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Hydrology and Earth System Sciences Discussions

Interactive comment on "Water footprints of cities – indicators for sustainable consumption and production" *by* H. Hoff et al.

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GENERAL COMMENTS

The scientific contribution of this paper is significant and the topic relevant for HESS. In general the paper is well written and structured. The assessment of more regional Water Footprints (WF), in this case 3 cities, is definitely a necessity in WF analyses. The authors indicate that a "true WF", which incorporates a WF sustainability assessment, is needed. Also other indicators need to be included. This is also very true, especially to define integrated policy options, e.g. for the EU (Vanham and Bidoglio, 2013).

A major comment is that the methodology is not clearly enough described. As I un-

derstand A WF of production was calculated as well as virtual water flows based on COMTRADE trade data. What is not clear, is whether a WF of consumption was calculated? The authors indicate that based upon production and local demands within grid cells, potential export grid cells are identified. In my opinion the Section "Methodology" should be adapted in order to answer some essential questions:

* What is defined as local demand and how is it quantified? Does local demand include livestock production/consumption? A list of 19 major crops is modeled, but no animal products. If I look at final results, e.g. soy in Berlin has a WF of about 120 m3/cap/yr which equals 329 lcd. This value is about the same as wheat in Berlin. As this value is so high, it includes soy for feed. I presume then the consumption of these crops incorporates the consumption of feed for livestock products? How is this handled at grid level, e.g. in agricultural regions where livestock is produced? What is there identified as local demand?

* What are the databases used? I only see the COMTRADE database was used for trade data. Where FAOSTAT data used for production data? Which database was used for consumption data?

* Why are 2 models used - GCWM and LPJmL? Is it not possible to use only one? When not why not? Doesn't LPJmL compute all necessary data? When the 2 models need to be used, was there a comparison made of the results of the 2 models (when some components are modeled double)?

* The assumptions listed page 2606 lines 1-6 off course limit the regional assessment strongly, as acknowledged by the authors, also in the Section "conclusions" on page 2620 line 22 upto page 2621 line 5. But these assumptions are justified. Even within cities there can be differences in consumption between "richer" and "poorer" districts. Data on this are lacking. Basically in their assessment national consumption data are spatially distributed over population rasters.

* I recommend strongly to additionally present a figure with a flowchart/workflow of the

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methodology for clarity reasons.

SPECIFIC COMMENTS:

* The choice of Delhi for India (page 2604 line 24) was maybe not the best as case study for a newly industrialized country, as India is unique because it comes from a very long (religious) tradition in being primary vegetarian. In most other newly industrialized country this is not the case. However, the analysis of Delhi is interesting anyway.

* Page 2607 lines 1-11: This section is somewhat arguable, as the WF of imported coffee not always equals the WF of exported coffee. In many European countries the coffee is e.g. roasted locally, contributing to a slightly higher WF of production. The constribution will however be very small.

* Page 2067 line 24: "Of that, 40% ....". This means only a treshold value was used, and not environemntal flows. Can a reference be given for this 40%.

* Page 2608 lines 10-23: If I look at figure 1, I see strong similarities for the EU with a recently published study (Vanham, 2013a). The industrialized and densely populated belt from the UK to Northern Italy is characterized by net VW imports, whereas other agricultural regions in Europe are characterized by net VW exports. This could be shortly stated in the manuscript.

* Page 2619: The authors list a few times for Berlin "The WF of luxurious diets ...". A reference should be given why this is a luxurious diet.

* Recently work on the influence of diets on the WF of nations/regions was published, and should be referenced to in the literature overview in the introduction: e.g. Vanham (2013b) and Vanham et Al. (2013).

LITERATURE

Vanham, D. (2013a) An assessment of the virtual water balance for agricultural products in EU river basins, Water Resources and Industry, In Press,

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Vanham, D. (2013) The water footprint of Austria for different diets. Water Science and Technology, 67(4), 824-830. http://dx.doi.org/10.2166/wst.2012.623

Vanham, D., and Bidoglio, G. (2013) A review on the indicator water footprint for the EU28, Ecological Indicators, 26, 61-75. http://dx.doi.org/10.1016/j.ecolind.2012.10.021

Vanham et Al. (2013) The water footprint of the EU for different diets" Ecological Indicators, 32, 1-8. http://dx.doi.org/10.1016/j.ecolind.2013.02.020

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