

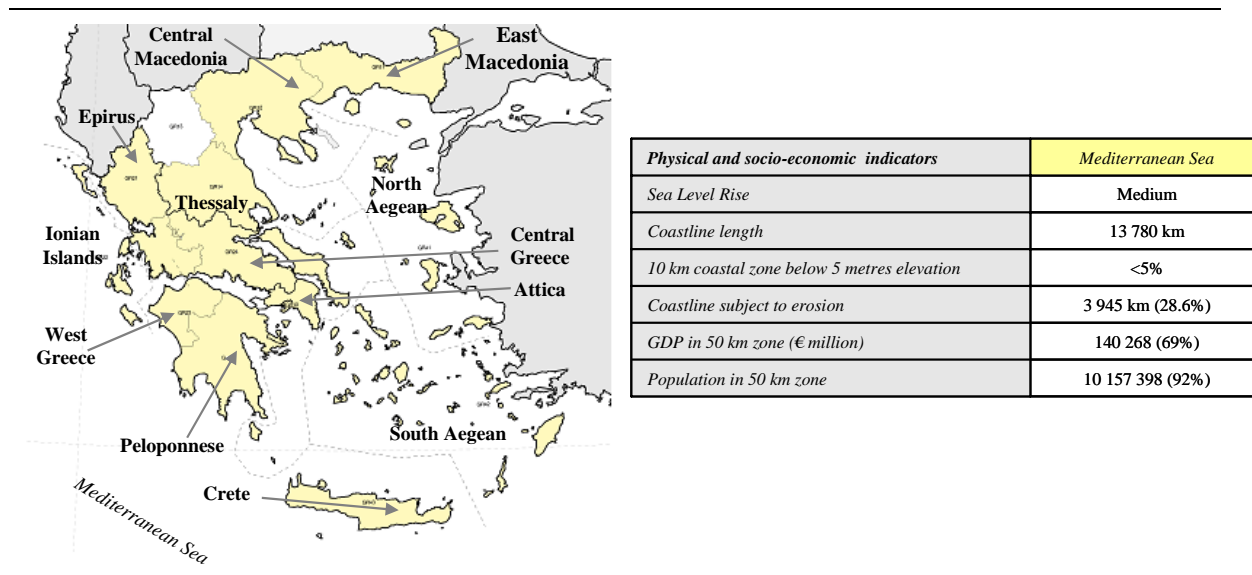
## **9. GREECE**

This country fiche provides a comprehensive overview and assessment of climate change adaptation in Greece. After detailing the vulnerability of the Greek 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 Greece as well as the current and future protection and adaptation expenditure. The persons contacted and sources of information used are listed at the end.

### **9.1. VULNERABILITY OF GREECE'S COASTAL ZONES TO CLIMATE CHANGE**

Greece has the most extensive coastline among all Mediterranean countries. The total coastline measures 13 780 km and includes many islands. The country consists of 13 regions, called peripheries, which form the largest unit of government beneath the state. *Figure 9-1* presents the 12 coastal regions of Greece bordering the Mediterranean Sea together with an overview of their main physical and socio-economic indicators.

Figure 9-1: Coastal regions of Greece 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 Greek coastal zones. Although flood-risk is rather limited, the risk of erosion is considerable mainly along the soft parts of the coast<sup>1</sup>. Despite localised seasonal shortages, the provision of freshwater is not yet a problem for Greece.

**a/ Flooding and erosion**

Greece has predominantly a rocky coast (70%). A minor part of the country's coastline, is characterised by sandy beaches and dunes as well as wetlands and lagoons. Those softer parts currently experience a high rate of erosion.

With regard to coastal flooding, the risk is rather limited as tidal ranges are relatively small in the Mediterranean area. Greece has not experienced any severe floods from the sea in the past and Sea Level Rise (SLR) is estimated to be only in the range of 0/+1 mm/year. On the other hand, most economic activities take place nearby the Greek coasts. Almost all big urban centres are located in the coastal zone as well as 80% of industrial activities and 90% of tourism and recreation. Furthermore 33% of the population lives within a coastal strip of 1-2 km. The population living at maximum 50 km of the seashore is estimated at 85%<sup>2</sup>.

<sup>1</sup> Soft parts of the coastline are not situated in one specific area, but are dispersed through the country.

<sup>2</sup> Ministry for the Environment, Physical planning and Public Works, 2006, *Report of Greece on coastal zone management*.

**b/      *Freshwater shortage***

Despite seasonal shortages observed at a local level, the availability and quality of water resources is currently satisfactory at national level. Freshwater shortage is however projected to become a potential threat in the future. Especially the Greek islands and the region of Thessaly may experience increasing periods of drought due to a reduction of summer precipitation. Climate change will result in a need for additional water storage facilities in order to sufficiently capture precipitation during the winter months.

Nevertheless, one of the main problems Greece has to deal with first is the lack of coordination within the water sector. A first step has been taken with the creation of the Central Water Agency.

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

Although Greece has mainly rocky coasts, the country is also known for its many wetlands around lagoons and large deltas. These areas are mainly protected in accordance with the EU Habitat Directive<sup>3</sup> and the EU Bird Directive<sup>4</sup>. At present 239 sites, which include terrestrial and marine eco-systems, are designated as sites of community importance and 151 sites are designated as Special Protection Areas within the framework of Natura 2000. Furthermore, the support of environmental institutions with appropriate infrastructure, equipment and training has been indicated as a top priority for the coming years<sup>5</sup>.

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

In Greece, no coordinated actions are undertaken in the field of coastal protection to date. Measures are decided upon in an ad-hoc way by different national authorities and implemented by local municipalities. The main actors involved at the national level are the *Ministry of Environment, Physical Planning and Public Works*, the *Ministry of Mercantile Marine* and the *Ministry of Economy and Finance*. Funding for coastal protection projects is mainly provided by European programmes. Municipalities carry out coastal protection projects to the extent they receive sufficient financial means by the state or the EU.

The *Ministry of Environment, Physical Planning and Public Works* is in charge of environmental policies and measures as well as spatial planning. The *Central Water Agency*, set up in 2005 by the Ministry of Environment, Physical Planning and Public Works in light of the Water Framework

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<sup>3</sup> Council Directive 92/43/EEC of 21 May 1992 on nature conservation.

<sup>4</sup> Council Directive 79/409/EEC on the conservation of wild birds.

<sup>5</sup> Ministry for the Environment, Physical planning and Public Works, 2006, *Fourth national communication to the UNFCCC*; GHK, 2006, *Strategic evaluation of environment and risk prevention under structural and cohesion funds for the period 2007-2013: national evaluation report for Greece*.

Directive, is responsible for defining the national water policy and coordinating the activities of regional directorates.

The *Ministry of Mercantile Marine* is responsible to protect marine and coastal areas from pollution. The *Ministry of Economy and Finance* is concerned with the planning and follow-up of coastal protection investments in Greece.

### **9.3. RESEARCH INTO GREECE'S VULNERABILITY TO CLIMATE CHANGE AND CLIMATE CHANGE SCENARIOS**

The main institutes involved in research into climate change and climate change scenarios in Greece are the *National Observatory of Athens*, the *Hellenic Centre for Marine Research*, the *National Technical University of Athens*, the *University of Athens*, the *University of Thessaloniki*, the *University of the Aegean* and the *Institute for Agricultural Research*. None of the institutes has dedicated climate change programmes but all of them undertake ad-hoc research projects dealing with the matter in light of their specific field of expertise. Each of these institutes carries out its research activities independently and no overall coordination exists. The conducted research is not financially supported by national or regional authorities. Financial resources are mainly provided by organisations such as the World Wide Fund for Nature (WWF) and other (mainly European) institutes.

Within the National Observatory of Athens, the *Institute of Environmental Research and Sustainable Development* (IERSD) is most involved in research with regard to climate change. The IERSD aims to promote environmental science and engineering within different fields of action such as weather forecasting, climate change modelling and water resources. Climate related research is mainly carried out on the basis of the IPCC-scenarios. Furthermore, the institute is involved in the EU-funded projects ENSEMBLES, DeSurvey and CIRCE. The ENSEMBLES-project<sup>6</sup> aims to set up a climate forecast system which can be used in different time and spatial scales. The main goal of the DeSurvey-project<sup>7</sup> is to develop a flexible and relatively low-cost system to monitor desertification and CIRCE's<sup>8</sup> main objective is to provide a first estimate of the impacts of climate change in the Mediterranean area.

The *Hellenic Center for Marine Research* is mainly involved in researching changes occurring in the marine environment as a result of the rise in temperature. In this regard, the institute is involved in

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<sup>6</sup> [ensembles-eu.metoffice.com](http://ensembles-eu.metoffice.com); project time-frame 2004-2009.

<sup>7</sup> [www.desurvey.net](http://www.desurvey.net); project time-frame 2005-2010.

<sup>8</sup> [www.circeproject.eu](http://www.circeproject.eu); project time-frame 2007-2010.

‘Sesame’<sup>9</sup>, an EU-funded project that aims to study the eco-system changes of the Mediterranean and the Black Seas.

The *National Technical University of Athens* and in particular the School of Civil Engineering/Department of Hydraulic Resources and Environmental Engineering and the School of Rural and Surveying Engineering are conducting studies to assess the impact of climate change upon, mainly, the water resources and their management, and to estimate coastal flood-risk.

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

In Greece, national climate change initiatives are limited to mitigation. Adaptation, with the exception of some research projects, has not yet been put on the agenda of national authorities. Therefore, no over-arching national plan or coastal defence policy currently exists in Greece. At operational level, measures are mainly undertaken on an ad-hoc basis. Most persons contacted in the light of this study indicated that hard protection measures (mainly breakwaters) are used the most. However, the Ministry of Environment, Physical Planning and Public Works indicated the contrary. This may mean that at study level one expresses the need of the most appropriate adaptation measures (more soft measures), whereas in practice only the past and current approach (hard measures) is familiar.

##### *a/ Policy initiatives*

The Ministry of Environment, Physical Planning and Public Works has appointed a climate change ‘official’<sup>10</sup> who is, amongst other things, preparing an overview of the different authorities involved in coastal protection and the measures undertaken to protect the coastal zones of Greece. The aim is to set up a network of focal points and to establish a national adaptation strategy with regard to climate change in the long-run.

Part of the strategy to cope with the consequences of climate change in coastal zones is already embedded in the law concerning the creation of new settlements or the expansion of existing ones<sup>11</sup> which provides for the following:

- Avoid the expansion of existing settlements, especially along the coast;
- Define boundaries of areas which could be built up;
- Encourage expansion in the areas where population density permits it;
- Protect beaches and natural coastal areas, assure public access.

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<sup>9</sup> Reference: <http://www.sesame-ip.eu>; project time-frame 2006-2009.

<sup>10</sup> In the course of 2008, a (first) climate change official was appointed in the person of Mrs. Elpida Politi.

<sup>11</sup> Law 1337/83.

Furthermore, the *Spatial Plan for Tourism* and the *Spatial Plan for Coastal Zones*, currently at the stage of consultation, address the risk of flooding and erosion by proposing a restricted set-back zone of 50 to 100 m. Within this area, building will be prohibited.

To overcome the lack of coordination within the water sector, the *Central Water Agency* was established in 2005 in accordance with the European Water Framework Directive<sup>12</sup>. This agency has been tasked to define a national water policy for Greece and to coordinate the activities of regional directorates.

***b/ Operational initiatives to protect against flooding and erosion***

Traditionally, protection measures against coastal erosion and flooding have been hard defences according to some contacts and soft defences according to others. Certainly, measures are taken on an ad-hoc basis and are initiated by different authorities.

From the contacts with the Ministry of Environment, Physical Planning and Public Works, the Ministry of Economy and Finance and the region of Central Macedonia it became apparent that to date hardly any information on coastal protection actions undertaken or scheduled for the future is available.

***c/ Operational initiatives to counteract water stress***

During the period 1992-1994, Athens suffered from periods of intense drought. This has been an incentive for the national government to take actions in the field of freshwater supply.

Ever since, the national government has initiated awareness raising campaigns. With the aim of raising the storage capacity of the freshwater reservoirs, the Ministry of Environment, Physical Planning and Public Works also started with the construction of dams. In addition, a first pilot project on using recycled wastewater for irrigation purposes is currently on-going in Thessaly.

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

An official request for financial information has been sent to the Ministry of Economy and Finance with a cover letter of the EC to receive an overview of the expenditure related to coastal protection as well as freshwater facilities, but no further information has been provided.

In order to give some indication on this expenditure, *Policy Research* estimates that the per kilometre coastline expenditure to protect the Greek coastal zones against flooding and erosion will be in line

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<sup>12</sup> Directive 2000/60/EC of 23 October 2000 on establishing a framework in the field of water policy.

with that of Cyprus as the same protection approach (hard defences), is being followed, although in a more ad-hoc fashion. Cyprus spends yearly about €0.45 million to protect its coastline of 367 km. Hence, extrapolation of this amount to the Greek coastline of 13 780 km results in some €16 million per year or €288 million over the period 1998-2015.

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

### **9.6.1. PERSONS CONTACTED**

<i>Name</i>	<i>Organisation</i>
<i>Giannakopoulos, Christos</i>	Institute of Environmental Research and Sustainable Development
<i>Prof Memos, Constantine</i>	National Technical University of Athens
<i>Mourmouris, Athena</i>	Ministry of the Environment, Physical Planning and Public Works
<i>Pantazis, Alexandros</i>	Consultant to the Ministry of the Environment, Physical Planning and Public Works
<i>Pantelopoulos, Pantelis</i>	Central Water Agency
<i>Papathanasiou, Evangelos</i>	Hellenic Centre for Marine Research
<i>Petrakis, Michael</i>	Institute of Environmental Research and Sustainable Development
<i>Politi, Elpida</i>	Ministry of Environment, Physical Planning and Public Works
<i>Zisopoulou, Smaro</i>	Ministry of Economy and Finance

### **9.6.2. SOURCES OF INFORMATION USED**

- Georgas D., 2000, *Implications of accelerated sea-level rise (ASLR) for Greece*, proceedings of SURVAS expert workshop on European vulnerability and adaptation to impacts of accelerated Sea-Level Rise (ASLR), Hamburg, Germany, 19 -21 June 2000
- GHK, 2006, *Strategic evaluation of environment and risk prevention under structural and cohesion funds for the period 2007-2013: national evaluation report for Greece*
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- [cordis.europa.eu](http://cordis.europa.eu)
- [www.coastalguide.org/icm](http://www.coastalguide.org/icm)
- [www.ensembles-eu.org](http://www.ensembles-eu.org)
- [www.gfz-potsdam.de/portal](http://www.gfz-potsdam.de/portal)