

Interactive comment on “Modeling for transboundary water resources planning and allocation” by D. Juárez and R. Lidén

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This is an interesting paper on a relevant topic. It compares and reviews three different water resources planning and modelling tools that are applied to one small transboundary river basin in Southern Africa, namely the Umbeluzi. The major conclusion, namely that the outcomes of the modelling exercise depend strongly on the choices made by the system modellers themselves, is supported by the data presented. The main difference between the models is the manner in which priority rules of water allocation are simulated. This point is well made in the paper, although it remains unclear how the WEAP21 model precisely implements priority rules.

One could therefore deduce that in heavily committed river systems, where making errors in planning decisions would come at great cost, it is worthwhile to conduct a

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similar exercise as reported in this paper, namely to apply different models to the same situation and critically evaluate the outputs. The involvement of key stakeholders in this evaluation process would be crucial, especially if difficult tradeoffs between different uses of water are to be made, and stakeholders really need to trust the validity of scenario outcomes. Moreover, as the situation in transboundary basins is even more delicate, here the team of experts setting up the models would ideally be multi-national, with representation of all riparian countries. In this context it would be interesting to get the views of water resources experts from Swaziland and South Africa on the argument developed in this paper.

Two additional recommendations would in my view be in order. The first is that of the three models reviewed, two are available free of charge (Waflex is open source, and WEAP21 is provided free of charge to third world experts). Hence these models may be more easily accessible to many users and thus they should get more attention in terms of academic scrutiny so that users are better aware of their strengths and limitations and the applications for which these models are best suited.

The second recommendation is specific for the basin reviewed: there is scope for developing one systems model that encompasses the Incomati, Umbeluzi and Maputo basins, given their ecological, hydraulic and socio-political interconnections. Apart from the fact that these adjacent basins all empty in Maputo Bay and are to some extent already connected hydraulically (a 40 year old interbasin transfer between the Incomati and Umbeluzi), they are also politically connected: the three basins encompass the entire territory of Swaziland, and the major decision for Maputo's next water supply (from the Incomati) resonates across all three basins. The three basins have already been modelled in Waflex and WRYM separately, so it must be possible to merge them into a comprehensive regional model that would indeed go beyond the river (Sadoff and Grey, 2002).

I need to make three remarks that are a bit more critical. First, I tend to disagree with the suggestion that the Waflex model is not complex (e.g. page 492 line 12): despite it

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being spreadsheet based, it can be made as complex as one would require.

Second, I also do not entirely agree with the statement in Table 4, namely that the use of macros in Excel limits transparency of the model. Sometimes the VB macros are more transparent than the formulae incorporated in the cells of the spreadsheet.

Third, the authors are not the first to compare Waflex with WRYM. This was done first by Nkomo and Van der Zaag (2004), although the main objective of that paper was not to conduct a comparative analysis. A reference to that paper could nevertheless be considered.

These remarks do not affect in any way the argument and conclusions of the paper. I therefore recommend that this paper be accepted for publication, that some minor editorial flaws will be corrected and that the authors are invited to consider the suggestions made in this review to enrich their conclusions.

Technical corrections

There are a few editorial weaknesses that need to be rectified (e.g. “Trough” on page 486 line 26). I also found one inaccuracy in a reference, namely to Wang and Hipel (2003) on page 481 line 22.

The title of this paper could include a reference to Southern Africa in order not to raise too wide expectations.

References

Nkomo, S. and P. van der Zaag, 2004. Equitable water allocation in a heavily committed international catchment area: the case of the Komati Catchment. *Physics and Chemistry of the Earth* 29: 1309-1317.

Sadoff, C.W., and D. Grey, 2002. Beyond the river: the benefits of cooperation on international rivers. *Water Policy* 4: 389-403.

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