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Sustainable Water and Agricultural Land Use in the Guanting Watershed under Limited Water Resources

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The Yongding River System is an important water source for the northeastern Chinese provinces Shanxi, Hebei, Beijing, and Tianjin. The Guanting Reservoir within this river system is one of the major water sources for Beijing, which is about 70 km away. Original planning assumed a discharge of 44 m^3/s for the reservoir, but the current mean discharge rate is only about 5 m^3/s; there is often hardly any discharge at all.

Water scarcity is a major threat for the socio-economic development of the area. The situation is additionally aggravated by climate change impacts. Typical upstream-downstream conflicts with respect to water quantity and quality requests are mixed up with conflicts between different sectors, mainly mining, industry, and agriculture. These conflicts can be observed on different administrative levels, for example between the provinces, down to households.

The German-Chinese research project "Sustainable water and agricultural land use in the Guanting Watershed under limited water resources" investigates problems and solutions related to water scarcity in the Guanting Catchment. The aim of the project is to create a vulnerability study in order to assess options for (and finally achieve) sustainable water and land use management in the Guanting region. This includes a comprehensive characterization of the current state by gap analysis and identification of pressures and impacts.

The presentation gives an overview of recent project results regarding regionalization of global change scenarios and specification for water supply, evaluation of surface water quantity balances (supply–demand), evaluation of the surface water quality balances (emissions–impact thresholds), and exploration of integrative measurement planning.

The first results show that climate in the area is becoming warmer and drier which leads to even more dramatically shrinking water resources. Water supply is expected to be reduced between one and two thirds. Water demand might be stabilized or reduced by one third in the coming 20 years. Extent and intensity of agriculture is one of the key factors in reducing water demand. Regarding the water quality, additional water treatment facilities can significantly reduce nitrogen and phosphorus input to the rivers and reservoirs. Water transfers might be necessary to replace current unsustainable groundwater use and reduce water scarcity under current and future climate. We use a multi-criteria vulnerability index to indentify hot-spot areas and to show adaptation potential of different regions.