

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

### **Anonymous Referee #3**

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The article discusses an interesting topic and the analysis and conclusions are generally sound and relevant. It merits publication. Still, the analysis and conclusions can be sharpened, and at times the paper is bit ambiguous. In particular, a clear view on the role of models in water planning and allocation is lacking. I recommend that the authors review their own paper critically and where necessary modify the terminology and rephrase several sentences and paragraphs, considering the following points:

A. The abstract states that international agreements are based on water system analysis models. In fact, the relation is different: (1) the development of international agreements can be supported (not: based on) models, (2) after an agreement is reached, more operational allocation models can be made that are based on the agreement (not the other way around). The authors could develop the ideas on models expressed by

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Dent (quote on p. 477), and link their analysis to these ideas.

B. The paper speaks of "system analysis models" or "tools", but in fact the three models discussed are allocation models. Implicitly, "system analysis models" suggests that allocation is a purely analytical challenge. (See for instance p. 477, line 11-13, which cannot be correct, or at least, it is not correctly phrased.)

C. The words "optimize" and "optimization" (several places) can be quite confusing. They suggest that there is one best solution, while in fact the best solution depends on the goals that one tries to achieved (expressed in different ways: priorities, penalties, objective function, ...). The authors should use optimize and optimization very carefully.

D. Page 478, lines 24-9, introduces the topic and objectives of the paper. Yet, one cannot examine the role that tools play in a process by just comparing the tools: this requires (non-technical) information on the (political) process as well. The authors give very limited information on this. What is mentioned under objective is enough to merit a publication, but then the topic of the paper needs to be rephrased. In addition, if available, some more information on the process would be welcome.

E. In the later sections, the term "model user" is used, but I think "application developer" is more appropriate. "User" suggests a passive role, while in fact many crucial decisions have to be taken in developing an application concerning for instance priorities and penalties. The real end-users are the authorities and operators of the infrastructure.

F. Finally, the abstract and the conclusion suggest that integrity of and trust in the application developers (my terminology) are a good alternative for a participatory process in which the major stakeholders agree on the allocation principles. This would mean leaving the decision on allocation principles to the application developers! First of all, on what should they base their decisions, and secondly, how to secure legitimacy if they are hired by one of the stakeholders only, e.g. one national ministry? Please review.

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In addition to these points, there are a number of less fundamental issues:

1. There are still some small language issues, e.g. p. 476, line 5 ("makes" should be "make"), line 17 ("vary" should be "varies"), p. 477, line 26 ("in" should be "on"), etc.
2. P. 477, lines 18-21: The issue of uncertainty is ignored.
3. P. 478, line 18: "allocated" should probably be "used by".
4. P. 480, lines 22-29 and Table 1 seem to mix up water use and water demand. Please check. Are there currently unmet demands in the basin?
5. P. 481, lines 7-25: Is it correct that allocation usually is a two-step process, or is this perhaps correct for Southern Africa? To my knowledge, quite often the (average/minimum) river run-off is allocated or the downstream country gets a fixed minimum. If the natural flow is calculated, how to take the effects of changed land-use into account? The process that is here described seems quite unpractical to me, given the fact that it is hard to change current water used, as discussed elsewhere in the paper.
6. Page 482, line 25: Is the term "target draft" clear to readers of HESS (not to me)?
7. P. 486-7: The authors could highlight that calibrating the WRYM-model to replicate historical allocation, even when this conflicted with national and international policy, was in itself a policy decision. Could the authors explain or discuss what the use of mimicking actual allocation in a model is? Does it merely strengthen the status quo with (intransparent) science or can it improve allocation in any way?
8. Could the authors give some details on how the levels of satisfaction were calculated?

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