

Energy – Water Nexus



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Energy and water are strongly interlinked. The energy-water “nexus” is more evident due to climate change increasing droughts, floods and different rainfalls. The interactions between water and energy is one of mutual dependency: the exploration of energy sources, biomass production and power generation need water; on the other hand, water distribution and processing needs energy.

15% of the global water withdrawals are used for the energy sector although the effective water consumption is smaller, as part of the withdrawal is led back to nature. Both withdrawals and consumption are projected to grow in the future, notably the consumption because of more biofuels.

Many energy sources, their extraction and fuel processing need water. These requirements depend on the fuel but also on the extraction site and technology. The power generation technologies differ significantly in their water needs. In general, the combined cycle gas turbine technologies need less water. Carbon capture and

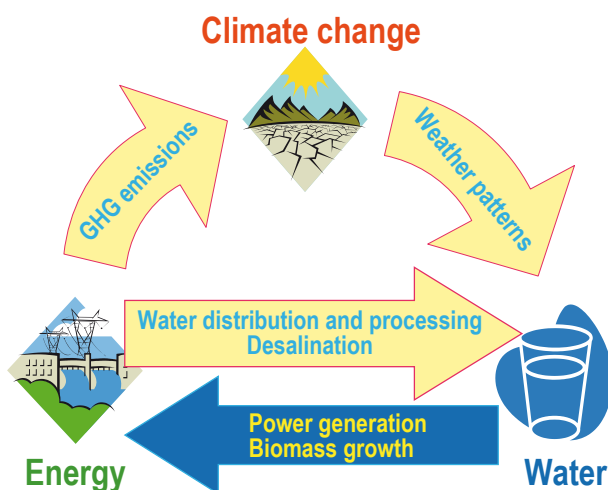
sequestration may remarkably increase the water use. Also, nuclear plants require more water than coal plants of the same capacity because they operate at reduced steam conditions. The renewable energy technologies differ: wind and photovoltaic technology barely consume water while water is important in concentrating solar systems. Hydropower is a story itself: run-of-river plants hardly lose water but evaporation from circulation plants with water storages may be significant.

When it comes to energy end-use, water is not only consumed in kitchens and bathrooms but is also a medium of heat transfer. Luckily, saving both energy and water often leads to mutually useful measures. Pumping is at the heart of the nexus. Eco-design requirements and energy labels address also water consumption of washing machines and dish washers. Saving devices such as water saving toilets, shower heads, thermostatic water taps are appliances that save both energy and water.

European fresh water use in the past two decades has been slightly declining mainly because of efficient industrial use. However, the high water demand for irrigation in Southern Europe has not decreased although the irrigation technologies have much improved. The energy needs of the water sector have been growing as more water treatment and irrigation is needed, also because of desalination.

Worldwide more than one billion people in developing countries do not have a safe access to clean water and proper sanitation. Water collection is often a major workload for women who need to fetch the daily water sometimes kilometres away. New technologies to construct wells and operate these for instance by solar pumps, have improved the living conditions in many countries.

The water – energy nexus has recently gained more political visibility. In the future, water scarcity may increase the vulnerability of the energy sector. We need intelligent, sustainable energy to meet the global water requirements. A key answer to these challenges is efficiency at every step - notably in pumping, automation and metering but also in appliances. All these issues are most familiar to the readers of REHVA Journal. Your expertise is invited to meet the nexus! **3E**



Strong direct and indirect links between energy and water.