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## Climate change and water resources in the Mediterranean

### *Water: a vital resource threatened by climate change, a needed adaptation of its management*

December 2003, Málaga, Spain

Italy is currently hosting in Milan the ninth conference of the parties of the climate change convention where world wide representatives of countries, international organizations, and experts are gathering. The scope of the event is at the scale of the stake: climate change is one of the principles environmental challenges of the 21<sup>st</sup> century. We know that our planet is warming faster than at any time in the last 10, 000 years but what is less known is the **tremendous impact it has on one of the most vital resource of the earth: water.**

The Mediterranean region, a rich and fragile mosaic of landscapes and ecosystems host one of the richest biodiversity of the world. Water resources availability is becoming a hot topic for the region as the consumption levels are exceeding water resources availability. This trend associated to the global warming will lead to the unsteadiness of sensitive ecosystems of the Mediterranean that would add disparity between northern and southern countries.

Spain owns the European record figure of dead people due to floods between 1990-2000 with losses over 200 millions euros per year.

Because of the threat posed to ecosystems and people by climate change, IUCN, is not only promoting mitigation of the greenhouse effect gas, but is also **developing adaptation strategies so that water resources can be preserved**

### **Mounting evidence in the Mediterranean, a threat for water resources**

Climate change is here and will be with us for a long time to come. It will have a significant impact on water resources and their management. Along the last decade, the direct impacts of climate change registered in the Mediterranean basin consist in lower levels of precipitations, a modification of the intensity and distribution of the precipitations, an increase of floods and a raise of temperatures. One emerging response can be defined: Water professionals and societies will need to adapt to climate change

In a short and long term view, **Climate change** will amplify its substantial destabilizing effect on the hydrological cycle and will have a pervasive influence on the future demand, supply and quality of fresh water resources in the region. It **will add pressure on water and environment resources and coastal systems** currently under stress. In the Mediterranean, water resources represent the most precious goods especially for the southern countries; the combination of the aridity of the region with climate change impacts will particularly threat ecosystems processes,

#### **Status of fresh water resources in the Mediterranean**

Fresh water resources in the Mediterranean are under increasing pressure in terms of both quantity and quality.

- **Northern Mediterranean** countries with higher, more regular rainfall also face climate-induced natural hazards, flooding and water shortages in basins susceptible to periodic drought. As a consequence, human and natural systems sensitive to water availability and water quality are increasingly stressed, or coming under threat. Those countries will have to face water quality degradation and meet the increasing needs of environmental protection and restoration.
- In **South and East Mediterranean** counties where utilization is now approaching hydrological limits, and the combined effects of demographic growth, increased economic activity and improved standards of living have increased competition for remaining resources. Water resources are already overexploited or are becoming so with likely future aggravation where demographic growth is strong. The Eastern countries will be more sensitive to short term or structural shortages, in certain areas.

- Over the last 100 years, the global climate has warmed by an average of 0,5 degrees Celsius, owing in part to greenhouse gas emissions from human activities. Climate models project that the Earth will warm by another 1.4 to 5.8 degrees Celsius over the next century.

- One third of Malta Island supply is now provided by desalination of sea water, at roughly 3 times the cost of limited conventional supply.

- In Spain, the total water abstracted is distributed between agriculture (68%) cooling water for energy production (14%) and industry uses (5%)

- In Cyprus, along the last century, while the precipitation is reducing at a rate of 1mm per year, the temperature increased on the average of 0,01°C per year.

- In the Mediterranean, agriculture accounts for 80% of water use.

- Indicators suggest 8 of the 12 South and Eastern Mediterranean countries now use more than 50 per cent of their renewable water resources annually (surface and ground water sources). With current trends, by the year 2025, eight of these 12 countries would consume more than 100 per cent of their renewable supply.

Source: Plan Bleu

- The snow cover has decrease along the last 20 years and glaciers are particularly threatened.

- The IUCN Water and Nature Initiative is a five years action programme to demonstrate that ecosystem based management and stakeholders participation will help to solve the water dilemma of today - bringing rivers back to life and maintaining the resource base for many.

## Mediterranean vulnerability to climate change

Many events associated to climate change threaten the balance of the Mediterranean ecosystems. The projected impacts of climate change will create a greater variability and extreme weather events, wetter winters and drier summers and hotter summers and heat waves.

The changes in temperatures and in precipitations levels and distribution will directly **affect the water demand, quality and watershed**. **Pollution will be intensified** by runoff in catchments and from urban areas. Rivers will have lower flows particularly in summer, and the sea temperature, salinity and concentration in CO<sub>2</sub>, nitrates and phosphates will also be affected. The most visible impact will be the **floods** which will be higher and more frequent. **The changes in the frequency of extreme events might be the first and most important change** registered in the Mediterranean. That will directly impact the **vulnerability** of the poorest countries.

Floods are the most common type of natural hazard in the Mediterranean region, after the earthquakes: only in the last decades all the Mediterranean countries had to defend from some massive flood and its associated catastrophic effects.

### The case of Algeria

Algeria is the largest country in the Maghreb region. In this country the significant exposure to recurring natural hazards (e.g., floods, earthquake, drought) emphasises the vulnerability of the poor population because of the recurring social, financial and economic losses. Algerian urban environment is characterised by rapid urbanisation and environmental degradation. Poor or non-existent drainage, water supply, sanitation, sewer and solid waste disposal systems, further enhance the deterioration and destabilisation of buildings and infrastructure. Deforestation, the elimination of vegetation cover, due to uncontrolled and often illegal development has contributed to further erosion, thus increasing hazard exposure. On November 2001, severe rains accompanied by floods and mud-flows affected fourteen villages in the northern part of Algeria. The disaster caused the loss of about 900 lives, approximately 95 percent of which occurred in the capital of Algiers (specifically in the Oued Koriche catchment area). Damage and loss of property were considerable across sectors, amounting to about US\$300 million (according to the Government sources). Since this disaster, there is a new way of thinking about flood disaster management in Algeria, particularly in urban areas.

## How climate change will affect water resources?

Healthy ecosystems are fundamentally dependent on receiving appropriate amounts of water, of a certain quality, at certain times – either as river flows, groundwater, or a combination. Climate change will put additional pressures on stressed ecosystems.

- As a result of the temperature warming, the **water demand** will increase. The evaporation from water bodies will reduce the available supply and the increased evapotranspiration from crops and natural vegetation as well as the water demand for irrigation or industrial cooling systems will add pressure on water resources.
- Water quality** will be affected by higher runoff which will increase pollution due to agriculture chemicals and less capacity to assimilate pollution with lower flows. The intensification of rainfall will primarily be responsible for soil erosion, leaching of agricultural chemicals and runoff of urban and livestock wastes and nutrients into water bodies.
- Watershed conditions** will suffer from erosion and desertification processes due to hotter and dryer summers, more frequent and prolonged droughts coupled with rainfall events. The higher temperatures would dry soils and increase salinization and generate a higher incidence of wind-blown soil erosion.

## 30 years of international commitment to cope with climate change

- **1979: the First Climate Change Conference**  
recognized climate change as a serious problem. This scientific gathering explored how climate change might affect human activities.
- **1988: The Intergovernmental Panel on Climate Change (IPCC)** is given a mandate to assess the state of existing knowledge about the climate system and climate change; the environmental, economic, and social impacts of climate change; and the possible response strategies.
- **November 1990: Second World Climate Conference.**  
The Intergovernmental Panel on Climate Change (IPCC) released its first assessment Report.
- **1992: the United Nations Framework Convention on Climate Change** was signed by 154 states at Rio de Janeiro. It is the foundation of global efforts to combat global warming. Both developed and developing countries accept a number of general commitments; they will:
  - develop and submit **national communications containing inventories** of greenhouse gas emissions by source and greenhouse gas removals by sinks.
  - develop **national programmes for mitigating** climate change and develop strategies for adapting to its impacts
  - promote **technology transfer** and the sustainable management, conservation and enhancement of greenhouse gas sinks and "reservoirs" (such as forests and oceans)
  - take climate change into account in their relevant social, economic, and environmental policies

## Adaptation: the IUCN response to climate change

Although governments and businesses are starting to take responsibility for their emissions, we are now past the point where the warming of the Earth can be avoided. Worse still, the emissions reductions that have been agreed so far are too modest to have any significant impact on the warming trend. Since we cannot prevent all climate change, we must attempt to adapt to it. While more aggressive reductions in greenhouse gas emissions are undoubtedly needed, effective and efficient sustainable development depends upon climate change adaptation becoming a part of natural resource policy and practice. We need to adopt an adaptive management style adjusting our actions based on learning.

IUCN has developed 3 possible strategies for addressing climate change in the Mediterranean region.

### ▪ Reducing the risk to hydrological variability and floods

An increase in the occurrence of floods, droughts and other extreme weather events due to climate change poses a considerable threat to national economies and sustainable development.

By reinforcing flood and drought preparedness programmes, introducing management measure to regulate runoff, erosion and sediment and by modifying infrastructure to cope safely and perform in higher floods, water managers will reduce the risk to hydrological variability. One other interesting tool could be the increasing of infiltration and capacity of urban storm water systems which play a major role when floods occur.

### ▪ Closing the demand-supply gap in water resources

In the Mediterranean water demand now exceeds or threatens to outstrip sustainable levels of supply by overstepping the renewable levels of ground water resources. This put under pressure the ecosystems of the region which will particularly impact the livelihoods of Mediterranean societies.

Some possible responses can consist in introducing greater flexibility to allocate between competing demands and matching water quality with demand, optimizing existing water regulation infrastructure (operations and retrofit) to most efficient uses and ongoing changes in water allocation priorities. A better balance between efficiency measures (recycling, conservation) and new supply measures (through water harvesting and desalination) as well as a combination of two possible water sources (surface water and ground water) would constitute other ways to bridge the demand supply gap in water resources.

### ▪ Balancing human and nature needs

Protection and restoration of ecosystems that provide critical land and water resources and services are urgently needed to maintain and restore natural capacities that support the protection of people and assets against increased climate variability and extreme events.

It will be necessary for example to introduce policies that recognise environment needs in water allocation, to recognize and sustain ecological services from rivers and wetlands (e.g. for ground water recharge and water purification) and to adapt minimum environmental flows provisions (surface and ground water) to the seasons and to the water cycle in wetlands.

■ **21 March 1994:** The Convention on Climate Change entered into force

■ **1995: first session in Berlin of the Conference of the Parties.** The COP is the supreme body of the convention. It comprises all the states that have ratified or acceded to the convention. It meets on a yearly basis. The COP can adopt new commitments through amendments and protocols to the Convention. In December 1997 it adopted the Kyoto Protocol containing binding emissions targets for developed countries.

■ **December 1997:** the Kyoto protocol was adopted at COP 3. Because there was not enough time to finalize all the operational details, 4 further COP have been necessary to be ready for implementation (in 2001).

- industrialized countries are to reduce their collective emissions of six greenhouse gases by 5,2% by 2008-12.
- The protocol includes 3 mechanisms: the clean development mechanism, an emissions trading regime and joint implementation

■ **1<sup>st</sup> to the 12<sup>th</sup> December 2003:** Ninth COP will be held in Milan, Italy

## IUCN action to address climate change at the global and local levels

In 2002, **five regional dialogues** have been held in Central America, Southern Africa, West Africa, South and Southeast Asia, and the Mediterranean. These dialogues looked at the need for and possible elements of an analytical framework to address climate change in the context of managing adverse impacts on water resources and wetlands systems in each region. Adaptation Here it was envisaged that **key information needs** would be identified.

Climate change **adaptation options** would be identified and evaluated in the context of sustainable management of water resources and projections for climate change. The adaptation frameworks for action would include steps that could be undertaken by NGOs, the private sector, community organizations and government agencies and partnerships.

### Examples of actions to adapt to climate change in the Mediterranean

In **Greece**, the government has begun to inform farmers about the potential impacts of climate change. In France, drought preparedness and prevention schemes are part of the legal framework on water resources development. The **French** government is also seeking to speed up the implementation of plans for the prevention of risks and to improve flood warning systems. Upstream measures such as reforestation are being implemented to prevent floods as part of catchment management. **Morocco** has taken steps to increase the number of wastewater plants and wetlands protection measures to reduce current vulnerability to water scarcity. In **Italy**, actions linked to the 2002 Environmental action strategy have focused on three priorities- water conservation, water quality, and sustainable water pricing. In **Cyprus**, measures have been implemented to increase the efficiency of water supply and develop non-conventional sources of water, such as desalination, which now makes up more than 10% of fresh water supply. **Spain** launched a plan for Forest Hydrology Restoration for which actions on soil degradation can be carried out in order to recover the ecological functions of forests soils in water cycle.

The means of identifying and implementing measures in action programmes would be based on principles of dialogue and partnership between government, business, civil society and water users at all three levels. Collaborative processes are required between the different sectors concerned.

In most Mediterranean countries, **institutional coordination mechanisms** are already in place that could be used to initiate national level processes. These include the focal points for UNFCC (United Nations Framework Convention of Climate Change) or IPCC (Intergovernmental Panel on Climate Change) responses and Ramsar, as well as interdepartmental panels or working groups, and in some cases, Commissions that have already established to study and coordinate responses to climate change issues.

***One clear message from the Mediterranean dialogue is the longer this task is left unattended in the Mediterranean, the more costly and disruptive it may be for society and the environment. Small changes now can make a huge difference over time, as the beneficial effects compound.***

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