

CIRCLE-MED FIRST COORDINATED CALL Integrated Coastal Zones and Water Management

INTRODUCTION

Climate change in countries bordering the Mediterranean Sea is becoming a major problem in terms of development policies, quality of life and environmental protection. Its effects can be felt in terms of temperature, precipitations, and sea level, either through mean trends or extreme events patterns.

The Intergovernmental Panel on Climate Change (IPCC) (2007) documented for the first time wide ranging impacts of changes in current climate such as *“retreating glaciers, longer growing seasons, shifts of species ranges, and health impacts due to heat waves. The observed changes described above are consistent with those projected for future climate change.”*(Part WGII-AR4 of the IPCC document)

Still according to the IPCC, Southern Europe, already vulnerable to climate variability, will be mainly negatively affected from future impacts of climate change: more frequent high temperatures, more frequent droughts, more frequent heat waves.

Finally IPCC stressed the need to promptly conduct impact studies and implement *“proactive climate change risk management adaptation plans.”*

II - CONTEXT

a) Specificities of the Mediterranean Regions

The Mediterranean regions have been developing mainly in coastal zones as outlets for more continental regions, through the settlement of industries and services, rapid population growth in big cities, intensive urbanization of rural coastal areas, and important tourism development. All of these factors generated considerable difficulties in environment preservation.

Hinterland zones support food security and recreation activities for urban peoples they provide ecosystem services vital for many activities: their contribution to water resources is major through watershed functions.

b) Water resources in the Mediterranean region

The Mediterranean region is highly vulnerable to climatic extremes, which can affect water resources and harvests. A major climate change can add vulnerability and raise serious questions about the sustainability of the region.

Water scarcity is a constant issue for the development of these regions. Water is not only a fundamental resource necessary for the livelihood of our societies; it is also a production factor in industry, agriculture and services, and a major factor in the preservation of coastal ecosystems.

In recent times, the intensification of agriculture through new crops (fruit, vegetable, early produce), large technical works (dams, irrigation networks) and management innovations for organizing irrigation networks helped meet food security needs and

promoted new food consumption patterns in urban areas. Climate change adaptation through water resources management concerned essentially agriculture, the highest consuming sector for water.

High water demand (for the development of industrialization, growth of large cities, maintaining good urban sanitary conditions and fulfilling other human needs) is a source of potential conflicts, and therefore creates a need for high-level planning processes and institutions. Water has clearly become a strategic factor in the viability and development of the Mediterranean region.

The first impacts due to a small rise of global surface temperature in the Mediterranean region will be felt in the water resource system. Reductions in water availability would hit the southern Mediterranean countries. Some countries are particularly more vulnerable, such as Egypt, Libya, Lebanon, Tunisia, Algeria, Morocco, Syria, and Malta where water availability already falls below, or approaches 1,000 m³ per person per year, which is the common benchmark for water scarcity.

Even technologically advanced countries, such as Spain, France, Italy, Greece and Israel, could suffer more frequent regional water shortages due to the twin problems of climate change and rising water-demand.

Some water supplies could become unusable due to the penetration of salt water into rivers and coastal aquifers as sea level rises. Water pollution, which is already a major health hazard in the region, would worsen still as pollutants become more concentrated with reductions in river flow.

Adaptation strategies of Mediterranean regions to these threats require an optimization of water management for each use, as well as efficiency improvements. But it is widely acknowledged that these strategies will not be sufficient: new trade-offs between different uses are drastically needed and are a key for continuing development and diminishing tensions between classes, communities, regions and nations in the Mediterranean region.

c) Coastal zones:

The impact of a higher average sea level on coastal areas may be increased during high tides and storms. Higher average sea level means higher tides and coastal storm flooding and storm surges covering more area. Larger areas of coastal lands could potentially be flooded and damaged. The coastal ecosystems particularly at risk include saltwater marshes, coastal wetlands, sandy beaches, coral reefs, river deltas, coastal archaeological sites, coastal cities towns and resort areas. Changes in these ecosystems and infrastructures would have major negative effects on tourism, freshwater supplies, and biodiversity.

Over most of the Mediterranean basin, a possible sea level rise could affect some low-lying coastal areas, which will be lost through flooding or erosion, while rivers and coastal aquifers would become more salty. The worst affected areas will be the Nile Delta, Venice and Thessaloniki where local subsidence can also play a role.

With increasing temperatures many valuable Mediterranean ecosystems could be lost as species fail to cope with the shift in climatic boundaries. Wetland sites will face

the dual threats of drying out and sea level rise. Most wetland sites in southern Europe could disappear with a 3 to 4°C rise in temperatures, affecting also biodiversity, such as food plants and in fisheries.

Most expected climate change impacts on the coastal zone (e.g., on water temperature, sea level, turbulence and surface currents, tides, floods, etc.) behave as direct ecological drivers that control and impact on ecosystem structure (e.g., species composition and abundance) and function (e.g., food web dynamics, biogeochemical fluxes rates), both in marine and transitional habitats. We can hence expect that climate change will cause a thorough departure from the 'good ecological status' demanded by the Water Framework Directive (2000/60/E). Consequently adaptation measures will need to consider this issue. Understanding the functional relation between those climate change drivers, the ecosystems processes and the provision of goods and services by aquatic ecosystems is necessary to properly assess the status of surface waters, and to foresee the ecological consequences of different adaptation strategies in terms of ecosystem structure and functioning.

III - RESEARCH CALL

In accordance with the aforementioned context, this call will focus on the following topics:

1. Adaptation Strategies in the Water Sector and Coastal Zones

. The following issues can be considered:

Urban zones: Maintaining recharge areas in the urban environment to cope with extreme storms and facilitate recharge of aquifers, optimize reclamation of wastewater in a sustainable manner. How to design sewage networks in ways that are sustainable for society and that preserve or improve human health. More specifically, the problem of water-borne diseases provoked by the dysfunction of marshy and coastal waters should be dealt with.

Agriculture: new production schemes, efficiency improvements in plant water use, techniques of precise transport of water to plants. Utilization of treated waste water.

Industries: improving techniques for optimal use of water in industrial processes may derive from more severe constraints on water availability.

Tourism: consequences of new sea-resorts on the human-environment system, importance of sea water quality in natural preserved zones.

Climate change and coastal ecosystems/water resources management: estuaries, lagoons, terrestrial ecosystem structure, processes and services affected by climate change and related changes in water resources.

Coastal zone/marine ecosystems and water management, which include:

- Studying the impact of climate change ‘drivers’ on the coastal zone through scenario simulations;
- Determination of the changes in the surface water and the coastal area’s environmental conditions subject to such drivers;
- Determination of the changes in the organisation and functioning of biological communities and ecosystems subject to such drivers;
- Determination of the role that natural ecological processes and structural complexity play for the resistance of aquatic ecosystems to such drivers, and for the supply of genetic resources needed for a long-term adaptation;
- Estimation of the impacts on natural resources and human activities in the coastal area;
- Proposal of management solutions and investment plans

2. A New Equilibrium in the Integrated Management of Water Resources and Coastal Resources

- a) How to rationalize, govern and put into action the trade-off between different water uses in the perspective of climatic change (IPCC scenarios give good frameworks for guiding the conceptualization of this question).
- b) Regulation between regions, spatial heterogeneity of the resource and the importance of watersheds in creating or regulating this heterogeneity may be important and could transform the way we think about collaboration and competition between zones; in some cases, trans-boundary problems may shift the equilibrium between nations.
- c) In all cases, at the planning level, innovative actions are to be elaborated for all kinds of resource allocation managements.

IV – GENERAL CONSIDERATIONS

- Multi-disciplinary approaches should play an important role in the different research fields mentioned above; a good balance between biotechnical sciences (from hydrogeology to agronomy) and social sciences is expected at the project level.
- Adaptation strategies call for early collaboration with decision makers in order to effectively disseminate recommendations from the call to policy practitioners. Research projects should aim at identifying and providing information to help solve practical adaptation problems.
- Bilateral or trilateral collaborations between nations are important ancillary parameters for providing a better European and Mediterranean collaboration.