

Interactive comment on “Reviews and syntheses: Dams, water quality and tropical reservoir stratification” by R. Scott Winton et al.

Anonymous Referee #1

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In this interesting and useful work, Winton and co-authors aimed at synthesizing the impact of tropical damming on water quality with two main focuses: 1) Stratification effect on discharged water hypoxia and thermal regimes, and 2) the sediment trapping. The authors additionally reported the most recent large reservoir constructions and analyzed if stratification pattern can be predicted. The study ends with potential management and calls for further measurements and tool development specific to tropical reservoirs. This is a good review overall. All information stated by the authors seems correct to me, although I am not specifically an expert on water quality impact on freshwater ecosystems. I have a few suggestions to improve, in my opinion, the readability and the impact of the review.

General comments

C1

1) Although they all make sense, most of the examples seem rather theoretical and look like hypotheses more than facts. I feel like the presented damming impacts would benefit from adding more actual data proving that downstream rivers are impacted or could be potentially impacted. For example, could the authors add reservoir temperature profiles, or give some idea of how much colder bottom waters could be. And how hypoxic it can be by giving some example of O₂ concentration measured in rivers near a reservoir discharge. Same for P and Si concentrations. Such data should be reported in the literature. If such data are not available, it would be good to mention it.

2) It looks to me that most of the potential impacts for tropical systems are also true for temperate/boreal reservoirs. What makes tropical reservoirs/dams particular? The authors mentioned that tropical reservoir can also stratify, similar to temperate ones, and that less is known about tropical systems. Are there any other main differences? Particularities of tropical systems should be explicitly emphasized in each section.

3) Section 3 is overly long for the ultimate message that tropical reservoirs do stratify. The authors have the stratification information for more than half of the reviewed reservoirs, so I am questioning how relevant (although quite interesting itself) is this thorough analysis of tropical reservoir stratification (i.e. Figs. 3 and 4). This statement (that tropical reservoir do stratify) can be delivered more efficiently and earlier in the manuscript, e.g. implemented in section 2.1. If section 3 is reduced (or implement in section 2.1), this would leave more room of a more in-depth review of tropical damming effect on water quality, and maybe no limited by the 50 most cited papers.

4) It is not always clear if the focus of this work is on water quality of the reservoir itself or the downstream river water quality. For example, the eutrophication impact discussion is mostly on reservoir water itself, and not on the downstream river. This distinction must be clear throughout the manuscript.

Specific comments

P1 L12: This looks like 3 processes, not 2

C2

Introduction: Many small paragraphs (often 2 or 3 sentences) make the introduction seems disconnected. Joining themes to form larger paragraphs may improve readability. Also, it should be clearer why low latitude research is needed from the beginning. The authors gave an example of fish behavior but this is not the focus of the review, right?

P1 L30: remove “relationship”

Figure 1: I am not convinced by the usefulness of the construction period data. Also, I don't understand what is the “projects started (5-year running sum)” meaning. However, the map with new reservoirs and volume is more useful.

P4 L6: “important” instead of “import”?

Section 2 title: Specify water quality of what: downstream river or reservoir?

Section 2.1: Would it be possible to implement here a shortened version of the stratification analysis?

P5 L6-8: This sentence can go in its specific section. Same for sentence at lines 10-11.

P5 L8-9: Is there any information on this? What is the most common depth of water releasing? I think this is a very important feature for this review. Adding information regarding this question would greatly improve the quality of this review.

Section 2.1.1: It would be interesting to report some data about water temperature difference between epilimnion and hypolimnion.

P6, L27: How frequent is dam water intakes deeper than oxycline? This information would be useful.

P6, L28-29: Is there any reported data on O₂ concentrations of released water from reservoirs?

P7, L11-12: Is there any reported evidence of persistent hypoxia in rivers downstream

C3

of low-latitude dams?

Section 2.1.3: This section rather focuses on the water quality of the reservoir itself. Is there any studies reporting P loading to downstream ecosystems, and/or example of downstream ecosystems eutrophication due to damming as suggested by Fig. 2?

Section 2.1.4: Is there any reported data on such reduced compound concentrations in tropical reservoirs?

Section 2.2: Maybe the authors could briefly explain some mechanisms involved in sediment trapping occurs.

P8, L28: I don't understand the meaning of “hungry” water here.

P9, L6-7: I don't understand this sentence. Please re-phrase.

P9, L10-11: This sentence is not clear. Is this statement more general or specific to the last example? Also, this seems more like a hypothesis than a fact.

Section 2.2.2: This impact seems important, although very few examples are given, and they are mostly related to fisheries. Is there any more information on such impact reported?

P9, L30-31: Since the review is on tropical systems, would it be worth to develop on these examples?

Section 2.3: I wonder if this section would be better suited at the beginning of the management section.

P10, L6-8 (related to comment P7, L11-12): This is a good example of hypoxia in the downstream river of a dam and should be moved to the hypoxia impacts section.

Section 3: This section is too long for the main message that tropical reservoirs usually stratify. I suggest to first report that stratification occurs, and maybe report examples of temperature differences between epilimnion and hypolimnion. Then, maybe briefly

C4

show that for the unknown reservoirs, stratification is likely based on e.g. morphometric predictors.

Section 4.1: I don't know what eflow is and what it does. Maybe the authors could briefly describe its main principle/objectives?

P15, L17-19: Is this the only example of tropical systems reaeration strategy?

Section 4: This section could be very extensive and that probably many aspects of managing can be covered: technical challenges, financial aspects, examples of successful management exercises, etc. However, this might be not the focus of this review. Here the authors seemed to have limited the number of examples/aspects, which result in an unfocused section. Could the authors try to refocus this section on fewer aspects and be more thorough regarding the most interesting/useful ones?

Section 5. This is overall a good section and very important.

P17, L1: Is "hydro" an accepted noun to designate a hydroelectric reservoir?

P17, L30-31 and P18, L1-2: Maybe mention that these are hypotheses and it further needs to be tested in the future.

P18, L3: add "to" in "It is difficult to assess".

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