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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modelling water provision as an ecosystem service in a large East African river basin" *by* B. Notter et al.

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We would like to thank the reviewers for their valuable feedback and comments. We will incorporate most of their suggestions in the final paper.

Anonymous reviewer 1: We will try to shorten the methodology part on the whole while more clearly describing the consideration of stakeholder preferences.

A. van Griensven:

1) In our opinion, economic valuation just one of many aspects of ecosystem services research, and not necessarily an integral part. Ecosystem services are defined as "the benefits people obtain from ecosystems" (Millennium Ecosystem Assessment, 2005).

In our study, we ask, "what water-related benefits are being obtained by people in the Pangani Basin?". Asking "what are those benefits worth?" is a possible next step, but first the benefits themselves need to be quantified. Economic valuation is one, but not the only way to evaluate trade-offs between ecosystem services; there are different arguments in favor or against it, but certainly there are various methodological difficulties associated with it, which to deal with would have been outside the scope of our study. Numerous publications (e.g. Carpenter et al., 2009; Daily et al., 2009; Farber et al., 2002) and discussions at conferences (e.g. the Conference on ecosystem services in Salzau in May 2008, http://www.uni-kiel.de/ecology/users/fmueller/ salzau2008/) confirm that most researchers concerned with ecosystem services regard economic valuation as just one of many aspects of ecosystem services research.

In our study, we have focused on setting up a hydrological model in such a way that we could distinguish "benefits" (i.e. resources and processes valued and accessible by stakeholders) from non-valued or non-accessible resources and processes, based on location and timing of their occurrence as well as on stakeholder preferences. The outcome may not be substantially different from a "classical" integrated river basin water assessment which has been carried out at sufficient spatio-temporal resolution to consider timing and location of resource availability in relation to stakeholder demand. However, the fact that a widely used model like SWAT first had to be adapted to make this distinction indicates that there were still methodological issues to be solved.

2) The scientific contributions of our study serve the overall purpose of using a hydrological model to quantify "benefits". This involved e.g. devising a new way of spatially subdividing a watershed in order to make stakeholder information compatible with physiographical information and at the same time reaching the required spatial resolution to assess accessibility of services; including input uncertainty in uncertainty analysis as a way to deal with uncertain observational data and increase transparency of results; or the development of indicators that can be derived from model outputs and at the same time comply closely as possible with the criteria for valuation set by

stakeholders. We will try to better highlight these contributions in the final paper.

3) We will provide the overall water balance and spatially averaged calibrated parameter values in the final paper (see also supplement).

4) The value of the RCHRG_DP parameter of 0.75 is not the calibrated value for the entire basin but just the "best" value obtained for the Kikuletwa subcatchment. On basin average, the final calibrated range of the parameter is 0.42 – 0.83. This may still seem high, but it results in just 2-6% of the incoming precipitation going to deep aquifer recharge (see also supplement). Other studies on SWAT in Africa reach similar or even higher values of RCHRG_DP (Betrie et al., 2011; Schuol et al., 2008; Ndomba et al., 2008) – the study of Ndomba et al. (2008) even in the Kikuletwa subcatchment of the Pangani Basin itself.

5) Thanks for noting the typos & co. - we will correct these!

References

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Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/8/C4849/2011/hessd-8-C4849-2011-supplement.pdf

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