

The Water-Energy Nexus in Global Context

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Water and energy resources and their interlinked use are increasingly recognized as critical drivers of population growth, food security, urbanization, and climate change – the defining environmental challenges of our era. The collective ability of societies to address conjunctive water and energy dependencies by devising and applying comprehensive policy frameworks will determine how these challenges are resolved. Global energy demand trends in the context of climate change and variability are forcing a reconceptualization of water management, particularly for electrical energy generation and biofuel production, which represent the among the largest users of freshwater. Similarly, water scarcity and quality as constraints to energy development represent growing concerns for energy policy. This paper reviews country-level data on energy and water – 1980-2010 trends in electrical energy generation, 2000-201 trends in biofuel production, and 2010 estimates of renewable water resources – in order to geographically identify hotspots and understand tradeoffs and opportunities in water-energy conjunctive management. Findings include the following: a) technological obstacles are surmountable, b) resource conservation is inevitable, driven by financial limitations and efficiency gains, and c) institutional arrangements remain the most intractable constraint to the virtuous water-energy-climate cycle. The first two conditions are especially true in developing and emerging societies, i.e., here, technological transition can rapidly respond to alternatives because of low installed infrastructure capacity, and low per-capita resource consumption is already the norm. Institutional innovation, however, can be thwarted by decision-making that diminishes the role of the scientific community and civil society, which seek to better integrate water and energy planning.