

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

M. Heistermann

heistern@uni-potsdam.de

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I would like to thank Dr Lorenz for his substantial comments.

He concludes that *"besides the conceptual shortcomings [...], the concept of the planetary boundary on freshwater must be questioned due to insufficient data quality and quantity."* In particular, Dr Lorenz highlights the fundamental gaps that exist in our quantitative understanding of regional and global water cycles. If I rephrase him correctly, these gaps preclude the usage of global models such as LPMml for a meaningful appraisal of freshwater resources or guidance on water management, and he presents a large body of literature (from his own research) to support these statements.

First of all, I would like to respond that I consider the concept of a planetary boundary on freshwater use as flawed - irrespective of our confidence in the underlying proce-

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ture on water balance modelling. Even if we *could* close regional and global water budgets, a global threshold would still be meaningless, as should become clear from the manuscript under discussion. This is why I did deliberately not address the issue of data and model uncertainty in the manuscript.

Having said that, I appreciate Dr Lorenz' comments very much! More generally speaking, many (not only global) assessments and modelling applications tend to tacitly condone knowledge or data gaps in order to come up with numbers. I often heard statements such as "we actually don't know, but this our best estimate". I rarely heard "we actually don't know". I suspect that admitting ignorance is rarely considered a business opportunity: there is a demand for solid numbers, and there will always be someone willing to meet that demand. In order to illustrate this, I would like to exemplarily cite some lines from the Water Footprint Assessment Manual (Hoekstra et al. 2011):

- p. 43: "In general it is always preferable to find local data pertaining to the crop field location. In many cases it is too laborious to collect location-specific data given the purpose of the assessment."
- p. 44: "When applying the 'irrigation schedule option' in the CROPWAT model, one needs soil data; if no soil data are available we advise to choose 'medium soil' as a default."
- p. 81: "When data for a specific catchment are lacking we recommend to reckon with a default value of at least 12 per cent [of land reserved for conservation]."
- p. 119: "A major challenge is therefore to develop more detailed guidelines regarding what default data can be used when accurate local estimates are not available. In this context it is relevant to develop a database with default water footprint estimates for a large variety of processes and products, differentiating between production regions (such as countries). This would be very helpful for assessing the water footprints of consumers or producers, who know what they

buy but often do not know all relevant details on the production and supply chain of the things they buy."

I am aware that these citations are not directly pertinent to the issue of the freshwater PB, and admittedly, they are presented in a poignant way. However, they should illustrate how easy it is to generate numbers from "default" assumptions. And while most practitioners and scientists (including myself) will be familiar with the issue of making "rough assumptions", our responsibility is to transparently communicate the role of these assumptions with regard to our results.

In this context, Dr Lorenz is also right with his call for a more effective communication of limitations in hydrological and hydrometeorological monitoring and modelling information at different scales and for different purposes. However, the present case and many others demonstrate how difficult it is, even if the limitations *were* clearly stated, to prevent unwarranted applications.

References:

Hoekstra, A. Y., Chapagain, A. K., Aldaya, M. M. and Mekonnen, M. M.: The Water Footprint Assessment Manual - Setting the Global Standard, Earthscan, London, Washington D.C.

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