

Interactive comment on “Global scale human pressure evolution imprints on sustainability of river systems” by Serena Ceola et al.

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The authors gratefully acknowledge the Referee for his/her fully supportive review. In what follows in *italics* are the comments provided by the Referee, and in **bold** fonts the authors' response, inclusive of the indication on how the text will be modified within the next days to comply with the Referee' recommendations and comments.

This is a thoughtful and well written paper that demonstrates the effects of human activities on rivers around the world. The nightlight satellite data allow a more consistent and meaningful analysis of the changes of these effects than alternative data sources. The description is clear, the analysis complete, and the interpretation convincing.

We wish to thank the Referee for his/her important appreciation.

C1

I only have one concern with the paper. The authors introduce a “Human pressure index” based on nightlight data but are not clear what processes exactly this index is to capture and why. Is the index a surrogate of consumptive use of irrigation water? In this case, one would have to argue that irrigation differs immensely around the world for the same light intensity. Also, what is the process reasoning that consumption is proportional to the use of light? I do not disagree with the concept, but it would be good to extend the justification. In some regions the index may be a surrogate of contamination of rivers, or changes to river morphology perhaps? Again, a full discussion of the processes the index is supposed to represent would be useful. This justification would also help in the discussion section of the paper which is currently mainly focusing on the limitations of the method, while the implications for water management should be added.

Thanks for this comment, which allows us to better explain our reasoning. Our approach, although relatively simple, defines human pressure on rivers as a basin scale cumulative effect of residing population and its economic activities on the natural river discharge at the basin outlet. In other words, we focus on (1) how many people live and act on a river basin (namely, the sum of nightlights) and (2) in which way this anthropogenic effect is diluted with river discharge. Local aspects such as dams and water withdrawals for civil, industrial and irrigation purposes are not taken into account. Therefore, nightlights and river discharge are considered the sole controlling and the best representative drivers of human pressure on rivers. Our analysis allows to quickly assess human pressure on rivers, with several potentialities for the identification of hot spot areas of change in pressure. This part will be added in the revised manuscript - section “Discussion and Conclusion”.

Recommendation: I recommend publication of the paper with minor changes. I suggest the authors elaborate on the process basis of the index to further strengthen the paper.

Thank you again.

C2

