Energy demand-driven water stress and mitigation in China

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Within a watershed, interregional energy supply chains upstream from a regionâ€™s purview place stress on local water availability. Unfortunately, reliable transboundary assessments of energy use on the water stress within watersheds largely remain lacking in China. We therefore investigate transboundary impacts on scarce water resources that are induced by energy demands (i.e., electricity, petroleum, coal mining, oil and gas extraction, and gas production). We develop a bottom-up high spatial resolution (scarce) water inventory for multiple sectors and link it to a 2017 multiregional input-output (MRIO) table of China to analyze scarce water use by region. We find that the energy-driven water footprint accounts for 21.6% of national water usage, of which 35.7% is scarce water. Moreover, non-electric power energy sectors contribute to around half of the nationâ€™s scarce water transfer. We identify three sets of regions whose water resources are stressed by energy demand, i.e., those in northern China and urban coastal clusters in both eastern and southern China. We then evaluate the impacts of eight mitigation options, including both production- and consumption-side measures, which would shift more than one third of the high stress areas in the Hai River and Northwest Rivers watersheds to low-to-moderate (or even low) stress. We highlight the need for transboundary collaboration to sustain water-constrained energy demand and to develop targeted measures to mitigate stress on water resources within a watershed.