

## **19. SPAIN**

This country fiche provides a comprehensive overview and assessment of climate change adaptation in Spain. After detailing the vulnerability of Spain's coastal zones, the responsibility and financing for coastal protection is explained. Next, the fiche presents the relevant research activities, the coastal defence, risk reduction and adaptation plans available in Spain as well as the current and future protection and adaptation expenditure. The persons contacted and sources of information used are listed at the end.

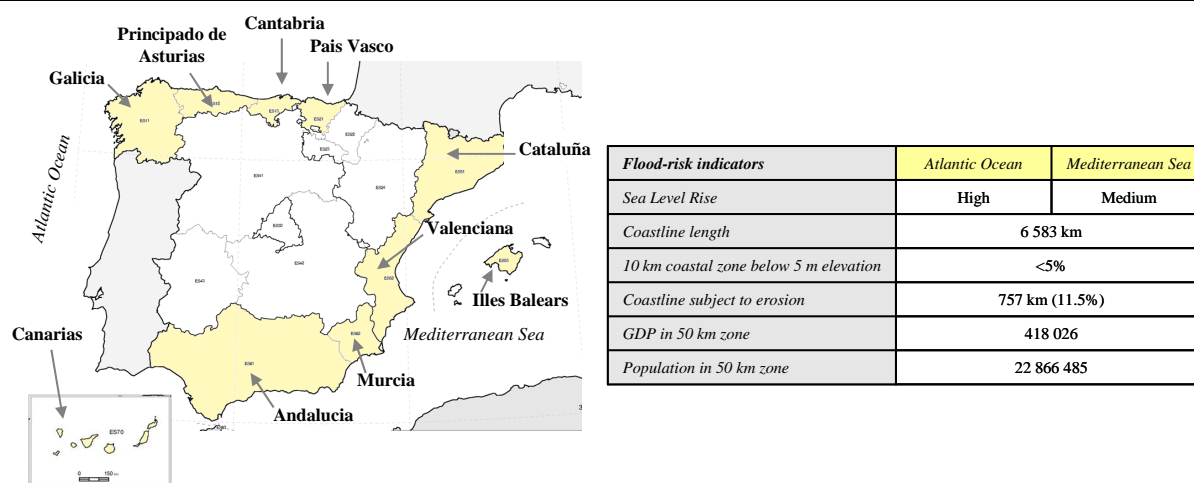
### **19.1. VULNERABILITY OF SPAIN'S COASTAL ZONES TO CLIMATE CHANGE**

Spain is located in south-western Europe on the Iberian peninsula. The Spanish territory also includes the Balearic, the Canary Islands<sup>1</sup> and two autonomous cities in North Africa, namely Ceuta and Melilla. The country consists of 17 administrative regions, 15 of which are located on mainland Spain. The coastline of the peninsula measures 6 583 km and borders the Mediterranean Sea and the Atlantic Ocean. *Figure 19-1* visualises the Spanish coastal regions and provides an overview of main physical and socio-economic indicators of the Spanish coastal zones.

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<sup>1</sup> Climate change impact and adaptation of the outermost regions have been described in a dedicated fiche.

Figure 19-1: Coastal regions of Spain and their main physical and socio-economic indicators



Source: Policy Research based on EEA, 2006, *The changing faces of Europe's coastal areas* (for Sea Level Rise and 10 km coastal zone below 5 metres elevation); European Commission (EuroSION study), 2004, *Living with coastal erosion in Europe: Sediment and space for sustainability* (for coastline length and coastline subject to erosion); Eurostat 2004 (for GDP and population in 50 km zone)

The following paragraphs discuss the main climate change risks for the coastal zones of Spain. Although certain Spanish regions and wetlands can be considered vulnerable to both flooding and erosion, water stress poses the greatest threat.

**a/ Flooding and erosion**

Spain has a high overall vulnerability to flooding and erosion. Nevertheless, vulnerability varies depending on the region.

In the case of a widespread Sea Level Rise (SLR), the most vulnerable areas are the deltas and enclosed beaches. Research studies have indicated that without beach nourishments, a 0.5 m SLR, which is considered to be a reasonable scenario for Spain by 2100, could result in the disappearance of 40% of the beaches in the east of Cantabria. Such rise in sea level would also result in the disappearance of about 50% of the Ebro Delta in the region of Cataluña<sup>2</sup>.

In addition, significant increases in wave height have been observed along the Cantabrian and Galician coasts over the past 50 years as well as changes in the direction of the waves particularly in northern Cataluña, leading to an increased risk of flood events along these areas.

<sup>2</sup> Sanchez-Arcilla A., Jimenez J.A., Valdemoro H. I. and Gracia V., 2008, *Implications of climatic change on Spanish Mediterranean low-lying coasts: the Ebro Delta case*, in: *Journal of Coastal Research* 24, 2, p. 306–316.

As to the problem of erosion, the Mediterranean coast is said to be most at risk. The total coastline subject to erosion is 11.5% or 757 km<sup>3</sup>. The most vulnerable regions in this respect are Andalucía with erosion along 41% of its coastline, Cataluña with 33% and Valencia with 26% despite these regions having defence works and artificial beaches along 25% their coastline<sup>4</sup>.

When taking different factors into account (e.g. SLR, erosion, wave height and direction) the regions with the highest exposure to climate change are considered to be Andalucía and Valencia followed by Cataluña, the Balears and Cantabria<sup>5</sup>.

**b/      *Freshwater shortage***

Water scarcity is a significant issue in many regions throughout Spain and climate change may aggravate the problem, with longer periods of dry weather.

Supply problems regularly occur in the Jucar basin during summer. In the Segura basin, water scarcity has resulted in an increase of the water prices by 30% for households. In 2008 the city of Barcelona was even forced to import water from Marseille in France, which also occurred in 2007. It is planned that by 2009 two desalination plants will open and provide water to the city of Barcelona.

Overall, the regions in the south-east of Spain are particularly vulnerable to water shortages due to the hot weather and intensive urbanisation of the coastline by the tourism industry and holiday homes<sup>6</sup>. These regions have furthermore an intensive agricultural sector requiring significant irrigation networks.

Furthermore, large areas of the Mediterranean are affected by saltwater intrusion. The main cause is groundwater over-abstraction for public water supply, followed by agricultural water demand and tourism-related abstractions.

**c/      *Loss of coastal eco-systems***

The Ebro Delta, covering 320 km<sup>2</sup> is, together with Doñana National Park<sup>7</sup>, one of the principal wetland areas of Spain. The delta is particularly fertile and constitutes the main agricultural area of Cataluña. At the same time, the Ebro Delta is an important biodiversity hot-spot with sand dunes,

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<sup>3</sup> Reference year 2001.

<sup>4</sup> National Institute for Coastal and Marine Management of the Netherlands, 2004, *Living with coastal erosion in Europe: Sediment and space for sustainability*.

<sup>5</sup> Uceda A.C., Sánchez-Arcilla A. and Cardeña Z., *Chapter 11 Impacts on coastal areas*, in: *Impacts of climate change in Spain*, p. 451-504.

<sup>6</sup> Moreira Madueño J.M., 2008, *El cambio climático en Andalucía - Dirección general de participación e información ambiental*.

<sup>7</sup> The Doñana National Park is situated in Andalucía.

marshes and rice fields providing habitats for many plant and bird species<sup>8</sup>. In 1983, part of the delta was designated as a protected area, the Ebro Delta Natural Park.

To date, dams along the Ebro disrupt the natural sediment process to the delta. As a result, the area is sinking, a process that is aggravated by rising sea levels. Actions undertaken to improve the water quality and correct the subsidence of the Ebro Delta are discussed in the remainder of the text.

## **19.2. RESPONSIBILITY AND FINANCING FOR COASTAL PROTECTION AND CLIMATE ADAPTATION**

To date, the responsibility for coastal protection and climate adaptation is situated mainly at national level in Spain. Legislative changes which are currently on-going aim for a greater involvement of the coastal regions through their regional climate change offices.

The main actors involved at national level are the *Ministry of Environment and Rural and Marine Affairs* (Ministerio de Medio Ambiente y Medio Rural y Marino - MARM) and its *Directorate-General for the Sustainability of the Coast and the Sea*. These authorities are responsible for all aspects of the marine and coastal environment within the Maritime Public Domain<sup>9</sup>.

Furthermore, the *Spanish Climate Change Office* (Oficina Española de Cambio Climático – OECC), has been designated as responsible body for developing the national climate change policy. In addition the office is responsible for:

- Providing advice to governmental institutions on climate related matters;
- Collaborating with the regions, universities and research institutes, public administrations and non-governmental organisations on initiatives with regard to the fight against climate change and the promotion of related research activities;
- Coordinating the different plans, programmes and strategies which are being developed to adapt to climate change.

Regional governments have the competency to develop urban planning of the coastal area. When necessary, coastal protection is entrusted by the Spanish Constitution to the national government. Funding for coastal protection comes from the national government through the budget of the Directorate-General for the Sustainability of the Coast and the Sea.

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<sup>8</sup> Sanchez-Arcilla A., Jimenez J.A., Valdemoro H. I. and Gracia V., 2008, *Implications of climatic change on Spanish Mediterranean low-lying coasts: the Ebro Delta case*, in: *Journal of Coastal Research* 24, 2, p. 306–316.

<sup>9</sup> The Maritime Public Domain (Dominio Público Marítimo Terrestre) is defined in the Shoves Act (Ley de Costas 22/1988 de 28 de Julio).

In Spain, all river basins, except those situated within the administrative boundaries of an Autonomous Region<sup>10</sup>, are managed by the *National Administration* (this is the majority of the territory). Public water administration is carried out in inter-community basins by the basin organisations called *Confederaciones Hidrográficas* and in intra-community basins by the *Water Administrations* of the corresponding Autonomous Communities. These organisations are, at river basin level, responsible for the administration and control of water, the development, monitoring and revision of River Basin Management Plans and the administration and control of the public water domain.

### **19.3. RESEARCH INTO SPAIN'S VULNERABILITY TO CLIMATE CHANGE AND CLIMATE CHANGE SCENARIOS**

In Spain, the MARM collaborates with different specialised academic institutes for climate change research. The *Spanish Climate Change Office* (OECC) is amongst others responsible for coordinating the research activities carried out by universities and research institutes. Research to climate change scenarios is mainly performed by the State Agency of Meteorology (Agencia Estatal de Meteorología – AEMet).

The ECCE project<sup>11</sup>, carried out by the *University of Castilla La Mancha* between 2003 and 2004 and funded by the national government, published a report on the assessment of preliminary impacts in Spain due to climate change. The report indicates a progressive increase in average temperatures over a 100 year period, an increase in frequency of days with extreme maximum temperatures in the peninsula, especially during summer, and a widespread trend towards lower annual precipitation. Between 2002 and 2004 the Spanish Climate Change Office also contracted the *University of Cantabria* to develop a series of studies and scientific tools to support the establishment of climate change adaptation policies and strategies for the Spanish coast.

More research is currently underway as two studies are due to be completed in 2009. The first study started already in 2005 as a collaboration between the MARM's Directorate-General for Water and the OECC. The study is being led by the institute CEDEX<sup>12</sup> and is aimed at simulating the impacts of climate change on water resources and the demand for water in Spain. The second project started in 2008 and is jointly coordinated by the OECC and the MARM's Dirección General de Medio Natural y Política Forestal. The actual research is being conducted by the *University of Extremadura* and the national *Museum of Natural Sciences*. The aim of this project is to evaluate the impact of climate change on biodiversity in Spain.

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<sup>10</sup> The following regions manage the river basins situated within their administrative boundaries: Galicia, Catalonia, the Balearic Islands, the Canary Islands, the Basque Country and Andalucía.

<sup>11</sup> 'Evaluación de los Impactos del Cambio Climático en España'; <http://ecce.uclm.es/>.

<sup>12</sup> Centro de Estudios y Experimentación de Obras Públicas.

Furthermore, a dedicated vulnerability and impact assessment methodology for Spain has been developed by Professor Losada under the authority of the climate change office in the Spanish Ministry of Environment. This methodology drives policy development in the field of coastal adaptation. The methodology is used to determine structure stability in the different Spanish harbours and beaches and to pinpoint the adaptation needs which will be incorporated in the forthcoming National Strategy for Sustainable Coastal Management.

Some studies are also being carried out at regional level. In the region of Cataluña for example a study on the dynamics of the Catalan coast during the period 1977-2004 was conducted in 2008 by the *International Center for Coastal Resources Research*. In the region of Andalucía the Proclian study<sup>13</sup> on the increased risk of heat waves, flooding and other extreme weather events is currently on-going. The results are foreseen for 2010.

The *Spanish State Meteorological Agency (Agencia Estatal de Meteorología – AEMet)* carries out research to climate change scenarios for each of the Spanish regions. In 2007 AEMet created a comprehensive database of regionalised scenarios on temperature and precipitation. The second phase of the work of AEMet, which will last for 3 to 4 years, will proceed to explore and develop new methods of regionalisation, using the global information on emission scenarios generated from the fourth IPCC report (2007).

#### **19.4. COASTAL DEFENCE, RISK REDUCTION AND ADAPTATION PLANS IN RELATION TO CLIMATE CHANGE**

In Spain, the government recognised that climate change is an issue that is linked to and can impact a range of different sectors. Hence, an integrated approach has been taken to tackle the issue. The inter-ministerial body *Spanish Climate Change Office (OECC)*, established in 2001, has been responsible for the creation of a national plan for adapting to climate change. An Integrated Coastal Zone Management strategy (ICZM) is currently underway. In addition, different measures are being applied to decrease water scarcity impacts.

##### ***a/ Strategic actions undertaken at national level***

In Spain, climate change and adaptation to the related effects is at present one of the governments' priorities. Overall the *Spanish Office of Climate Change (OECC)*, subordinated to the Ministry of Environment and Rural and Marine Affairs, is the responsible actor for developing the national climate change policy in an integrated manner. In this respect, the OECC has developed the 2006 national plan for adaptation to climate change.

The national plan for adaptation to climate change, called '*Plan Nacional de Adaptacion al Cambio Climatico*' (PNACC), was adopted in 2006. This 'National Climate Change Adaptation Plan' provides the current framework for evaluating the impacts, vulnerability and adaptation to climate change in Spain. The overall objective of the plan is to integrate adaptation to climate change in the planning processes of all relevant sectors or systems (e.g. water management, agriculture, forests, biodiversity, coasts, tourism and health). Main actions to be undertaken according to this plan include the creation of regional climate scenarios and the assessment of the impact of climate change for all the relevant socio-economic sectors and ecological systems<sup>14</sup>.

Furthermore in 2005, a communication document entitled '*Hacia una gestión sostenible del litoral español*' ('Towards sustainable coastal management in Spain') was published. This document is a roadmap to sustainable coastal management. The roadmap does not refer to climate issues but calls for a national coastal management plan, following the EU Recommendation on Integrated Coastal Zone Management.

Such a *National Strategy for Sustainable Coastal Management*, is currently underway. The Canaries will also be accounted for in this forthcoming strategy. The main challenges identified for this strategy include adaptation to climate change, the need to slow coastal urbanisation, to restore physical as well as natural functionalities of the coast and to change the coastal management model. These challenges will be further discussed with stakeholders at national and regional level before finalising the national integrated coastal management strategy.

***b/ Actions undertaken at sub-national level***

Spain counts 17 regions of which 10 are located along the coast. Three regions vulnerable to climate change in terms of flooding and erosion, namely Andalucía, País Vasco and Asturias, have been selected as case in point<sup>15</sup>.

***Andalucía***

Andalucía is one of the largest regions of Spain, located in the south. The region has borders with both the Mediterranean Sea and the Atlantic Ocean. The main vulnerabilities identified for the coastal areas of Andalucía are water scarcity and Sea Level Rise. SLR could affect low wetlands, increase erosion or provoke the retreat of the coastline.

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<sup>13</sup> The study is being carried out by the *University of Granada*, the *University of Jaén* and the *University of Almería*.

<sup>14</sup> First research actions are undertaken already; AEMet focuses on the creation of regional climate scenarios and climate change impact studies for the water sector and biodiversity which are due to be completed by 2009; these actions are described under the research paragraph.

<sup>15</sup> Contacts have also been made with Cantabria; at regional level, Cantabria does not undertake actions related to climate change adaptation in the coastal zones.

The Andalusian *Strategy for the Adaptation to Climate Change* was adopted in 2002 but was primarily focused on mitigation rather than adaptation. As a follow-up a *Mitigation Action Plan (2007-2012)* was adopted in June 2007. An *Adaptation Action Plan* is currently under preparation with the Regional Ministry for the Environment as the lead contractor.

The Adaptation Action Plan will follow a sectoral approach including agriculture, tourism, health, energy, insurance and transport. Coastal issues will mostly be dealt with under the flag of tourism<sup>16</sup>. In this regard, adaptation measures are expected to concentrate on studies assessing the impacts of SLR for the beaches or analysing water stress and water demand in urban areas along the coast. The results of the Proclian study<sup>17</sup> will serve as an input for the finalisation of the Adaptation Action Plan.

In addition, the Operational Programme for Andalucía 2007-2013<sup>18</sup> outlines the following measures which will be co-funded by the EU:

- Construction of a desalination plant in Costa del Sol;
- Prevention and management of environmental risks (including coastal floods, beach re-nourishment, maintenance of infrastructures, dunes management, etc).

The measures taken with regard to the water sector will be described in the remainder of the text.

### ***Pais Vasco***

Pais Vasco is located in the north of Spain and borders the Atlantic Ocean. This region is most vulnerable to flooding as SLR and wave heights are higher along this stretch of the coast.

In 2006, the Basque Office of Climate Change was set up and the Basque plan to combat climate change for the period 2008-2012 was completed one year later. This plan focuses upon both mitigation and adaptation. With respect to adaptation, especially the minimisation of risks for human health and national resources (e.g. eco-systems, biodiversity, water resources) is referred to. Concrete actions put forward for the coastal zones focus on research to the impacts of flooding and possible adaptation measures.

### ***Asturias***

Asturias is located in northern Spain and borders the Atlantic Ocean. The coastline of this region offers a wide range of landscapes such as steep cliffs, beaches, dunes and estuaries. The coastal landscape holds most of the population of the region and has an important role in the regional economy.

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<sup>16</sup> About 70% of tourism in Andalucía is concentrated in the coastal zone.

<sup>17</sup> This study has been described under the research paragraph.

<sup>18</sup> Junta de Andalucía, 2007, *Programa operativo de Andalucía 2007-2013*.



In July 2007 a regional Climate Change Office has been set up to establish a regional mitigation and adaptation strategy. This office has created an Asturias Expert Panel (CLIMAS), with 50 researchers from different universities and research centres. At present, this group is preparing a preliminary assessment of climate change impacts at regional level to be presented in the course of 2009. This assessment will form the basis for preparing the regional adaptation strategy.

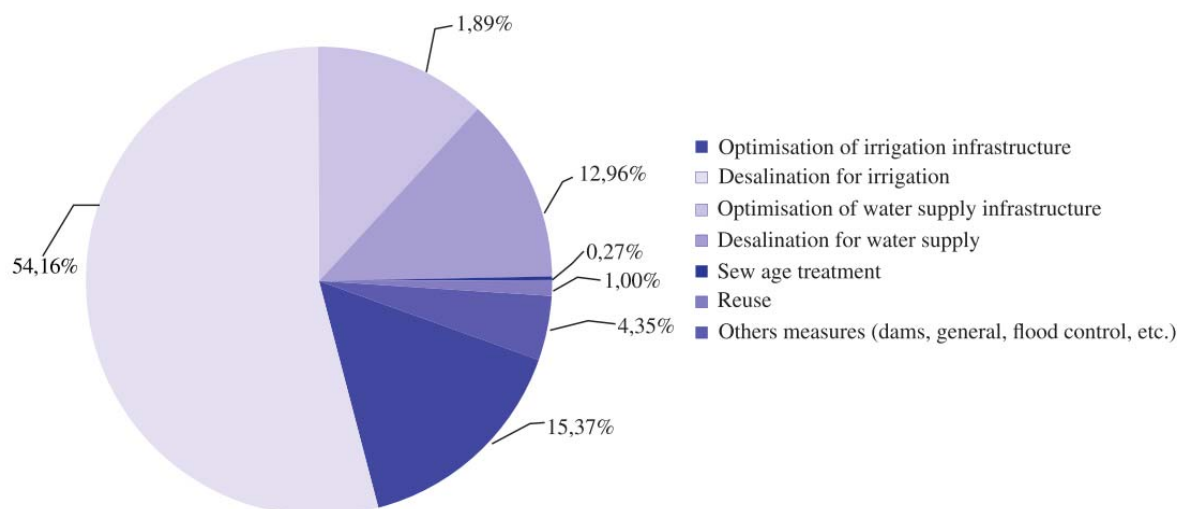
In 2009 the construction of a new Coastal Observation System will commence. It is expected that the system will be entirely operational by 2012. One of the main activities of this centre will be the monitoring of climate change effects along the coastline.

*c/ Measures taken to counteract the problem of freshwater shortage*

In Spain, actions to counteract water stress are aimed at increasing the public water supply in order to overcome demand peaks. *Drought management plans* together with a high number of *water infrastructures* aiming to increase water resources and reduce water losses have allowed to overcome the last drought period without launching drastic measures for the population, agricultural or industrial sectors.

Over the years, new *water infrastructures* have been constructed or existing ones modernised. Metering programmes, for both surface and groundwater are being use to control water abstraction. Water saving and water efficiency technologies are being promoted. These include public awareness campaigns led by municipalities and supply entities. In addition, a joint management of surface and groundwater is done by the River Basin Authorities. Last, there has been an important increase over the past years of non-conventional water resources, such as waste water and desalination. The regions that are in first instance eligible for support are situated along the Mediterranean. *Figure 19-2* presents an overview of the different actions undertaken in Spain.

**Figure 19-2: Overview different water actions undertaken in Spain**



Source: Spanish government, 2008, *The national reform programme 2008 progress report*

To tackle water scarcity and drought situations, Spain has furthermore developed *Drought Management Plans* (DMPs), which are binding for all river basins since 2007. The DMPs constitute important reference documents that can help in reducing drought impacts, through a planned and participative approach. Since their implementation, the DMPs have provided the basis for managing droughts by defining drought phases, the measures to be applied progressively as well as the necessary monitoring and follow-up processes. The plans include methods and measures agreed on by all participating stakeholders including civil society, public administration as well as the scientific community. This more controlled and planned management of droughts has allowed prioritising water uses, ensuring public urban supply and minimising environmental degradation.

## **19.5. PAST, PRESENT AND FUTURE ADAPTATION EXPENDITURE**

For Spain, the adaptation expenditure has been split between the protection against flooding and erosion on the one hand and the actions to counteract freshwater shortage on the other hand.

### *a/ Flooding and erosion*

In Spain, the expenditure against flooding and erosion is funded by the national government, through the budget of the Directorate-General for the Sustainability of the Coast and the Sea. Over the period 1998-2015, the coastal protection investment totals €935 million.

In 2008, Spain spent a total amount of €62.71 million to protect its coastal zones against flooding and erosion. Some 84% of the measures undertaken are mixed and soft measures. The indirect expenditure includes the studies carried out under the responsibility of the Spanish Climate Change Office.

More detailed information can be found in *Table 19-1*.

**Table 19-1: Expenditure to protect against coastal flooding and erosion (in €million)**

Year	MAINTENANCE AND CAPITAL EXPENDITURE*		INDIRECT EXPENDITURE	TOTAL
	<i>Hard**</i>	<i>Mixed and soft***</i>		
1998	19.08	9.12		28.20
1999	18.80	8.98		27.79
2000	22.50	10.75		33.26
2001	27.46	13.12		40.58
2002	52.33	25.00	0.23	77.56
2003	48.40	23.13	0.23	71.76
2004	33.82	16.16	0.23	50.21
2005	6.53	39.68	0.26	46.47
2006	3.63	45.27	0.26	49.16
2007	10.78	73.13	0.26	84.17
2008	8.01	54.44	0.26	62.71
2009	<i>n.a.</i>	<i>n.a.</i>	0.26	51.99
2010	<i>n.a.</i>	<i>n.a.</i>		51.99
2011	<i>n.a.</i>	<i>n.a.</i>		51.99
2012	<i>n.a.</i>	<i>n.a.</i>		51.99
2013	<i>n.a.</i>	<i>n.a.</i>		51.99
2014	<i>n.a.</i>	<i>n.a.</i>		51.99
2015	<i>n.a.</i>	<i>n.a.</i>		51.99
<b>TOTAL</b>	251.35	318.78	1.98	<b>935.79</b>
	570.13			

\* Detailed figures on coastal maintenance and capital expenditure could only be provided by the Directorate-General for the Sustainability of the Coast and the Sea for the period 2005-2008; for the period 1998-2004 the general budget line for the coast was provided; Policy Research has calculated the expenditure of 1998-2004 based on the average proportion of respectively hard, mixed and soft measures to the total budget line over the period 2005-2008 and applied these proportions to the yearly general budget lines of 1998-2004; as a trend in total expenditure can not be observed, future total expenditure (2009-2015) has been calculated by Policy Research based on the average total expenditure of the previous years (1998-2008)

\*\* Hard measures include hard coastal defence structures

\*\*\* Mixed and soft measures include removing constructions built illegally in the maritime public domain, dismantling hard coastal defence structures, actions for the improvement and development of beaches, management of coastal sediments, artificial sand nourishments, reclaiming coastal land which belongs to the public maritime domain but which has been built on illegally and extending the public maritime domain by acquiring more land

**b/ Freshwater shortage**

Table 19-2 presents a detailed overview of the expenditure to counteract freshwater shortage in the Spanish Mediterranean regions between 2005 and 2009. In this period of time, close to €3.8 billion is invested to upgrade public water supply. As yearly average this is about €760 million.

**Table 19-2: Investments in Spanish Mediterranean regions (2005-2009)**

<i>Region</i>	<i>Province / City</i>	<i>Amount allocated</i>	<i>Main actions</i>
<i>Andalucía</i>	<i>Malaga</i>	€227 million	<ul style="list-style-type: none"> <li>– 2 desalination plants</li> <li>– Re-use of wastewater</li> </ul>
	<i>Almeria</i>	€352 million	<ul style="list-style-type: none"> <li>– 4 desalination plants</li> <li>– Second phase for a sea water desalination plant in Carboneras</li> <li>– Improvement of infrastructure of irrigation water</li> <li>– Re-use of wastewater</li> </ul>
<i>Murcia</i>	<i>Murcia</i>	€876 million	<ul style="list-style-type: none"> <li>– 3 desalination plants</li> <li>– 2 desalination plants for irrigation</li> <li>– Expansion of 2 existing desalination plants</li> <li>– Evacuation of saline water in the Valley and Guedalentín</li> <li>– Re-use of wastewater</li> <li>– Modernisation of the infrastructure</li> </ul>
<i>Valencia</i>	<i>Alicante</i>	€618 million	<ul style="list-style-type: none"> <li>– At least 5 desalination plants</li> <li>– Improving water quality in 2 areas</li> <li>– Expanding 2 existing desalination plants</li> <li>– Evacuation of saline water</li> <li>– Modernisation of infrastructure</li> <li>– Improving the water quality for urban supply</li> <li>– Re-use of wastewater</li> </ul>
	<i>Castellon</i>	€173 million	<ul style="list-style-type: none"> <li>– Development of software for capturing groundwater</li> <li>– Desalination plants for urban supply and irrigation</li> <li>– Modernisation of irrigation</li> <li>– Improving re-use and cleaning of wastewater</li> </ul>
	<i>Valencia</i>	€428 million	<ul style="list-style-type: none"> <li>– Modernisation of the hydraulic infrastructures</li> <li>– Major repairs and automation of the main channel of the Campo del Turia</li> <li>– At least 3 wastewater re-use plants</li> <li>– Strengthening the supply system in the metropolitan area</li> </ul>
<i>Cataluña</i>	<i>Taragonna</i>	€215 million	<ul style="list-style-type: none"> <li>– Improving water quality in the Ebro delta</li> <li>– Correction of subsistence and regression of the Ebro delta</li> <li>– Establishment of environmental indicator network in the Ebro delta</li> <li>– Hydrological restoration of the continuity of the river Ebro</li> <li>– Sanitation programme of urban waste in the Ebra basin</li> </ul>
	<i>Girona</i>	€47 million	<ul style="list-style-type: none"> <li>– Expanding the desalination of Tordera</li> </ul>
	<i>Barcelona</i>	€848 million	<ul style="list-style-type: none"> <li>– Desalination of the metropolitan area</li> <li>– Expansion and improvement of treatment, rehabilitation and decontamination of the aquifers</li> <li>– Hydrological restoration for improving water quality</li> <li>– Closer treatment systems for improving environmental sanitation and the quality of water supply</li> </ul>
<b>TOTAL</b>		€3 784 million <sup>19</sup>	

<sup>19</sup> The total amounts per region may vary as the plan goes forward; the national reform programme 2008 progress report estimates the total amount for emergency actions at €4 734 million over the period 2005-2009 of which 37% is already undertaken or currently under way.

## **19.6. PERSONS CONTACTED AND SOURCES OF INFORMATION USED**

### **19.6.1. PERSONS CONTACTED**

<i>Name</i>	<i>Organisation</i>
<i>Álvarez Rodríguez, Javier</i>	Centro de Estudios Hidrográficos del CEDEX
<i>Cachón de Mesa, Javier</i>	Dirección General de Costas – Ministerio de Medio Ambiente y Medio Rural y Marino
<i>Garrote de Marcos, Luis</i>	ETS Ingenieros de Caminos
<i>Dr Gonzalez Marco, Daniel</i>	Universitat Politecnica de Catalunya. International Centre for Coastal Resources Research (CIIRC)
<i>Iglesias, Ana</i>	Universidad Politécnica de Madrid (UPM)
<i>Martínez Lope, Concepción</i>	Oficina Española de Cambio Climático (OECC) - Ministerio de Medio Ambiente y Medio Rural y Marino
<i>Oliveras Xiol, Ruth</i>	Oficina Catalana de Cambio Climático
<i>Ortiz Menárguez, Amador</i>	Dirección General de Costas – Ministerio de Medio Ambiente y Medio Rural y Marino
<i>Pena, Carlos</i>	Dirección General de Costas – Ministerio de Medio Ambiente y Medio Rural y Marino
<i>Pérez valverde, Carolina</i>	EUCC Mediterranean Center
<i>Picatoste, Ramón</i>	Oficina Española de Cambio Climático (OECC) - Ministerio de Medio Ambiente y Medio Rural y Marino
<i>Sierra, Ana Ruiz</i>	Dirección General de Costas – Ministerio de Medio Ambiente y Medio Rural y Marino

### **19.6.2. SOURCES OF INFORMATION USED**

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