



Good practice

A study on the environmental, economic and social impacts of climate change in Greece

Climate change is going to have significant impacts on environment, economy and society during the next decades. In February 2009 on the initiative of the Governor of the Bank of Greece a committee of distinguished scientists was set up with the task of preparing a study on that issue. After 26 months (June 2011) the findings of the study were presented, focusing on the cost of climate change for the Greek economy, the cost of implementing adaptation measures and the cost of moving to a low emissions economy.

Scientific background-Tools-Methodology

Teams from different scientific disciplines were brought together for this project. The teams included physicists of the atmosphere, climatologists and geophysicists, experts in agriculture, forestry and fisheries, as well as experts in water resources, tourism, the built environment and energy, not to mention economists and sociologists.

The study produced climate projections for Greece, in a detailed geographic breakdown up to the year 2100. These data are available to the

research community. A series of sectoral studies analysed the biophysical impact of the anthropogenic (human-induced) component of climate change and estimated the costs of climate change, disaggregated by sector, across time horizons extending to 2050 and 2100. The findings of the sectoral studies were then incorporated into a general equilibrium model of the Greek economy, in order to estimate the overall cost of climate change in terms of changes in GDP, social welfare and sectoral output. The sectoral studies also helped define the scope for adaptation to climate

change through preventive measures. The next step was to assess the total cost for the Greek economy of adaptation measures, as well as the cost savings that can be achieved thanks to these measures, given that the damage from climate



change would be reduced.

The study made climate change projections for the 13 regions into which Greece was divided on the basis of climatic and geographic criteria, while a database and model simulations were developed for the main scenarios of greenhouse gas emissions.

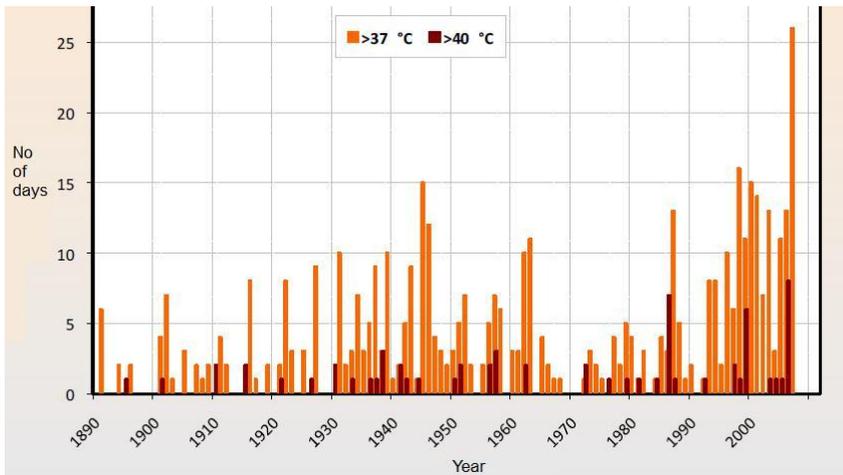


Figure: Number of days/year with maximum temperature >37 °C and >40 °C, Thisio

Based on the climate simulations, climate change risk and impact assessments were made with regard to water reserves, the mean sea level, fisheries and aquaculture, agriculture and agricultural land, forests and forest habitats, biodiversity and ecosystems, tourism, the built environment, transportation, health and mining. The individual studies present quantified estimates of projected environmental and economic impacts. These estimates could serve as valuable input in the designing of adaptation policies.

Summary of findings

Greece has an extremely long coastline of some 16,300 km, of which around 1,000 km correspond to areas highly vulnerable to climate change, due to the risk of a rise in the average level of the sea surrounding Greece by an estimated 0.2 to 2 meters by the year 2100. Many sectors of the economy, including tourism, land use and transportation will be affected.

According to two extreme climate change scenarios it is expected that by the end of the 21st century, the decrease in

precipitation levels due to anthropogenic factors will be of the order of 5% and 19% countrywide, respectively; air temperature will increase by 3.0° C and 4.5° C, respectively. The simulations point to significant changes in several climate parameters, such as humidity, cloud cover, etc.

Even under an intermediate scenario, the Greek mainland in 2071-2100 would, compared to now, have some 35-40 more days with a maximum daily temperature of 35° C or more, while even greater would be the increase (by around 50 at the national level) in the number of tropical nights (when minimum temperatures do not fall below 20° C). At the other end of the spectrum, the number of nights with frost is expected to drop significantly, especially in Northern Greece (by as many as 40). Moreover, the rise in average temperature will prolong the vegetation period by 15-35 days. One of the major impacts of global warming is that the demand for electricity for cooling in the summer months will increase.

Changes are also expected in precipitation extremes. In Eastern Central Greece and North-Western Macedonia, the maximum amount of precipitation occurring within 3-day periods is expected to increase by as much as 30%, whereas in Western Greece it is expected to decrease by as

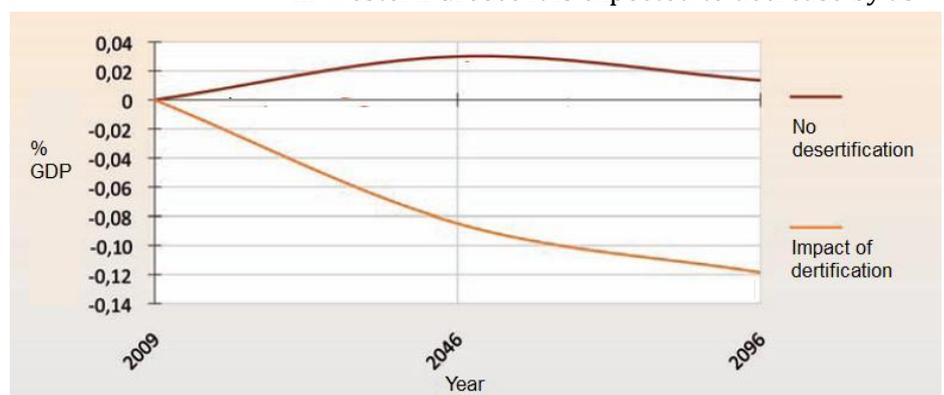


Figure: Scenario for the impact of desertification on the income from agriculture

much as 20%. By contrast, the greatest increases in drought periods are projected for the eastern part of the mainland and for Northern Crete, where 20 more drought days are expected per year in 2021-2050 and up to 40 more drought days are expected in 2071-2100. As a result of climate pattern changes, the number of days with a very high risk of fire is expected to increase significantly by 40 in 2071-2100 across Eastern Greece (from Thrace down to the Peloponese), while smaller increases are expected in Western Greece.



Figure: Desertification of area which was a lake

On a general note, the impact of climate change on all sectors of the economy that were examined was found to be negative and, in several cases, extremely so. The impact, for instance, on fir, beech and pine forests would be considerable, while fire fighting costs are expected to shoot up on account of the increasing number of and area affected by forest fires. Meanwhile, the abundance of species and biodiversity are expected to decline. Furthermore, climate change, as measured by its projected impact on the tourism confidence index (TCI) by the end of the century, is expected to have serious repercussions on Greek tourism – mainly on the seasonal and geographical patterns of tourist arrivals. The consequences of climate change on the built environment, transportation, health, mining and other sectors are also important.

Cost scenarios

With regard to economic impact assessments, specific studies were carried out using three different scenarios: the worst-case scenario in terms of greenhouse gas emission intensity, called the “Inaction Scenario”, corresponds to no action being taken to reduce anthropogenic

greenhouse gas emissions. It was estimated that, under this scenario, Greece’s GDP would drop by an annual 2% in 2050 and 6% in 2100, and that the total cumulative cost for the Greek economy over the period extending till 2100, expressed as GDP loss relative to base year GDP, would amount to €701 billion (at constant prices of 2008).

The second scenario, called the Mitigation Scenario, presumed that Greece would achieve a consistent and drastic reduction in greenhouse gas emissions within a broader global effort and that, as a

result, the average global temperature would not increase by more than 2^o C. The total cumulative cost of the Mitigation Scenario for the entire period till 2100, expressed in terms of GDP loss, comes to €436 billion (at constant prices of 2008). In other words, the total cost for the economy under the Mitigation Scenario is €265 billion less than under the Inaction Scenario, meaning that the mitigation policy would reduce the cost of inaction by 40%.

Finally, given that an adaptation policy is also necessary in order to reduce the damage from

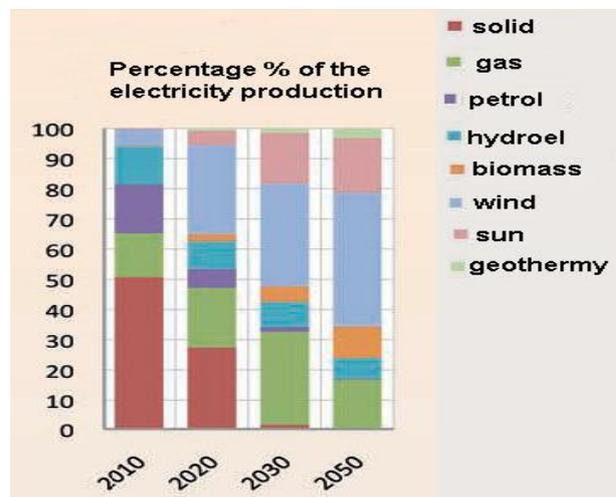


Figure: scenario for the production of electricity till 2050



climate change, an Adaptation Scenario was examined. Under this scenario, Greek GDP would drop by 2.3% and 3.7%, respectively, in 2050 and 2100, while the cost of adaptation policies would total €67 billion. It must, however, be stressed that the adaptation measures do not eliminate all the damage from climate change, but simply contain it. Thus, the cumulative cost for the Greek economy of the (now reduced) damage from climate change was estimated at €510 billion (at constant prices of 2008) over the period till 2100. As a result, the total cost for the Greek economy under the Adaptation Scenario is the sum of, first, the cost incurred by the economy on account of the adaptation measures and, second, the cost of the (reduced) damage from climate change; this sum (the total cumulative cost through 2100) was estimated at €577 billion (at constant prices of 2008).

Avenues for future work

- The social dimensions of climate change impact deserve to be explored further, especially as regards possible increases in poverty and migration, since the effects of climate change and of the policies dealing with it will be most strongly felt by the lower income population groups
- The study points out the urgent need for work to begin on the formulation of a long-term strategy for adaptation measures.
- Long-term energy planning is the core of climate change mitigation policy. The transition to an economy of low greenhouse gas emissions concerns all sectors of economic activity, consumption and energy production.
- New technologies, new activities, new standards for buildings and means of transportation, as well as the reorganisation of production activities need to become the focus of the new growth effort aiming at a low-emissions economy and protection against possible climate change-induced damage.

The full report is available in Greek on the Bank of Greece website (www.bankofgreece.gr) under the special section dedicated to the Climate Change Impacts Study Committee, while the full text of “Foreword and summary of findings of the Report” written by Professor Christos Zerefos is also available in English.

The MiSRaR project

The MiSRaR project is about Mitigation of Spatial Relevant Risks in European Regions and Towns.

The project is a cooperation between seven partners in six EU member states:

- *the Safety Region South-Holland South, The Netherlands (lead partner)*
- *the city of Tallinn, Estonia*
- *the region of Epirus, Greece*
- *the province of Forlì-Cesena, Italy*
- *the municipality of Aveiro, Portugal*
- *the municipality of Mirandela, Portugal*
- *the Euro Perspectives Foundation (EPF), Bulgaria.*

The goal of the project is to exchange knowledge and experiences on risk mitigation in spatial policies. The project will result in a handbook in which the lessons on the mitigation process and the good practices from the partners are presented.

The MiSRaR project is cofinanced by the European Regional Development Fund and made possible by the INTERREG IVC programme.

www.misrar.eu

Contact information

*Nico van Os, general project manager MiSRaR,
Safety Region South-Holland South
n.van.os@vrzhz.nl*

*Nikos Batzias
Region Epirus
Greece
nimpatzi@thesprotia.gr*