3rd International Conference on Earth System Modelling
Vol. , 3ICESM-122, 2012
3rd International Conference on Earth System Modelling

Impacts of Climate Change on Water Availability in Cyprus and the Eastern Mediterranean: Possible Mitigation/Adaptation Measures

M. A. Lange

The Cyprus Institute, Energy, Environment and Water Research Center, Nicosia, Cyprus (m.a.lange@cyi.ac.cy, +357 22 208625)

It is anticipated that the Eastern Mediterranean and Cyprus will be disproportionally and adversely affected by future climate change. This will most likely lead to enhanced water scarcity in the region. The water balance on Cyprus is already strained by increasing temperatures, diminishing precipitation rates and rising demand, resulting in the highest Water Stress Index among European countries.

To satisfy the increasing demand and to minimize the losses of surface water to the sea, the Government of Cyprus embarked in an ambitious programme of water development works with the construction of many dams and conveyors and irrigation networks in the 1980s and 1990s. However, recurring decreases in winter and spring precipitation have led to reduced water levels in the dams. The winter 2007/08 has seen record lows in rainfall resulting in vanishing groundwater resources and in water volumes of less than 10% reservoir capacities of the existing dams.

As already mentioned, current climate projections indicate an increase in summer temperatures as well as a decrease in precipitation throughout the year. However, in order to assess future climate change, the results of global climate models have to be “down-scaled” through regional numerical climate models (RCMs). The results of RCM model runs demonstrate that the volume of total winter precipitation maybe reduced by 25% and 40% relative to values for the reference period 1961-1990 for the 2021-2050 and the 2071-2100 time window, respectively. This underlines the already mentioned notion of enhanced water scarcity under conditions of climate change.

Given this situation, the import of water from neighbouring countries as carried out during 2008 clearly represents only a short-term remedy. Increasing the capacity for seawater desalination, as planned by the Cyprus government but based on current technologies will result in enlarged consumptions of conventionally generated electricity and enhanced CO_2 emissions from power plants. This will boost the dependency on imported energy sources and thereby imply significant economic and political constraints for Cyprus. As an alternative, the employment of renewable energies for seawater desalination represents a more promising remedy for providing increasing amounts of potable water under conditions of climate change.

A technology that holds particular promise is the employment of concentrated solar power (CSP) to be employed for the co-generation of electricity and desalinated seawater. Providing additional potable water in an environmentally sound manner addresses both, adaptation (provide for rising needs of potable water) and mitigation needs (reduced greenhouse gas emissions) to climate change. This holds true also for the provision of "green electricity", whose demand is likely to increase due to, e.g., enhanced need for space cooling during hot summer months. While concentrating on the situation in Cyprus, the conclusions drawn will be relevant for neighbouring countries in the entire (eastern) Mediterranean.