

## ***Interactive comment on “Analyses of impacts of China’s international trade on its water resources and uses” by Z. Y. Zhang et al.***

**Anonymous Referee #1**

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This manuscript reports on the virtual water net exports for China. This has been done before, but the novelty here is a focus on province-level assessments in addition to a national assessment. Overall I liked this paper, but I had concerns about 1) ignoring return flows, and 2) considering regional net water exports only based on international trade, but apparently not considering intra-national trade. If the issues described below are adequately addressed, I would support publication of this work.

Major comments 1. The authors have considered only so-called blue water, excluding ‘green water’ (i.e., soil water). The authors are suggested to review the work of E. Kendy, especially the 2007 paper in *Water Policy*. They argue that what is most important in a regional water balance is the actual ET, not the amount of water withdrawn

C2133

from so-called blue water. a. The current authors argue that to combine blue/green waters would be ‘misleading’. However, it is suggested that to ignore return flows, as is done here, would be even more misleading. It is strongly suggested that the present work should consider these prior findings in their justifications for their approach. b. Also, it is stated (p. 3547 lines 21-23) that soil water not used by plants evaporates. In fact, this water is mostly infiltrated to become groundwater. 2. Section 3.2 considers regional variations in virtual water trade and also considers specifically the degree of virtual water export for several Chinese provinces that are ‘arid’. However, the only statistics considered are related to inter-national trade. Apparently intra-national trade is not considered in the analysis. This needs to be considered and explained more clearly to evaluate whether apparent regional water export deficits are being compensated for (or exacerbated) by region-to-region intra-national trade between provinces within China. Note that the discussion (p. 3556, lines 20-23) link the findings to implications for water policy on a regional basis, thus it is important to be clear about the total effects of water trade (not just the international kind, but also the intra-national level trade). 3. The results and analyses presented here are entirely based on the data in Tables 1 and 2, and are thus also entirely reliant on the reliability of these data. What is the source of these data? Apparently it is the China Statistical Bureau data from 2002 and 2009. 4. When new variables are introduced, please give the dimensions (e.g., dollars per volume of water, etc). For much of Section 2.2, it was not clear to me what the dimensions were for several of the variables.

Minor comments 1. P. 3544, Line 6 – The statement about “total water resources” should be clarified as I think it is something closer to renewable water resources rather than “total”. 2. P. 3545, Line 16 – Should be “results showed” 3. P. 3545, Line 12 – Should be “Using a similar” 4. P. 3545, Lines 25-26 – This statement seems intended as a partial justification for the need for this study. That is, the premise is that there are relatively few studies of virtual water flows that focus on all economic sectors. However, this cannot be an important justification for the present study because Zhao et al. (2009) did exactly that for China (i.e., analyzed virtual water flows for all economic

C2134

sectors in China). Thus, the real justification for this study must come from differentiating the work from that of Zhao et al. (2009). 5. P. 3546, Line 17-18 – Suggest “study contribute to a better understanding. . . provide scientific bases for” 6. P. 3546, Line 23 – Cite the China Statistical Yearbook here 7. P. 3547, Lines 2-4 – It is not clear why the aggregated 20 sectors need to be classified as primary, secondary, tertiary. These classifications were not referred to again in the paper so I suggest removing them. 8. P. 3549, line 5 – Check if this should be “matrices” 9. P. 3549, line 10 – “is known as” should be followed by either “a” or “the” 10. P. 3550, line 2 – Here “freshwater” actually means just the blue water. 11. P. 3551, line 9 – Remove the repeated “table”. 12. P. 3551, line 18 – Suggest the following improved phrasing: “is the proportion of the final demand that is composed of the total. . .” 13. P. 3552, lines 8-10 – Please revise this sentence to remove the repetition. 14. P. 3552, line 19 – Should be “stage of the” 15. P. 3555, line 2 – Specify which ratio. 16. P. 3556, line 3 – The results do not “reveal” that China is a water exporter as this has been found by previous investigators. This should be reworded to something like “confirms earlier findings”. 17. P. 3556, line 11 – Is this an annual 8% export of the annual renewable water supply? If so, then 8% does not sound that high. 18. P. 3556, line 22 – I assume this should be “severe” (not ‘server’) 19. P. 3558, lines 11-14 – Are agricultural products actually used as feedstocks to the exporting industries? Or perhaps it is human labor that is nourished on agricultural outputs that is then used as the industrial input? 20. P. 3558, lines 17-19 – “Smelting” is repeated here 21. P. 3558, lines 21-23 – “In essence. . .” I like this sentence. 22. Table 1 a. Sector 5 is called “Wearing” – Please clarify what this means. b. Are all of these water uses really for export? How does the sector “restaurant and hotel” export virtual water? In Figure 4, this sector is listed as the largest contributor to Beijing’s virtual water export, so it is worth clarifying. 23. Table 2 – What is the logic for the ordering of the provinces here? Consider ranking based on one of the data sets shown. 24. Table 3 – a. Do these regions represent groups of provinces? Which ones? b. If not, then how were the regional assessments done given that data was available at the province level. c. Finally, the authors have previously published a study on the HHH

C2135

region; are these data the same as in that paper? If so, sources should be clarified in the Table caption. 25. Figure 3 is not cited (or described) in the text. 26. Figure 4 – By what criteria are these provinces determined to be water scarce? This should be justified in the text somewhere. For example on p.3557, line 4, Tianjin is said to be extremely water scarce, but perhaps some measure of water availability should be provided somewhere.

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C2136