



Water scarcity and drought in the Mediterranean

The balance between water demand and availability has reached a critical level in many southern areas of Europe, the result of over-abstraction and prolonged periods of low rainfall or drought. Reduced river flows, lowered lake and ground water levels, and the drying up of wetlands are widely reported, alongside detrimental impacts on freshwater ecosystems, including fish and bird life.

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Olive groves in Córdoba province, Andalusia, Spain

In Turkey's Konya Basin, a combination of drought and excessive abstraction of water for agriculture has led to the drying up of a number of lakes and wetlands. Lake Tuz, for example, formerly the country's second largest body of water and visited by thousands of flamingos each summer, has been severely reduced in size. Sinkholes and land collapse are also reported in the Konya Basin, triggered by a severe depletion of the ground water resource.

Where water resources have diminished, a worsening of water quality has often followed because less water has been available to dilute pollutants. In addition, salt water increasingly intrudes into 'over-pumped' coastal aquifers throughout Europe. On Greece's Argolid Plain, for example, boreholes have had to be abandoned due to excessive levels of salinity found in the ground water as a result of such salt water intrusion.

Farmers have seldom had to pay the full resource and environmental cost for water

The Mediterranean region is particularly susceptible to the detrimental impacts of water scarcity and drought. Not only does the region experience relatively low 'effective' rainfall (i.e. the amount once evapotranspiration is accounted for) but both agriculture and tourism exert a significant pressure on available water resources.

Water and agriculture

Across Europe as a whole, agriculture accounts for about 24 per cent of total water use. In parts of the Mediterranean, however, this share can reach up to 80 per cent due to the widespread irrigation of crops, a practice that enhances their yield and quality. Most irrigation water is abstracted during the summer months when crop water demand peaks but water is least available. Moreover, most of the water abstracted by agriculture is 'consumed' through plant growth and evapotranspiration, with often no more than a third being returned to a water body after use. Excessive abstraction for irrigation has been driven, at least in part, by the fact that farmers have seldom had to pay the full resource and environmental cost for water. And until recently, EU subsidies often incentivized water-intensive cultivation.

Summer tourism

International tourist numbers have increased markedly in the Mediterranean region over recent decades and much of the coastline is now



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built on. Not only do tourists enhance pressure on the public water supply through using water for food, drink and personal hygiene; leisure facilities such as swimming pools, water parks and golf courses all exacerbate the problem. Moreover, most tourists visit the region during the summer months when water resources are already subject to considerable stress.

An ever expanding supply

To satiate the demands from agriculture, tourism and other sectors, water supply in the Mediterranean has steadily expanded over recent decades through the building of reservoirs, inter-basin transfers and, increasingly, energy hungry desalination plants. Problematically, this disproportionate emphasis on supply has provided no incentive to limit water use by any sector. Instead, it has promoted the excessive abstraction observed in many Mediterranean regions today that, in combination with periods of drought, have often led to water resources falling to a critical level.

Shipping water

In Cyprus, for example, water use for irrigation and domestic purposes has grown steadily over the last 20 years. In 2008, however, Cyprus suffered its fourth consecutive year of low rainfall, and water availability reached a critical level in the summer months. To ease the island's crisis,

water was shipped in from Greece using tankers and the Cypriot Government was forced to apply emergency measures, including the cutting of domestic supplies. Similarly, in Catalonia, during the spring of 2008, water levels in the reservoirs supplying 5.8 million inhabitants were only at 20 per cent of capacity. The situation was so bad that plans were made to ship fresh water in, at an estimated cost of €35 million. Luckily, May was wet and, in the end, only a few shiploads were transported to Barcelona.

Management of water resources

Continued expansion of water supply is clearly not a viable option for water resource management in the Mediterranean either now or in the future, particularly given the climatic changes anticipated for the region. Climate models predict hotter, drier summers for southern Europe with a progressive increase in the frequency and severity of droughts during the 21st century.

The Mediterranean region needs to implement a sustainable approach to the management of its water resources, focused on conserving water and using it more efficiently. Integral to this is a more equitable approach to water abstraction that addresses not only the requirements of competing economic sectors but also the need for healthy freshwater ecosystems. Successfully im-

Liberian-flagged 'Westama' anchored off Cyprus's southern coast on 2 July 2008. The vessel is carrying 40,000 cubic metres of drinking water from Greece, imported by Cyprus to alleviate the effects of a crippling drought. The island plans to bring in an estimated 8.0 million cubic metres of water in shipping tankers by November.

Cyprus is taking action

While the current situation with respect to water scarcity and drought in the Mediterranean is worrying, positive developments are apparent. In Cyprus, for example, an integrated approach to water management implements measures to ensure water security both now and in the future, accounting for the impact of climate change. As Mr Sofoclis Aletraris, Director of the Water Development Depart-

ment in Cyprus, points out, “A range of measures address the management of demand including metering of water consumption, water pricing that not only reflects its growing scarcity but includes the provision of subsidies for saving potable water, programs to reduce distribution losses, improvement of on-farm management irrigation systems and, the promotion of a water-saving culture”.

Catalonia addresses demand

In Catalonia too, the Catalan Water Agency has taken positive steps to implement more sustainable water management, addressing demand, rather than only focusing on supply. Various conservation practices and measures to improve efficiency have been established, including more recycling and reuse of water. During the 2007–2008 drought, rapid implementation of these measures led to a 17 per cent drop in urban water use. However, as Lorenzo Galbiati of the Catalan Water Agency

explains, “the aim was not only to address the drought crisis but to implement these measures for the longer term, thereby also adapting to the drier climate predicted for this region in future years”. The approach appears successful and as Galbiati points out “whilst some time has now past since the drought ended, the measures implemented remain effective. Per capita water use in Barcelona has now fallen to less than 120 litres per day, one of the lowest levels in Europe”.

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Adaptation research & results: the CIRCLE Mediterranean Call **Saltwater intrusion is a major threat to freshwater**

There is a widespread need among European member states for more specific climate research that incorporates the needs and questions of stakeholders. Within the ERA-net CIRCLE, applied research projects have started in an international collaboration; (preliminary) results are being presented or will be published soon. An update on CIRCLE MED.

“Within the CIRCLE MED call, eight projects have been selected”, says Marie Mojaisky, the French coordinator of this geographical research group. “We only expect results at the end of 2010 at the earliest.” According to Mojaisky, countries involved in the research projects range from France, Portugal, Israel and Italy to Croatia, Morocco,

Albania and Tunisia. All these and other partner-countries have one thing in common: they are closely connected to the Mediterranean sea. Its surrounding ecosystems may be among the most impacted by global change drivers. They will at least suffer a decrease in water resources. Therefore within the CIRCLE MED call, research projects on ‘Integrated coastal zone and water management issues’, were funded. Case studies in France, Portugal and Morocco collect data on salt water intrusion problems and groundwater management. “Farmers’ perceptions, needs and questions will be addressed in the study”, Mojaisky explains.

Other MED call studies will focus on the effect of climate

change on freshwater resource availability in other Mediterranean and Atlantic Ocean regions (e.g. the Azores). Preliminary results of interviews in the Italian basin point out that the stakeholders identify saltwater intrusion as one of the major threats to coastal zone freshwater resources. The INTERMED project carried out by Italian, Israeli, and Croatian research institutes are working together on exploring intertidal ecosystems, in order to gain knowledge on whether climate change impacts will cause habitat loss and loss of ecosystem goods like shellfish for human consumption, and the economy.

for more information on CIRCLE see p. 14



plementing such an approach will also address the need to adapt to climate change and contribute to lower energy consumption, because water and energy use are closely linked.

New approaches to irrigation

Irrigated agriculture is central to the economy in many parts of the Mediterranean and in some areas ceasing irrigation could lead to severe economic hardship. Adopting a more sustainable and efficient approach to agricultural water use is critical, therefore, not only to protect the environment but to ensure that agriculture remains profitable. Fundamental change is especially important given the predictions for some regions of the Mediterranean that future lack of water will seriously affect agriculture.

Various practices can be implemented to ensure that agriculture uses water more efficiently. These include the timing of irrigation so that it closely follows – on a daily basis – crop water requirements; adopting more efficient techniques such as sprinkler and drip irrigation systems; and using pressurized pipe networks rather than gravity-fed open channels.

Deficit irrigation also has great potential. This is a technique that reduces the amount of water applied to below the ‘theoretical irrigation need’

of the crop on the basis that the financial savings from reduced water use outweigh the modest reduction in crop yield. To incentivize implementation of these and other measures, however, it is necessary that farmers pay a price for water that reflects its true cost. Additionally, illegal water abstraction must be rigorously addressed. Funds disbursed under the Common Agricultural Policy can also play an important role with respect to subsidizing costs of implementing measures to reduce agricultural water use.

Consumer awareness

Much can also be done to implement a more efficient use of the public water supply. Leakage of water from supply systems can be substantial and efforts need to be made to improve detection, quantify leakage more accurately and upgrade and maintain networks. Achieving more sustainable use of public water supplies will also depend strongly upon raising public awareness of water conservation, including measures such as rainwater harvesting and the use of ‘grey’ water. Various means are available to inform domestic, business and tourist water consumers. Eco-certification of hotels, for example, can help tourists make informed choices. As with the agricultural sector, however, appropriate water pricing structures need to be implemented in order to incentivize water savings.



About the author

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Climate adaptation in the IJsseldelta: the Overijssel approach

The river IJssel in the Netherlands is a major branch of the river Rhine, the third largest river of Europe. It discharges its flows to the IJsselmeer Lake. The IJsseldelta is a low-lying area that is threatened by floods from both the river IJssel and the IJsselmeer Lake.

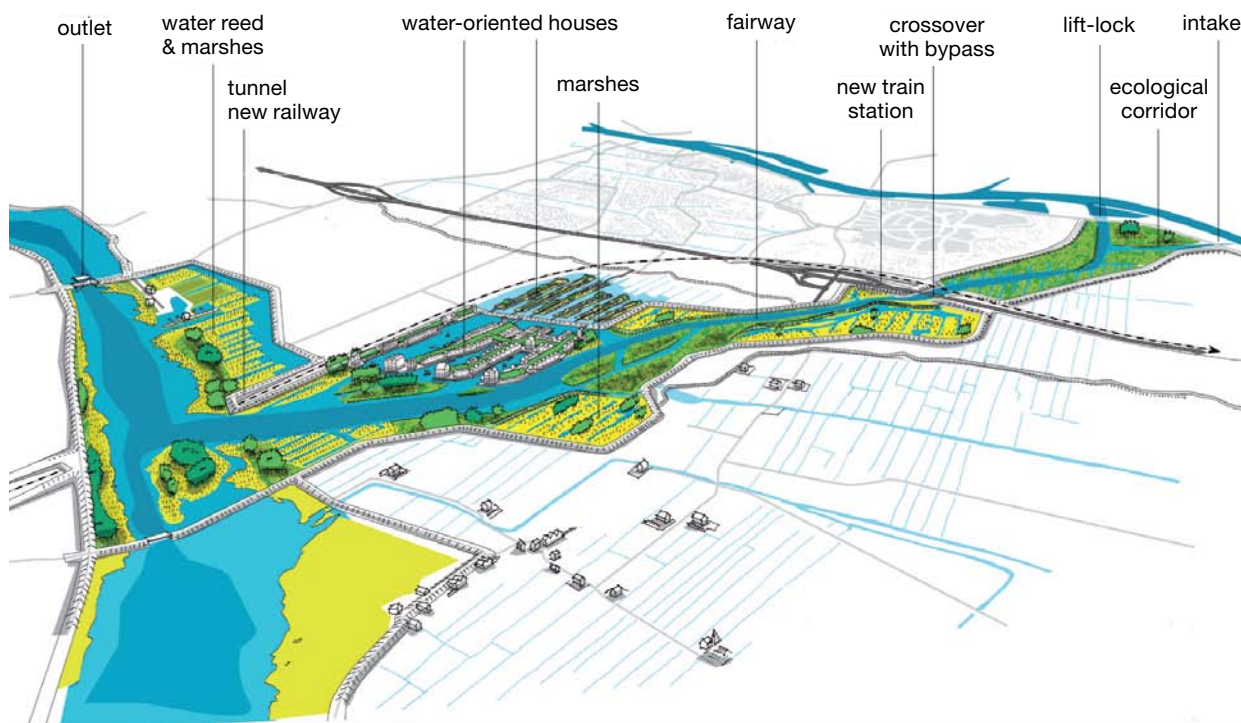
In 2005 the Province of Overijssel initiated the process of drawing a sustainable development plan for the IJsseldelta area with a strong focus on climate adaptation. The challenge was to combine and integrate several spatial developments (housing, infrastructure, leisure, nature, agriculture),

with the construction of a so-called bypass of the river IJssel.

The result is an integral plan that is supported by more than 20 governmental and non-governmental organizations. With the construction of the bypass some 350 hectares will be added to the floodplains of the delta of the river IJssel. The effect of the restoration of the floodplains is that the water levels of the river IJssel will decrease substantially during situations of high river discharges. This contributes to the safety and resilience of the area.

One of the most recent ideas is to develop a climate proof dike – a kind of super dike along the river bypass – that at the same time can act as an embankment for housing development. In September 2009 an agreement was reached to finance the project, which will cost about €325 million in total. If everything goes according to plan and without delay, the implementation of the project will start in 2013.

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Impression of the integral plan of project IJsseldelta (2008)