

The Economics of Groundwater Management: Optimization Models and Policy Instruments

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This lecture introduces well-established economic frameworks to examine the extraction and depletion of groundwater over time. Participants will learn: the concepts of marginal user cost, resource rent, net present value, common property management, and optimal management; the difference between economic equilibria under common property management and optimal management of groundwater; and the details of the dynamic processes that lead to steady-state outcomes. The lecture will also survey some of the techniques—including dynamic programming—developed to solve the optimal dynamic path of groundwater extraction and price. The lecture will conclude with a discussion of command-and-control and incentive-based policies that could ensure the future sustainability of groundwater stocks.

A list of indicative readings is below:

Hardin, G. 1968. “The Tragedy of the Commons.” *Science* 162(3859): 1243–1248.

Gisser, M., and D.A. Sanchez. 1980. “Competition Versus Optimal Control in Groundwater Pumping.” *Water Resources Research* 16(4):638-642.

Koundouri, P. 2004. “Current Issues in the Economics of Groundwater Resource Management.” *Journal of Economic Surveys* 18(5): 703–740.

Nasim, S., and S. Helfand. 2016. “Optimal Groundwater Management in Pakistan’s Indus Water Basin.” IFPRI PSSP Working Paper No. 34, International Food Policy Research Institute, Washington DC.