

Options for improving water use efficiency under worsening scarcity: Evidence from the Middle Olifants Sub-Basin in South Africa

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Abstract

Following the political changes in the early 1990s, the South African government introduced a comprehensive reform process for the water sector with the goal of achieving an enhanced and more equitable water management system. This paper analyses the existing water allocation situations and applies a non-linear optimisation model to investigate the optimal intra- and inter-regional allocation regimes in the Middle Olifants sub-basin of South Africa. Economic issues such as efficiency gains related to water transfers are discussed and calculated water price elasticities and estimated water demand functions provide necessary fundamentals for further modelling work. Social and environmental aspects are accounted for by including constant water demands in the model. Results show higher benefits from inter-regional water allocation. Reducing water supply levels to conform to the sustainable water supply policy, it can be shown that although water supply is reduced by approximately 50%, total benefits from water use are only reduced by 5% and 11% for inter- and intra-regional allocation regimes, respectively. These results indicate that alternative water allocation mechanisms can serve as policy instruments to offset the effects of water scarcity.

Keywords: Optimal allocation, water, IWRM, Middle Olifants, South Africa