



Urban impacts on groundwater resources and quality in the Kabul Basin, Afghanistan

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Afghanistan was affected by a long period of wars from 1979 to 2002. As a result much of the country's infrastructure including the water supply in Kabul had been destroyed. Academic education and exchange in the field of geosciences came to an almost complete halt. On behalf of the Federal Foreign Office of Germany, BGR resumed its work in Afghanistan in 2003. Together with Afghan experts, information on the groundwater resources of the Kabul basin was gathered. The project was focused on the Kabul basin due to the desperate water supply situation there. The population sharply increased from 1.8 million in 2002 to 3.0 million in 2004 due to the influx of a vast number of internal and external refugees. A severe drought lasting from 2000 to 2004 further complicated Kabul's water problems. Due to the drought-related shortage of surface water, groundwater is now the major source for drinking water in the Kabul basin. Only 20 % of the population have access to tap water. The rest depends on shallow wells equipped with hand pumps. Their quality was tested by an extensive sampling and analysis programme. The Kabul aquifers consist of coarse and permeable sandy to gravely material. They were deposited by several rivers draining the basin. Usually the aquifers are covered by loess loams which form the major groundwater protection layer. The main sources of groundwater recharge are direct exfiltration from the rivers after the snowmelt and foothill infiltration at the rim of the basin. Kabul's typical continental climate practically precludes any groundwater recharge directly from precipitation. The drought and the rising population have led to an overexploitation of the groundwater. Falling groundwater levels are an alarming indicator. The shallow groundwater in the city has received tremendous amounts of pollutants due to a lack of proper waste and wastewater disposal. More than 86 % of all households only have simple cesspits. Common indicators of wastewater influence

are elevated concentrations of nutrients such as nitrate, sulphate and faecal bacteria. The high infant mortality can at least be partially attributed to the insufficient water hygiene. The mostly negative water budget of the Kabul basin results in strong evaporation which leads to an increase in salts. The drought has aggravated this problem since pollutants are not being flushed out. Groundwater in areas with formerly shallow table contains too much salt to be used for human consumption or irrigation.