Hydrological Processes, Climate, and Land Cover in Mauritius

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Policy-relevant scientific evidence is minimal, yet critical for the sustainable management and use of natural resources on small islands, where the effects of natural disasters and anthropogenic pressure tend to be exacerbated due to size, limited resources, geographic dispersion and isolation from markets. Being more sensitive than mainlands, islands can also serve as early warning systems for understanding the effects of environmental changes on mainlands.

My dissertation research aims to quantify the relative effects of human activity and climate variability on freshwater recharge on the small island country of Mauritius. The first component of the project seeks to 1) characterize rainfall patterns across the island at inter annual and inter decadal time-scales over the past 80 years, 2) identify the major linkages between large-scale climate processes and rainfall variability, and 3) investigate the role of geography in modulating the response of rainfall to climate variability on the island. Characterizing long term rainfall patterns across space and time and further understanding the effect of climate on rainfall variability in Mauritius are important prerequisites for the second part of my research, in which I will explore how the mechanisms and extent of land cover and land-use have shaped surface water recharge in selected catchments. Land cover is known to alter hydrologic processes through altered vegetation retention, soil water infiltration and evapotranspiration. In watersheds where forested landscapes have been cleared and or paved with impervious material, the amount and speed of streamflow water increases, with resulting consequences on a number of processes including stream capacity to carry storm flow, flood risks and underground water recharge. Although linkages between land cover, hydrologic processes and water quality are well established in the scientific literature, the relative effects of climate and land cover on hydrologic processes are poorly understood, especially on islands, and represent an important avenue for future research.

Water managers face enormous complexity in their effort to predict changes in water resources, demand and cost. Ultimately, I hope to facilitate the decision making process by providing managers with regional scale information on changes in rainfall and streamflow over time, and their linkages to changes in climate and land cover. This study represents the foundation of a long term research project on climate, water resources, and human activity on Mauritius and surrounding small islands in the Indian Ocean.

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