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The water-food-energy nexus in Pakistan: a biophysical and socioeconomic challenge

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In an earlier paper (Kirby et al., 2017, Agricultural Water Management, 179, 34-46), we examined the historical trends and likely future of water use and food availability in Pakistan. We extend the analysis to include hydropower generation, and the energy demand in food production due to pumping groundwater for irrigation. Business-as-usual scenarios suggest that with a rapidly growing population there will be a large increase in groundwater use and hence also energy use for food production to maintain the current level of food (in)security. However, current groundwater use is already unsustainable in many areas, and the energy sector is also failing to keep up with demand. We examine the economic and political challenges in several scenarios which may maintain or improve food security while lessening the unsustainable use of groundwater and / or improving the imbalance of energy supply and demand. We conclude that there is no single, obvious solution to Pakistan's water – food – energy dilemma, and that the future therefore depends on progress on several elements of water, food and energy policy.