Water Resources Availability in Kabul, Afghanistan

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The availability of water resources is vital to the rebuilding of Kabul, Afghanistan. In recent years, droughts and increased water use for drinking water and agriculture have resulted in widespread drying of wells. Increasing numbers of returning refugees, rapid population growth, and potential climate change have led to heightened concerns for future water availability.

The U.S. Geological Survey, with support from the U.S. Agency for International Development, began collaboration with the Afghanistan Geological Survey and Ministry of Energy and Water on water-resource investigations in the Kabul Basin in 2004. This has led to the compilation of historic and recent water-resources data, creation of monitoring networks, analyses of geologic, geophysical, and remotely sensed data. The study presented herein provides an assessment of ground-water availability through the use of multidisciplinary hydrogeologic data analysis. Data elements include population density, climate, snowpack, geology, mineralogy, surface water, ground water, water quality, isotopic information, and water use. Data were integrated through the use of conceptual ground-water-flow model analysis and provide information necessary to make improved water-resource planning and management decisions in the Kabul Basin.

Ground water is currently obtained from a shallow, less than 100-m thick, highly productive aquifer. CFC, tritium, and stable hydrogen and oxygen isotopic analyses indicate that most water in the shallow aquifer appears to be recharged post 1970 by snowmelt-supplied river leakage and secondarily by late winter precipitation. Analyses indicate that increasing withdrawals are likely to result in declining water levels and may cause more than 50 percent of shallow supply wells to become dry or inoperative particularly in urbanized areas. The water quality in the shallow aquifer is deteriorated in urban areas by poor sanitation and water availability concerns may be compounded by poor well construction practices and little planning.

By 2050, the available water resources in the Kabul Basin may be reduced as a result of Central Asian climate changes. Increasing air temperatures associated with climate change are likely to lead to a decreasing snowpack and an earlier growing season, resulting in less recharge from river leakage. As a result, more than 60 percent of existing supply wells may become dry or inoperative. The impacts of climate change would likely be greatest in the agricultural regions in the western areas of the basin. Water resources in the in northern areas of the basin may meet future water needs. However, in other areas of the basin, particularly the more urbanized southern areas adjacent to and including the city of Kabul, water resources may be stressed.

Ground water in deep aquifers, more than 100 m below land surface, is presently unused. Conceptual ground-water-flow simulations indicate that ground water in deep aquifers may be thousands of years old. The deep aquifer may sustain limited increases in municipal water use, but may not support increased agricultural use which is much greater than municipal use. However, the hydraulic feasibility and quality of deep ground-water extractions are not well known and are being investigated.

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