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The Main Takeaway:

Water availability is expected to decline in the future due to population growth and climate change. In my research, I investigate how water use evolves in an urbanizing area in response to population growth, land-use regulations, and permanent changes in precipitation. In doing so, I explicitly recognize how human behavior, through land-use decisions, mediates the effects of external drivers on water use, which has implications for water scarcity.

Title: *How Do Population Growth, Land-use Regulations, and Precipitation Patterns Affect Water Use? A Fine-scale Empirical Analysis of Landscape Change*

Abstract:

A considerable amount of research in the earth and atmospheric sciences has been devoted to the question of how climate change, coupled with an expanding human population, will affect the availability of fresh water for human consumption. However, without accounting for intermediate changes in human behavior and institutions that influence water use, the modeling frameworks used in these analyses are limited in their ability to address the question of how population growth and climate change will affect water scarcity. In this dissertation I explore how localized population growth and changes in precipitation patterns influence water consumption by exploiting the fundamental linkage between land and water use, a relationship that is driven by landowner decision-making at spatially disaggregate scales. To generate my focal results concerning water use, I employ an empirical strategy based on a set of parcel-level econometric models and landscape simulation modeling techniques to account for the fine-scale connections between land use, water use, and broad external drivers such as population and income growth. Importantly, my modeling framework accommodates the institutional factors that govern the spatial pattern of both water endowments and new land development. Further, my approach is replicable in that it can be applied to any region in which water allocations are tied to the holding of land in a particular use. For the analysis conducted here, however, I focus on Oregon's Willamette Valley, where the major source of land-use change is urban development and agricultural producers are the largest consumers of water.

