

Global Climate Stabilization: Opportunities and Conflicts for Bioenergy Carbon Capture and Storage (BECCS) within the Water-Energy-Food Nexus

Paul Stoy (PI), Selena Ahmed and other partners (NSF EPSCOR grant)

The objective of the proposed project is to advance IAM science and to inform climate policy by evaluating the impacts and potentials of the IPCC RCP 4.5 climate stabilization scenario within the WEF Nexus in the UMRB. Our overall research question is: What are the trade-offs of increasing bioenergy production in the UMRB for food and water systems and for biodiversity? Our research approach is based on a “multiple constraints” perspective, described by six scenarios that systematically evaluate and provide feedback to the RCP projections. In the UMRB, these scenarios assume that land use change is constrained by climatic conditions (mainly aridity), socio-economic decisions related to management including irrigation, increasing competition for water rights coupled with rapid energy development, and by dietary and feed demands. The UMRB also has an important role in climate stabilization scenarios because biofuel expansion and carbon capture and sequestration technologies, which lead to negative CO₂ emissions, may be realistic within the region because of its climatic suitability for producing biofuel crops. The following storylines, or narratives, will be analyzed, acting as constraints, using a variety of ecological, climate, and socio-economic metrics focusing on i) hydrologic budgets, ii) crop yields and climate change, iii) total radiative forcing from biogeophysical processes, iv) changes in gross domestic product, v) shifts in diets and dietary demands, and vi) impacts on biodiversity. The net effects of the individual drivers will be quantified as the difference between scenarios, i.e. S1 minus S6.