Climate Maladaptation and the Commons: Groundwater Management in India[*]

Nikhil Basavappa   Ricardo Pommer Muñoz
Columbia University   Columbia University

September 29, 2025

Abstract

India is the world's largest groundwater user, with 90% used for agriculture. Groundwater, however, is a common pool resource, generating a tragedy of the commons that threatens agricultural sustainability. We develop a tractable model to show how a popular policy intervention — subsidizing efficient irrigation technology — can exacerbate distortions away from socially optimal groundwater extraction. To test the model's key predictions, we leverage physical variation in the extent of extraction externalities and a multi-state groundwater management scheme that subsidized irrigation efficiency upgrades. We find that the impact of the policy depends on the severity of extraction externalities: extraction falls by 9.2% in low-externality areas but rises by 11.0% in high-externality areas. Low-externality farmers maintain cropping intensity with less groundwater input, while high-externality farmers crop the same land more intensively. Finally, we find divergent effects on climate resilience: low-externality farmers, by extracting less when rainfall is normal, can extract more during droughts. High-externality farmers do the opposite, undermining climate resilience. Our findings illustrate that the same common pool conditions that justify an intervention also determine its welfare implications.