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Water Stress: The Importance of Socio-Economic Driving Forces Compared to Climate Change

M. Flörke and J. Alcamo
Center for Environmental Systems Research, University of Kassel (floerke@usf.uni-kassel.de)

The aim of this work was to analyse the impact of not only climate change and population, but also the effects of income, electricity production, water use efficiency, and other driving forces on water resources. For assessing the status and changes in the world water situation, the concept of "water stress" was introduced. In this study we used the withdrawals-to-availability ratio (w.t.a.) which is defined as the total annual water withdrawals divided by the long-term average annual water availability, as an indicator to identify river basin areas under water stress. Four main sectors are included in the calculations: domestic, industry, irrigation, and livestock. The variables were computed with the global water model WaterGAP (Water Global Assessment Prognosis) to analyse the impacts of climate change and socio-economic driving forces (derived from the A2 and B2 scenarios of IPCC) on future global water stress.

The results show that in 1995 (current situation), 21.6% of global basin river areas are under severe water stress, mostly in India, Northern China, Middle Asia, the Middle East, Northern and Southern Africa, parts of Southern Europe, Western Latin America, a large part of the Western United States and Northern Mexico. By the 2050s, this value is estimated to rise up to 28.3%, and will reach almost 30% in the 2070s. Compared to 1995 and depending on the scenario considered, the water stress increases in 62 to 76% of the total river areas, decreases in 20 to 29% and remains more or less constant for the rest. The main reason for decreasing water stress is the increased water availability derived from a higher precipitation as a result of the climate change. On the other hand, water stress increases due to the growth in water withdrawals mainly in the domestic sector. In contrast to previous global studies, it was found that increasing water stress is mainly driven by enhanced income that stimulates water demand in developing countries, rather than by population growth. It should be noted that in the future the agriculture sector continues to have the largest volume of water with-

drawals, but does not undergo very large increases over the scenario period because the extent of irrigated land was held constant. We have also seen that most climate scenarios expect a wetter world and higher average runoff. Nevertheless some already arid regions may become drier.

In this study we have combined the impact of climate change and several socio-economic driving forces in a consistent analysis of the world’s water situation. This analysis has helped us to identify certain "critical regions", where climate change and increasing water use may exert more pressure on water resources. Many of these critical regions will need the help of the international community to develop strategies to cope with water scarcity and thus secure sustainable development.