

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

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Received and published: 14 April 2017

As a water economist with a great admiration for hydrologists and water scientists more generally, I find these discussions fascinating.

PBs for water are perhaps useful to raise awareness among unscientific readers, but, Heistermann demonstrates rather clearly, as soon as the surface is scratched, the concept produces more confusion than insights.

Water footprints are similar: Tony Allan's original construct of "virtual water" showed that, for example, more water is embodied in Egypt's food imports than flows through Aswan. Insightful and worrying! The subsequent myriad tables of numbers, arrows of global virtual water trade and other "indicators" that have been constructed by the Water Footprint network have added nothing of policy relevance, as Wichelns (2010)

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and others have argued, even if they were computed correctly Perry (2014).

As another commentator has noted, while CO₂ emissions are of global relevance - "my" coal fired boiler contributes to global CO₂ just as validly as "your" car driving. In the case of water, management is local, and impacts are local (as partially qualified below), so analysis must be local.

Professor Savenije's excellent comments point out that "local" can be quite a large area - certainly beyond the irrigated field, project, or even basin.

I pursue this idea below, and would welcome corrections:

The annual global water balance is as follows (000km³):

Precipitation over sea: 458

ET from sea: 503

(Net transfer to land): 45

Precipitation over land: 119

ET from land: 65

(Outflow to sea): 45

(<http://new.unep.org/dewa/vitalwater/jpg/0102-water-cycle-EN.jpg>)

Now if we assume that the incremental ET over irrigated land is 1m/yr (that is, incremental compared to the alternative rainfed ET), and the annual irrigated area is the annual volume of ET due to irrigation over the entire world irrigated area (300Mha) is 3,000 km³ or about 5% of ET from land.

Are we worried that marginal increases in the 5% of ET attributable to irrigation GLOBALLY is a global threat to precipitation, runoff, etc? I think not.

Are we worried that the much higher proportion of LOCAL ET attributable to LOCAL

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irrigation in SOME areas is a threat to LOCAL precipitation pattern, etc? Definitely. . .

I conclude that the impacts of withdrawals (and more importantly the impact of incremental consumption from the dominant consumer, irrigation) are not susceptible to global prescriptions. Water issues must always be analysed at the appropriate scale with appropriate local targets for sustainability, etc.

Establishing these PB global rules of thumb entirely distracts technical and political attention (and often funding) from "proper" analysis of local scenarios.

Perry, C. (2014) 'Water footprints: Path to enlightenment, or false trail?', *Agricultural Water Management*, 134, pp. 119–125.

Wichelns, D. (2010) 'Virtual Water and Water Footprints Offer Limited Insight Regarding Important Policy Questions', *International Journal of Water Resources Development*, 26(4), pp. 639–651. doi: 10.1080/07900627.2010.519494.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-112, 2017.