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# Quantifying the impact of climate change on household water use in mega cities: a case study of Beijing, China

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Amid rapid urbanization and climate change, global urban water consumption, particularly household water use, has continuously increased in recent years. However, the impact of climate change on individual and household water use behavior remains insufficiently understood. In this study, we conducted tracking surveys in Beijing, China, to determine the correlation between climatic factors (e.g., temperature, precipitation, and wind) and household water use behaviors and consumption patterns. Furthermore, we proposed a genetic programming–based algorithm to identify and quantify key meteorological factors influencing household and personal water use. The results demonstrated that water use is mainly affected by temperature, particularly daily maximum (TASMAX) and minimum (TASMIN) near-surface air temperature. In addition, showering and personal cleaning account for the largest proportion of water use and are most affected by meteorological factors. For every 10□ increase in TASMAX, showering water use nonlinearly increases by 3.46 L/d/person and total water use nonmonotonically increases by 1.14 L/d/person. When TASMIN varies between −10□ and 0□, a significant change in personal cleaning water use is observed. We further employed shared socioeconomic pathway scenarios of the Coupled Model Intercomparison Project 6 to forecast household water use. The results showed that residential water use in Beijing will increase by 21%–33% by 2035 compared with 2020. This study offers a groundbreaking perspective and transferable methodology for understanding the effects of climate change on household water use behavior, providing empirical foundations for developing sustainable water resource management strategies.