

Title:

Socio-hydrologic Drivers of the Pendulum Swing between Agriculture Development and Environmental Health: A Case Study from Murrumbidgee River Basin, Australia.

Summary

Of all major challenges humans are facing in the modern era, resource constraints and environmental impacts are of serious concern. Urban areas, agriculture, industrial and energy development face water constraints alike. Scarcity of water for irrigation is a leading concern of farmers. Mighty rivers, are significantly depleted and highly polluted in their course over years. Environment and ecology is now seriously threatened given this situation. Inefficient irrigation practices are leading to aquifer depletions and this situation is now endemic. In this context, the current manuscript clearly describes, using a detailed case study from Murrumbidgee River Basin, the challenges and drivers. Although, the authors are driving the point that there needs to be a paradigm shift in viewing and understanding the problems from a social perspective, I see it as a changing perspective in the hydrologic community toward engineering. The issues raised here are not unique to the location and mankind is always exposed to changing conditions. How they deal with the issues entirely depends on the cultural and political situation in that region. It is a highly challenging task if not impossible to model evolving human values/behavior and a claim that social interactions based water allocation model that is dynamic is optimistic. However, the manuscript clearly points out the necessity for better management and the significance of demand fluctuations aligned to social conditions in water resource modeling. The paper has good discussion points and with minor revisions, will become a good case study presentation paper that drives the key points. It does not have any significant methodological contributions, but this manuscript should be viewed as a discussion paper that addresses or presents the current water management issues in a clear fashion.

Please see some comments on the manuscript below.

Questions

- 1) **Abstract: Paragraph line 15;** The statement is over optimistic. Modeling the evolution of human values is a challenging to impossible task. A better term may be human demands. What people value at any given time is impossible to quantify.
- 2) **Introduction: Paragraph line 5;** Contrary to the statement here, humans do behave rationally to maximize their benefits. This will lead to a collective benefit if there is a mutual benefit in all the transactions. Please also state clearly, if the water supply problems here are related purely to climate shocks or due to lack of proper storage facilities to act as buffer.
- 3) **Introduction: Paragraph line 15;** “hydrologic predictions”: have to clearly state upfront what is being predicted here.
- 4) **Page 7200 Line 20:** Can the authors clarify here on what ecological costs are, how they are being measured, and how can one come up with a tradeoff measure between ecological costs and value of water?
- 5) **Page 7200 Line 5:** Reference required for IMRW limitations. Sivapalan et al 2012 is a similar opinion paper on the need for hydrologists to looks at real demands also. However, it did not have any modeling demonstration. Can the authors clarify this?

6. **Page 7203, Line 5:** “Development of perceptual model”.. in this context the authors should at least cite some references on papers that addressed these issues before. For example please refer to [A modeling framework for sustainable water resources management](#), Authors Ximing Cai, Daene C McKinney and reference there in .
- 6) **Table 1:** Mention in the caption that the change of decline in bird population is also provided in parenthesis.
- 7) **Figure 1:** Please be more descriptive for the figure. Example: What are the dots (stations), triangles (weirs) etc... this will help readers who are not familiar with these notations.
- 8) **Figure 2:** Other important and competing water sectors can be mentioned here.
- 9) **Figure 3:** Please have actual time line here on the time axis.
- 10) **Figure 4:** Make the fonts bigger. Also, please improve the resolution of the figure.

Corrections

Principal Criteria

Good (2)

Scientific Significance:

Does the manuscript represent a substantial contribution to scientific progress within the scope of Hydrology and Earth System Sciences (substantial new concepts, ideas, methods, or data)?

The manuscript describes in detail one of the existing issues in water management with an example from Australia and points out the need to view the water and human interactions from a demand stand point also. In that way, it is trying to steer the hydrology community toward understanding water issues with an engineering perspective again. In that sense, it will be a good paper with a detailed case study and discussion. It does not have any methodological contributions per se, but

Principal Criteria

Good (2)

the paper should be referred for the discussion on these issues more than the methods.

Scientific Quality:

Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?

These are addressed appropriately.

Presentation Quality:

Are the scientific results and conclusions presented in a clear, concise, and well-structured way (number and quality of figures/tables, appropriate use of English language)?

Yes, but with a few exceptions on figures. See above for details on this.