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Hydrology and Earth System Sciences
Discussions

Interactive comment on "A century scale human-induced hydrological and ecological changes of wetlands of two large river basins in Australia (Murray) and China (Yangtze): development of an adaptive water resource management framework" *by* G. R. Kattel et al.

Anonymous Referee #1

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GENERAL COMMENTS:

This manuscript examines the impacts of anthropogenic changes in hydrological regimes on ecosystem health, and hence ecosystem services. The authors focus on three wetlands: a wetland in the Murray river basin in Australia (Kings Billabong), as an example of human-induced change resulting in a permanently inundated wetland, and two wetlands in the Yangtze river basin in China (Zhangdu and Liangzi) as examples of

dehydrated wetlands due to the construction of water storage infrastructure and land reclamation. Sediment cores were sampled in each wetland to investigate the evolution of species type and diversity over a century in response to human-induced changes. The authors find that changes in hydrological regimes directly impact ecosystem health and subsequently propose a framework for adaptive water resource management.

On the whole, I found the manuscript to be interesting as it measures the impact of human-induced hydrological regime changes on ecosystem health using sediment archives. However, I find the transition from a fairly comprehensive discussion of eco-hydrology to adaptive water resource management (effectively socio-hydrology) to be very abrupt and not well supported. The framework presented comes across as being somewhat simplistic and superficial, without sufficient grounding in the literature (given the framework components proposed have little connection to the body of the manuscript). For the last section to form a useful contribution I believe it needs to be substantially enhanced (there is much in recent socio-hydrology and adaptive management literature to augment with). Otherwise I would suggest the authors perhaps de-emphasize this section (e.g. excluding it from the title) and possibly restructure it as either 'implications of the results' or 'possible avenues for future research' rather than a framework that is capable of guiding water management.

SPECIFIC COMMENTS:

1. As the paper currently stands, I believe the title overemphasizes the development of an adaptive water management framework as a key contribution and goal of the paper (see my comments above as to why this does not seem appropriate). Perhaps the authors could focus the title more on the hydro-ecological evolution of the basins given the strengths of the paper?

2. p.8252 L4-5: compared with what previously? A before and after comparison of sediment load would strengthen this point.

3. p.8253 second paragraph: it may be worth reaffirming the socio-economic impor-

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tance of this to highlight the message of why the authors are working up to an adaptive water resource management framework.

4. Section 2.2: this is an excellent description of the site. By comparison, the description of KB (section 2.1) comes across as a little superficial and would benefit from greater context (e.g. climate) and statistics in terms of impacts.

5. Section 2.3: is there an inconsistency here? The lake area is listed as 304.3km2 and 22067ha.

6. Section 3: I am not convinced that this section adds too much relative to what has already been discussed in sections 1 and 2. As a result it becomes somewhat repetitive. Perhaps sections 2 and 3 could be merged and repetition kept to a minimum, as much of the information in section 2 is repeated without a great deal of additional context or takeaway messages.

7. p.8258 L13-15: is reservoir construction the sole reason for the two preceding trends? It is not immediately apparent why increased water consumption would result in increased dry season discharge of the Yangtze river. Could you please clarify this point?

8. Section 4.1 L18-19: is this sentence complete?

9. Section 5.1: a finding of greater diversity post interference seems counterintuitive. p.8265 L8-11 cites evidence contrary to this finding. I would suggest the authors attempt to place the present findings into context at this juncture, given their contradictory nature.

10. Section 6.2: I found much of this section to be quite repetitive. The detailed discussion of population levels and species, although well supported by literature, comes across as overly detailed. This is especially since, by this point, given the expectation created by the title of the manuscript, I was expecting the discussion to take a more high level focus (i.e. what do these changing population levels mean to higher level

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ecosystem services and to the socio-economic context). Although this is touched upon briefly in parts, the larger scale message is lost in the detail. This would provide a more intuitive link to then build an adaptive water resources management framework. As it stands, this section has a purely eco-hydrological focus, which is still compelling if a little repetitive. As I said in my earlier comments, de-emphasizing the AWRM focus upfront would most likely alleviate most of these issues.

11. Section 6.3 p.8271 L4-6: This is a sweeping opening statement that seems disconnected from the rest of the paper. I do not believe the case for this has been convincingly made to this point (i.e. no discussion of higher level impact or literature citations in this regard). The focus of the paper to this point has consistently been on the detail (i.e. shifts in population composition and diversity at the subfossil cladocedan level) rather than on a connection with socio-economic impacts and river basin management. If the authors choose to retain this section, I believe this link needs to be made much more clearly and convincingly throughout.

12. Section 6.3 p.8271 L14-19: the authors may wish to look at recent literature outlining the evolution of management focus in sub-basins of the Murray river which actually show a shift in focus from socio-economic to environmental water allocation (e.g. Kandasamy et al. (2014)).

13. Section 6.3 p.8271 L20-23: This is a very ambitious claim (i.e. "taking into account the historical environmental, technological, economic, institutional, cultural, and social values") which I do not believe the model achieves in its current simplistic state. This statement is unsubstantiated within the context of the presented framework.

14. Section 6.3 p.8271 L23-26: As with my comment above, I do not believe the authors show sufficient regard for what "integrated" means in the context of a management framework. There is significant debate in the literature discussing the pros and cons of integrated water resource management, with one of the primary issues being the challenges associated with defining an "integrated" system (e.g. Biswas (2004)).

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15. Section 6.3 p.8272 L22-24: The three restoration pillars proposed are very vague, e.g. what does "efficient water allocation" mean? How is this measured? Similarly, L25 refers to improving "livelihoods", "institutional capacities" and "the value of efficient infrastructure" - how would each of these be defined/ measured? I do not believe the authors have convincingly presented a case for this framework. A number of concepts are introduced, none of which are easily measured or translatable to reality, and thus the paper does not provide any useful guidance for practical application. If the authors choose to retain this section, I would suggest building a much stronger foundation from the literature to demonstrate a greater depth of understanding, as well as including practical/ real case examples to illustrate their propositions. Overall, I feel that s6.3 lets the paper down as it is not well supported.

16. Fig. 3: Why are all graphs identical despite KB being converted to a permanently inundated wetland vs other lakes which are dehydrated?

TECHNICAL CORRECTIONS:

As a quick note, there are a great deal of minor typos and written/ grammatical mistakes so I would urge the authors to review the paper in detail.

1. p.8251 L10: delete "the" before "two of"

2. p.8251 L22-26: the addition of a reference that reinforces the broad evolution of this river basin would be useful here.

3. p.8251 L27: insert "the" before "majority"

4. p.8252 L12: insert "the" before "Yangtze River"

5. p.8252 L25: insert "a" before "characteristic state"

6. p.8253 L12: assess should be "assessing"

7. p.8253 L26: delete "a" before "large scale"

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8. p.8254 L1: insert "an" before "adaptive"
9. p.8254 L9: delete either "to" or "until" before "1923"
10. p. 8254 L12: insert "the" prior to "natural flow"
11. p.8254 L18: delete "in 1927" (twice in same sentence)
12. p.8255 L11: insert "the" prior to "Yangtze"
13. p.8252 L25: insert "a" before "characteristic state"
14. p.8253 L12: assess should be "assessing"
15. p.8253 L26: delete "a" before "large scale"
16. p.8254 L1: insert "an" before "adaptive"
17. p.8254 L9: delete either "to" or "until" before "1923"
18. p.8254 L12: insert "the" before "natural flow"
19. p.8254 L18: delete "in 1927" (twice in same sentence)
20. p.8255 L12: insert "the" before "Yangtze"
21. p.8256 L23: delete "projects" (repeated twice)
22. p.8257 L2: do you mean "changes in ecosystem structure"?
23. p.8258 L9: insert "the" prior to "wetland"
24. s5.1: check figure numbering - I think you mean to refer to Figs 4 and 5
25. p.8262 L1: delete "until the 1980s..."
26. p.8262 L23: insert "to" before "this change"
27. p.8263 L21: insert "a" before "decrease"
28. p.8264 L13: "2000s"

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29. p.8264 L18: "within" the Murray and Yangtze?

30. p.8265 L13: delete "that" before "of natural"

31. p.8267 L4: check spelling of Liangzi

32. p.8267 L10: do you mean "decrease in water quality"?

33. p.8267 L13: "little or no impact"

34. p.8267 L17: should be "prefer"

35. p.8271 L3: I think you mean "these three wetlands suggest that water resource...."

36. p.8272 L20: should this be "changes to ecosystem functioning"?

37. Fig. 1 caption: insert "the" before "wetland"

38. Fig. 3 caption: I think you mean "Kings Billabong's conversion to..."

39. Fig. 7 caption: L4 & L5 insert "the" before "ecosystem"; L8 delete "expected"

40. Check date inconsistencies of references: Gell (2014 vs 2015); Kattel et al. (2014 vs 2015); Van den Brink (1993 vs 1994); Yang et al. (2011a vs b)

REFERENCES

Biswas, A. K.: Integrated water resources management: a reassessment, Water International, 29, 248-256, 2004

Kandasamy, J., Sounthararajah, D., Sivabalan, P., Chanan, A., Vigneswaran, S., and Sivapalan, M.: Socio-hydrologic drivers of the pendulum swing between agricultural development and environmental health: a case study from Murrumbidgee River basin, Australia, Hydrol. Earth Syst. Sci., 18, 1027–1041, doi:10.5194/hess-18-1027-2014, 2014

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