



Water resources management in South Africa: Should the focus be on land use change, climate change or both?

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Through multiple forces of change human activities have extensively altered land cover and land use, and these alterations impact upon the hydrological system at both regional and basin scales. Thus, to effectively manage water resources, the interdependence between land use and the hydrological system must be recognized as “any land management decision becomes a water management decision” (Falkenmark et al., 1999, pg 58). Over and above land use, the hydrological response of a catchment is impacted by the water engineered system, viz. dams, irrigation, inter-basin transfers, off-takes and return flows. A further layer in the complexity of water resources management is introduced with climate change. Water resources worldwide, but particularly in semi-arid regions of Africa, are highly sensitive to, and strongly coupled to changes in the climate and climate variability. Changes in the climate, viz. increasing temperature, changing precipitation and enhanced carbon dioxide levels (CO₂), may alter the hydrological response of a catchment. The hydrological response to the impacts of changing land use and changing climate will be the result of complex interactions, where anthropogenic climate and/or land use change will moderate or exacerbate the effects of the other, a further difficulty in assessing these interactions will be that dominant driver may vary at different spatial and temporal scales.

This paper will present an assessment of the impacts of land use and climatic changes against a reference, both separately and jointly, on the hydrological response of three case study catchments in South Africa, viz. the Mgeni, Upper Breede and Luvuvhu catchments. The aim of the study was to determine whether land use change or climate change is more dominant in influencing the hydrological response, or whether it is a combination of both land use and climate change. Results indicate that it is a combination of land use change and climate change which is most dominant in influencing the hydrological response in the three case study catchments. However, the influence of joint land use and climate change on the hydrological response is not simply a summation of the impact of separate land use change or climate change. From the results in the three case study catchments, when land use change and climate change occur jointly the impacts on the hydrological response are amplified.