

Interactive comment on “HESS Opinions: A Planetary Boundary on Freshwater Use is Misleading” by Maik Heistermann

D. Gerten (Referee)

gerten@pik-potsdam.de

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General

This paper suggests that hydrologists should not only disapprove but actively refute the concept of a “planetary boundary” (PB) for human freshwater use. The main reasoning is that there is no proof that local/regional transgressions of tolerable water use limits would lead to a large-scale (planetary) impact; that the current status of this PB wrongly indicates that the water situation is globally fine; and that it might be dangerous if politicians, companies etc. adopted the immature if not erroneous PB concept (for e.g. falsely suggesting that excessive water use in some locations could be offset through water savings elsewhere). I acknowledge that this is an opinion paper speaking for itself, but I like to rectify some points and refer to some recent developments that

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the author should reflect (in addition to the points raised by previous commentators), as otherwise the concept of PBs and also the concept of water footprints is partly misrepresented.

Main points

It is true that the current approach to determine a PB for human freshwater use does not convey quantitative evidence that regional regime shifts in hydrological systems “could push the entire earth system away from its current state”. Rather, as the author correctly notes, such massive hydrological changes need to be seen in the context of climate and land use changes. Actually, these interactions are reflected in the PB concept which clearly states that all 9 PBs are closely coupled – they altogether constitute the earth system and no single dimension should be considered in isolation. Also, the concept acknowledges that while single regional regime shifts or other hydrological disturbances may not induce larger-scale effects, but that occurrence of such events in many places might well do so (whether and where is not (yet) known, hence the positioning of the PB at the lower end of the scientific uncertainty zone).

That said, the PB concept is an effort to describe the status of the earth system as a whole as influenced by collective human activities, along its (currently nine) dimensions – of which the freshwater cycle is one. Indeed it is arguable to use the global consumptive blue water use as a proxy (i.e. as an integral variable) to capture the very complex ways by which humans alter the global water cycle; but instead of defeating the concept it can also be argued that we need better metrics to describe the global hydrological impact of human activities, ideally capturing how these interact with anthropogenic climate and land cover change. I also agree that the current notion that the PB for water use is still in a globally “safe space” (<4000 km³/yr) might provoke misunderstandings – but that is exactly the reason why in the Steffen et al. (2015) paper sub-global boundaries were introduced: these still cover only part of the human interferences with the water cycle (based on transgression of local environmental flow requirements) – but importantly they exhibit the very spatial pattern of detrimental

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freshwater system alterations and water scarcity. Since the publications of Steffen et al. (2015) and also Gerten et al. (2013), this spatial information should no longer be separated from the global PB value, even if it is not yet satisfactorily solved how to adequately add up the regional transgressions in many places to a global value (as the author correctly notes).

In other words, the PB concept is in no way contradictory to the many studies on regional water problems – it is rather an attempt to integrate these into the larger picture of other global environmental problems, and yes, to detect whether and where there is a point beyond which the global situation may no longer be “acceptable” (certainly an ethical question too, which is why also ethicists try to develop the concept further, see Ziegler et al. 2017). The question here is: if the manifold and in many regions devastating human interferences with the water cycle are to be considered a part of the overall anthropogenic impact upon the earth system – and I am pretty sure they should, otherwise the role of water would be gravely downplayed! – how can we do that? Hence, the author might ask himself whether he would really like to give up asking this question, and why not rather invite hydrologists to provide convincing alternatives should they disagree with the current PB approach. Is it ever more maps of water scarcity, curve plots of increasing number of dams or aquatic species loss, or more detailed descriptions of local water problems (neglecting that they have more and more global drivers and impacts eventually requiring supraregional governance)? How to respond to the question whether and to what degree water problems are a global phenomenon, whether there is a “global water crisis”?

The usefulness of the PB concept lies in the fact that it puts forward the idea that the earth system is under severe pressure by humans along multiple dimensions, freshwater being one of them. I personally disagree with the author that its increasing recognition is a development of concern – because it rather increases awareness among policy-makers and business people that integrated and increasingly global perspectives on environmental issues including water issues are needed. There is no doubt

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that many of its aspects and quantitative approaches are still premature, but science goes on to improve knowledge further, ideally in a co-creative manner with stakeholders as demonstrated by the transdisciplinary conference mentioned by the author and by various papers on the topic (e.g. Cliff et al. 2017). While it can never be ruled out that some people try to abuse such concepts for their own purpose (as suggested by the discussion surrounding Fig. 2 in the opinion paper), most others (according to my experience) critically reflect the idea of a PB (for freshwater use) but at the same time think about how to develop it further qualitatively and quantitatively – in constructive ways.

The author also addresses aspects of the water footprint concept – I'm not sure what this criticism is actually about (in addition to what authors such as D. Wichelns have argued before) and what it tells us that A. Hoekstra and J. Rockström have not yet published papers together. But I would like to point to recent research that tries to unify the two concepts, also sorting out some misconceptions inherent to this opinion paper: Hoekstra & Wiedmann (2014), Fang et al. (2014), Fang et al. (2015), Hoekstra (2017). In this context I would like to highlight that the PB concept is about critical environmental limits to water use while the water footprint concept is about the actual magnitudes and locations of that use – they complement each other and should not be confused. And, if correctly understood, they both do not at all invite to “globally offset water-related environmental impacts” and they do not at all neglect the message that “the impacts of water scarcity on human welfare are already obvious”.

Technical/minor points: Abstract and Section 1 are largely redundant.

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