulting decrease in the energy and carbon intensities of the economy (Sections 2 and 3). However, until recently less attention has been paid to the demand side and energy efficiency in the end-use sectors, as reflected by still relatively high final energy intensity.

Portugal implemented various energy efficiency policy packages during the review period. The current policy framework is provided by the 2008 *National Energy Efficiency Action Plan* (PNAEE) or "Portugal Efficiency 2015".[10] Prior to the PNAEE, there were few quantified energy efficiency goals (Table 5.1). The Plan aims to reduce overall final energy consumption by 9.8% by 2015 (compared with the 2001-05 average), with measures in all sectors not covered by the EU ETS, *i.e.* transport, part of industry, residential and services, and the public sector. The greatest savings are expected in the transport and industry sectors. Sectoral measures are complemented by initiatives that address consumer awareness, taxation, and incentives and financing. Table 5.3 lists measures that are projected to yield the largest energy savings. While many measures have existed throughout the review period, the PNAEE is particularly useful in aggregating these measures, setting intermediate and final targets for each, and identifying indicators of progress consistent with the respective energy savings objectives. The Plan is consistent with the EU 20-20-20 targets[11] and with the National Climate Change Programme (PNAC) and National Allocation Plan for Emission Allowances (PNALE).

It is estimated that the *PNAEE will cost the government EUR 30 million per year*, excluding tax incentives. Half this cost is covered by the differential between the increased (+5%) electricity tariff paid by high-consuming domestic customers and the discounted tariff (–2.5%) paid by low-consuming ones. The remainder is covered by national and EU funds, and by the proceeds of the taxes on electricity consumption and on low energy efficiency lighting.[12] Most of these resources are channelled to low-interest loans for investments in energy efficiency measures, "efficiency cheques" and the bonus for renewal of electric appliances (Section 4.2).

4.1. *Promoting energy efficiency in the industrial sector*

The main measure aimed at curbing energy use and CO_2 emissions from industrial facilities not participating in the EU ETS is the *Management System of Intensive Energy Consumption* (SGCIE) (Table 5.3). Launched in 2008, the SGCIE broadens the scope of the 1986 Regulation for Energy Management to include a larger number of installations, thereby increasing potential energy savings. It is aimed primarily at mid-sized and large industrial facilities.[13] As of 2007, facilities included in the SGCIE accounted for 34% of TFC by industry, implying that the majority of industrial energy consumption (and GHG emissions) is

Table 5.3. **Targets and results of the National Energy Efficiency Action Plan**

	Expected savings (ktoe)[a]	Performance indicators	Base year	2015	Cumulative savings 2009 (ktoe)
Transport	706				85
Reduction in vehicle tax for acquisition of light goods vehicles	231 (33%)	% of light goods vehicles in the vehicle fleet 10 years or older	*37%*	*30%*	38
Inclusion of the CO_2 emission factor in vehicle taxes		Average CO_2 emissions of new vehicles sold	143g/km	110g/km	
Voluntary agreements with manufacturers to produce lower CO_2-emitting cars[b]		% of vehicles with low emissions (< 110 gr/ Km) in the vehicle fleet	..	*10%*	
Urban mobility: light Mondego subway; establish Lisbon and Porto Metropolitan Transport Authorities; urban mobility plans for district capitals	130 (18%)	% of modal shift (passenger-km) from individual to public transport	..	*5%*	15
Energy Efficiency System in Transport: Regulation for Energy Management; voluntary agreements for 5% reduction in transport energy intensity	77 (11%)	Energy intensity of goods transport	591 toe/gross value added	550 toe/gross value added	–
Motorways of the sea	61 (8.5%)	% of international goods traffic shifted from road to maritime transport		*20%*	–
Logistics Portugal: national network of 11 multimodal platforms, 2 air cargo centres and a single logistics connection (sea-port-land)	52 (7.5%)	% of road traffic in multimodal platforms (tonne-km)		*75%*	–
Residential and services sectors	484				92
Non-residential buildings certification	104	Number of certifications		22 705	11.6
	(21.5%)	% of buildings in class B or higher		*30%*	
Residential buildings certification	94	Number of certifications		475 159	11
	(19.5%)	% of buildings in class B or higher		*7%*	
Lamp replacement: phasing-out of incandescent light bulbs through programmes to finance CFLs, thermal accumulators and other equipment	75 (15.5%)	% of compact fluorescent lamps (CFLs)		*61%*	33.2
		Number of replaced lamps		5 million	
Replacement of large electric appliances (Renova +): scrapping subsidies (EUR 50-100) for energy-efficient white goods and low-interest loans	62 (13%)	% of refrigerators, freezers and washing machines in classes A, A+ and A++		*37%, 25%, 25%*	17.7
		Number of replaced appliances		1 million	
Small-scale electricity production and solar thermal	49 (10%)	Installed microgeneration capacity		165 MW	2
		Installed solar thermal capacity		1 385 million m^2	12.8
Industry	536				137
Management System of Intensive Energy Consumption (SGCIE), with fiscal incentives	536 *(100%)*	Energy intensity of industry	339	332	137
Public sector					4
Energy certification of public buildings	49 (33%)	% of buildings in class B or higher		*20%*	1.5
Total	**1 792**				**325**

a) Share of savings from the sector in parenthesis.
b) EU auto-oil programme.
Source: ADENE (2010).

subject to some form of regulation (either the EU ETS or the SGCIE). The SGCIE imposes binding energy audits: participating companies are obliged to implement multi-annual energy rationalisation plans to reduce their energy consumption and/or intensity, and to report periodically on their progress. Under ministerial approval, these plans provide facility operators with exemptions from the oil and energy tax (ISP), as well as the possibility to apply for investment subsidies. The amount of both financial support and the tax exemption must be returned in cases of non-compliance with targets and measures, in

addition to the payment of a fine proportionate to the unrealised energy savings (ADENE, 2009).

While facilities must meet a target agreed with the government, they have an information advantage concerning their actual energy consumption and realistic potential savings. In this context, *exemption from the ISP* can be counterproductive since it reduces installations' incentive to save on energy consumption and/or go beyond the target. Such exemption is not justified by the need to avoid double fuel taxation, as is the case for participants in the EU ETS which also benefit from ISP exemption but bear the cost of the CO_2 allowance (Section 8).

4.2. Energy efficiency of the residential, commercial and public sectors

The *Portuguese residential sector* is noted for a large number of second homes, which tend to be less efficient than primary residences, and high use of biomass (wood) as fuel. *Domestic electricity consumption* grew rapidly between 2000 and 2007 (by 38%). However, there are indications that overall household energy efficiency improved during the period, most likely due to construction of new buildings (which tend to be more efficient than older ones), the use of LPG and natural gas for water and space heating, and policy measures such as appliance labelling and thermal efficiency regulations (ADENE, 2009).

Several building efficiency measures existed throughout the 2000s and sometimes earlier.[14] The PNAEE streamlines these various measures. The largest contributors to achieving the savings goal in the building sector are: energy certification of buildings; a programme for phasing-out incandescent lamps; subsidies to support the purchase of energy-efficient electric appliances against scrapping of old ones;[15] and incentives to install solar thermal and micro-generation from renewables in the residential sector (Table 5.3).

An *energy certification system for buildings* became mandatory in 2007, together with strengthened building regulations. The system was gradually extended to all residential buildings in the sale and resale market, from 2009. It requires all buildings on the market to be in an optimal energy class (*i.e.* greater than or equal to B-, in a range from A+ to G). Among the novelties of the certification and building codes is the obligation to install solar collectors for heating. The Portuguese real estate market has rapidly accepted the certification practice, and at least 75% of new housing stock is classified as energy-efficient (IEA, 2009a). However, new and renovated buildings make up only a small share of the entire building stock. The rental market, including tourism related housing, is not covered by the certification system. Upgrading the existing stock that does not enter the sale market remains a challenge.[16] In addition, smart metering of domestic electricity consumption is crucial to the success of measures promoting energy efficiency and wider use of renewables in residential buildings (Section 5). The government should ensure that the planned investment in metering and networks ("InnovGrid") is made.[17] It should also consider developing measures similar to the SGCIE (Section 4.1) to address small consumers in the service sector, especially tourism related businesses (*e.g.* hotels, restaurants), which experienced the fastest growth in energy consumption during the review period.

The PNAEE also includes *innovative fiscal and financial measures*, such as a tax on energy-inefficient light bulbs, the "efficiency cheque" and an additional 10% bonus on tax credits for a mortgage used to purchase a highly efficient home. "Efficiency cheques" are an

attractive incentive for final customers, aimed at sustained energy savings over time. Representing 10 to 20% of the annual electricity bill, they are given to customers who can demonstrate that they have sustained a certain level of electricity savings (10 or 20%, respectively) in the previous two years. The tax on light bulbs is paid by manufacturers and retailers. Revenues are used to finance the PNAEE measures and the Portuguese Carbon Fund. Other fiscal and financial measures include: an increase in the tax rate on heating fuels, already included in the PNAC (to be fully implemented in 2014); an accelerated depreciation regime for investments in energy-efficient equipment and vehicles in the services (and industry) sectors; subsidised low-interest loans for investments in energy efficiency measures; and income tax deductions for investments in solar collectors and renewable microgeneration systems.

4.3. *Reducing final electricity consumption*

In addition to the PNAEE measures, in 2007 the energy regulator (ERSE) launched the *Consumption Efficiency Promotion Plans* (PPECs) to promote efficient electricity consumption in the industry, agriculture, services and residential sectors. Each PPEC supports actions proposed by suppliers, grid operators, and business and consumer associations. The proposed measures are selected using a tendering procedure and ranked on the basis of a cost-benefit analysis that takes into account environmental benefits (including abatement of GHG emissions) and cost savings for the electricity sector. The cost of these measures is partly financed through the tariff system, up to a predetermined maximum total amount. Measures concerning efficient lighting and cooling have been those most used so far.

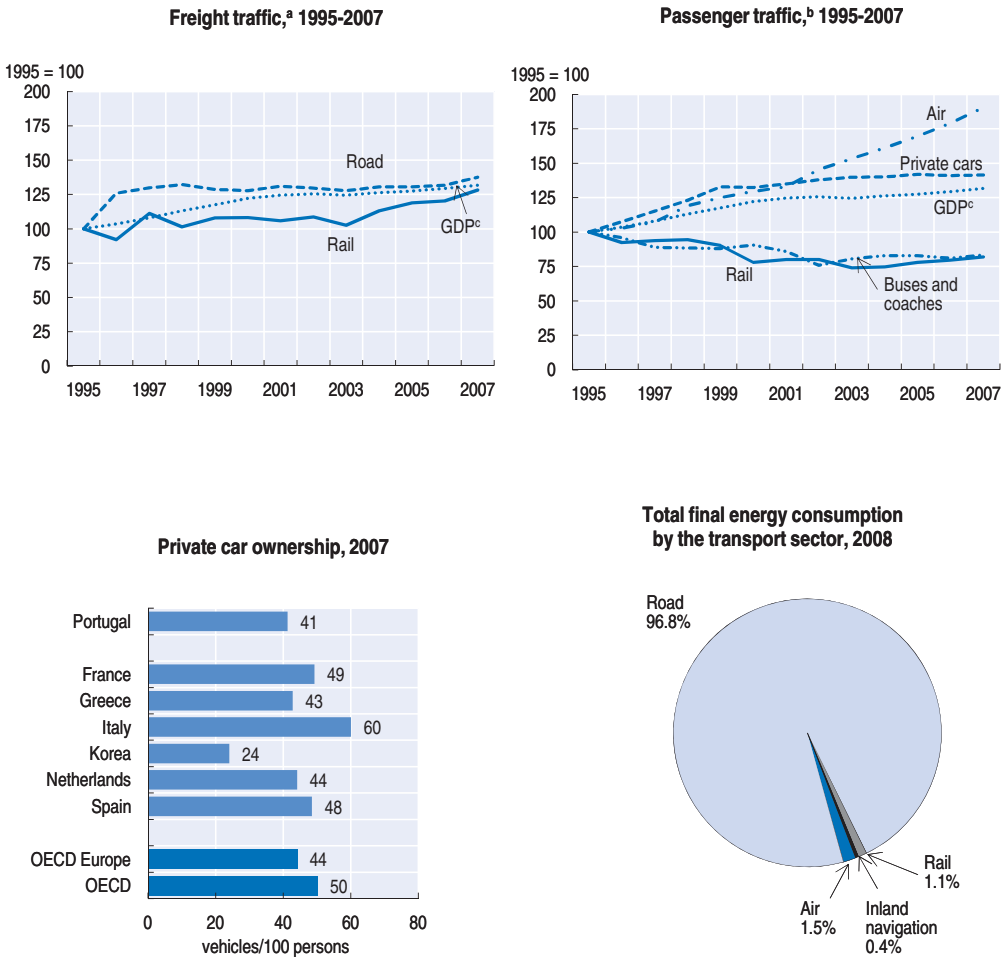
The PPECs approved in 2007-10 are expected to deliver *savings* of about 4 400 GWh (1.6 Mt CO_2) until 2030, at a *cumulative cost* of EUR 33 million, to be included in the electricity tariff and paid by final customers. The *benefits* are estimated to be ten times higher than the costs (EUR 328 million). The impact on the tariff has been negligible: about 0.2% of the monthly electricity bill for domestic customers (ERSE, 2010).

The *average cost of electricity savings* has been decreasing since the system was launched, owing to the competitive selection process. The PPEC 2009-10 is expected to deliver electricity savings at an average cost, included in the tariff, of EUR 5.4/MWh. Not only is this lower than the unitary expected benefits (about EUR 90/MWh), but it is also lower than the extra cost of electricity generation from renewables (EUR 28/MWh) (ERSE, 2009).[18] Similarly, the PPEC 2009-10 allows CO_2 savings to be achieved at a unitary cost of EUR 14.6/t CO_2 compared to EUR 20t/CO_2, which is the value of CO_2 emissions considered in the feed-in tariff for renewables. This raises the issue of the cost-effectiveness of Portugal's mix of measures to promote energy efficiency and the use of renewable sources.

4.4. *Reducing energy consumption in the transport sector*

Transport is the largest energy end-use sector (Figure 5.1). Its expected further growth makes it the greatest challenge to Portugal's energy efficiency and climate change policies. During the review period, air passenger transport experienced the fastest growth. Road transport is the dominant transport mode: cars account for about 85% of passenger travel and heavy good vehicles for 95% of freight haulage, above the respective EU averages. As a result, road transport makes up 97% of energy use by the sector (Figure 5.4) and is the focus of many of Portugal's energy and environmental measures.

Figure 5.4. **Transport sector**



a) Index of relative change since 1995 based on values expressed in tonne-kilometres.
b) Index of relative change since 1995 based on values expressed in passenger-kilometres.
c) GDP at 2005 prices and purchasing power parities.
Source: OECD, Environment Directorate; OECD-IEA (2010), *Energy Balances of OECD Countries.*

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During the review period, *road freight and passenger transport* volumes (in tonne-km and passenger-km) increased less than in the 1990s and less than had been expected by the Portuguese government, as did the entire transport sector's energy use and CO_2 emissions (Figures 5.1 and 5.4). This was mainly due to sluggish economic growth in the 2000s, but also to a moderate shift in passenger travel from private vehicles to light rail and subway systems in the large urban areas of Lisbon and Porto, whose transport infrastructures have been greatly upgraded (APA, 2008). However, in a scenario in which oil prices are lower, it is possible that rapid growth could recommence: Portugal's motorisation rate (cars per inhabitant) is still below the OECD average, suggesting that use of passenger cars is likely to grow further unless policies are effective in reversing the trend. Moreover, passenger and freight transport is still heavily dependent on road, and the infrastructure needed to significantly increase use of alternative transport modes (*e.g.* public transport, combined freight shipping) is still inadequate and needs to be developed. Some planned

infrastructure development projects, such as high-speed railway lines, have been postponed due to public budget constraints.

Several measures addressed *transport efficiency* throughout the 2000s, focussing on the renewal of vehicle fleets, including the public fleet, improvement of urban mobility (including public transport), and promotion of a shift in freight transport from road to maritime and rail modes. The PNAEE relies on this same combination of measures to deliver the greatest energy savings in the transport sector (Table 5.3).

A *vehicle scrapping incentive* (in the form of a tax rebate) has been in place since 2000. It was restricted to cars with low CO_2 emissions levels in 2009-10 and has been restricted to electric vehicles as of 2011. Vehicle scrapping incentives (and other types of subsidisation of environment-friendly vehicles) are generally less efficient than charges based on pollution by road transport and represent government expenditure. These incentives encourage the use of private vehicles, which can potentially offset technical efficiency gains, as shown by increases in the passenger vehicle transport volume and motorisation rate, which have remained steadily coupled. Experience in other countries shows that increased purchases of more fuel-efficient vehicles generally result from increasing fuel prices (Schweinfurth, 2009). The Portuguese ten-year car scrapping programme has now exhausted its stimulus potential. It caused buyers to advance their purchasing decisions, as shown by the stabilisation of car sales since 2003 and a slight increase in the average age of the fleet (APA, 2008). Indeed, vehicle scrapping programmes are generally intended to be temporary and used as counter-cyclical measures in vehicle-producing countries.

Vehicle taxation was reformed in 2007 to partially link taxation to CO_2 emissions, thereby creating a fiscal incentive in favour of more energy-efficient vehicles.[19] The rates were also redesigned so as to shift part of the tax burden from the registration tax to the annual tax. This, in principle, would provide stronger incentives to change cars, since the user is confronted with the tax annually rather than only at the moment of purchase.[20] However, in the Portuguese case, such an incentive may be undermined since owners of cars bought before the reform remain subject to the old and lower annual tax. The tax rates are higher for diesel vehicles in order to address their higher impacts on local air pollution; diesel cars with particle emissions equal or above 0.005 g/km are also subject to an extra tax (EUR 250). While the vehicle taxation reform is a step forward, taxes on purchase and ownership of vehicles are less efficient than fuel taxes and road charges in reducing emissions since they are more distant from actual vehicle use. Moreover, in the Portuguese case they provide very, and possibly disproportionately, strong incentives to abate CO_2 emissions compared to the incentives faced in other sectors of the economy (*e.g.* in those participating in the EU ETS): the tax rates rapidly increase with the level of CO_2 emissions/km and are much higher in Portugal than in other OECD countries (OECD, 2009b).

These fiscal measures have succeeded in *renewing the car fleet*, confirming that car purchasers are sensitive to fiscal stimuli. The average CO_2 emission rate of new cars (average CO_2 emissions per km) sold in Portugal has greatly declined, at 135 g/km in 2009 compared to the EU average of 154 g/km. The share of diesel-powered cars in the fleet has also increased, stimulated by the fuel price differential (Section 8).[21] On the other hand, the average age of heavy goods vehicles is relatively high (nearly 12 years) (APA, 2008).

In 2009, after the PNAEE was published, the *Electric Mobility Plan* was introduced to promote large-scale use of electric vehicles by 2020 (Box 5.3). Its main goals are to reduce Portugal's dependence on oil imports, most of which are used for transport, and to increase

the efficiency of the electric system. Benefits are also expected through reducing GHG emissions. This plan is closely linked to the government's strategy to develop renewable electricity, especially from hydro and wind power (Section 5). Since Portugal's electricity generation mix largely relies on fossil fuels and the economy's electricity intensity has been steadily increasing (Figure 5.1), the objectives of the plan will be achieved only if electric vehicles replace (rather than supplementing) the fuel-powered fleet; the renewable energy targets are met; and there is timely development of the network and metering infrastructure (smart grids). The government's investment in the system is considerable, in terms of both infrastructure development and various types of subsidies to promote the purchase of electric vehicles and renewable electricity generation. The challenge is to further mobilise the private sector, electric utilities and R&D institutions.

Overall, Portugal's energy efficiency policy in regard to the transport sector has accepted the Portuguese attitude to driving (a "car culture" common to many other countries). The Electric Mobility Plan and CO_2-based vehicle taxes, while commendable, are examples of this underlying thinking. Measures have focussed on promoting the uptake of cleaner vehicles and providing substantial government subsidies; *rather limited efforts have been made on the demand side*, i.e. to provide better incentives to change private behaviour and drive more energy-efficiently. For instance, road toll revenue per kilometre of network is relatively low, and road tolls are not differentiated by location or by vehicle fuel or environmental efficiency.[22] Only in 2010-11, was road pricing extended to a number of motorways, which were not priced due to social or regional development concerns.[23] There is scope to increase cost-effectiveness by linking more directly taxation or pricing to vehicle use. While the scope for increasing fuel taxation seems rather limited (Section 8), there are opportunities to either introduce or raise user charges (such as road tolls and congestion charges) and differentiate them by vehicle environmental performance, route and time of travel (OECD, 2010). Such instruments, together with the development of public transport, especially in urban areas, would help reduce the distances travelled. This would supplement the benefits of reduced emissions from a single vehicle with those arising from having fewer cars on the roads, including reduced congestion and travel time.

4.5. *Strengths and weaknesses of Portugal's energy efficiency policy*

Portugal has made steady progress in implementing the *IEA Energy Efficiency Recommendations*, especially in the building sector (IEA, 2009b).[24] The PNAEE constitutes a clear and coherent strategy, with well-designed and realistic measures and some innovative practices, such as the efficiency cheque and differentiated electricity tariffs for low and high consuming customers. It provides a sound governance structure, with clear identification of responsibilities and mechanisms for monitoring, follow-up and funding (EC, 2009). However, it is unclear how the measures were selected, the associated performance targets established or the budget allocated. Furthermore, the PNAEE does not include the activities of the energy regulator, the PPEC (Section 4.3), which potentially overlap. For instance, both the PNAEE and the PPEC include initiatives for energy-efficient lighting in the residential sector, so that there is potential duplication of efforts and costs.

One-fifth of the PNAEE had been completed in 2009, with cumulative savings of 325 ktoe realised in 2008-09 (ADENE, 2010). Portugal will be on track to meet its objectives if implementation continues at this rate. However, the highest savings were obtained in the industrial sector and might well be due to the economic crisis, as shown by the sector's increased energy intensity. Actions in the public sector and on transport infrastructure

Box 5.3. **Electric Mobility: electric vehicles, renewable energy and smart grids**

The Programme for Electric Mobility in Portugal, launched in 2009, aims to develop a network of an estimated 180 000 electric vehicles and 25 000 charging points by 2020 (ADENE, 2009). Portugal is one of the first countries to develop and implement a national project to promote large-scale use of electric vehicles. Following an agreement with Renault and Nissan, it determined that one-fifth of its public fleet vehicle purchases should meet a zero-emissions standard from 2011. Meeting this target would require the purchase of 1 500 electric vehicles in 2011. Renault-Nissan started deliveries in early 2011, making Portugal the first European country to be supplied with electric vehicles from this alliance. In 2012, Nissan and Renault were to mass-market electric vehicles globally.

The Mobi-E network, part of the Electric Mobility Programme, will create a car charging system in partnership with vehicle manufacturers, municipalities, utilities and business investors. A pilot infrastructure system will be established through a business model involving an electric mobility retailer (selling electricity for the electric vehicle), a charging network operator (operating access points and making a charging service available through various retailers), a services operator, an electricity distribution network and a managing entity. Recharging facilities will also be installed at a large number of gasoline stations. Twenty-five municipalities are involved in the pilot infrastructure network.

Tax incentives and public procurement, as well as local small-scale projects, are also being used to support deployment. Electric vehicles will be exempt from vehicle taxation; the state will provide an income tax benefit for private buyers of about EUR 800 per vehicle and introduce tax incentives for companies that convert to electric-powered vehicles. These benefits will start in late 2010 and continue for at least five years. Additional measures, such as reduced parking rates, preferential access and financing subsidies, are being studied.

Portugal expects to reduce its final energy consumption and oil imports: final energy consumption will be decreased by 2% (or 5 million barrels of oil) through replacing 10% of oil consumption from transport with electricity if most of this electricity is generated from renewable sources (MEID, 2010). The efficiency of the electric system is also expected to be improved, as the vehicles will absorb excess night electricity generation while charging. In the post-2020 phase the development of a vehicle-to-grid system is foreseen, which will also allow vehicles to send electricity to the grid at peak times. Portugal estimates savings of 0.5 Mtoe/year of primary energy supply, 4 Mt CO_2 eq/year of GHG emissions and EUR 2 billion/year on oil imports by 2020. It is estimated that the development of industrial clusters linked to the electric vehicles and the network will create about 3 000 new jobs and EUR 500 million of value added.

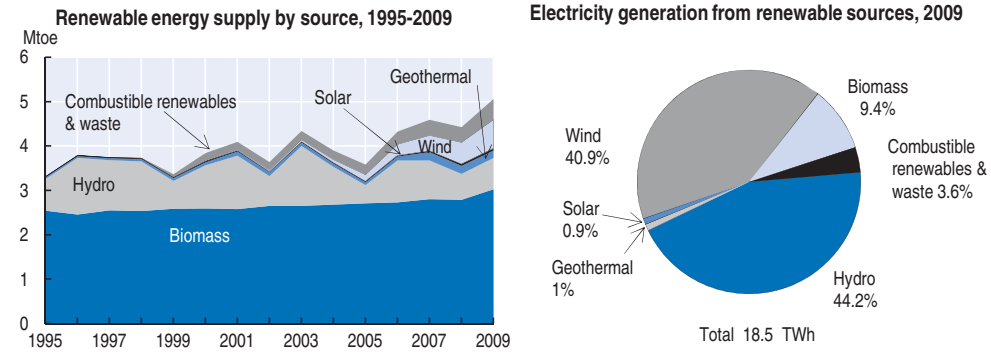
have lagged behind (Table 5.3). The savings were achieved at an overall cost to the government budget of about EUR 325 million in two years, of which one-third in tax incentives. This is much higher than the amount initially foreseen. Part of the package for stimulating economic recovery was also allocated to the Plan (EUR 82 million in 2009). Therefore, it is unclear whether the entire budget necessary to implement the Plan will be available, or whether the selected measures are those that will achieve the projected energy savings at the least cost. As indicated in the previous sections, many PNAEE measures involve state subsidies in various forms, which increases pressure on Portugal's already strained public finances (Chapter 2). Overall, this suggests that estimates of the amount of savings expected may be too optimistic without other interventions, especially

further demand-side management, *i.e.* incentives to change private behaviour. One way in which the government's energy efficiency goals across all sectors could be accelerated is to encourage greater private sector participation.

5. Renewable energy

Portugal uses *renewable energy* in four principal forms: *i)* a source of energy for electrical power generation; *ii)* biomass (wood) in the industrial and residential sectors; *iii)* biodiesel transport fuels; and *iv)* solar thermal and geothermal in the residential and commercial sectors. With the exception of hydropower, renewable energy supply in all categories grew during the review period, by 32% overall (Figure 5.5). The most remarkable growth was in wind power, solar photovoltaic power (although from a small base) and biodiesel transport fuels, which only appeared in the mix in 2006.

Figure 5.5. **Renewable energy**



Source: OECD-IEA (2010), *Energy Balances of OECD Countries.*

StatLink http://dx.doi.org/10.1787/888932375794

5.1. *Renewables for electricity generation*

With 38% of *electricity production from renewable sources* in 2009, Portugal has one of the highest shares of renewables in electricity generation among OECD countries. In compliance with the EU Renewable Electricity Directive (2001/77/EC), it established a target of 39% of gross electricity consumption to be met by renewable energy, including large hydropower, by 2010. This target translated into source-specific targets for installed capacity, which, however, can diminish investor flexibility and raise overall costs. These goals were revised several times during the review period to be significantly more ambitious (Table 5.4). The target is now 45% of gross electricity consumption to be produced from renewables by 2010, and 60% by 2020 (MEID, 2010). Portugal is very close to meeting its 2010 target (Table 5.1).

Wind and hydro resources, which are considered the most valuable energy resources in Portugal, are expected to make the most significant contribution to meeting these targets. *Hydropower* has traditionally played a significant role in Portugal's power mix, although, until recently, installation of new generation capacity has not kept pace with the rapid growth in electricity demand. Portugal estimates that less than half its hydropower potential is currently exploited, compared to 95% in countries such as France, Germany and Italy.

Table 5.4. **Electrical capacity from renewable energy sources**

	Installed capacity (MW)		Target capacity (MW)	
	2000	2010[a]	2010[b]	2020[c]
Wind	84	3841	5 100[d]	8 500
Biomass[e]	8	106	250	250
Biogas	1	24	100	
Municipal waste	88	88		
Geothermal	18	30		250[f]
Wave	0	4.2	250	
Solar photovoltaic	1	120	150	1 500
Microgeneration (rooftop solar thermal)	0	0.2	165[g]	
Small hydropower < 10 MW	266	334		
Large hydropower > 10 MW	4 038	4 497	5 575	8 600[h]
Total	**4 504**	**9044**	**11 590**	**19 100**

a) September 2010.
b) National Energy Strategy, approved in 2005.
c) National Energy Strategy, revised in 2010 (or New Energies Plan, ENE 2020).
d) By 2012.
e) Without cogeneration.
f) Includes hydrogen, and wave.
g) Installation of 50 000 units by 2015.
h) Includes small hydropower.
Source: DGEG.

Box 5.4. **National Programme of Dams with High Hydroelectric Potential**

The National Programme of Dams with High Hydroelectric Potential (PNBEPH) primarily aims to increase Portugal's hydropower capacity and to exploit 70% of its hydropower potential (compared to the current 46%). If coupled with other initiatives for energy production from renewable sources, especially wind, and combined with the measures set out in the PNAEE, the PNBEPH is expected to achieve the 2020 target for renewable electricity, thereby contributing to reduce Portugal dependence on imported fuels and GHG emissions. The Programme was subject to socio-economic evaluation and strategic environmental assessment. It was approved in December 2007 and ten hydroelectric power plant locations were selected, out of the 25 potential sites initially identified. The ten plants are to be located in the basins of the Rivers Douro, Vouga, Mondego and Tejo.

According to the PNBEPH, the ten sites chosen have a potential capacity of approximately 1 100 MW and an estimated yearly gross electricity output of 1 630 GWh. Seven sites, or 807 MW of capacity, will allow electricity storage to help stabilise the electricity system (pumped storage). Public tenders to allocate the privately funded construction and operation of the ten selected hydroelectric sites were launched. As of the end of 2009, eight sites were attributed, one had already passed the environmental impact assessment stage, and the others were awaiting environmental assessment results (IEA, 2009a).

To meet its hydropower capacity goals, the government has proposed licensing *new dams* (Box 5.4). These dams are controversial, especially because of their potential impacts on water flows and on ecosystems (Section 3). Some parties have claimed that not enough consideration was given to alternative strategic options in the assessment procedures, the need for dams in terms of broader energy policy, or impacts on river basins (along with river basin plans) and the ecosystems where they might be located. Environmental NGOs

have asserted that classifying the dams as projects of national interest (PINs) limited the effectiveness of the consultation process. On the other hand, it is argued by some that the dams will provide additional benefits in terms of flood and drought control and fire risk mitigation.

The government has established an ambitious target of 5 100 MW of *wind capacity* by 2012. If this target is met, Portugal will have the highest levels of wind energy penetration in the world. The forecasted high levels of wind energy penetration will require careful design and management of the Portuguese electricity system. Substantial electricity storage capabilities will be required to avoid wasting the excess wind power produced when demand is low. Storage on this scale requires hydro pumped storage. Excess wind (or other intermittent) power is used to pump water up into reservoirs, where it is stored until electricity demand is such that the water can be released through the dams' turbines to regenerate a portion of the power.

A significant contribution to achieving the targets is also expected from *photovoltaic*, especially with the construction of the Moura photovoltaic power plant, the largest in Europe. The target for *biomass* capacity is to be met primarily through thermoelectric plants using forest biomass, in order to achieve multiple objectives: *i)* to increase the share of electricity generated from renewable sources; *ii)* to create economic clusters based on forest-waste collection, timber and paper-pulp industries; and *iii)* to contribute to keeping forests clear and reduce the risk of forest fires. In addition, a 5 to 10% share of coal should be replaced by biomass and waste in the coal-fired power plants at Pego and Sines as from 2010. Portugal has also been investing in *wave energy*, with the aim of combining electricity generation with the development of innovative industrial activities linked to this technology. In 2008, the world's first commercial wave power plant began to generate electricity in a maritime area off Aguçadoura in the central part of Portugal's western coast.

The large investment in renewable energies (about EUR 8 billion in 2005-12) is expected to create nearly 10 000 direct *jobs in the sector* (Chapter 2). Portugal aims to develop industrial activities linked to the renewable technology sector and to become a net exporter of such technologies, especially wind and solar power. An industrial cluster linked to wind power has been developed, with a budget of EUR 1 750 million, involving the creation of approximately 1 700 direct and 4 500 indirect jobs (IEA, 2009a).

Support mechanisms

In Portugal, as in many other countries, *support mechanisms for renewable energy sources* are based on feed-in tariff systems, tax benefits and small levels of investment subsidies. The principal instrument for promoting renewable electricity in Portugal is the so-called "special regime production" (PRE), whereby renewable-based power benefits from a feed-in tariff, *i.e.* an above-market price at which electricity is sold to the grid. The tariffs are based on a complex formula that takes account of the technology, environmental aspects and the inflation rate.[25] They include minimum and maximum levels, according to the variations of the load on the grid, and are guaranteed for a fixed period (typically 15 years) and up to a certain production threshold (IEA, 2009a). Large hydropower plants are excluded from this support mechanism. A simplified licensing procedure and favourable tariffs apply to microgeneration capacity from renewables at household level, provided that a solar thermal collector is also installed.

Portugal's *feed-in tariffs* are consistent with similar tariffs in other EU countries (Table 5.5) and are sufficiently attractive to bring to market all the capacity that the government opens for tender. The overall support framework provides sufficient stability for investors (EC, 2009b). With the exception of the rates for solar photovoltaic power, the feed-in tariffs have declined during the review period to take account of the decreasing cost of generation from different technologies (especially wind) and improved investment

Table 5.5. **Feed-in tariffs for electricity from renewable energy sources in selected OECD countries, 2010**

	Wind (on-shore)	Wind (off-shore)	Solar photovoltaic	Biomass	Hydro
			EUR/MWh		
Portugal	74	74	310-450	100-110	75
Austria	73	73	290-460	60-160	–
Denmark	78	78	–	39	–
France	82	310-580	–	125	60
Germany	50-90	130-150	290-550	80-120	40-130
Greece	70-90	70-90	550	70-80	70-80
Italy	300	300	360-440	200-300	220
Netherlands	118	186	459-583	115-177	73-125
Spain	73	73	320-340	107-158	77

Source: Europe's Energy Portal (December, 2010).

profitability. The use of competitive tendering to license renewable-sources power plants makes it possible to keep actual compensation levels below the feed-in tariff rates, thereby helping to reduce system costs (IEA, 2009a). In 2010, support to renewable electricity accounted for about 16% of domestic customers' monthly electric bill (ERSE, 2010).

The transmission system operator issues *Renewable Energy Certificate System (RECS)* certificates, which guarantee the origin of energy generated from renewable sources. Currently, only hydropower plants are registered under the RECS. The RECS certificates can be voluntary traded. The last-resort electricity suppliers (mainly EDP Serviço Universal) are obliged to purchase all the electricity from renewables (and cogeneration plants) produced under the PRE for resale to end-customers. Portugal should consider shifting from such a system to one in which all suppliers must source a quota of their output from renewables (IEA, 2009a). Such a quota obligation system could be linked to tradable green certificates, based on RECS, for low-cost gap technologies (such as on-shore wind or biomass), while leaving the feed-in tariff support to less mature technologies which need very stable low-risk incentives. Since carbon incentives to the energy transformation sector are provided by means of the EU ETS (Section 8), the support schemes should be phased out for technologies that are competitive with fossil fuels, as Portugal correctly did in the case of geothermal and large hydropower.

Performance and challenges

The last changes to the feed-in tariff system (in 2005 and 2007), with the revision of the rates and the introduction of time limits and tendering procedures, have been largely effective in stimulating the development of renewable electricity, especially from wind. Electricity capacity installed under the PRE increased from less than 10% of total generation capacity in 2000 to over 30% in 2009. Portugal is among the countries with the

highest *support effectiveness* (together with Germany, Spain and Denmark). All these countries have used feed-in tariffs to encourage wind power deployment, with average remuneration levels (USD 0.09-0.11/kWh) lower than those in countries applying quota obligation systems with tradable green certificates (USD 0.13-0.17/kWh) (IEA, 2008). Wind farm developers in Portugal pay 2.5% of the revenue from electricity production to the municipality where the plants are located. This has tended to facilitate installations since it implies a steady flow of additional income to the municipality. However, local opposition has been growing, especially in regard to visual impacts.

Overall, Portugal's support policy seems to reflect the five fundamental *principles of renewable policy design*.[26] However, the overall costs of Portugal's renewable support policy and its interactions with the EU ETS should be considered. Support to renewables could encourage innovation and diffusion of emissions-reducing technologies, beyond the incentives provided by the EU ETS. However, OECD analysis shows that when a carbon price exists, applying other policy tools, including renewable or biofuel subsidies and targets, can lead to overlap and undermine cost-effectiveness (OECD, 2009c).

Further steps to reduce the impact of *non-economic barriers* on the effectiveness and costs of Portugal's renewable support policy should be considered. Despite simplification of administrative and permitting procedures, these are still seen as the main obstacle to development of the renewable energy sector (IEA, 2009a). The lead time for grid connections is among the highest in the EU (EC, 2009b). Grid capacity is a major impediment to the development of renewable electricity, especially when it is considered that hydro and wind resources are greater in the interior and the northern part of the country while the consuming areas are mostly on the west coast.

Transparency and stakeholder dialogue in regard to the handling of renewable electricity's rapid expansion is important for future growth and continued public acceptance. In particular, environmental assessments of new projects should be subject to the broadest possible public consultations. Development projects should be assessed in the framework of the broader energy strategy, taking into account impacts on electricity tariffs (which include the cost of the feed-in tariffs) and cumulative environmental impacts where the plants are located. The full costs of the accelerated pace of renewables growth should be passed on to electricity consumers in an equitable manner.

5.2. Biofuels for transport purposes

In 2004, Portugal set its *target for biofuels consumption* as a percentage of gasoline and diesel consumption according to the EU Biofuels Directive (2003/30/EC). In 2008, it established a 10% target to be achieved by 2010, which was much more ambitious than the EU target (5.75%). This seems to be primarily linked to the objective of reducing imports of oil for transport purposes. Biodiesel was introduced on the Portuguese market in 2006 and its use rapidly increased; in 2009, its share in transport fuels was 3.5%. Portugal has five industrial biodiesel production plants. However, despite this recent growth the country is not likely to meet its target.

The target is being pursued through *subsidies for investment and excise duty exemptions for biofuels*. Biofuels produced by authorised small producers and local government entities are fully exempt from the oil and energy tax (ISP).[27] Partial exemptions of up to EUR 0.28/litre (compared to the diesel excise duty of EUR 0.36/litre) apply to biofuels from other sources up to a certain amount per producer, depending on the location of production and the

feedstock used. Total or partial exemption is allowed for a maximum of six years to pure or blended biofuels. In 2009, a 6% biodiesel blend became mandatory and this was increased to 10% in 2010. The government concluded agreements for the use of biodiesel in public passenger and freight transport fleets, with the percentage of biodiesel to be incorporated in fossil fuels at above 10%. All these measures are also intended to foster the development of agricultural energy products and the associated transformation industry.

While the tax exemption is easy to implement, it is expensive for the government in terms of revenues foregone, with a high risk of overcompensation. The *mix of tax exemptions and blending obligations* guarantees achievement of the target and gives certainty to investors and industry (through the obligation), while compensating for the extra costs of biofuels and leaving the final price at the pump unchanged (through the tax exemption) (EC, 2009b). However, in Portugal (as in other countries) the cost of biofuel promotion critically depends on commodity prices (crude oil and agricultural products) and remains higher than other GHG abatement technologies in other sectors. Experience in OECD countries shows that biofuel production costs per unit of fuel energy are significantly above those for fossil fuels, implying that biofuel production will remain dependent on subsidisation, especially in European countries (OECD, 2008). Portugal's biofuel policy has been effective in fostering the use of biofuels, although the effects on GHG emission reductions and fossil fuel substitution appear to be modest as in many other countries (OECD, 2008). Portugal should take into consideration the overall costs of such ambitious targets, including the impacts on land use, agricultural input use, water quality and biodiversity in Portugal itself and in biofuel producing countries.[28]

6. Research and development

Several Portuguese energy policy goals involve the development and deployment of new technologies, for instance to meet the ambitious targets for the use of renewable energies. However, Portugal's *public energy R&D budget* is small when compared to that of other OECD countries (IEA, 2009). Funding from EU research programmes plays a significant role. Public funding has fluctuated significantly since 2000.[29] A high level of fluctuations, combined with lack of predictability and the size of the Portuguese investment in R&D, make it difficult for R&D actors to plan and carry out high-quality research.

Renewable technologies and nuclear power are the dominant *energy research areas*, accounting for 42% and 34% of the total government energy R&D budget, respectively, in 2008. Budget allocations reflect policy priorities for renewable energies: in 2008, half the renewable R&D budget was allocated to wind power technologies, 22% to solar (especially for heating), 20% to bioenergy (including transport biofuels) and 6% to wave. Energy efficiency, which accounted for about 7% of the total government energy R&D budget, has traditionally focussed on industrial technologies. More recently, attention has been given to energy-efficient technologies for transport, carbon capture and storage, and hydrogen production. There are expectations that R&D funding for energy efficiency will increase in the near term (IEA, 2009).

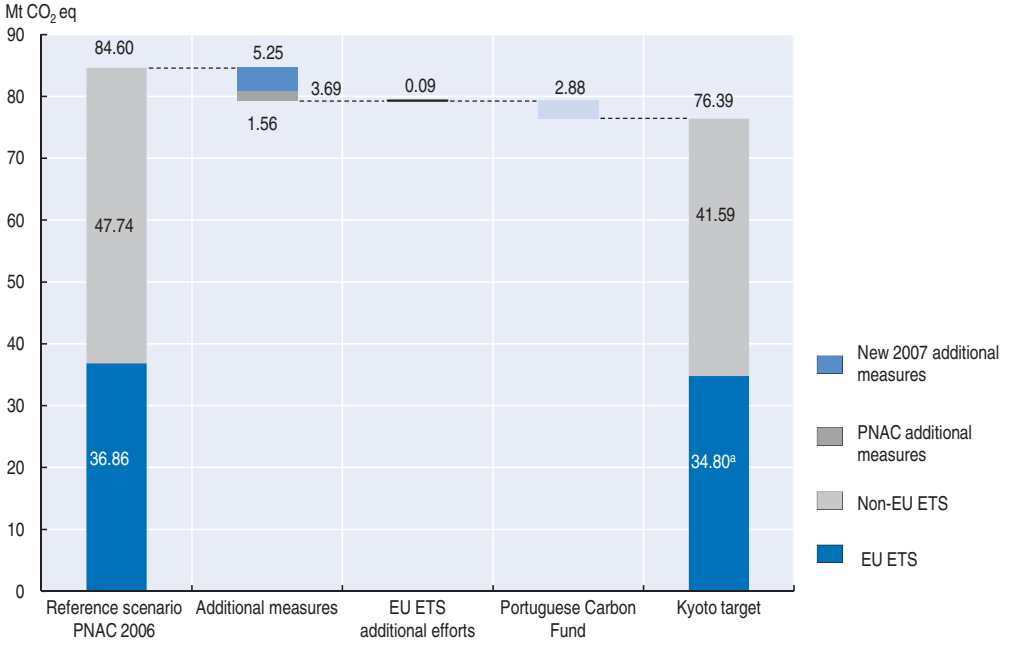
Public research centres have also strengthened their co-operation with the industrial sector, which has provided some funding in recent years, especially in areas such as wind power projects, waste incineration with energy recovery, and solar. The government has supported the creation of strategic R&D and industrial clusters in key technology

development activities such as wind, solar and wave (Chapter 2). However, Portugal does not have an energy R&D strategy setting out clear and quantified priorities categorised by short-, medium- and long-term objectives.

7. The National Climate Change Programme

The *National Climate Change Programme* (PNAC) is a strategic plan established to meet the terms of Portugal's Kyoto Protocol commitment and the EU burden-sharing agreement. It was last revised in 2008 and consists of cross-cutting measures (*e.g.* participation in the EU ETS) and sectoral measures covering both energy related sectors and those that are not directly energy related (*e.g.* agriculture, forestry, waste). With the implementation of the measures that had already been in place as of 2005 (the "reference scenario"), annual GHG emissions were expected to reach 84.6 Mt CO_2 eq (Figure 5.6). It is estimated that additional policy measures included in the 2006 PNAC (the "additional measures scenario") will reduce emissions by 3.69 Mt CO_2 eq. These measures were strengthened in 2008, with more ambitious targets for the use of renewable energy sources and biofuels (the "new 2007" measures), which aim to reduce emissions by 1.56 Mt CO_2 eq and lower national emissions to 79.36 Mt CO_2 eq per year. It is planned to meet the 2.97 Mt CO_2 eq shortfall in meeting the Kyoto target by participating in the EU ETS (0.09 Mt CO_2 eq) and in the Kyoto emissions trading mechanism (2.88 Mt CO_2 eq) (Figure 5.6). The Portuguese Carbon Fund (FPC), the financial instrument used to purchase emission credits on the international market, has a budget of EUR 348 million.

Figure 5.6. **Mechanisms used to meet Portugal's Kyoto Protocol commitment**



a) Includes EU ETS new entrants reserve (4.3 Mt CO_2 eq) .
Source: Portuguese Environment Agency.

GHG mitigation measures in the energy, transport and industry sectors largely coincide with the energy efficiency measures included in the PNAEE (Section 4) and with those in place to achieve renewable energy targets (Section 5). PNAC measures in the agriculture and forestry sectors include improved management practices for croplands, grazing lands, livestock waste, tree plantations and forestry. Measures aimed at industrial processes and waste management are the implementation of the EU Directives on Integrated Pollution Prevention and Control (IPPC), packaging and packaging waste, and landfills.[30]

A process is in place for *twice-yearly reviews by the CECAC* of progress in implementing PNAC measures. The CECAC recently launched an innovative emissions monitoring and forecasting website (*www.cumprirquioto.pt*). Monitoring indicates that the implementation of some measures has outperformed expectations, for example in the case of the promotion of electricity generation from renewable energy sources and the reduction of electricity consumption by about 1 000 GWh by 2010 (Table 5.6). The vehicle scrapping incentive programme has also been more successful than anticipated. The implementation of some other measures (*e.g.* substitution of fuel oil cogeneration by natural gas generation, construction of public transport infrastructure in Lisbon and Porto, and uptake of biofuels) has been disappointing. The largest number of measures with regard to which there has been underperformance has been in the transport sector. In all, PNAC measures have had 7.14 Mt CO_2 eq less effect than expected. As of 2010, the distance to the Kyoto target was estimated at about 13 Mt CO_2 eq over the whole Kyoto commitment period, to be covered mainly through the FPC. The initial estimate of 18.5 Mt CO_2 eq was reduced to take account of the efficiency gains achieved, as well as the 2008-09 economic crisis, which is expected to contribute to emission reductions up to 2012 (CECAC, 2010).

This *lack of effectiveness* has been acknowledged by the responsible entities, which have started work on contingency plans to fill information gaps and identify operational steps to be taken to speed up implementation. Taking into account expected emission reductions (Table 5.6), Portugal should focus on identifying more effective ways to meet these targets and then fully implement them, with a view to its post-2012 commitments.

A *comprehensive assessment of the cost-efficiency of current policy measures* does not appear to have been carried out, although the economic efficiency of some PNAC measures was assessed. This partial analysis indicates that the measures that could produce GHG emission reductions at the least cost would be improvements in energy efficiency in electricity transmission, distribution and final consumption (IEA, 2004). However, the extent to which the results have been used to minimise the cost of climate change mitigation is unclear. For example, the very generous support for renewable energy is not necessarily cheaper than energy efficiency policies. The cost-effectiveness of transport sector policies has not been evaluated, although reductions in this sector are expected to produce almost half the total required.

8. Price signals

Energy prices and taxes

Retail prices of unleaded gasoline and diesel fuels were fully liberalised in 2004. Overall, fuel prices increased between 2002 and 2008 in line with world market prices, but more than the OECD Europe average. Tax rates were increased to compensate for inflation (Figure 5.7). Taxes account for 64% of gasoline prices (higher than in many other OECD Europe countries) and 48% of diesel prices (at the lower end among OECD Europe countries). In

Table 5.6. **Main policies and measures in the 2008 PNAC**

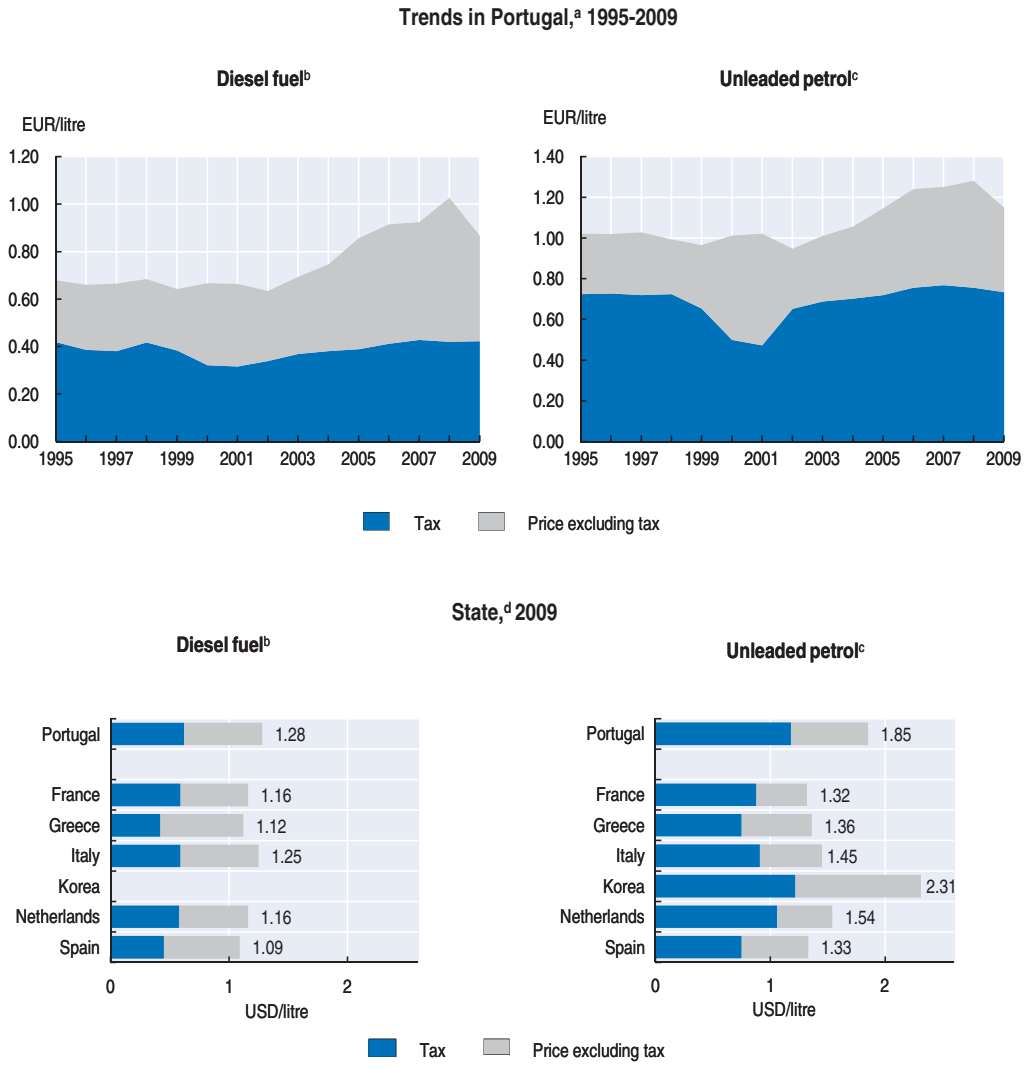
Sectors	Measures	Expected annual average GHG emission reductions (kt)	Implementation results[a] (annual average – kt)
Cross-sectoral measures			
Emission trading	EU Emissions Trading System (EU ETS)	90	..
Energy			
Combined heat and power generation	Increased electricity generation from cogeneration systems	200	–22.3
Natural gas	New natural gas combined cycle power plants	114-155	–49.9
Renewable energy sources	Increased electricity generation from renewable energy sources, to meet the target of 45% gross electricity consumption provided by renewables by 2010	738	463.5
	Promotion of water heating by solar energy	101	1.9
	Co-combustion of biomass (5 to 10%) and coal at Sines and Pego power plants	380-761	..
Energy efficiency	40% increase in energy efficiency in buildings through adoption of new building regulations	90	0
	Reduction of rate of energy losses in energy transport and distribution to 8.6% by 2010	146	10.9
	Reduction of electricity consumption by about 1 000 GWh by 2010	795	113.2
Industry	Revised Regulation on Management of Energy Consumption (RGCE) to promote energy efficiency in the industrial sector	32	0
	Incentives for substitution of fuel oil cogeneration by natural gas generation	189	–189
	Increase in industrial fuel tax	78	0
Households and services	Realignment of tax burden on diesel fuel for heating	73	–36.5
Transport			
Promotion of modal transfer	Promotion of passenger modal transfer[b]	483	..
	Promotion of freight modal transfer to maritime/rail[c]	234	..
Biofuels	10% biofuels in transport fuels	1 804	–562
Vehicle renewal	Vehicle scrapping incentive	3.3	59.2
Agreements/partnerships	Auto-Oil Programme: voluntary agreement with vehicle manufacturing associations	175	–26.7
Vehicle taxes	Review of current tax regime for private vehicles to factor out CO_2 emission tax	..	..
Agriculture	Cropland management and grazing land management	500	21.0
	Treatment of, and energy recovery from, livestock waste	429	–311.0
Waste management	Implementation of Directive on packaging and packaging waste	900	..
	Implementation of Landfill Directive	363	–42.9
Forestry	Programme for sustainable development of forests[d]	3 743	–434.0
	Promotion of forests' carbon sink capacity through improvement of forestry management	800	–24.4

a) Distance to/from expected annual GHG reductions: a negative sign means underachievement; annual average 2008-09 or 2008-10.
b) Includes expansion of the Lisbon Metro; construction of the Metro Sul do Tejo and the Porto Metro; improved rail services; establishment of the Metropolitan Transport Authorities in Lisbon and Porto.
c) Includes railway connection to Aveiro seaport; motorways of the sea; improved rail services.
d) Financial support and incentives for new tree plantations.
Source: APA (2010) and *www.apambiente.pt*.

particular, transport fuel prices are higher than in Spain, which has caused a certain amount of cross-border fuel tourism, especially by heavy goods vehicles.

Current transport fuel taxation does not fully address *environmental externalities related to climate change and air pollution*. Excise taxes are favourable to diesel, which continues to encourage diesel vehicle sales. Economic theory suggests that fuel taxes are the best instrument to address CO_2 emissions from road transport (OECD, 2009a). However, the already relatively high fuel taxation and the price tax differential with Spain limit the scope for further tax rate increases, especially on diesel (OECD, 2010b).

Figure 5.7. **Road fuel prices and taxes**



a) At constant 2005 prices.
b) Automotive diesel for commercial use.
c) Unleaded premium (RON 95).
d) Diesel fuel: at current prices and exchange rates; unleaded petrol: at current prices and purchasing power parities.
Source: OECD-IEA (2010), *Database of end-use prices.*

StatLink http://dx.doi.org/10.1787/888932375832

Energy taxes in Portugal generally exceed the minimum levels required by EU legislation. To encourage the use of natural gas, its consumption has been exempt from taxation. Partial or total exemptions also apply to other fuels, including those used for electricity generation, for powering boats (including fishing boats), in agriculture, in facilities participating in negotiated energy-saving agreements (Section 4.1) and in the EU ETS, as well as biofuels (Section 5.2). A lower value added tax (VAT) rate applies, among others, to heating oil and household consumption of natural gas and electricity. These exemptions and the reduced VAT rate can reduce incentives to use energy efficiently by lowering end-use prices. The increase in the tax rates on fuel for industrial use and on heating oil, with a view to a harmonisation with the tax rate on diesel by 2014, are

important steps towards discouraging fossil fuel consumption. However, Portugal should reconsider the *excise duty exemptions and reduced VAT rates* on domestic electricity and fossil fuel use, in order to encourage permanent changes in consumption patterns and contribute to fiscal consolidation. Overall energy taxation could be restructured to better target environmental externalities. In particular, a carbon tax (*i.e.* tax rates based on fuel carbon content) could extend carbon pricing to the sectors currently excluded from the EU ETS (residential, commercial, transport and low energy-intensive industrial sectors).

The *electricity and gas markets* have been progressively liberalised. However, Portugal should end the remaining retail tariff regulation, as recommended by the IEA (2009). *Electricity prices* paid by households are higher than the OECD Europe average (Table 5.7). Overall, despite the rise in oil and gas prices, electricity prices have increased less than the

Table 5.7. **Energy prices in selected OECD countries, 2009**

	Electricity			Oil		Natural gas
	Industry (USD[c]/kWh)	Households (USD[d]/kWh)	Industry[a] (USD[c]/t)	Households[b] (USD[d]/1 000 l)	Industry (USD[c]/10^7 kcal)	Households (USD[d]/10^7 kcal)
Portugal	**0.127**	**0.232**	**559.9**	**1 019.7**	**484.1**	**1 033.5**
France	0.107	0.125	440.0	626.9	438.9	665.7
Greece	0.114	0.148	487.8	953.6	441.1	1 013.8
Italy	0.276	0.241	474.7	1 223.8	557.7	897.4
Korea	0.058	0.127	525.9	1 250.0	479.5	954.0
Netherlands	0.141	0.214	390.3	767.4	500.1	963.0
Spain	0.103	0.203	456.3	736.5	433.8	886.7
OECD Europe	0.140	0.179[e]	481.7	677.6	459.8	841.1
OECD	0.107	0.144	..	676.6	304.0	643.8
Portugal price/ OECD Europe (%)	*91*	*125*[e]	*116*	150%	..	..
Portugal price/OECD (%)	*119*	*161*	..	151%	*159*	*161*

a) Low-sulphur oil.
b) Light fuel oil.
c) At current exchange rates.
d) At current PPPs.
e) 2008 data.
Source: OECD-IEA (2010), *Database of end-use prices*.

StatLink http://dx.doi.org/10.1787/888932376117

OECD Europe average. They decrease during the year with higher production of hydropower, whose production costs are lower than those of thermal energy (dependent on fuel imports). With market liberalisation, previous power purchase agreements were terminated with the exception of two generators, one of which is coal-fired. These long-term power generation contracts lock Portugal into significant long-term emissions from the electricity sector (IEA, 2009a).

Natural gas prices for households are higher than the OECD average and much higher than those applied to industry (Table 5.7). As in most countries, gas prices have rapidly increased since 2002 following the global market.

Emissions trading

The EU ETS, as outlined in the 2006 and 2008 *National Allocation Plans for Emission Allowances* (PNALE I and II), covers the largest CO_2 emitters and energy users. During the first trading period (2005-07), there was an excess supply of allowances in Portugal, as throughout the whole system. Emissions by Portuguese entities were verified as 89% of Portugal's allocation. Overall, during the first trading period there was less pressure to abate GHG emissions on the trading sectors than on the non-trading ones (IEA, 2004).

The *initial emission allowance allocation* was reduced by 9% in 2008-12 (to 34.8 Mt CO_2/year). All allowances were allocated for free. The majority went to power plants, cement installations and refineries. The EU ETS installations now account for nearly all of Portugal's power sector and refinery emissions, about 65% of its industrial sector emissions and 44% of national emissions. The thermoelectric power sector saw its allocation decrease by 33% from the first to the second trading period, and went from having too many allowances to not having enough to cover business-as-usual emissions. This was the only sector with verified emissions above the allocation in 2008, the first year in the Kyoto Protocol commitment period, while total verified emissions were slightly below the initial allocation (ERSE, 2009b; CECAC, 2010). However, allocations to the industrial sector were higher than in the previous period and higher than verified emissions. The EU ETS therefore requires greater abatement efforts in Portugal's electricity sector than in its process industries. Industrial users are being encouraged (by the number of permits freely allocated) to maintain their emissions at roughly 2003-04 levels in the period 2008-12.[31] Since emissions in 2003-04 were at a higher level, this could be a case of over-allocation, providing inadequate incentives for participants to reduce their emissions. Overall, the impact of the EU ETS on Portugal's GHG emissions has been modest.

External costs of electricity generation

External costs arising from the environmental impacts of electricity production are significant in most OECD countries and reflect the dominance of fossil fuels in the generation mix. In Portugal, the *external costs of electricity production* fell by some 40% between 1990 and 2005 despite rising electricity production. As seen in the previous sections, this decrease was primarily due to a combination of fuel switching (from coal to natural gas), increased use of renewable energy, higher generation efficiency (partly due to more efficient gas plants) and the use of pollution abatement technologies. In 2005, the average external costs of electricity production in Portugal were slightly above the EU average of EUR 18-59/MWh (EEA, 2008), or between 25% and 80% of the 2005 electricity price for industrial customers.[32]

Despite progress, these *external costs are still not reflected adequately in energy prices*. Consumers, producers and decision-makers therefore do not receive the accurate price signals necessary to reach decisions about how resources could best be used.

Notes

1. Earlier in the review period, Portugal's energy policy frameworks were presented in, among others, the 2000 revision of the Energy Programme and the 2003 Portuguese Energy Policy Framework. Renewable energy and energy efficiency policy measures were outlined in the 2001 Energy Efficiency and Endogenous Energies Programme or "E4 Programme", the 2001 Measure to Support the Harnessing of the Energy Potential and Rationalisation of Consumption (MAPE) and various

pieces of legislation. Climate change strategies and measures were elaborated in the 2004 and 2006 National Climate Change Programmes.

2. CECAC is co-ordinated by a representative of MAOT. On its board are representatives of the Ministry of Economy, Innovation and Development and the Ministry of Finance and Public Administration, acting as sub-co-ordinators, as well as representatives of the ministries responsible for foreign policy, agriculture and rural development, public works and transport.

3. A sharp fall in TPES and TFC in 2006 was also linked to decreased use of energy products as feedstock, especially in the petrochemical industry.

4. In 2007, Portugal consumed 0.17 toe per USD 1 000 of GDP (2005 prices), against an OECD Europe average of 0.12 toe. The difference is less when GDP is corrected for purchasing power parities.

5. Portugal is one of the few OECD countries in which electricity intensity (electricity consumption per unit of GDP) increased between 2000 and 2007.

6. From the point of view of energy efficiency, a higher share of diesel vehicles in the fleet means less energy is consumed for the same transport activity (expressed in passenger-kilometres or tonne-kilometres). From the point of view of pollutant emissions, there are strong indications that a larger number of diesel vehicles could result in increased emissions of nitrogen oxides and particulate matter.

7. For example, precipitation was lower in 2007 than in the previous year, but emissions from energy generation continued to decrease.

8. In 2008, Portugal emitted 10.8 kt of NO_x and 4.4 kt of SO_x per Mtoe of TPES, compared with the OECD averages of 6.4 and 4.5 kt.

9. For example, the sodium hypochlorite used to prevent algae proliferation in the pipes.

10. The PNAEE implements the EU Directive on energy end-use efficiency and energy services (2006/32/EC). This Directive contains an indicative national energy savings target of 9% up to 2016, to be reached through energy services and other energy efficiency improvement measures in the sectors not covered by the EU ETS.

11. The EU 20-20-20 targets, set out in March 2007, seek: *i*) a reduction in EU GHG emissions of at least 20% below 1990 levels; *ii*) 20% of EU energy consumption to be provided by renewable energy sources; and *iii*) a 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency. These targets are to be met by 2020.

12. The proceeds of the electricity tariff differential and the taxes on electricity consumption and low energy efficiency light bulbs are earmarked for the Energy Efficiency Fund and the Portuguese Carbon Fund.

13. Facilities with more than 500 toe annual energy consumption. EU ETS installations and smaller plants may participate voluntarily.

14. For example, the EU appliance and equipment labelling programme has existed in Portugal since 1994; thermal regulations for buildings have been in effect since 1991; and fiscal incentives for residential solar-thermal units have been used since at least 2001.

15. Refrigerators, freezers and washing machines (white goods) are the most widely used appliances in Portugal, but less than half of appliances sold are in the highest energy efficiency classes compared to the EU average of over 70% (in 2005).

16. Estimates indicate that upgrading the existing building stock to the efficiency levels required for new buildings would cost between EUR 1 250 and 6 500 per building, with an average payback period of 6 to 11 years and savings of 0.4 toe per building per year (ADENE, 2009).

17. The "InnovGrid" ("Intelligent Meters and Networks") project aims to support the installation of intelligent energy measurement systems for around 10% of domestic electricity customers. In 2010, around 50 000 customers are expected to have this equipment installed in their homes. The project will also help strengthen the penetration of electric vehicles (ADENE, 2009).

18. If the costs directly borne by promoters of the measures (and not included in the tariff) and by customers are also considered, the average cost of savings would rise to about EUR 8/MWh, still below the benefits and the price differential between electricity from renewables and that generated from fossil fuels.

19. The new registration tax (ISV) introduced CO_2-based differentiation alongside cylinder capacity-based differentiation. The relative weight of the CO_2-based portion was also gradually increased from 10% to 60%. Under the new circulation tax (IUC), those two criteria are also used to determine

the annual amount to be paid by cars bought after the reform (for older cars the tax continues to be based on cylinder capacity and age).

20. However, evidence that this is the case in practice is still too limited (OECD, 2009a).

21. Diesel fuel has a higher carbon content than gasoline, but diesel vehicles are typically more fuel-efficient than otherwise identical gasoline vehicles. The share of alternative fuels, such as gas and LPG, is negligible in Portugal.

22. Portugal is among the OECD countries where revenue from motorway tolls is highest as a percentage of GDP, but this mainly reflects its extensive motorway network (OECD, 2010b).

23. The principle of toll-free motorways, or SCUT (Sem Custo para os UTilizadores) in Portuguese, was introduced in 1997 and implemented on seven motorways for a total of 914 km.

24. Responding to a request by the Group of Eight (G8 Summit, Gleneagles, 2005), the IEA formulated a set of energy efficiency policy recommendations covering 25 fields of action across seven priority areas: cross-sectoral activity, buildings, appliances, lighting, transport, industry and power utilities. These 25 recommendations were presented to the G8 summit at Hokkaido, Japan, in July 2008.

25. The feed-in tariff formula evaluates CO_2 emissions at EUR 20 per tonne of CO_2.

26. Renewable policy design should reflect five fundamental principles: *i)* removal of non-economic barriers (administrative hurdles, obstacles to grid access, poor electricity market design, lack of information and training) and management of social acceptance issues; *ii)* a predictable and transparent support framework to attract investments; *iii)* introduction of transitional incentives, decreasing over time, to foster and monitor technological innovation; *iv)* incentives guaranteeing a specific level of support to different technologies based on their degree of technology maturity; and *v)* consideration of the impact of large-scale penetration of renewable energy technologies on the overall energy system (IEA, 2008).

27. Dedicated small producers are firms producing up to 3 000 tonnes per year from waste materials or using production process and feedstock that are more environment-friendly. The exemption is capped at overall production of 40 000 tonnes of biofuel per year. Local government entities are exempted in the case of production used for their own transport purposes or those of non-profit organisations.

28. These aspects are expected to be taken into account in the national legislation implementing the EU Directive on the promotion of the use of energy from renewable sources (2009/28/EC), which prescribes the verification of compliance with the sustainability criteria for biofuels.

29. There is, however, considerable uncertainty in regard to the exact breakdown as statistics are not systematically collected.

30. The Integrated Pollution Prevention and Control (IPPC) Directive (2008/1/EC) stipulates that pollution issues should be integrated into plant permitting procedures, and that best available techniques should be applied. The packaging and packaging waste directives (Directives 94/62/EC and 2004/12/EC) set targets for shares of packaging waste to be recovered or incinerated at waste incineration plants with energy recovery, and shares of packaging waste to be recycled. The landfill directive (Directive 1999/31/EC) regulates waste acceptance procedures and the technical configurations of landfills. It also sets targets for reducing the amount of biodegradable municipal waste put in landfills.

31. The allocation of allowances for each sector is based on the calculation of historical emissions for each installation, relative to the period 2000-04, corrected by a maximum factor of combustion emissions achieved by the sector (except when that is not viable).

32. The external cost of electricity generation is based on the sum of three components: climate change damage costs associated with emissions of CO_2; damage costs (*e.g.* impacts on health and crops) associated with other air pollutants (NO_x, SO_2, NMVOCs, PM_{10}, NH_3); and other non-environmental social costs for non-fossil electricity-generating technologies (EEA, 2008).

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PART II

Chapter 6

Coastal Zone Management

This chapter analyses key challenges in the management of coastal zones of mainland Portugal, namely coastal areas and coastal waters. It examines a variety of pressures, natural and man-made, including coastal erosion, extensive development of secondary housing, as well as pressures brought by growing tourism, fisheries, industrial development and maritime traffic. Steps have been taken to reduce these pressures, including the development of an integrated coastal zone management plan, reform of the institutional framework, and the introduction of a mix of regulatory, economic and investment measures. These measures are analysed in light of their effectiveness and efficiency, and their integration with other policies, including tourism and climate change.

Assessment and recommendations

For centuries, coastal and maritime activities have been important to Portugal's economy and to the social and cultural identity of its people. The coastal zone, stretching along the Atlantic Ocean, is one of the country's greatest assets. It occupies only 8% of the continental surface area, but concentrates 76% of the population and 85% of the country's economic activities. It is particularly important in regard to economic development. Coastal areas are a source of food and raw materials. They are vital for transport and trade, contain some of the most valuable natural habitats and heritage sites, and are a favorite tourism and leisure destination. However, much of the coastal zone is threatened by the deterioration of socio-economic, environmental and cultural resources. Erosion and flooding exacerbate problems associated with rapid urbanisation and put pressures on areas important for nature protection and biodiversity conservation, as well as environmental pollution from households and economic activities. In addition, there is a longer-term threat of rising sea levels caused by climate change.

During the review period, Portugal strengthened its planning framework for the management of coastal zones. Building on the historic concept of a "public maritime domain", nine Coastal Zone Management Plans (POOCs) were elaborated covering the entire length of the continental coast. The POOCs, established in accordance with a detailed information base, have launched a number of coastal protection projects addressing man-made and natural pressures. They have also raised awareness of coastal areas' importance. The POOCs have been well co-ordinated with nature protection plans. Following a preliminary analysis of the potential impacts of climate change in sensitive coastal areas, some adaptation and prevention actions have been taken. Nonetheless, the fragmentation of responsibilities for coastal zones and the difficulty of harmonising activities at different planning and management levels have made more difficult the implementation of the POOCs. Local authorities' capacity to work under national CZM plans has also been insufficient in some areas.

An evaluation and revision of the POOCs in 2005 led to a number of initiatives that strengthened their role and implementation. The *Litoral 2007-13* programme further prioritised actions defined in the POOCs, with a focus on areas where people and buildings are most at risk. Four *Polis Litoral* schemes launched in priority areas in 2006 provide an innovative basis for effective coastal zone management, particularly improvement of beaches and prevention of erosion. The *Polis Litoral* schemes allow close co-ordination among the different agencies involved, especially in regard to addressing illegal construction in protected areas and relocation of affected populations. The National Strategy for Integrated Coastal Zone Management (ENGIZC), adopted in 2009, sets out a 20-year timeframe for sustainable development of coastal areas, encompassing coastal planning policies in both marine and terrestrial zones. The ENGIZC fulfilled an overdue Portuguese Government obligation under the EU Recommendation concerning Integrated Coastal Zone Management.

While the POOCs define the rules for construction in sensitive areas, which include risk and nature conservation areas, to protect people, infrastructure and natural values, there is still weak enforcement of planning and construction regulations, along with delays in coastal protection and regeneration efforts and a lack of continuity between land- and sea-related policies. While the 2006 National Strategy for the Ocean and the ENGIZC have similar objectives, they are not well integrated nor is their implementation well co-ordinated, especially in port areas. Coastal zone management is largely based on fund transfers from the central level or via *ad hoc* arrangements between local authorities and the private sector. Economic instruments allowing the internalisation of environmental concerns by the tourism or construction sectors have not been developed. There are still few data or indicators on coastal zones' assets and operations, which prevents the assessment of the benefits of protection measures and progress towards targets.

Due to the richness of its natural assets, the coastal zone is a major tourist attraction. Tourism is one of the engines of the Portuguese economy. Recognising the value of Portugal's natural areas, the 2007 Tourism Strategy gave impetus to a number of actions to address the negative impacts of earlier tourism development. Emphasis has been placed on redirecting some tourism development inland. However, seasonality remains a significant problem and tourism's demand patterns continue to put pressure on the environment (*e.g.* through congestion and waste discharges from tourist facilities). Some tourism infrastructure projects are located in ecologically sensitive areas or in areas that have some legal protection status. Planning or implementing such infrastructure should be subject to EIA and/or SEA in order to ensure the minimisation of, and/or compensation for, the impacts on areas of high nature and biodiversity values, and to safeguard their functional and structural integrity.

Recommendations

- Vigorously implement actions identified under the *Polis Litoral schemes* with a view to regenerating and protecting sensitive coastal areas; strengthen enforcement of planning regulations, particularly in nature protection areas; consider expanding the programme to other coastal areas with a view to covering the entire Portuguese coastline.
- Make greater use of *economic instruments* to achieve coastal zone management objectives so as to provide better incentives for land use planning and to finance infrastructure and the acquisition of fragile and threatened land for nature protection and biodiversity conservation; this could include charges for building permits, taxes on second homes, tax incentives for brownfield remediation in coastal zones, a nature tax on building permits, and a capital gains tax for sales of agricultural land to developers; such instruments should be designed so as to avoid perverse incentive effects such as encouraging construction in environmentally sensitive areas.
- Strengthen *co-ordination mechanisms for coastal zone management planning and implementation,* particularly mechanisms for better co-ordinating water, coastal and marine management in the context of implementing the National Strategy for the Ocean, the National Strategy for Integrated Coastal Zone Management, and River Basin Management Plans.

Recommendations *(cont.)*

- *Better co-ordinate implementation of the National Strategy for Integrated Coastal Zone Management with the National Strategic Plan for Tourism*, placing particular emphasis on reducing the environmental impacts of tourism infrastructure, especially in nature protection and biodiversity conservation areas.
- Continue to *strengthen capacities to support the co-ordinated development and implementation of coastal zone management* policy; this should include strengthening databases and indicators for coastal zone management and spatial land use, as well as capacities to conduct cost-benefit and multi-criteria analysis, including the value of eco-system services in coastal zones.

1. Characteristics and pressures on coastal areas[1]

1.1. Key natural characteristics of the Portuguese continental coast

Portugal's continental coastline extends around 1 000 km along the country's west and south coasts. The *main natural features* include the estuaries of the rivers Tagus and Sado, small bays (Peniche, Sines, Lagos) and lagoons (Vouga-Aveiro, Óbidos, Faro). Estuaries provide shelter for numerous bird populations, which use them as migratory stations, wintering areas and breeding grounds. The capes, including Mondego, Carvoeiro, Roca, Espichel, Sines, São Vicente and Santa Maria, are small and few in number, but of great beauty. There are also areas with well-cared-for beaches and sand dunes (Torreira-S. Jacinto, Mira-Cap Mondego, Leirosa-Nazaré, Tróia-Sines, Ria Formosa). Cliffs are a dominant feature in the south, particularly around Cabo da Roca, Arrábida and Espichel and along the coast between Vila Nova de Milfontes and the cape at Sagres (Figure 6.1).

Figure 6.1. **Typology of Portugal's coastal zone**

Source: MAOTDR/INAG (2006).

Beaches and cliffs have great recreational and protection value, and a *number of ecosystems benefit from various forms of protection*. About 50% of the coastal zone integrates legally protected areas and is incorporated into the National Network of Protected Areas. Crucial areas for nature protection and biodiversity conservation purposes include not only the estuaries of Tejo and Sado, but also lagoons and the *Natura 2000* network sites of the Parque Natural da Ria Formosa and Ria de Aveiro, the protected areas of Litoral Norte (from Esposende to Caminha), and an area with a continuous protected status between Peniche and the western Algarve (Chapter 3).

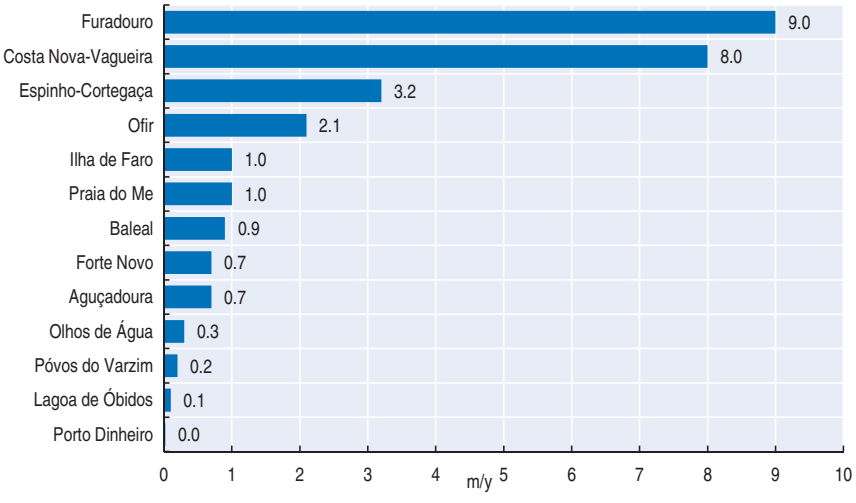
There has been a significant increase in *artificial surfaces along the coastline*, with over 50% of artificial cover in mainland Portugal within 16 km of the ocean (Freire *et al.*, 2005).[2] Studies that assessed a strip 20 km inland from the coast, far further inland than the definition used in the Coastal Zone Management Plans, found marked regional differences in the extent of artificial surfaces between 1985 and 2000, with the most significant increases in the Algarve, the Norte and Lisbon (Freire *et al.*, 2009). The artificial surface cover of the 20 km coastal strip was found to be most extensive in the Norte (41%) and in Lisbon (21%).

1.2. Pressures on coastal zones

Coastal areas in Portugal are subject to a variety of pressures of *natural and man-made origin*. One of the most important threats to the country's continental coast is *coastal erosion*. The percentage of the coast that is suffering erosion (29%) is among the highest in Europe (GHK, 2006). A combination of natural processes and reduced sediment supply from rivers, due to anthropogenic activities, results in coastal erosion rates as high as 10 metres per year in areas such as Furadouro and Costa Nova Vagueira (Figure 6.2). In other areas, such as Forte Novo, the erosion rate can be less than one metre per year. Studies suggest that erosion will increase particularly rapidly in areas considered to be of "very high" vulnerability, although they note that growth will also be strong in areas with "very low" or "low" vulnerability (Pinto *et al.*, 2009).

Figure 6.2. **Coastal erosion rates**

metres/year

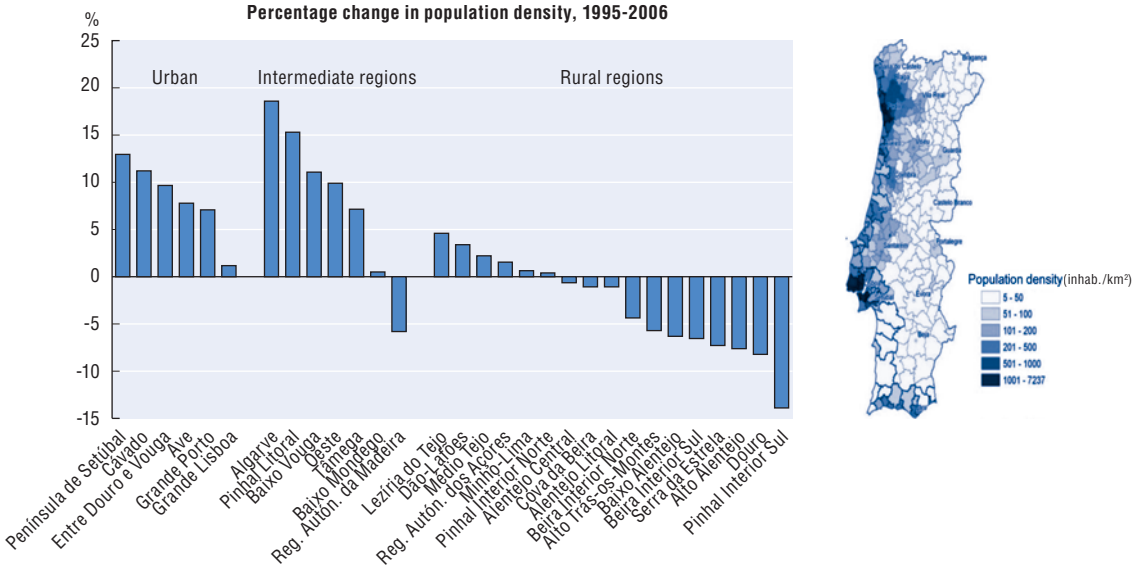


Source: MAOTDR/INAG (2006).

StatLink http://dx.doi.org/10.1787/888932375870

Several migratory movements during the last century from inland rural areas to coastal urban centres increased population pressures on the coast. Coastal areas account for only 8% of the continental surface area, but 76% of the population is concentrated in these areas. *Population density* in coastal areas is twice as high as the average for continental Portugal, at 244.2 and 112.4 inhabitants per km^2, respectively (Pinho, 2007). The coast is where the largest urban centres are located, in particular Lisbon and Porto, which continue to experience population growth (Figure 6.3).

Figure 6.3. **Population density, status and trends**



Source: OECD, *Regional Statistics Database;* INE.

StatLink http://dx.doi.org/10.1787/888932375889

Population growth, tourism development and rising incomes in Portugal have led to *extensive development of housing*, including a growing amount of rental housing and more secondary homes, accompanied by the expansion of various services and related infrastructure. Several examples of intense urban development in unstable and environmentally sensitive areas are found along the coast. In a number of cases, construction has been illegal or has taken place although it was not in compliance with permitting procedures. It is estimated that there are 3 200 illegal structures in the national network of protected areas, mostly in coastal areas, and that such illegal construction may still be ongoing. However, efforts to stop illegal construction on dunes and even beaches, which reached alarming proportions in the 1990s, received more attention in the review period.

Due to the richness of its natural assets, the coast is a *major tourist destination*. More than 90% of foreign tourists visit coastal areas (Taveira Pinto, 2004). Tourism is one of the engines of the Portuguese economy, accounting for about 5% of GDP and 10% of total employment in 2008 (TP, 2009). Although Portugal experienced a *downturn in visitors* in 2008-09 related to the global economic downturn, as well as competition from other leisure destinations, it is estimated that tourism's contribution to GDP has the potential to increase in the future.

Ensuring that tourism activities do not damage the environment is a key challenge. *Several tourism developments have been located in ecologically sensitive areas* or even areas that are already protected. For example, building permission was recently granted for a large resort, the Costa Terra, in the northern Alentejo which will cover 200 ha including 2 km of coastline. An official environmental impact assessment carried out for the project found that there would be negative impacts on local habitats such as wooded dunes and juniper thickets, as well as on 10 amphibian species, 15 reptile species, 130 bird species and 21 mammal species. There were concerns about this EIA, which failed to address cumulative impacts and the impacts of fragmentation.[3]

Pressures on the environment in coastal zones are also exerted by *industrial facilities* located along the coast, such as oil refineries and petrochemical and cement plants. Industrial impacts include visual intrusion, emissions to air and water, and deposition of waste. Particular risks are linked to releases (accidental or routine) of chemical substances to the air and coastal waters (Chapter 3).

Heavy maritime traffic represents a significant threat to the environment, with numerous recorded environmental pollution incidents.[4] About 60 million tonnes of merchandise was handled in the five main ports (Leixões, Aveiro, Lisbon, Setúbal and Sines) in 2009, accounting for over 95% of total tonnage. Although the quantity of goods unloaded from continental ports was relatively stable during the review period, there has been a significant increase (44%) in the quantity of goods *loaded*, which is associated with increased freight traffic around the ports and along the coast. It is estimated that more than 100 million tonnes of merchandise will be handled in 2015 by the five main ports (Aicep, 2010).

The *fisheries sector* operating in Portugal's Exclusive Economic Zone (EEZ) remains an important economic sector, but it also contributes significantly to the challenges to be met in managing territorial waters and coasts.[5] Total production of fisheries products, including those from aquaculture, amounts to about 220 000 tonnes per year. Portugal has the highest per capita consumption of fisheries products in the EU, at 57 kg per person per year compared to the EU average of 23 kg. Its fishing fleet, made up of about 8 700 vessels and amounting to a total tonnage of over 100 800 GT, operates near Portuguese ports (EC, 2008).[6] There are extensive fish processing and vessel maintenance operations in some ports, as well as related urban development. Port development leads to habitat loss and fragmentation, pollution of the air and coastal waters, and waste generation, which call for measures to mitigate the negative effects.

Aquaculture in Portugal, largely mollusc-based, is less likely to have significant environmental impacts than, for example, large-scale aquaculture in parts of the Mediterranean and elsewhere (Box 6.1). There is evidence, however, that some aquaculture facilities were constructed in public domain areas despite negative environmental impact assessment results and opposition from NGOs.

Portugal's interest in renewable energy sources has expanded from hydro, solar, wind and biomass to tapping the *power of the ocean*. A Maritime Pilot Zone for capturing the energy of ocean waves was created off the Portuguese coast in 2008 to support deployment of offshore wave energy prototypes and farms, with an installed capacity of 250 MW. This zone of about 320 km^2 is located on the west coast off São Pedro de Moel (Palha *et al.*, 2010). Although wave energy is generally considered relatively neutral in regard to its environmental impacts, some do occur, including impacts on marine ecosystems from

Box 6.1. **Aquaculture**

Aquaculture output stood at 7 893 tonnes in 2006, with total sales of EUR 43 million (OECD, 2009). Major species cultivated include oysters, clams, sea bream, sea bass and eel. The significance of clams and oysters is clear, with sales of EUR 20 million. Most aquaculture products are consumed domestically, with export sales making up only 6% of the total. Overall sales figures, when compared to the significant investments in aquaculture in the period prior to 2007, seem modest. However, some investments (notably in a turbot farm which is about to begin operations) will bring returns in the longer term.

Portugal's aquaculture is largely confined to offshore sites and estuaries. Almost 90% of aquaculture facilities are located in publicly domain areas, based on ten-year private concessions. The industry is characterised by a great deal of extensive farming, largely family-based. There has been a move to encourage aquaculture as an alternative for fishermen facing reduced fishing quotas.

Aquaculture in Portugal needs to address a number of significant problems, notably competition from intensive Spanish and Greek aquaculture, whose products are imported. The need to differentiate Portugal's product has acted as a driver for efforts to certify production, with many facilities considering becoming more ecological. The objective of national fisheries policy in regard to aquaculture is to increase production and product diversity, but also product quality, so as to improve the sector's competitiveness. In addition, structural modernisation is being promoted within the current fisheries management plan. These objectives are consistent with those established by the EU in the Common Fisheries Policy, particularly the 2002 Strategy for the Sustainable Development of European Aquaculture, which promotes environmental, economic and social sustainability. There has been significant investment in aquaculture in recent years. Over EUR 125 million, allocated between 2000 and 2006 under the EC's Directorate-General for Maritime Affairs and Fisheries (DG MARE) programme, focussed on investments in improving aquaculture operations. Under the 3rd Community Support Framework (CSF III), the emphasis has been on project analysis and environmental rules, including effluent treatment and the use of alternative energy sources and innovative technologies.

large construction, those on species near the surface, and those from the creation of artificial reefs (Pelc *et al.*, 2002). Using energy from waves at offshore sites could reduce their height and power as they approach the shoreline, contributing to a reduction of coastal erosion. Since the environmental impacts are still unknown, the main objective of pilot projects is monitoring and learning from field results (Palha *etal.*, 2010). The development of the maritime spatial plan, launched in 2009, should provide further opportunity towards better management of various activities and their environmental impacts.

The Portuguese mainland is potentially at risk from the *impacts of climate change*, which include sea level rise, changes in the direction and the power of waves, storm surges and flooding. The main climate change impacts on the coastal zone include the (permanent) inundation of dry- and wetlands in low-lying areas, as well as accelerated erosion. Erosion and sea level rise can present a significant threat to wetlands in lagoonal and estuarine environments.[7] Some marshes and wetland areas may cope with the sea level rise through upward and landward displacement. However, many of these areas are situated in front of man-made infrastructure to protect salt works or aquaculture facilities, as well as for flood

control, limiting potential for landward migration. This coastal squeeze could ultimately lead to the loss of such areas (PRC, 2009).

2. Policy and institutional setting

Traditionally, the coast has been considered the *legal division between territorial and maritime laws* and seldom as an area of integrated legislative and management competence. Laws concerning coastal areas have defined the rights of ownership of coastal lands and established legal principles for the division between state and private property. They have also provided a national legal basis concerning access to coastal waters for navigation and fishery. Over time, a number of administrative regulations have been adopted independently in policy areas such as spatial planning, flood prevention, nature conservation, navigation, ports, pollution, fishing, mineral extraction, tourism and local self-government. Ensuring coherence and integration among these regulations is a major challenge.

Main concepts and approaches

Portugal has been a world pioneer in developing laws to protect coastal zones. The concept of *Public Maritime Domain* (*Domínio Público Marítimo, DPM*) was introduced at the end of the 19th century and remains valid today. A regulatory regime for DPM was established in 1971 (Decree-Law 468/71). This defined the DPM as a strip of coastal land and water extending landward for a distance of 50 metres from the spring high seawater mark and seaward to a bathymetric depth of 30 metres. The DPM is owned and managed by the state. Thus permanent occupation or privatisation of land were not allowed. However, provisions were established under which private use could be authorised with a temporary license or a concession. An innovative feature of this concept was the designation of an "adjacent zone" on land, where occupation was restricted in order to protect against threats posed by the ocean. This measure provides a means of limiting human settlements in the most sensitive coastal areas (Carneiro, 2007).

The nine *Coastal Zone Management Plans (Planos de Ordenamento da Orla Costeira, POOCs)*, developed for the entire length of the continental coast at the end of 1990s, are the most important instruments for coastal planning and management. The purpose of the POOCs is to: *i)* establish extensive knowledge about the costal zones, including pressures and management; *ii)* promote and improve the quality and value of beaches with particular environmental or tourism importance; *iii)* plan different uses of, and activities in, the coastal zone; *iv)* restrain building activity in sensitive areas (especially beaches) and changes in land use purposes; and *v)* promote nature protection and conservation. *Other instruments related to coastal zone management* include the National Ecological Reserve regulations, introduced in 1983, and the transposition of the European Coastal Charter into national legislation in 1990. They establish a series of guiding principles for land use, nature protection, access to the coast, and the location of infrastructures and public spaces. Such principles were expected to be applied in various types of planning instruments, including port expansion plans and housing development plans. In practice, principles such as minimum distance from the coastline, sitting of coastal access perpendicular to the coastline, and the establishment of natural or rural areas between urban spaces have frequently not been followed (Carneiro, 2007).

Management of coastal zones takes place within the *three hierarchical levels of territorial land use planning and management*. The National Programme for Spatial Planning Policy

(PNPOT), whose most recent policy was adopted in 2006, provides guidance on lower-level planning that includes Territorial Land Use Plans (PROTs) and special land use plans, such as those for protected areas (Protected Area Land Management Plans, POAPs), river catchments (River Basin Management Plans, PBHs) and estuaries (Estuary Management Plans, POEs), together with the POOCs. For example, the PROTs Algarve classifies parts of the Algarve as "a critical area of coastal erosion", thus banning construction of housing within 500 metres of the coastline. The third tier of land use management consists of municipal and inter-municipal land use plans, with the former subdivided into municipal master plans, urbanisation plans and detailed plans. A regulatory framework requires regional and municipal plans to be in full compliance with the provisions of special land use plans, giving special land use plans (including those for costal zones) precedence over municipal plans. From 2009, instead of setting strict rules for municipal land use planning the POOCs establish security levels depending on the sensitivity of the territory.

Institutional responsibilities

In view of the maritime sector's importance, implementation of the 1971 regulatory framework for the Public Maritime Domain (DPM) was overseen by the Directorate-General for Ports. Greater recognition of the environmental value of the coastal zone in the early 1990s led to the assumption of responsibility for the DPM, and for the development of coastal zone management policies and related planning, by the *Ministry of Environment and Regional Planning* (MAOT). The Water Law and the Tenure Law adopted in 2005 gave the Water Institute (INAG) responsibility for planning in the DPM, including in port areas. The INAG, working in co-operation with the Regional Co-ordination and Development Committees (CCDRs) and other entities, has developed a model for land use that allows protection of coastal areas within the POOC. The Ministry of National Defence has continued to play an important role through the Commission of the Maritime Public Domain in port areas and the Oceans Strategic Commission, which oversees ocean policy (Carneiro, 2007).

Implementation of coastal zone management at the sub-national level was strengthened in 2008 by transferring responsibilities for managing the zone 50 metres inland, within the DPM and outside protected areas, from the CCDRs to the River Basin District Administrations (ARHs), which now issue permits for different uses within the DPM. This change should provide a better mechanism for co-ordinating coastal zone and integrated river basin management. Local authorities continue to develop and implement municipal plans in the strip 500 metres from the water line according to the rules defined in the POOC. Exceptions are zones outside the DPM that are considered high risk (*e.g.* due to coastal erosion), where the CCDRs or the ARHs must approve any intervention. The Nature and Biodiversity Conservation Institute (ICNB), the INAG and the ARH, which are also responsible for implementing the coastal defense works, are subordinate to the MAOT. A Strategic Co-ordination Group under the MAOT ensures overall co-ordination and monitoring of the POOCs' implementation.

3. Performance of policy responses

3.1. Coastal zone management planning

During the period 1995-2005, nine POOCs were developed covering the entire length of the continental coast (Table 6.1). Most of these plans included key measures, entities responsible for implementation and delivery, and estimated costs and an associated

Table 6.1. **The Coastal Zone Management Plans and their estimated budgets, including coastal protection**

Coastal Zone Management Plans (POOC)	Period	Region	Supervisory body	POOC budget (EUR million)	Coastal protection (EUR million)
Caminha-Espinho	1999-2009	Norte	INAG	38	17
Ovar-Marinha Grande	2000-10	Centro	INAG	74	19
Alcobaça-Mafra	2002-15	Lisbon & Tagus Valley	INAG	25	12
Sintra-Sado	2003-15	Lisbon & Tagus Valley	ICNB	105	5
Cidadela de Caiscais-Forte de São Julião da Barra	1998-2009	Lisbon & Tagus Valley	INAG	8	1
Sado-Sines	1999-2009	Alentejo	INAG	13	..
Sines-Burgau	1998-2009	Alentejo & Algarve	ICNB	10	0.6
Burgau-Vilamoura	1998-2009	Algarve	INAG	18	12
Vilamoura-V.R.S. António	2005-15	Algarve	ICNB	130	17
Total				**421**	..

. .: not available
Source: PRC, 2009.

implementation schedule. Thus they represented an important step towards strengthening coastal zone management. Six POOCs were developed under the supervision of the INAG and three, which included protected areas, by the ICNB. The POOCs provided a detailed classification of beaches and regulation of their use. They also established the operational and funding framework for projects to promote and improve the quality and value of beaches of particular environmental or tourism importance, mapped areas and interventions for nature protection and biodiversity conservation, and identified risk areas and established rules for human activities and soil occupation.

An important feature of the POOC regulations is the *extension of the area subject to planning* from the 50 metres inland covered by the DPM to 500 metres inland. This has allowed better integration of the various features influencing coastal areas, especially prohibition of construction and authorisation to demolish illegal structures. Port areas were excluded from the POOCs, as they fall under the management of autonomous port administrations or the national maritime administration. Military areas are also excluded.

Funding for the POOCs' implementation has been provided in the national budget, supported by EU Structural and Cohesion Funds (Table 6.1). The main items of expenditure include: *i)* engineering solutions for the protection of coastal areas at risk, *e.g.* groynes, breakwaters, and similar structures that reduce coastal erosion; *ii)* urban regeneration measures, including assistance in rehabilitating degraded urban areas and local and regional fishing hubs; *iii)* rehabilitation of beaches; *iv)* demolition of illegal construction and support for relocation of affected populations; *v)* environmental monitoring and awareness raising; and *vi)* technical assistance to municipalities. Port administrations and the Ministry of Defense are responsible for financing measures in port areas and military areas, respectively.

An evaluation of *implementation of the POOCs* carried out in 2005-06 highlighted the *achievements of their implementation*, which included enhanced planning along the coastal strip measured in terms of the limited occupation of coastal areas, particularly in sensitive or high-risk areas. Some improvements have also been made in both urban and natural

areas, while access to the coast has been better regulated. The POOCs have created a unified regime by means of which specific actions along the coast, mostly relating to coastal defense, are planned and financed. Monitoring and research activities have been systematised and enhanced. Strategic guidance provided by the MAOT has enabled more rational and efficient planning of interventions, allowed more balanced distribution of funds, and ultimately improved the ability to evaluate and review plans. Detailed GIS-referenced information sets were prepared for coastal zones, and awareness of the importance of coastal zone management was raised. The POOCs have been well co-ordinated, with management plans (POAPs) prepared for protected areas throughout Portugal (Carneiro, 2007).

However, the evaluation revealed that progress has not been sufficient with respect to *several investments* that were delayed or had been put on hold. Only 24% of the total budget had been spent, with close to two-thirds devoted to coastal defense alone and over 20% to actions aimed at improving the quality and value of beaches (Carneiro, 2007). A relatively high share (22%) of the interventions carried out had not been envisaged in the original POOCs. This may suggest important gaps in the original plans, or lack of monitoring of project implementation. The review also highlighted a lack of sufficient human and financial resources due to central government failure to transfer assigned resources. Difficulties in fostering co-operation and in the sharing of responsibilities, including financing, among the entities involved in implementing the POOCs was considered one reason for the failure to develop more detailed operational plans and implement individual actions (Carneiro, 2007).

A number of problems were faced during the *development of the POOC*. These derived from differences in the composition and technical expertise of the teams that prepared them, the use of different methodologies, the characteristics of the different coastal areas, and the attitudes of the technical commissions involved in developing the plans. Consequently, the POOCs vary in quality, which is contrary to the overarching purpose of harmonising management practices along the entire length of the continental coastline (Carneiro, 2007). Fragmentation of responsibilities for coastal zones and difficulties in harmonising the various levels of planning and management have limited the POOCs' effectiveness.

A review of the POOCs led to the adoption of a new programme, *Litoral 2007-13,* which further prioritised implementation of the actions defined in the POOCs with a focus on areas where people and buildings are most at risk. Specific emphasis was placed on protection against erosion and floods, including construction of groynes and breakwaters in areas with high erosion rates, carrying out beach nourishment and dune recuperation, and assigning areas for natural realignment where erosion rates are low. Important measures were introduced to speed up the demolition of illegal structures in risk zones and coastal protection zones in the DPM and the relocation of affected populations to low-risk areas.

In parallel, *four POOCs have been revised* (Caminha-Espinho, Ovar-Marinha Grande and Odeceixe-Vilamoura, which covers part of POOC Sines-Burgau, and all of Burgau-Vilamoura). It is expected that others will be revised in the near future. The plan for Vilamoura-Vila Real de Santo António was approved in 2005.

The most recent legislation related to the POOCs, introduced in 2009, strengthened *mechanisms for monitoring, consultation and participation in the preparation of the plans*. It

stipulates that committees should be created to oversee the technical development of plans. Their composition should reflect the nature of the interests to be safeguarded and the relevance of the technical implications. This legislation also defines specific periods for public consultation on the plans and their approval.

The *Polis Litoral schemes* have become the main mechanism for implementing the *Litoral 2007-2013 programme* in selected coastal areas (Box 6.2). Building on the success of an earlier *Polis scheme* in urban areas, they were launched in four priority areas with a view to better co-ordinating the actions of various authorities to prevent and protect coastal areas (persons, property and ecosystems) against natural hazards and to restore the legality of land use in coastal areas. One priority action focusses on demolishing structures houses built in coastal areas that are threatened by encroachment of the sea. Funding is provided to compensate relocation costs to people whose demolished homes were their principal residence. These schemes also strengthen nature conservation areas while designating locations for economic development, especially tourism and housing. It is too early to draw clear conclusions about the *Polis Litoral* schemes, but they appear to be a useful mechanism for co-ordination between the various institutional actors and stakeholders involved.

The legal requirement for the *Estuary Management Plans (POEs)* introduced in 2008 (Decree-Law No. 129/2008) allows better management and protection of an area, which has

Box 6.2. **Polis Litoral**

Polis Litoral (the Integrated Operations of Rehabilitation and Recovery of Coastal Areas) was launched in 2006 as part of the *Litoral 2007-13* programme. The *Polis Litoral* schemes cover over 300 km of seafront, including the banks of lagoons and estuaries. The key objectives of *Polis Litoral* interventions include:

- strengthening environmental resources as competitiveness factors, through developing economic activities related to coastal resources and linking them to the preservation of natural resources;
- protecting and rehabilitating coastal zones in order promote nature and biodiversity conservation, the reinstatement and restructuring of coastal lagoons, and preservation of the natural heritage and landscape;
- preventing (and protecting people, property and systems against) natural hazards;
- promoting public use of the coast, supported by reclassification of bathing, environmental and cultural heritage areas.

Four *Polis Litoral* schemes are operated by private companies, with participation by the state and municipalities (Table 6.2). Financing, estimated at EUR 322 million between 2007 and 2013 according to the Strategic Plans for Interventions, is provided by the state (Ministry of Environment and Spatial Planning, Ministry of Economy, Innovation and Development, and Ministry of Public Works, Transport and Communications), municipalities and the private sector, supported by EU funding (Cohesion Fund, European Regional Development Fund, European Fisheries Fund). The companies have advisory boards, on which relevant institutions are represented which co-ordinate actions within the coastal zones. All the operations of the *Polis Litoral* companies are subject to environmental impact assessment procedures.

long been covered by specific rules assigned to ports and therefore not covered by the POOCs. Since the POEs are expected to apply to transitional waters and their waterbeds and banks (within the DPM) and to the estuarine fringe a maximum width of 500 metres starting from the shore, their development should be closely linked to the POOCs' coastal zone protection measures.

Table 6.2. **Polis Litoral companies**

Company	Area	Budget 2007-13 (EUR million)
Polis Ria Formosa	48 km of coastline and 57 km of lagoons in 5 counties (Loulé, Olhão, Faro, Tavira, Vila Real de Santo António)	87
Polis Litoral Norte	50 km of coastline, 35 km of estuary and 30 km of river banks in 3 counties (Caminha, Viana do Castelo, Esposende)	92
Polis Ria de Aveiro	60 km of coastline, 140 km of lagoon front and 24 km of riverfront in 11 counties (Agueda, Albergaria-a-Velha, Aveiro, Estarreja, Ílhavo Aveiro, Mira, Murtosa, Oliveira do Bairro, Ovar, Sever do Vouga and Vagos)	96
Polis Litoral Sudoeste	Continental coast between San Torpes and Burgau, a distance of 150 km, with a total intervention area of 9 500 ha covering four counties (Sines, Odemira, Aljezur, Vila do Bispo)	47

Source: MAOTDR/INAG.

3.2. Integrated Coastal Zone Management Strategy

The development of an integrated coastal zone management strategy has been on the agenda since the 1990s. The *1998 Litoral Programme*, which mapped the main coastal risks and outlined the main areas of intervention, and a follow-up *2003 Programme of Interventions on the Continental Coastal Fringe – Finisterra*, which identified a series of specific actions to address degradation of the coasts of continental Portugal, were early attempts to establish a strategic framework. However, a combination of lack of a clear definition of the programmes' co-ordination mechanism and overall lack of political will resulted in their having a limited impact. Nevertheless, the programmes acted as important awareness raising activities concerning coastal issues, compiled useful information, and proposed some specific interventions in priority areas. The focus of a work group created for the *Finisterra* programme was eventually redirected towards re-establishing the legal status of the unlawful occupation of coastal zones.

The development of an integrated strategy began again in 2006 with the adoption of a report on *Bases for the National Integrated Coastal Zone Management Strategy*. This report led to the adoption of the *National Strategy for Integrated Coastal Zone Management* (ENGIZC) in 2009. The ENGIZC, which fulfilled an overdue obligation of the Portuguese government under the Recommendation of the European Parliament and the Council concerning Integrated Coastal Zone Management (ICZM) (2002/413/CE), set out a 20-year timeframe for sustainable development of coastal zones, encompassing coastal planning policies in both marine and terrestrial zones. The strategy identified 37 prioritised strategic options and associated structural measures under eight principal objectives.[8]

The ENGIZC Strategy is expected to provide renewed impetus for strengthening the management of coastal areas. Its future success depends on the implementation of *key actions identified in the 2006 background report*, in particular drafting a basic law on integrated coastal zone management (which would revise and consolidate the current legal regime) and creating networks and forums on coastal matters, including the establishment of a

national co-ordinating unit to support implementation of the new coastal management framework.

The development of the ENGIZC was subjected to a *strategic environmental assessment*, carried out jointly by researchers and representatives of the INAG. On the basis of identified strategic objectives and "critical factors for decision making", the SEA concluded that the ENGIZC was well-developed with respect to prevention and management of natural and technological risks, but that the land use planning model was less clear (Partidario *et al.*, 2009).

3.3. Links with other strategies

The *National Ocean* Strategy (ENM) was adopted in 2006. It identifies the ocean as one of the keys to the country's future development. Its goals are to be achieved through "efficient, responsible and committed co-ordination that actively contributes to the international oceans agenda, taking into consideration the principles of sustainable development and of precaution, and striving towards an ecosystem approach in the integrated management of natural resources, including coastal areas" (ENM, 2006).

Despite similarities in the objectives of the ENM and the ENGIZC, *elaboration of the two strategies has not been well co-ordinated*. In particular, there is a lack of continuity between planning and policy implementation in regard to the land and sea. The principal reason has been a distinction in the spatial scope of the two policy areas, with the ENM encompassing all ocean areas under Portuguese jurisdiction (including possible extension of the continental shelf, which is currently under consideration) while the ENGIZC is limited to a relatively narrow strip of land and coastal waters (12 nautical miles). Another difference is related to the uses of (and activities in) coastal and ocean areas. However, implementation of the two Strategies, especially in regard to education, awareness raising, and strengthening of monitoring and enforcement, could provide an opportunity to develop joint activities in order to optimise resources and take advantage of synergies. Such an approach would follow the lines of the 2006 EU Thematic Strategy on the Protection and the Conservation of the Marine Environment and the 2008 Marine Strategy Framework Directive (2008/56/EC). Additional efforts will also be needed to establish structures that could better facilitate the co-ordination of policies that were dispersed among different ministries. This includes co-ordination between the Interministerial Commission for Sea Affairs (CIAM) and bodies responsible for the implementation of the ENGIZC.[9]

The *National Strategic Plan for Tourism* (PENT) adopted in 2007 recognises the growing pressures on coastal areas from tourist activities and the risks to tourism operations from environmental degradation. It highlights urban, environmental and landscape quality as integral parts of tourism that should be used to promote Portugal as a tourism destination. The PENT envisages several measures to shift the tourism focus away from traditional coastal destinations (*e.g.* the Algarve and Lisbon) towards tourism inland, and to promote quality tourism associated with natural assets like forests, the landscape and mountains. With the introduction of six new tourism poles (Douro, Serra da Estrela, Oeste, Alqueva, Litoral Alentejano and Porto Santo) there is some evidence that the coastal areas' market share of total tourism is declining slightly while there has been a 33% growth of tourism in rural areas (TP, 2009). This suggests that a policy of promoting inland tourism is starting to bear fruit. However, seasonality remains a significant problem, with nearly 40% of overnight stays in the period between July and September. This demand pattern continues

to put pressure on the environment (*e.g.* through congestion and waste discharges from tourist facilities).

Growth in the number of *second homes* in areas with attractive natural and cultural landscapes and other amenities has been an important element of land use and landscape change in Portugal. However, the impacts of second home expansion have been perceived differently in sectoral strategies. For example, in the PENT residential tourism is considered to be one of the top-ten priorities, while the 2006 National Programme for Spatial Planning Policy recommended that its expansion be controlled because of impacts on the sustainability and management of land use and landscapes. The increase in the number of second homes has been stimulated by property taxes providing revenue to local authorities. Only a few local field studies on second homes in rural and coastal resort areas were carried out in the 1980s and 1990s, and no research on this subject was ever undertaken at regional and national levels (Nazaré Roca *et al.*, 2009). Thus, it is likely that national policy measures and instruments aimed at encouraging, restraining or otherwise regulating residential tourism, or the expansion of second homes in general, will prove unproductive in terms of meeting spatial and sectoral development objectives at the local and regional levels. Effective management of the existing and future impacts of growth in the number of second homes should be supported by better, more thorough inventories.

Bathing water quality improvement is a key part of actions to increase the coverage of wastewater treatment. Under PEAASAR II, one of the objectives is to provide public urban wastewater treatment systems for 90% of the population, with investments estimated at EUR 3.1 billion (MAOT, 2006).

3.4. Use of economic analysis and instruments

Experience in some other OECD countries, especially France, Italy and Spain, suggests that coastal zone management would benefit from the application of *economic valuation techniques and economic instruments*. The former could help establish trade-offs among the many competing policy objectives involved in coastal zone management, while the latter could help internalise negative environmental externalities and establish appropriate prices and incentives for more environmentally sustainable practices. Very few economic instruments have been used in this way in Portugal. Further analysis of their potential application is warranted (Table 6.3).

One study showed that there was significant *willingness to pay for water quality improvements*, largely related to amenity and recreation effects (Machado, 2002). A 2009 case study showed that in central Portugal (Ovar-Marinha Grande) expected losses from ecosystem services would amount to one-fourth of the total value they provide every year (nearly EUR 200 million) (Alves *et al.*, 2009).[10] The analysis of ecosystem service losses from coastal erosion has already been used to develop the Coastal Protection Investment Support Tool (COPIST), which helps coastal zone managers to identify cost-effective locations for coastal protection work. Carrying out such studies, supplemented by the appropriate transfer of results from other countries to Portugal, should provide a useful basis for the use of analytical tools such as cost-benefit analysis in coastal zone management (Markandya *et al.*, 2008).

Regarding economic instruments, the introduction of *taxes or charges for a construction permit,* as for example in France, could generate revenues that could be invested in coastal

Table 6.3. **SWOT analysis of economic instruments for ICZM**

	Economic instruments to promote sustainable construction/ discourage illegal construction	Tourist eco-charges	Incentives for brownfield redevelopment
Strengths	● based on polluter pays principle ● provides revenues for improving ● coastal areas (if earmarked) reduces pressure on coast	● based on user pays principle ● provides revenue for improving coastal areas may improve the attractiveness of resorts for "high quality" tourism	● provides incentives to remediate buildings ● reduces pressure on greenfield sites
Weaknesses	● may be seen as a "carte blanche" for developments ● collection costs may be significant if legal action is required	● opposition from tourism sector ● compliance costs for industry	● cost to taxpayer to assist development
Opportunities	● rate of charges sets example to protect coastal area	● encouraging better quality tourism, leading to increased per capita expenditure	● improved quality of coastal building infrastructure
Threats	● setting rate of charge difficult: should not be set too high (no development) or too low ● may be difficult to implement with pressure from significant stakeholders	● tourism under pressure from competitors; additional cost could reduce tourism demand and revenues ● legislative barriers	● unexpected remediation expenditures ● low uptake of subsidies affecting effectiveness

Source: OECD, Environment Directorate.

zone management, including nature conservation projects. They can also provide incentives for construction outside coastal areas.

Fines to discourage illegal construction have been used in Portugal. However, their effectiveness has been limited by the weak enforcement capacities of local authorities. Considering the extent of illegal construction in some areas, important efforts should be devoted to better enforcement of planning requirements as well as stricter application of fines. Closer co-operation between national authorities and the local population and NGOs should provide a way to exert pressure on local decision-makers to undertake non-compliance actions and ensure better transparency in their implementation. Fines could be extended to other illegal activities along the coasts, such as illegal extraction of natural resources.

Tourist eco-charges are another source of revenue that could be used to pay for environmental protection and thus promote a higher quality of tourism. However, there may be potential barriers to their implementation in terms of perceived threats to competitiveness and the institutional framework – including the legal basis for regional eco-taxes of this type. For example, these measures were applied briefly in Mallorca, Spain, but met substantial opposition due to a perceived threat to competitiveness and difficulties with the legal framework for such measures in that country. Studies that evaluated the potential for such an economic instrument in the case of Hvar in Croatia found that tourists were willing to pay such a tax for environmental improvements in tourism destinations, although here again there were institutional barriers to the creation of this type of instrument (Taylor *et al.*, 2005).

Higher taxes on *greenfield development,* combined with tax incentives to promote brownfield redevelopment, would provide another means to reduce pressures from new construction in coastal areas. (Thornton *et al.*, 2007). A review of incentive schemes in Europe concluded that there is a need for further direct and indirect financial incentives for brownfield redevelopment, as it has higher costs than development on greenfield sites so

that there is a rationale for relative fiscal incentives. Such incentives have been used successfully in a range of countries to reduce urban sprawl and protect green areas (Alberini *et al.*, 2003).

3.5. Climate change adaptation policies

Coastal areas are likely to be significantly affected by climate change. Portugal has been the subject of significant research on possible impacts under the *Scenarios, Impacts and Adaptation Measures (SIAM) research project*. The SIAM II project investigated the impacts on eight socio-economic sectors, including the coastal zone (PRC, 2009). Sea level rise was experienced in Portugal in the 20th century, with an increase of 15 cm (Andrade et al., 2002). The most significant impacts in coastal zones include coastal inundation and wetland and lowland displacement, more rapid erosion of the coasts, increased storm surge and flooding, and encroachment into estuaries and lagoons with changes in tidal regime and sediments (Andrade *et al.,* 2002). The risks to coastal lagoons and estuaries, including the Sado and Tagus estuaries, could be particularly significant. There are substantial risks of coastal erosion, although the risk factors associated with sand deficiency from damming may play a more significant role here than sea level rise (Ferreira *et al.,* 2008).

The *National Climate Change Programme* and the *National Climate Change Adaptation Strategy* aim to minimise impacts in the long run. Climate and sea level rise scenarios were taken into consideration in the preparatory studies preceding development of the POOCs. However, evidence suggests that only the plans for Burgau-Vilamoura and Vilamoura-Vila Real de Santo António took sea level rise into account. As a result, the POOCs include measures such as prohibition of building works in high-risk zones and removal of illegal structures on barrier islands. Such measures also protect coastal ecosystems. It is difficult to evaluate the adequacy of these plans, and further policy measures may need to be considered as climate change scenarios become more sophisticated. The National Climate Change Adaptation Strategy puts the ENGIZC at the centre of the plan to address climate change in the coastal zone, but a separate group is charged with addressing impacts on tourism.

At local level, the *Strategic Plans for Adaptation to Climate Change in the Sintra and Cascais Municipalities*, completed in 2009 and 2010 respectively, appear to be major developments and should provide a template for other municipalities in Portugal in responding to the challenges of climate change (Box 6.3).

Expenditure on combating flooding and erosion is provided from national as well as EU funds.[11] Most of the actions undertaken are detailed in the POOCs and implemented by the INAG. During the period 1998-2015, expenditure to protect Portuguese coasts against flooding and erosion totals EUR 131 million. In 2008, expenditure to protect the coasts against flooding and erosion amounted to EUR 12 million, double that allocated in previous years. Of this amount, 80% is equally divided between the construction and rehabilitation of hard protection structures, such as dikes and breakwaters, and soft measures including dune rehabilitation and beach nourishment. Indirect measures include preparatory studies to define the most appropriate measures, as well as technical planning. However, no budgets exist which directly relate to protection against the loss of ecosystems due to climate change, as the overall objective is to return natural areas to (or maintain them in) their natural state. Interventions for the protection of ecosystems often have a low investment cost, *e.g.* construction of walkways that people can use to access the beach without damaging the dune system.

Box 6.3. **Analysis of climate change impacts in the Municipality of Cascais**

The Municipality of Cascais covers an area of around 100 km^2 north of Lisbon. It is home to 183 000 residents. The municipality includes areas of outstanding natural beauty, such as the Cascais-Sintra natural park with its mountains, forests, beaches and dunes, but it also has a diverse and very rich built heritage. It is a key tourist destination in Portugal´s centre, particularly the towns of Cascais and Estoril, and hosts international coastal and motor sporting events, conferences and various leisure activities.

Cascais was one of the first 100 "pioneering cities" in the world to formally commit to reduce CO_2 emissions beyond the EU 20% objective (reduce carbon emissions by 2020 by improving energy efficiency and increasing the use of renewables by 20% and 20%, respectively). To achieve this goal, the municipality agreed to develop a Local Strategy for Climate Change, which will involve its stakeholders in helping to determine the main strategic directions for political, economic and development action on climate change. Several studies are under way to better assess the municipality's impacts on climate, and climate's impact on it, including:

- the Cascais case study, carried out under the SIAM framework, which examines how climate change could affect water resources, coastal zones, fisheries, agriculture, human health and impacts on tourism, energy, forestry and biodiversity;
- the Energy Matrix municipality-wide study, which assesses the potential for energy production from renewable sources, identifies energy consumption and flows for residential, industrial, service and transport sectors, and calculates respective carbon emissions at the municipal and council levels. Twenty-five municipal buildings are subject to real-time monitoring of energy flows;
- the Carbon Footprinting of Municipal Agencies, which undertook carbon studies in 2009 to understand the carbon footprint of the activities of several municipal agencies such as Cascais Atlântico, Cascais Agenda 21, Cascais Natura and Cascais Energia.

Notes

1. Various terms have been used to define coastal areas. A Portuguese working group, established in 2006 to develop the National Strategy for Integrated Coastal Zone Management, distinguished four types: *i)* Littoral (*Litoral*), an area covering the entire shoreline and all the terrestrial area influenced directly or indirectly by the sea; *ii)* Coastal Zone (*Zona costeira*), an area extending from the 200-metre sea depth line inland as far as tides, waves or winds reach and have an influence; *iii)* Coastal Stretch (*Orla costeira*), an area of coast under the direct influence of sea activity, ranging from the 30-metre sea depth line 50 metres inland, and *iv)* Coastline (*Linha de costa*), a reference line defined as the intersection between the mean height of sea level and land. This chapter largely focuses on the Coastal Stretch.
2. There is a general lack of clear data on a spatial basis on Portugal's performance during the review period. Remote sensing data could fill the gap somewhat, but the degree to which such data are available for timeframes relevant to policy actions is unclear.
3. The Portuguese government has argued that any negative environmental impacts would be offset through a new management plan for the area, which would include a private conservation zone.
4. Major recorded incidents include the *Coral Bulker* fuel oil spill at Viana de Castello in 2000 and the *Prestige* oil spill on the Spanish coast of Galicia in 2002.
5. Portugal has one of the largest Exclusive Economic Zones (EEZ) in Europe, covering over 1.7 million km^2. The EEZ associated with the mainland includes an area of 327 667 km^2, with 953 633 km^2 around the Azores and 446 108 km^2 around the Madeira archipelago.
6. Approximately 6 700 of the continental vessels are non-trawlers under 12 metres in length. Another 1 066 vessels are registered in the Autonomous Regions of the Azores and Madeira.

7. The main coastal lagoon areas are Ria de Aveiro and Ria Formosa, located in the Centro region and in the south of the country (Algarve), respectively.
8. The eight objectives included: *i)* Integration and International Co-operation; *ii)* Enhancement and Reinforcement of Institutional Communication; *iii)* Conservation of Resources, Natural and Landscape Heritage; *iv)* Rehabilitation of Coastal Zones and Sustainable Development of Activities and Uses; *v)* Mitigation of Risks and Social, Economic and Environmental Impacts; *vi)* Integrated Policies; *vii)* Public Participation and Raising Social Awareness and Knowledge; and *viii)* Integrated Evaluation of Policies and Coastal Zone Management Initiatives.
9. The CIAM, which involved representatives from relevant ministries, was tasked to co-ordinate, monitor and assess implementation of the ENM, as well as harmonising it with other related initiatives. Together with the creation of the CIAM at governmental level, a Permanent Forum for Sea Affairs (open to civil society participation) was established.
10. The analysis included a wider strip of land, extending 10 km from the coastline.
11. For the period 1998-2005, on average 30% is supported by EU funds per year.

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I.A: SELECTED ENVIRONMENTAL DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	PRT	SVK	ESP	SWE	CHE	TUR	UKD*	OECD*
LAND																																
Total area (1000 km^2)		9985	1964	9832	378	100	7741	268	84	31	79	43	338	549	357	132	93	103	70	301	3	42	324	313	**92**	49	505	450	41	784	244	35294
Nitrogenous fertiliser use (t/km^2 of agricultural land)		2.9	1.1	2.7	9.3	17.3	0.2	2.3	2.7	9.8	7.6	6.5	7.5	6.9	9.2	3.7	5.1	0.7	8.0	5.2	11.3	10.9	10.2	9.1	**2.8**	5.9	2.7	7.4	3.4	3.6	5.2	2.2
Pesticide use (t/km^2 of agricultural land)		0.05	0.04	0.07	1.18	1.32	-	0.04	0.11	0.51	0.11	0.12	0.07	0.25	0.19	0.22	0.17	-	0.07	0.61	-	0.56	0.07	0.09	**0.47**	0.20	0.15	0.07	0.09	0.04	*0.15*	*0.07*
Livestock densities (head of sheep eq./km^2 of agr. land)		139	252	168	723	1492	59	817	500	1586	244	824	321	470	649	388	159	58	1120	422	999	1982	844	312	**425**	211	307	380	765	244	*547*	190
FOREST																																
Forest area (% of land area)		34.1	33.5	33.2	68.5	64.3	19.7	31.5	47.0	22.3	34.3	12.7	72.9	29.0	31.8	29.8	22.4	0.3	10.5	30.6	33.5	10.8	32.4	30.5	**37.7**	40.2	35.7	68.7	30.8	14.4	11.8	30.7
Use of forest resources (harvest/growth)		..	..	..	0.2	1.0	..	0.7	0.6	0.8	..	..	0.7	..	1.0	..	..	..	0.9	..	..	..	0.4	0.5	**..**	..	..	..	..	..	0.5	..
Tropical wood imports (USD/cap.)	*2*	3.2	0.9	2.8	7.9	5.0	9.1	5.3	0.9	28.1	0.9	7.7	5.8	9.8	3.7	5.0	0.1	8.0	7.1	7.4	0.7	33.2	4.0	1.4	**14.1**	1.8	6.1	1.5	0.6	2.1	3.0	4.9
THREATENED SPECIES																																
Mammals (% of species known)		20.3	31.8	16.8	23.3	11.4	23.8	18.0	22.0	35.9	20.0	22.0	10.8	19.0	37.9	38.2	37.8	-	1.8	40.7	51.6	18.6	18.2	13.5	**26.2**	21.7	13.3	18.3	32.9	14.3	*15.8*	..
Birds (% of species known)		9.8	16.2	11.7	13.1	6.3	13.0	21.0	27.7	24.9	50.0	16.3	13.3	19.2	27.3	1.9	14.5	44.0	5.4	18.4	23.1	21.6	14.5	7.8	**33.3**	14.0	26.9	17.5	36.4	3.7	*16.2*	..
Fish (% of species known)		29.6	27.6	31.7	36.0	8.9	1.0	10.0	50.6	23.4	41.5	15.8	11.8	36.1	68.2	26.2	43.2	-	23.1	35.1	27.9	22.1	-	21.0	**62.9**	24.1	51.4	10.9	38.9	11.1	*11.1*	..
WATER																																
Water withdrawal (% of gross annual availability)		1.4	17.8	19.5	20.1	36.2	4.8	1.6	4.1	31.2	10.7	4.9	2.1	17.0	17.2	12.1	4.9	0.1	2.3	24.0	2.9	10.9	0.8	18.3	**12.4**	0.8	29.2	1.4	5.0	17.3	*12.0*	*11.2*
Public waste water treatment (% of population served)		86	40	68	74	89	..	80	93	69	76	90	80	80	95	65	57	57	65	94	95	99	79	64	**70**	58	92	86	97	46	*97*	*73*
Fish catches (% of world catches)		1.1	1.6	5.2	4.7	2.0	0.2	0.5	-	-	-	0.9	0.2	0.6	0.3	0.1	-	1.6	0.2	0.3	-	0.5	2.6	0.2	**0.3**	-	1.0	0.3	-	0.6	0.7	25.7
AIR																																
Emissions of sulphur oxides (kg/cap.)		52.0	25.9	34.2	6.1	8.3	122.9	18.7	2.7	9.1	16.8	3.6	12.9	5.8	6.1	39.8	8.8	48.1	10.1	4.9	6.4	3.1	4.2	26.2	**10.0**	12.8	11.6	3.3	1.8	15.1	8.3	20.4
(kg/1000 USD GDP)	*3*	1.4	1.8	0.8	0.2	0.3	3.5	0.7	0.1	0.3	0.7	0.1	0.4	0.2	0.2	1.5	0.5	1.3	0.3	0.2	0.1	0.1	0.1	1.6	**0.5**	0.6	0.4	0.1	-	1.2	0.2	0.7
% change (2000-2008)		-25	-5	-29	-15	-18	11	25	-29	-43	-34	-33	-15	-42	-22	-10	-82	74	-68	-61	134	-29	-25	-34	**-64**	-45	-64	-26	-15	-26	-58	-28
Emissions of nitrogen oxides (kg/cap.)		64.2	14.0	48.7	14.7	24.6	82.5	37.8	24.7	21.9	25.1	27.6	31.7	20.5	16.8	31.8	18.2	70.3	24.4	17.8	38.2	16.6	36.8	21.8	**24.5**	17.6	27.5	16.9	10.6	18.1	22.9	29.1
(kg/1000 USD GDP)	*3*	1.8	1.0	1.1	0.5	1.0	2.3	1.5	0.7	0.7	1.1	0.8	0.9	0.7	0.5	1.2	1.0	1.9	0.6	0.6	0.5	0.4	0.7	1.3	**1.2**	0.9	1.0	0.5	0.3	1.5	0.7	0.9
% change (2000-2008)		-15	4	-27	-11	6	17	16	-	-29	-18	-25	-20	-23	-25	7	-2	-17	-20	-27	12	-26	-14	-1	**-13**	-12	-11	-27	-18	24	-25	-18
Emissions of carbon dioxide (t./cap.)	*4*	16.5	3.8	18.4	9.0	10.3	18.5	7.8	8.3	10.4	11.2	8.8	10.6	5.9	9.8	8.3	5.3	6.9	9.9	7.2	21.5	10.8	7.9	7.8	**4.9**	6.7	7.0	5.0	5.7	3.7	8.3	10.6
(t./1000 USD GDP)	*3*	0.46	0.29	0.42	0.29	0.40	0.52	0.31	0.23	0.31	0.48	0.26	0.32	0.19	0.29	0.31	0.29	0.19	0.25	0.26	0.29	0.28	0.16	0.48	**0.23**	0.33	0.25	0.14	0.15	0.30	0.24	0.34
% change (2000-2008)		3	18	-2	-3	19	17	12	13	-6	-4	-4	4	-2	-3	7	-2	3	7	1	30	3	12	2	**-12**	-3	12	-13	5	31	-2	1
WASTE GENERATED																																
Industrial waste (kg/1000 USD GDP)	*3, 5*	..	..	..	40	30	10	10	..	40	30	10	100	50	20	..	30	-	30	20	20	30	20	90	**40**	80	20	100	-	20	20	40
Municipal waste (kg/cap.)	*6*	400	360	750	400	380	600	400	580	490	310	800	520	540	580	450	450	560	740	560	710	620	830	320	**480**	310	580	520	730	430	570	560
Nuclear waste (t./Mtoe of TPES)	*7*	6.3	0.1	0.9	1.4	2.9	-	-	-	2.2	1.8	-	2.0	4.3	0.9	-	1.9	-	-	-	-	0.1	-	-	**-**	3.3	0.8	4.9	2.3	-	1.8	1.4

.. not available. - nil or negligible.

1) Data refer to the latest available year. They include provisional figures and Secretariat estimates. Partial totals are underlined. Varying definitions can limit comparability across countries.

2) Total imports of cork and wood from non-OECD tropical countries.

3) GDP at 2005 prices and purchasing power parities.

4) CO_2 from energy use only; sectoral approach; international marine and aviation bunkers are excluded.

Source: OECD Environmental Data Compendium.

5) Waste from manufacturing industries.

6) CAN, NZL: household waste only.

7) Waste from spent fuel arising in nuclear power plants, in tonnes of heavy metal, per million tonnes of oil equivalent of total primary energy supply.

UKD: pesticides and threatened species: Great Britain; water withdrawal and public waste water treatment plants: England and Wales.

I.B: SELECTED ECONOMIC DATA (1) **OECD EPR / THIRD CYCLE**

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	**PRT**	SVK	ESP	SWE	CHE	TUR	UKD	OECD
GROSS DOMESTIC PRODUCT																																
GDP, 2009 (billion USD au 2005 prices and PPPs)		1167	1334	12987	3789	1243	775	108	289	348	232	178	164	1913	2630	299	171	11	161	1599	35	601	230	638	**219**	106	1244	301	287	836	1988	35882
% change (2000-09)		16.9	10.9	15.7	4.4	41.1	31.1	25.2	14.7	12.0	33.6	5.5	16.4	11.1	4.7	33.4	22.5	29.1	31.3	1.3	29.6	12.0	17.6	41.2	**5.0**	54.3	22.9	16.1	14.9	33.8	14.1	14.5
per capita, 2009 (1000 USD/cap.)		34.6	12.4	42.3	29.7	25.5	35.3	24.9	34.5	32.5	22.1	32.3	30.8	30.5	32.1	26.6	17.1	34.0	36.2	26.5	69.9	36.4	47.7	16.7	**20.6**	19.5	27.1	32.4	37.0	11.6	32.2	30.0
Exports, 2009 (% of GDP)		36.8	28.9	12.8	18.7	51.2	22.0	30.5	59.3	87.6	78.2	57.6	50.7	26.8	48.9	23.1	82.7	43.9	92.9	29.7	180.1	80.2	50.8	37.9	**33.5**	88.1	27.5	55.0	57.1	23.8	30.3	28.3
INDUSTRY	*2*																															
Value added in industry (% of GDP)		32	36	22	30	37	26	31	23	38	26	32	20	30	19	29	24	34	27	15	25	46	32	24	**38**	28	28	28	28	24	27	-
Industrial production: % change (2000-08)		-5.2	7.9	5.0	5.5	60.8	11.7	11.0	36.1	11.5	57.0	5.5	24.8	-0.4	21.1	0.3	55.9	..	42.2	-1.8	15.0	10.7	-7.1	63.4	**-7.7**	77.1	0.6	13.2	20.8	41.1	-6.5	10.3
AGRICULTURE																																
Value added in agriculture (% of GDP)	*3*	2.2	3.4	1.3	1.5	2.9	6.4	1.7	0.7	2.5	1.2	3.0	2.0	0.9	3.7	4.3	5.8	1.7	2.0	0.3	1.8	1.2	3.7	2.3	**3.1**	2.6	1.6	1.2	8.6	0.7	2.5	-
Agricultural production: % change (2000-09)		15.7	18.4	11.9	-5.0	-	-7.2	11.9	-	-7.7	..	8.1	2.0	-3.0	4.0	-22.0	7.5	5.9	-9.1	-4.0	-7	-6.0	-3.1	13.3	**-6.0**	4.3	-5.9	-1.0	2.0	10.6	-3.9	..
Livestock population, 2009 (million head of sheep eq.)		94	259	689	37	27	247	93	16	22	10	22	7	137	110	18	9	1	47	57	1	38	9	50	**15**	4	86	12	12	96	97	2320
ENERGY																																
Total supply, 2009 (Mtoe)		250	177	2172	474	229	131	18	32	56	43	18	33	253	319	29	25	6	14	163	4	77	27	94	**24**	17	128	43	27	92	198	5172
% change (2000-09)		-0.6	22.1	-4.5	-8.7	23.2	21.3	8.4	13.7	-4.7	7.9	-4.0	2.8	0.5	-5.5	7.2	-0.6	78.1	2.3	-5.1	17.5	5.5	2.5	5.0	**-3.3**	-3.9	5.1	-8.5	9.3	20.7	-11.4	-1.2
Energy intensity, 2009 (toe/1000 USD GDP)		0.21	0.13	0.17	0.13	0.18	0.17	0.17	0.11	0.16	0.19	0.10	0.20	0.13	0.12	0.10	0.15	0.51	0.09	0.10	0.11	0.13	0.12	0.15	**0.11**	0.16	0.10	0.14	0.09	0.11	0.10	0.14
% change (2000-09)		-14.9	10.1	-17.4	-12.6	-12.7	-7.5	-13.4	-0.8	-14.9	-19.2	-9.0	-11.7	-9.5	-9.7	-19.6	-18.8	38.0	-22.1	-6.3	-9.3	-5.8	-12.8	-25.6	**-8.0**	-37.7	-14.5	-21.3	-4.9	-9.8	-22.3	-13.7
Structure of energy supply, 2009 (%)	*4*																															
Solid fuels		8.3	5.0	22.4	21.5	28.1	42.5	9.0	9.3	5.7	42.1	22.3	17.0	3.9	22.7	28.0	10.7	1.4	14.8	7.7	1.6	9.7	2.1	54.8	**12.1**	22.3	8.5	3.5	0.6	30.9	15.3	19.7
Oil		34.9	56.3	36.9	42.7	40.0	30.8	34.9	39.0	41.1	20.6	35.6	27.5	31.2	32.5	55.6	27.6	15.2	50.1	42.1	64.4	38.3	32.7	25.4	**48.3**	19.9	47.2	27.6	42.5	27.2	32.7	37.2
Gas		30.7	27.7	25.1	17.0	13.5	21.6	19.6	23.4	26.3	15.1	21.9	10.9	15.1	23.9	10.4	37.3	-	30.7	40.2	30.9	45.5	20.2	13.1	**18.0**	29.8	24.2	2.6	9.9	31.3	39.5	24.2
Nuclear		9.3	1.5	10.0	15.4	16.8	-	-	-	22.0	16.0	-	19.2	41.8	11.0	-	16.5	-	-	-	-	1.4	-	-	**-**	22.1	10.7	30.4	26.7	-	9.1	11.3
Hydro, etc.		16.8	9.5	5.7	3.4	1.6	5.2	36.5	28.2	4.8	6.2	20.2	25.4	8.0	10.0	6.1	7.8	83.4	4.4	9.9	3.2	5.0	45.0	6.7	**21.6**	5.9	9.4	35.8	20.3	10.6	3.3	7.7
ROAD TRANSPORT	*5*																															
Road traffic volumes per capita, 2007 (1000 veh.-km/cap.)		10.1	0.7	16.3	6.8	4.7	10.1	13.7	10.3	9.2	4.6	8.2	10.1	8.5	7.0	10.1	2.3	9.6	10.1	9.3	8.8	8.4	8.2	4.2	**8.9**	2.9	5.2	8.6	8.3	1.0	8.3	8.7
Road vehicle stock, 2007 (10 000 vehicles)		1883	2569	24795	7413	1590	1417	273	513	575	483	262	299	3665	4922	608	349	24	226	4021	36	822	269	1702	**573**	166	2696	478	430	946	3316	67323
% change (2000-07)		7.2	67.7	12.2	4.8	31.8	19.4	17.4	3.6	9.8	29.5	16.3	21.1	8.4	7.9	42.1	26.9	34.4	46.5	11.2	20.8	11.7	16.7	41.2	**20.6**	15.6	25.8	9.0	11.9	58.6	17.1	14.9
per capita (veh./100 inh.)		57	24	82	58	33	67	65	62	54	47	48	56	59	60	54	35	78	52	68	75	50	57	45	**54**	31	60	52	57	13	54	57

.. not available. - nil or negligible.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Value added: includes mining and quarrying, manufacturing, gas, electricity and water and construction; production: excludes construction.

3) Agriculture, forestry, hunting, fishery, etc.

4) Breakdown excludes electricity trade.

5) Refers to motor vehicles with four or more wheels, except for Italy, which include three-wheeled goods vehicles.

Source: OECD Environmental Data Compendium.

I.C: SELECTED SOCIAL DATA (1)

		CAN	MEX	USA	JPN	KOR	AUS	NZL	AUT	BEL	CZE	DNK	FIN	FRA	DEU	GRC	HUN	ISL	IRL	ITA	LUX	NLD	NOR	POL	**PRT**	SVK	ESP	SWE	CHE	TUR	UKD	OECD
POPULATION																																
Total population, 2009 (100 000 inh.)		337	1076	3070	1275	487	220	43	84	108	105	55	53	626	819	113	100	3	45	598	5	165	48	382	**106**	54	459	93	77	719	609	11936
% change (2000-09)		10.0	9.3	8.8	0.5	3.7	14.6	11.9	3.1	5.2	2.3	3.4	3.1	6.0	-0.4	2.9	-1.9	13.5	17.6	5.8	13.1	3.8	7.5	-0.4	**4.0**	0.5	14.1	4.8	7.8	11.9	4.9	6.2
Population density, 2009 (inh./km²)		3.4	54.8	31.2	337.4	488.8	2.8	16.1	99.7	353.4	133.2	128.1	15.8	114.0	229.3	85.2	107.7	3.1	63.5	200.0	190.5	397.9	14.9	121.9	**115.5**	110.6	90.9	20.7	187.5	91.8	253.7	33.9
Ageing index, 2008 (over 64/under 15)		81.5	19.1	63.6	164.3	59.3	68.6	60.5	113.3	100.9	103.9	85.7	99.0	91.2	154.1	130.2	106.3	55.5	52.9	140.5	77.1	83.4	76.8	87.5	**114.1**	78.2	113.1	105.5	114.8	26.8	92.5	76.2
HEALTH																																
Women life expectancy at birth, 2007 (years)		83.0	77.5	80.7	86.0	82.7	83.7	82.2	82.9	82.3	79.9	80.7	83.1	84.3	82.4	82.0	77.3	82.9	82.1	84.0	81.9	82.3	82.9	79.7	**82.3**	78.1	84.4	83.0	84.2	74.8	81.1	..
Infant mortality, 2007 (deaths /1 000 live births)		5.0	15.2	6.7	2.6	4.1	4.2	4.8	3.7	3.7	3.3	3.8	2.8	3.8	3.8	3.6	5.9	2.0	3.1	3.7	2.5	4.1	3.2	6.0	**3.4**	6.7	3.8	2.5	4.4	17.6	4.8	..
Expenditure, 2007 (% of GDP)		10.1	5.9	16.0	8.1	6.8	8.7	9.2	10.1	10.2	6.8	9.8	8.2	11.0	10.4	9.6	7.4	9.3	7.6	9.0	7.3	9.8	8.6	6.4	**9.9**	7.7	8.5	9.1	10.8	5.7	8.4	..
INCOME AND POVERTY																																
GDP per capita, 2009 (1000 USD/cap.)		34.6	12.4	42.3	29.7	25.5	35.3	24.9	34.5	32.5	22.1	32.3	30.8	30.5	32.1	26.6	17.1	34.0	36.2	26.5	69.9	36.4	47.7	16.7	**20.6**	19.5	27.1	32.4	37.0	11.6	32.2	30.0
Poverty (% pop. < 50% median income)		12.0	18.4	17.1	14.9	14.6	12.4	10.8	6.6	8.8	5.8	5.3	7.3	7.1	11.0	12.6	7.1	7.1	14.8	11.4	8.1	7.7	6.8	14.6	**12.9**	8.1	14.1	5.3	8.7	17.5	8.3	10.6
Inequality (Gini levels)	*2*	31.7	47.4	38.1	32.1	31.2	30.1	33.5	26.0	26.0	25.0	25.0	26.0	26.0	30.0	34.0	26.0	28.0	31.0	32.0	27.0	28.0	24.0	32.0	**37.0**	24.0	31.0	23.0	27.6	43.0	33.0	30.3
Minimum to median wages, 2003	*3*	41.0	19.0	32.0	31.0	25.0	57.0	46.0	x	47.0	37.0	x	x	61.0	x	49.0	49.0	x	38.0	x	54.0	51.0	x	40.0	**44.0**	45.0	29.0	x	x	44.0	44.0	..
EMPLOYMENT																																
Unemployment rate, 2008 (% of civilian labour force)	*4*	6.1	4.0	5.8	4.0	3.2	4.2	4.2	3.9	7.0	4.4	3.4	6.4	7.8	7.3	7.7	7.8	3.0	6.0	6.8	4.8	2.8	2.5	7.2	**7.8**	9.5	11.4	6.1	3.5	9.8	5.6	6.1
Labour force participation rate, 2008 (% 15-64 years)		80.4	65.0	75.6	80.8	69.3	77.9	79.9	78.4	69.0	70.3	83.5	76.2	69.1	80.0	68.3	60.4	85.0	73.8	63.4	68.3	81.0	82.0	62.7	**78.3**	68.8	74.2	71.2	85.2	50.8	76.6	72.2
Employment in agriculture, 2008 (%)	*5*	2.4	13.0	1.5	4.2	7.2	3.3	7.0	5.6	1.8	3.3	2.7	4.5	2.9	2.3	11.3	4.5	4.0	5.8	3.9	1.4	2.6	2.8	14.0	**11.5**	4.0	4.4	2.2	4.0	23.7	1.5	5.0
EDUCATION																																
Education, 2007 (% 25-64 years)	*6*	87.1	33.6	88.7	84.0	79.1	69.9	72.1	81.0	69.6	90.9	75.0	81.1	70.0	85.3	61.1	79.7	64.1	69.5	53.3	67.9	73.3	80.7	87.1	**28.2**	89.9	51.2	85.0	86.8	30.3	69.6	71.0
Expenditure, 2006 (% of GDP)	*7*	6.1	5.7	7.6	4.9	7.0	5.2	5.9	5.4	6.1	4.6	7.1	5.6	6.0	4.7	..	..	7.8	4.7	4.5	3.1	5.6	5.4	5.3	**5.6**	-	4.8	6.3	5.6	..	5.8	5.7
OFFICIAL DEVELOPMENT ASSISTANCE	*8*																															
ODA, 2009 (% of GNI)		0.30	..	0.20	0.18	0.10	0.29	0.29	0.30	0.55	..	0.88	0.54	0.46	0.35	0.19	..	..	0.54	0.16	1.01	0.82	1.06	..	**0.23**	..	0.46	1.12	0.47	..	0.52	0.31
ODA, 2009 (USD/cap.)		119	..	93	74	17	126	72	137	243	..	509	241	198	146	54	..	..	224	55	816	389	846	..	**48**	..	143	489	298	..	186	108

.. not available. - nil or negligible. x not applicable.

1) Data may include provisional figures and Secretariat estimates. Partial totals are underlined.

2) Ranging from 0 (equal) to 100 (inequal) income distribution; figures relate to total disposable income (including all incomes, taxes and benefits) for the entire population.

3) Minimum wage as a percentage of median earnings including overtime pay and bonuses.

Source: OECD.

4) Standardised unemployment rates; MEX, ISL, TUR: commonly used definitions.

5) Civil employment in agriculture, forestry and fishing.

6) Upper secondary or higher education; OECD: average of rates.

7) Public and private expenditure on educational institutions; OECD: average of rates.

8) Official Development Assistance by Member countries of the OECD Development Assistance Committee.

REFERENCE II

Actions Taken on the 2001 OECD Review Recommendations

Recommendations	Actions taken
	GREENING GROWTH
Decouple pressures on the environment from sectoral activities (*e.g.* energy, industry, transport, agriculture) through better *institutional and market integration* of environmental concerns in sectoral decision making and practices.	An extensive planning and consultative framework has been established at the governmental level to integrate environmental considerations in sectoral policies. This has resulted in a reduction of the environmental impacts of economic growth. The Ministry of Environment and Spacial Planning has led a number of initiatives resulting in the introduction of regulatory and economic instruments that stimulated structural change, investment and better sectoral policies, which has helped to reduce most forms of pollution.
Further strengthen national and local *sustainable development* efforts (*e.g.* by adopting a national sustainable development strategy).	The National Strategy for Sustainable Development to 2015 and its implementation plan were approved in 2007. The Strategy provides the framework for the integration of various planning and strategic instruments. Its implementation is regularly monitored.
Integrate environmental concerns in *fiscal* policies and decrease environmentally harmful subsidies.	Portugal has introduced several environmentally related fiscal measures, including the waste management tax, the water resource tax and the tax on inefficient light bulbs. Other taxes have been reformed to reflect environmental performance, such as those on the purchase and ownership of vehicles (now partly linked to CO_2 emissions) and the local property tax (now reduced when renewable energy source equipment and solar panels are installed). Excise duties have been increased, especially those on industrial fuels and domestic heating oil. Excise duty exemptions and reduced value added tax rates continue to apply to different uses of energy products and to products or activities that are potentially environmentally harmful.
Ensure that *environmental convergence*, both within the EU and within Portugal (*e.g.* among regions) receives higher priority in the implementation of EU cohesion policies.	In the programming period 2000-06, the EU's contribution to environmentally related investments accounted for 9% of the EU funds allocated to Portugal. Funds were mostly used to finance water and waste infrastructure investment. In the programming period 2007-13, about 23% of the total available EU contribution has been allocated to improving the environment, promoting sustainable growth and combating climate change.
Develop the use of *economic instruments* and full cost recovery in the provision of environmental services, and progress towards full adherence to the polluter pays and user pays principles.	An increase in water and waste tariffs, in conjunction with the introduction of water and waste management taxes, has enabled better cost recovery in water and waste service provision. Most households (nearly 90%) are subject to a multi-part water tariff, consisting of a fixed connection charge and billing at a volumetric rate. There is also widespread use of increasing block tariffs. Wastewater charges are less well-developed, as they are either fixed or dependent on water consumption and other variables, *e.g.* property value. Similarly, several municipalities do not charge households for waste services or the charges are based on water bills and other variables.
Significantly increase *economic analyses* of environmental policy measures.	Economic analysis is not used systematically to support environmental policy decisions, although a few policy documents (*e.g.* the Portuguese Environment and Health Action Plan) have undergone some form of economic or cost-benefit analysis.
Take *distributive effects* into account when privatising environmental services, introducing economic instruments or changing legislation concerning property and user rights.	In 1997, the Institute for the Regulation of Water and Solid Waste (IRAR) was created to regulate water supply, wastewater and urban waste service operators. Its purpose, in particular, has been to ensure that tariffs guarantee efficient and socially acceptable prices without harming the financial sustainability of service providers. The IRAR also analyses consumer complaints and assists in conflict resolution between consumers and service providers. The IRAR was transformed into the Water and Waste Services Regulation Authority (ERSAR) in 2009, with increased regulatory responsibilities covering approximately 500 management service entities irrespective of their management model.

Recommendations	Actions taken
IMPLEMENTATION OF ENVIRONMENTAL POLICIES	
Continue implementing the various national plans and investment programmes and review and revise the *National Environment Plan*.	A large number of national plans and investment programmes related to priority environmental issues, identified by the 1995 National Environment Plan, were designed during the review period. They have been implemented in connection with national development plans, such as the 2000-06 National Plan for Economic and Social Development, the 2005 National Action Programme for Growth and Jobs (PNACE) and the 2006 National Policy Programme for Land Use Planning (PNPOT). Planning development has been closely linked with the EU funds provided by the Operational Programme of the third Community Support Framework for the period 2000-06, and with the National Strategic Reference Framework (QREN) for the period 2007-13.
Continue to strengthen implementation of *integrated pollution prevention and control* licensing mechanisms.	Significant reform of the environmental permitting and licensing system was launched in 2000 with the introduction of IPPC permitting for large installations. Permitting procedures have been simplified: the Environment Agency is the only competent national authority for IPPC permitting, and installations may use accredited private entities to prepare permit requests. A new system for accelerated licensing of projects of potential national interest (PIN) has been in force since 2005.
Prepare contingency plans in the event of an industrial accident, pursuant to the *Seveso* Directive.	National legislation on the prevention of major accidents was strengthened in 2007 by the introduction of additional evaluation mechanisms such as an annual presentation of audit reports on Safety Management Systems, performed by qualified auditors and applicable to operators of "upper tier" establishments, and land use compatibility assessments applicable to new Seveso sites and changes in existing ones. Several guidance documents and forms have been published to support the implementation of these mechanisms. The system of integrated environmental permits covers sites listed under the *Seveso II* Directive. However, about half the required installations have not completed External Emergency Plans.
Strengthen the financial and human resources devoted to national environmental inspection to support progress in *compliance with and enforcement of environmental regulations*.	The capacity of the Environmental and Spatial Planning General Inspectorate (IGAOT) has been strengthened to carry out and co-ordinate compliance assurance and promotion with regard to environmental, spatial planning and nature protection legislation. Since 2006, the IGAOT has also exercised financial and administrative control of the operations of agencies subordinate to the MAOT. Enforcement of nature protection legislation has been strengthened by the creation of the Service for Nature and Environmental Protection (SEPNA) of the National Republican Guard, which enforces compliance with environmentally related legislation, particularly concerning hunting, fishing, and non-compliance in the forestry sector. The IGAOT and the SEPNA are authorised to carry out inspections, investigate non-compliance and initiate administrative offence procedures. They function as law enforcement bodies, as set out in relevant legislation.
Strengthen the capacity to *evaluate the environmental impact* of regional and sectoral development schemes.	Procedures for environmental impact assessments of projects that may have significant environmental impacts were revised in 2000 and again in 2005. As required under EC regulations, EIAs in Portugal involve multi-stage procedures that are to be undertaken prior to project development. EIA procedures begin with the submission of an environmental impact study (EIS) by proponents of projects. The EIS is subject to non-mandatory screening to help focus on projects that present the greatest potential environmental risks. In 2007, detailed provisions were set out to ensure public participation in the environmental assessment of sectoral plans and programmes. Several public discussions took place on key strategic documents, such as the National Sustainable Development Strategy, River Basin Management Plans, the National Climate Change Programme, the National Environmental and Health Action Plan, and the National Strategic Tourism Plan.
Foster the development of *environmental democracy* through further improvement in environmental information, increased participation (*e.g.* in EIA processes) and the development of Local Agenda 21 initiatives.	Provision of environmental information was strengthened during the review period. The Environment Agency has become the key government body responsible for collecting, maintaining and disseminating environmental data and carrying out an integrated analysis of the results of implementing policies and measures. The annual State of the Environment reports produced by the Environment Agency are presented to the Parliament to support discussions of the national budget. Since 1999, the use of indicators in environmental reporting has become widespread. A 2007 publication on a system of sustainable development indicators (SIDS) presented environmental topics in the wider context of sustainability, reflecting efforts to integrate environmental concerns in sectoral (*e.g.* energy, transport, agriculture, tourism and industry) policy. In 2008, several portals were launched to provide on-line access to information on a wide range of environmentally related issues. Portugal ratified the Aarhus Convention in 2003 and has made progress in ensuring that the public is able to exercise the rights set out in the Convention's three "pillars". A 2006 law on access to environmental information and the conditions for its provision has strengthened access to the already well-established system for dissemination of environmental information to the public.

Recommendations	Actions taken
IMPLEMENTATION OF ENVIRONMENTAL POLICIES *(cont.)*	
	Several tools have been developed to enable adequate public participation in EIA procedures. They include notification that documents are available for consultation, through press releases and the print and other media, as well as letters to NGOs, universities, industry associations and others informing them about the EIA procedures. A database has been made available on the Internet to provide further information on EIA processes, including non-technical summaries of EIAs, executive summaries of environmental conformity reports concerning environmental impact declarations, and proposals to define the scope of public consultations. The results of decisions on projects under evaluation are also made available on the Internet. Help desks and clarification meetings (in which project proponents, project consultants and the Evaluation Committee participate) respond to inquiries by citizens directly affected by projects.
Air Management	
Implement further measures to reduce *SO_x, NO_x and CO_2* emissions in order to fulfil domestic and international commitments cost-effectively; continue to design and implement measures to reduce emissions of ozone precursors.	Progress in reducing emissions of key air pollutants from the industrial and energy sectors has mainly been achieved through structural changes, fuel switching, and efficiency improvements in energy transformation. Air pollution reduction efforts have been supported by further development of a regulatory framework for better air management, industrial licensing, and enforcement and compliance promotion. These reductions have allowed Portugal to meet the 2010 SO_x emission target established under the EU National Emission Ceilings (NEC) Directive ahead of schedule, and to be on track to meet NO_x and NMVOCs emission targets. Emissions of suspended particulate matter, largely generated by the energy industries, industrial processes and transport, stabilised during the review period following increases in the 1990s.
Expand air quality *monitoring* (*e.g.* to include fine particulates and ground-level ozone).	Portugal is now covered by the Air Quality Monitoring Network, comprising 77 stations that continuously measure concentrations of CO, NO_2, SO_2, O_3, PM_{10}, $PM_{2.5}$ and benzene (C_6H_6). Stations are located in urban and rural areas affected by industrial or traffic related emissions. Measurement campaigns are also carried out to evaluate concentrations of heavy metals and hazardous substances. Since 2004, installations subject to industrial permitting have been required to carry out self-monitoring and report to the Portuguese Environmental Agency and Regional Development and Co-ordinating Commissions.
Establish or enhance *air quality management programmes* for major cities.	Pollution reduction in large urban areas, such as Greater Lisbon (Lisbon and the Tagus Valley) and Greater Porto, has been guided by Air Quality Improvement Plans developed to identify the main pollution sources and measures needed to meet PM_{10} and NO_2 limit values. The plan for Lisbon has given priority to shifting passenger travel from private vehicles to light rail, buses and the recently expanded subway system, as well as introducing access charges for entering the centre of Lisbon by car (differentiated according to the number of passengers). Other measures have included designation of high occupancy lanes of highways, and renovation of taxis and the solid urban waste collection fleet.
Water Management	
Implement *water management by river basin*, in particular through river basin authorities.	Ten River Basin Boards, created in 2008, are responsible for water resources planning and the development of *River Basin Management Plans*.Although these Plans have not been finalised, they are expected to provide a better instrument to manage and protect surface and groundwater resources. Important linkages are also expected to be made with plans for coastal area management.
Continue to improve the *efficiency of water and wastewater services* by extending the formation of plurimunicipal bodies to the whole territory, by opening the water service supply sector to private operators and private funding and by applying the user pays and polluter pays principles.	Guided by the strategic plans for water and wastewater services, PEAASAR I (2000-06) and PEASSAR II (2007-13), initiatives have been taken to complete consolidation of the "wholesale" water supply and sanitation systems by plurimunicipal companies (in the first period) and to optimise the sector's environmental performance, clarify the role of private enterprises and improve organisation of the "end-users" service system (in the second period). The "end-users" service is still dominated by municipalities, but the number of corporatised municipal companies and concessionaries has been growing.
Mobilise national and international technical, human and financial resources to achieve the 2006 objective of *90% of population connected* to public wastewater treatment.	The share of the population connected to public wastewater treatment plant increased during the review period, from 55% in 1999 to 72% in 2008. However, the established objective has not been met. Connection rates vary from relatively high levels in the south (83% in Sado and Mira, 79% in the Algarve) to as low as 47% further north (Minho, Lima). Additional efforts are needed to achieve the 90% objective by 2013 in the new timeframe.

Recommendations	Actions taken
Promote the use of economic instruments such as *pollution charges* for industry and *withdrawal charges* for agriculture.	The Water Resources Tax, introduced in 2008, has become a key instrument of national water management policy that implements the polluter pays and user pays principles. It collects a rent for use of water resources by economic entities, helps cover the environmental costs of activities likely to have significant impacts on water resources, and recovers administrative costs related to planning, management and oversight of water quality and quantity. The tax has five components, including a volumetric payment for water abstracted for private use, differentiated according to the type of user and adjusted according to the water scarcity coefficient in a region, and a payment for discharging, directly or indirectly, effluents that could have significant impacts (COD/BOD, nitrogen or phosphorus pollution), differentiated according to the pollutant and pollution load contained in the discharge, expressed in kilograms.
Prepare national pollution reduction programmes for all *hazardous substances* discharged into water (*e.g.* by industry).	Several legal provisions have been adopted to reduce and control discharges of hazardous substances to the aquatic environment, but no explicit programme has been developed.
Extend water quality monitoring to *all groundwatersources* used or intended for drinking water abstraction.	Water quality monitoring systems have been extended to all groundwater sources expected to be used for public supply. There has been a significant decrease in the number of analyses whose results show standards for drinking water being exceeded.
	Waste Management
Complete closure of uncontrolled *dumping sites* by 2001.	All uncontrolled waste dumps were closed in 2002. Landfills are subject to analysis and monitoring related to the technical requirements for closure, and for collection and treatment of leachate and biogas, as required by the EU Landfill Directive.
Continue to implement the *national plans on municipal, industrial and hospital waste management*; monitor the performance in implementation, and review and revise the plans accordingly, with special attention to waste prevention efforts.	Several measures have been taken to implement the 1997-2005 Strategic Plans for Municipal Solid Waste (PERSU I), with a focus on creating an incentive framework for waste reduction and the development of adequate infrastructure for waste treatment. A new programnme for the period 2007-16, PERSU II, was approved based on a review of PERSU I. It emphasises the need to develop appropriate infrastructure and equipment to support waste collection and separation, including collection and recycling centres and the development of Extended Producer Responsibility schemes for specific waste streams. The 2003 National Plan for the Prevention of Industrial Waste (PNAPRI) established specific additional goals for waste reduction and increased recycling and recovery, including the objective of Portuguese self-sufficiency in managing hazardous waste through the construction of integrated recovery and disposal centres (CIRVER) and co-incineration in cement kilns. The Strategic Plan for Hospital Waste (PERH) was approved in 2009.
Where appropriate, adopt *household waste charges* based on waste production rather than on water consumption.	Progress in establishing household waste charges that would allow better cost recovery has been slow. Several municipalities do not charge households for waste services at all. In those that charge, rates are still linked to water bills or other variables.
Continue to develop quantitative targets for *industrialwaste* stream management; use economic incentives to encourage industrial waste recycling.	Reuse of waste or recovered material as a secondary raw material was encouraged by the creation in 2006 of the Organised Waste Market, a voluntary system which promotes exchange of information about waste materials available on the market and facilitates trading of these materials between economic entities.
Foster the development of a *waste management industry* including co-incineration of hazardous industrial waste in cement plants.	Two specialised facilities for hazardous waste treatment (CIRVER) were opened in 2008, bringing Portugal closer to meeting the long overdue objective (established at the beginning of the review period) of self-sufficiency in hazardous waste treatment.
Develop public information on options for *hazardouswaste* treatment.	A Waste Registry and Information System (SGIR), transformed in 2007 into the Integrated Electronic Database on Waste (SIRER), provides a uniform mechanism for waste registration and access to information about different types of waste. It makes updated information available to the public.
	Nature and Biodiversity
Implement the *national biodiversity strategy*, in particular measures to control rapid urban expansion and tourism development in coastal areas and taking account of the *Natura 2000* network.	The process of designating areas within the *Natura 2000* network (except marine areas) is practically completed. Total land areas cover nearly 2 million ha (total marine areas cover only 130 000 ha). Land management in these areas has been given high priority. *A* Guide for the Eco-Tourism Investor has been published.
Finish establishing and implement management plans for the *national network of protected areas*; establish and implement management plans for Ramsar *wetlands* and restore migratory routes between marine and inland waters for migratory fish species.	New or improved management plans (PO) have been prepared for several protected areas. Progress has been made in inventorying, evaluating and monitoring wetlands, which will facilite their management.
Ensure that nature conservation is taken fully into account in *implementing regional, coastal and municipal land use plans*.	The *Natura 2000* Network Sectoral Plan provides guidance on the inclusion of relevant measures and restrictions in municipal or special plans for land use planning. The whole of Portugal's coastal area is now covered by land use plans.

Recommendations	Actions taken
Explore the possibility of raising private funds for nature conservation to progressively assure its *long-term financing*.	The Fund for the Conservation of Nature and Biodiversity was created in 2009. It is based on promoting participation by local authorities, private sector organisations, representatives of civil society, and other public and private entities in financing nature conservation activities. The Business and Biodiversity Initiative has been consolidated.
Continue efforts to implement biodiversity conservation in *agriculture, forestry and fisheries*.	The Strategy of Agricultural and Forestry Management for *Natura 2000* is part of the National Strategy for Rural Development 2007-13. The Operational Fisheries Programme 2007-13 includes measures to protect aquatic wildlife and enhance the environmental quality of coastal communities.
INTERNATIONAL COMMITMENTS	
Ratify and implement formal international agreements to prevent *marine pollution* from ships (OPRC, London Protocol to the London Dumping Convention) and those that would enable higher compensation in the event of an *oil spill accident* or damage from noxious substances along the coasts.	Portugal has ratified international agreements to prevent marine pollution from ships (OPRC 1990, OPRC-HNS 2000, MARPOL PROT 1997) and to enable higher compensation in the event of an oil spill accident (CLC PROT 1992, FUND PROT 1992, FUND PROT 2003). Other key international agreements that enhance maritime safety and environmental protection (LC PROT 1996, AFS 2001, BWM 2004) have not yet been ratified.
Take measures to reduce imports of *CFCs* so as to contribute to protection of the ozone layer, pursuant to the Montreal Protocol.	Imports of ozone-depleting substances (ODS) are subject to the EC Regulation 2037/2000 (replaced by Regulation 1005/2009 in January 2010). Releases of controlled substances for free circulation or inward processing require an import licence from the European Commission. Free introduction into the European Community of regulated substances from third countries is subject to quantity limits. Since 2004, all ODS are under strict customs control. Imports of CFC-12 to Portugal decreased from 2000 to 2005, but increased in 2006 and 2007.
Increase *ODA* in line with national commitments, as well as the share of ODA devoted to environmental projects.	Between 2000 and 2009, Portugal's net ODA fell slightly. It did not meet the EU target of 0.33% ODA/GNI in 2006 and the projection for 2010 (0.34%) is well below the minimum DAC-EU donor target of 0.51%. The objective of 0.7% in 2015 will be extremely challenging. The share of environment, and water and sanitation, in total official development assistance (about 1%) reflects a low priority in Portuguese development co-operation compared to that indicated by other DAC countries.
ENERGY AND ENVIRONMENT INTEGRATION	
Develop energy efficiency programmes in the transport, residential and industry sectors (*e.g.* for small and medium-sized industries) so as to derive multiple benefits: more efficient energy use, lower fuel import dependence and reduced emissions of both conventional air pollutants and CO_2; implement fuel quality improvement plans fully.	The National Energy Efficiency Action Plan (PNAEE), approved in 2008, includes a wide-ranging set of measures in the transport, residential, service and industry sectors, including the development of certification and energy management schemes for medium-sized industrial facilities. Stricter fuel quality standards, in line with EU rules, have entered into force.
Strengthen the guidance function of environmentally related taxes concerning transport and energy.	The prices of electricity, natural gas and transport fuels have been liberalised. Excise duties have been increased, especially on industrial fuels and domestic heating oil. Taxes on the purchase and ownership of vehicles have been partly linked to CO_2 emissions, and a tax break for less polluting diesel vehicles has been introduced.
Continue to act to reduce the average age of vehicle fleets through improved control of used car imports, enhanced technical inspections and economic incentives for fleet renewal; continue to develop public transport.	Economic incentives for fleet renewal have been provided in the form of car scrapping incentives and vehicle taxation based on CO_2 emissions. The government has provided financial support for the renewal of heavy vehicles used in both passenger and freight transport. Economic and environmental criteria (*e.g.* CO_2 emission limits) have been introduced for vehicles in public fleets. Central and local governments have invested in renewing their fleets.
Intensify efforts to improve the modal split in passenger and freight transport, and to develop sustainable urban transport systems.	The government has invested heavily in developing and upgrading public transport infrastructures, such as the Lisbon metro and light rail networks and public transport in Porto. Sustainable mobility plans have been developed for 40 selected municipalities. A Logistics Plan has been developed, providing for a national network of freight multimodal platforms, logistics centres and air cargo centres.
Implement the national strategy to achieve GHG emission reduction targets and capture multiple ancillary benefits.	A national strategy has been developed to combat climate change, accompanied by an implementation plan (PNAC). The PNAC, last revised in 2008, includes several measures designed to abate domestic emissions, supplemented by participation in the EU ETS and use of the Portuguese Carbon Fund.

Recommendations	Actions taken
COASTAL ZONE MANAGEMENT	
Fully monitor and enforce the implementation of recent *coastal and municipal land use plans* and, in the process, increase municipalities' and tourism professionals' information on and commitment to the integration of environmental concerns into tourism decisions.	A review of implementation of the coastal zone management plans (POOC), carried out in 2005-06, was followed by their revision and the adoption of the *Litoral 2007-13* programme, which further prioritised implementation of the actions defined in the POOC with a focus on areas where people and buildings are most at risk. Building on the success of an earlier Polis scheme in urban areas, *Polis Litoral* schemes were launched in four priority areas with a view to better co-ordinating the actions of various authorities. Priority actions focus on demolishing structures in coastal areas that are threatened by encroachment of the sea, and strengthening nature conservation areas while designating locations for economic development, especially tourism and housing.
Put more emphasis on *eco-friendly forms of tourism*, with efforts to include domestic tourists; promote the integration of *sustainable tourism in local economies* (*e.g.* coastal areas that are under intense pressures from tourism, as well as relatively poor inland areas).	The 2007 Tourism Strategy highlights urban, environmental and landscape quality as integral parts of tourism in Portugal. Initiatives have been launched to shift the focus from traditional coastal destinations (*e.g.* the Algarve and Lisbon) towards destinations inland (six new tourism poles), and to promote quality tourism associated with natural assets such as forests, the landscape and mountains.
Develop the use of *economic instruments* (*e.g.* access fees, airport charges, taxation of second homes) in line with the polluter pays and user pays principles.	Economic valuation studies have been carried out to assess biodiversity loss in coastal areas and the benefits of protecting these areas. With the exception of fines for illegal construction in protected areas, there has been no progress in applying economic instruments to strengthen coastal zone management.

Source: OECD, Environment Directorate, Environmental Performance Reviews: Portugal, 2001.

REFERENCE III

Abbreviations

AdP	Águas de Portugal
ANPC	National Authority for Civil Protection
APA	Portuguese Environment Agency
ARH	River Basin District Administrations
CAC	Climate Change Commission
CCDRs	Regional Development and Co-ordinating Committees
CECAC	Executive Committee of the Climate Change Commission
CIAM	Interministerial Commission for Sea Affairs
CIRVER	Centres for Integrated Recovery and Disposal of Hazardous Waste
CNGF	National Forest Bodyguard (also called the Forest Police)
DGEG	Directorate-General for Energy and Geology (of MEID)
DGOTDU	Directorate-General for Spatial Planning and Urban Development
DGRF	Directorate-General of Forest Resources
DPM	Public Maritime Domain
DPP	Department of Foresight and Planning and International Affairs
EEZ	Exclusive Economic Zone
ENDS 2015	National Strategy for Sustainable Development to 2015
ENGIZC	National Strategy for Integrated Coastal Zone Management
ENM	National Ocean Strategy
ERSAR	Water and Waste Services Regulation Authority
ERSE	Energy Service Regulatory Authority
FIFG	Financial Instrument for Fisheries Guidance
FPC	Portuguese Carbon Fund
GESTIGAOT	Database of regulated installations and inspection activities
ICMA	Interministerial Commission for Maritime Affairs
ICN	Nature Conservation Institute
ICNB	Institute for Nature Conservation and Biodiversity
ICZM	Integrated Coastal Zone Management
IGAOT	Environmental and Spatial Planning General Inspectorate
IGP	Portuguese Geographic Institute
IHRU	Institute of Housing and Urban Redevelopment
INAG	Water Institute
INE	National Institute of Statistics
IPTM	Port and Maritime Transport Institute

IRAR	Institute for the Regulation of Water and Solid Waste
ISP	Oil and energy tax
ISV	Car registration tax
ITI	Integrated Territorial Intervention
IUC	Circulation tax for cars
MADRP	Ministry for Agriculture, Rural Development and Fisheries
MAOT	Ministry for Environment and Spatial Planning
MAOTDR	Ministry for Environment, Spatial Planning and Regional Development
MEID	Ministry of Economy, Innovation and Development
MOPTC	Ministry of Public Works, Transport and Communications
MOR	Organised Waste Market
NEC	National Emissions Ceiling
OPRC	Oil Pollution Preparedness, Response and Co-operation
PALOPS	African countries whose official language is Portuguese
PBH	River Basin Management Plans
PEAASAR	Strategic Plan for Water Supply and Sanitation
PENT	National Strategic Plan for Tourism
PERH	Strategic Plan for Hospital Waste
PERSU	Strategic Plan for Municipal Solid Waste
PESGRI	Industrial Waste Strategic Plan
PIENDS	ENDS 2015 Implementation Plan
PIN	Project of national interest
PIRSUE	Intervention Plan for Municipal Waste
PNAC	National Climate Change Programme
PNACE	National Action Programme for Growth and Jobs
PNAEE	National Energy Efficiency Action Plan
PNALE	National Allocation Plan for Emission Allowances
PNAPRI	National Plan for the Prevention of Industrial Waste
PNBEPH	National Programme of Dams with High Hydroelectric Potential
PNPOT	National Programme for Spatial Planning Policy
PNRE	National Programme for Reducing Emissions from Large Combustion Plants
PNUEA	National Plan for the Efficient Use of Water
POAP	Protected Areas Land Management Plan
POCTEP	European territorial co-operation programme for cross-border co-operation between Spain and Portugal
POE	Estuary Management Plans
POEM	Maritime Spatial Management Plan
POOC	Coastal Zone Management Plan
PPDAs	Environmental Performance Promotion Plans
PPECs	Consumption Efficiency Promotion Plans
PRACE	Programme for Restructuring the Government's Central Administration
PRODER	Rural Development Programme
PROT	Territorial Land Use Plans
PSRN 2000	Natura 2000 Network Plan
PTEN	National Emissions Ceilings Programme
PT-NEHAP	Environment and Health Action Plan 2008-13
QREN	National Strategic Reference Framework

RAN	National Agricultural Reserve
REA	Regime of Industrial Activity
RECS	Renewable Energy Certificate System
REN	National Ecological Reserve
RFCN	Fundamental Network for Nature Conservation
RGCE	Revised Regulation on Management of Energy Consumption
RNAP	National Network of Protected Areas
SCUT	Toll-free motorways
SEIS	Shared Environmental Information System
SEPNA	Service for Nature and Environmental Protection (of the National Republican Guard)
SGCIE	Management System of Intensive Energy Consumption
SGIR	Waste Registry and Information System
SIAM	Scenarios, Impacts and Adaptation Measures
SIDDAMB	Search engine for existing environmental laws
SIDS	Sustainable Development Indicators
SIRAPA	Integrated Register System of APA
SIRER	Integrated Electronic Database on Waste
SNAC	National System of Classified Areas
SNITS	Spatial and Urban Planning and the National System of Territorial Information portal
TGR	Waste management tax
TRH	Water Resources Levy
ZIF	Forest Intervention Area

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