IWRM2018-107
8th International Water Resources Management Conference of ICWRS

Development of an integrated model for the Campaspe catchment: a tool to help improve understanding of the interaction between society, policy, farming decision, ecology, hydrology and climate

Takuya Iwanaga (1), Baihua Fu (1), Jenifer Ticehurst (1), Wendy Merritt (1), Daniel Partington (2), Barry Croke (1,3), and Anthony Jakeman (1)

(1) Fenner School of Environment and Society, Australian National University, Canberra, Australia, (2) National Centre for Groundwater Research and Training, Flinders University, Adelaide, Australia, (3) Mathematical Sciences Institute, Australian National University, Canberra, Austalia

Management of water resources requires understanding of the hydrology and hydrogeology, as well as the policy and human drivers and their impacts. This understanding requires relevant inputs from a wide range of disciplines, which will vary depending on the specific case study. One approach to gain understanding of the impact of climate and society on water resources is through the use of an integrated modelling process that engages stakeholders and experts in specifics of problem framing, co-design of the underpinning conceptual model, and discussion of the ensuing results. In this study, we have developed such an integrated modelling process for the Campaspe basin in northern Victoria, Australia. The numerical model built has a number of components:

1. Node/link based surface water hydrology module based on the IHACRES rainfall-streamflow model
2. Distributed groundwater model for the lower catchment (MODFLOW)
3. Farm decision optimisation module (to determine irrigation requirements)
4. Policy module (setting conditions on availability of water based on existing rules)
5. Ecology module (determining the impacts of available streamflows on platypus, fish and river red gum trees)

The integrated model is component based and has been developed in python, with the MODFLOW and surface water hydrology model run in external programs, controlled by the master program (in python). The integrated model has been calibrated using historical data, with the intention of exploring the impact of various scenarios (future climate scenarios, different policy options, water management options) on the water resources. The scenarios were selected based on workshops with, and a social survey of, stakeholders in the basin regarding what would be socially acceptable and physically plausible options for changes in management. An example of such a change is the introduction of a managed aquifer recharge system to capture dam overflows, and store at least a portion of this in the aquifer, thereby increasing the groundwater resource as well as reducing the impact of existing pumping levels.