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Discussions
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Interactive comment on "Sharing water and benefits in transboundary river basins" *by* D. Arjoon et al.

Anonymous Referee #1

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General Comments:

The paper considers an institutional arrangement to distribute welfare in a river basin by maximizing the economic benefits of water use and then sharing these benefits using a (game theoretic?) method developed through stakeholder involvement. The methodology was applied to the Eastern Nile River basin.

The paper makes an interesting contribution to the body of knowledge surrounding calculating the benefits of transboundary water sharing. However, there are several shortcomings that should be addressed before the paper can be published in the journal. First the Methodology section of the paper is incomplete and needs to be improved as suggested in the specific comments below, mainly tha the axiomatic process that implements the bankruptcy game should be introduced and explained in the method-

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ology section. Otherwise, the main potential contribution of the paper is without a methodological basis and is completely ad hoc depending on the site being studied. Second, the method was not actually applied using real stakeholders but it is applied to the widely studied Easter Nile Basin. The authors need to acknowledge the history of water use in this basin and how the benefits sharing indicated in the results of the paper differ from recent or projected use of water in the basin.

Specific Comments:

P.1-L.20: “There is a consensus among water professionals that the cooperative management of shared river basins should provide opportunities to increase the scope and scale of benefits” The authors have provided a single reference to justify this assertion. A broader consensus needs to be demonstrated before this statement can be accepted.

P.2-L.10: “water is allocated to maximize the net benefits from water use over the whole basin (economically efficient allocation).” Not all of these papers take the economist’s position that one can simply maximize the benefits of water use in a basin and many of them recognize the political and administrative boundaries present in their case study basins and how those boundaries affect (restrict) the allocation of water in the basins.

P.3-L.30: “pseudo-market approach, a river basin authority (RBA) plays the role of water system operator, identifying economically efficient allocation policies which are then imposed on the agents (water users). The agents are charged for water, payments are redistributed to ensure equitability among the users.” “the RBA collects information that is required to assess the demand curves, or at least the productivity of all users in the system, once at the beginning of each year.” How realistic is this? In many parts of the world, this information is considered confidential. “. . .based on the bid information, the demand curve can be inferred using the residual imputation method. . .” This seems much more realistic that requiring users to give up their business information.

P.4-L. 15: “techniques such as remote sensing can be applied to validate land classifi-

cation and cropping areas" Do the authors utilize these methods in this paper?

P.4-L.30: "allocation decisions are identified by matching demand with supply in a cost effective way, i.e. by giving priority of access to users with the highest productivity" It is not clear what the authors mean by "cost effective" way and this should be more clearly defined. Giving water to its highest valued use may be cost effective, but that depends on how you define "cost effective". Please clarify. As mentioned previously, this allocation method depends on the benevolent water manager having the authority to allocate the water is such a manner and in the real world this ignores any water rights or transboundary agreements that may exist in the basin. I think the authors should point out this limitation and discuss its implications in detail later in the paper.

P.4-L.30: "...power companies are considered non-rival water users since a unit of water released through one dam can be used downstream by another dam..." This may or may not be the case. In the case of the Syr Darya basin in Central Asia, this is certainly NOT the case since electricity production is in high demand in the winter when there is no irrigation water demand and hydropower releases in winter are lost to summer irrigation use. In the Eastern Nile, where the authors apply their model, the Grand Ethiopian Renaissance DamÂămay or may not be operated in a manner that allows the non-rival use of the water for power. The authors need to make this clear and explain the limitations of their assumptions.

P.6-L.5: "...Non-consumptive users buy inflow from the RBA, at the marginal value at the user site, and then sells the outflow downstream, back to the RBA, at the marginal value of water at the downstream site..." Why not just say that the users pay the difference between marginal value at the user site and the marginal value of water at the downstream site?

P.7-L.5: The Methodology section of the paper is incomplete since it does not indicate any method of determining the "transfer payments". The idea is stated that the "fairness" of the payments will be determined through an "axiomatic process" involving the

stakeholders, but no methodology is mentioned for how this procedure is carried out. Some description of a method should be given here, since this is the main contribution of the paper (the other components are well known and reported in the literature previously). Otherwise, the main potential contribution of the paper is without a methodological basis and is completely ad hoc depending on the site being studied. Section 3.5 presents much of the methodology (bankruptcy game theory) and should be moved back to Section 2 and the main aspects presented as general methodology.

P.13-L.5: "...for this study, the properties for this rule were not developed with stakeholder input as this was beyond the scope of this research project" So the method was not actually applied using real stakeholders. This fact needs to be pointed out in the abstract as it substantially weakens the impact of the paper. In addition, the authors do not acknowledge the history of water use in this river basin and the massive efforts that have been made to develop lasting and fair transboundary water sharing agreements in the basin. How do these historic efforts differ form the water allocation and benefits sharing indicated in the results of the authors' model? This should be explained and discussed in some detail, since this could be a major contribution of the paper to understanding water sharing in the Nile basin.

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