

Interactive comment on “Resolving conflicts over trans-boundary rivers using bankruptcy methods” by M. Zarezadeh et al.

Anonymous Referee #2

Received and published: 5 February 2014

The manuscript very nicely presents a bankruptcy approach for allocating water among stakeholders in trans-boundary basins. Water allocation schemes are a relevant topic even for developed areas with plenty of information. The paper is very well written, easy to understand and provides very clear theoretical development and numerical examples on how bankruptcy might work and traditional game theory may not. I liked very much the exercise of putting the theory in. There is some innovation in the manuscript in terms of evaluating stability of the solutions; however, the paper would benefit from some improvements including a better set of conclusions, some roadmaps and organization as well as other minor issues.

Major Issues Contribution of the paper seems more or less clear. It talks about non-cooperative and cooperative game theory and information needs for these approaches

C7770

to be useful. It argues that quantitative results are limited in these and that the paper's approach based on rules is relatively new. A better job could be done in pages 13858, 1359 and 13860 to summarize how the paper approach fits in the larger literature context. Perhaps a simple chart that maps the families of water allocation methods over two or three dimensions would be very helpful and highlight the contribution of the manuscript.

Conclusions are somehow vague. I recommend sharpening the key findings and linking them with specific results or their discussion.

Some additional subheadings would improve readability of the paper. For example over River bankruptcy problems have one referring to bankruptcy in the context of other approaches, then start in p. 13860 with a second subheading elements of bankruptcy problems, and lastly a subheading for innovations. Perhaps a better title for the third main heading could be 'Bankruptcy methods' and consider changing heading 2. Think in the paper flow and the purpose of each main section. Do something similar for the remaining headings.

The authors are knowledgeable about the subject and seem to be very productive publication-wise. Yet better recognizing previous efforts on similar approaches should be better reflected in the literature review and the discussion of their results. I encourage to compare or simply find commonalities and differences between these results and similar transboundary basin water allocation papers.

Address some issues with the mathematical formulations. For example in equations 1-11. What is the objective function about? Please elaborate. How is the program solved for all time steps in the year? Notation is very confusing. Please guide the reader better.

I liked the stability section, but how was the voting figured out for estimating plurality indexes of the allocation methods? (In table 1). The bankruptcy stability index is then one of the innovations of the paper. Please have a better explanation of equations 27

C7771

and 28. How do these work and how are they an improvement over Loehman et al. 1978. What is the term v_i ? Please clarify these equations.

Minor issues

Figures and tables need some improvements.

Table 1. Caption, put in parentheses 'acceptability' or something with a qualifier of what does the plurality index indicates. It just adds a sentence to the caption and makes the paper easier to read.

Table 2. Likewise please provide a better roadmap. Higer the value then means. . . Just add a sentence.

Figure 1, enlarge nodes and improve color scheme for black and white printing. In the caption perhaps discuss more what is going on.

Figure 2. Enlarge scale on the lower right. Perhaps overlay a schematic like the one in figure 1 indicating inflows, sinks, demand and supply. Improve color scheme for B& W printing.

Figure 3. Enlarge fonts. Perhaps eliminate smoothing in lines since this is not really a continuous but a discrete parameter.

Figure 4. Vertical axis, mention annual. Use different line types for the availability.

Figure 5. Eliminate smoothing in the monthly flows since the way the problem is solve is at a monthly time step, right? Enlarge fonts in legend. Vertical axis perhaps mention monthly (since these are flows and demands).

Figure 6. Hard to read, but is challenging to accommodate all this information. Perhaps of more value is to graph scarcity rather than allocations. That can tell better the story.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 13855, 2013.