

Interactive comment on “The water footprint of Indonesian provinces related to the consumption of crop products” by F. Bulsink et al.

Anonymous Referee #1

Received and published: 9 September 2009

In general the paper is well written and nicely presented. My primary concern involves the content. As written, the analysis in the paper lacks sufficient motivation and the results and implications are not particularly accurate or helpful. In addition, the authors derive implications and make policy suggestions that go beyond the scope of their analysis. For these reasons, the paper lacks the rationale, rigor, and scientific credibility we normally expect of publications in scholarly literature.

In brief, the authors calculate a large number of crop water requirements for the provinces of Indonesia, and using those calculations they describe “virtual water flows” and “water footprints.” There is nothing particularly innovative, insightful, or harmful in such calculations. Yet we should be concerned when the authors extend their dis-

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cussion beyond the realm of their calculations. This occurs when the authors speak about, and make recommendations regarding, “the role of trade in water resources management.”

The authors put forth the perspective that water footprints should matter in Indonesia, and that somehow a “large external water footprint is releasing the water scarcity” on the island of Java. The island is densely populated and many resources are scarce on a per capita basis. Yet rainfall is quite adequate. The average annual rainfall in the lowlands of Indonesia ranges from 1.7 to 3.2 meters. In the highlands, annual rainfall can exceed 6 meters. Water scarcity is a relative concept, for sure, and water supply per capita is an interesting and meaningful statistic. But the authors do not describe the water situation in Indonesia with a degree of accuracy or completeness. This oversight leaves the analysis largely unmotivated, and many readers likely will wonder why the authors are calculating water footprints and comparing them across provinces in such a humid region.

The authors attempt to motivate their analysis by calling upon a “consumer and trade perspective” with respect to water management. They cite a single article when invoking that perspective – and one of the authors of that article is an author of the current paper. The authors state further that “Quantitative information about the water footprint per province and interprovincial virtual water flows can feed a discussion on the role of trade in water resources management.” I suppose the information will feed a discussion, but this statement is not alone sufficient for motivating the analysis presented in the paper.

I have no comments regarding the calculations in the paper, as I assume the authors have calculated correctly the crop water requirements. However, I will suggest that the notion of a “gray water footprint,” and the way in which the authors calculate this component, are questionable at best. The authors focus on nitrogen fertilizer use only, they assume that fertilizer use is the same in all provinces, and they use a U.S. Environmental Protection Agency standard to determine an appropriate dilution factor. The

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pertinence of a U.S. EPA nitrate standard in Indonesia is not made clear. In addition, the dilution construct is artificial, unless farmers or someone else actually uses water to dilute nitrate concentrations. It is interesting also that the authors consider fertilizer use and food consumption to be the same in all provinces, and yet their analysis is geared toward examining differences in water footprints across provinces.

The authors' statement that "Because blue water originates from groundwater or surface water, this component has a larger effect on the environment than green water use" is not supported with any citations to existing literature or empirical evidence. It is not helpful or appropriate in scholarly literature to create such an unsupported, inaccurate narrative. Empirical evidence or citations to existing literature are needed to support the statement.

The final paragraph of the paper is particularly problematic and inappropriate. The authors have no basis for recommending that Indonesia reform its agricultural sector on the basis of "water-efficient production and wise trade" to "assure a high degree of food self-sufficiency." They have not examined or reported any evidence that might contribute to forming and supporting such a policy recommendation. Furthermore they suggest that "the overall Indonesian water footprint may be reduced by promoting wise trade between provinces." The authors do not present any empirical evidence or any citation to existing literature that suggests there is any problem with Indonesia's current water footprint. Yet they suggest it should be reduced. Here again, it is not helpful or appropriate in scholarly literature to create an unsupported, inaccurate narrative.

In summary, the manuscript lacks sufficient motivation, and the authors do not provide sufficient rationale for their analysis. In addition they extend their discussion far beyond the analysis they have conducted, and make recommendations that are not supported by their analysis or by any existing literature. For these reasons, the manuscript falls short of the quality and care generally expected of publications in scholarly literature.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 5115, 2009.

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