

Response to Reviewer #1

We greatly appreciate your detailed and constructive comments. These comments will be individually addressed in the revision of the manuscript. Below we provide a point-to-point response to your comments and clarify the important points of your main concerns.

(1) Thanks for recommending the paper by E. Kendy et al (2007) (Title: Can urbanization solve inter-sector water conflicts? Insight from a case study in Hebei Province, North China Plain). We carefully read the paper and learnt some insights about the role of actual ET in agriculture in the regional water balance in Hebei. We will cite this paper in the revision of our paper in describing the data. We acknowledge the importance of actual ET in the regional water balance, but this is not the concern of this study. The objective of our study is to provide a comprehensive quantification of the blue water uses in different economic sectors and the associated virtual water trade through China's international trade of goods and services.

We agree with the reviewer that the return flow from agriculture should be considered in the calculation of water use in the sector. We will deduct the return flow in the calculation of the water use in agriculture when revising the manuscript. Based on the data in the Water Resources Bulletins of the nine major river basins in China, the return flow rate in the agricultural sector ranges between 25- 35%. Deducting the return flow will lead to a reduction of agricultural (blue) water use by the same percentage range. Consequently, the quantities of total water use and virtual water trade will be smaller than the numbers presented in the current version of the manuscript. However, the downscale of the quantities will not affect the conclusions made in the paper.

We will rewrite the sentence on soil water (p.3547, lines 21-23) for clarity in the revision of the manuscript.

(2) We fully agree with the reviewer that the intra-national trade is important in affecting regional water uses and balances. However, our paper focuses on the assessment of the impact of China's international trade on water resources and uses in different provinces (as stated in the title of the paper). The results of our study demonstrate that China's international trade has a significant impact on water resources and uses in different provinces. This, however, does not deny the importance of the intra-national trade in balancing water budget in different provinces. We can not provide an assessment of a region-to-region intra-national trade because it is beyond the scope of this study. To avoid confusions and enhance stringency, the relevant sentences in discussion (page 3556, lines 20-23) will be rewritten in the revision of the paper.

(3) The data in Table 1 and 2 are not the statistical data, but the calculation results based on the data sources described in Section 2.1. In essence, the results provided in Table 1 are the main basis of the rest of the calculation in the paper. The information about data processing is provided in Section 2.1 and the calculation procedures of the indicators in Table 1 and 2 are provided in Section 2.2. Apart from the DWUC data which were estimated based on Zhao et al. (2009), the rest of the base data used for the calculation are from various official statistics, including China

Statistical Bureau. We are aware of the possible unreliability of the official data in China. However, for a study of this scale, we have no other option but rely on the official statistics. We will note the data quality problem in Section 2.1 in the revision of the manuscript.

(4) The suggestion is taken. The dimensions of the variables are added wherever needed.

Response to the minor comments

Detailed comments	Responses
<i>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”.</i>	The suggestion is taken.
<i>2. P. 3545, Line 16 – Should be “results showed”</i>	The suggestion is taken.
<i>3. P. 3545, Line 12 –Should be “Using a similar”</i>	The suggestion is taken.
<i>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 sectors in China). Thus, the real justification for this study must come from differentiating the work from that of Zhao et al. (2009).</i>	The added value of our study is stated in the last two paragraphs of Section 1. In essence, the study of Zhao et al. (2009) is a national-level analysis while our analysis is at the sub-national level (provincial level). Besides, our assessment focuses on the impact of China’s international trade of individual economic sectors on water resources and uses across regions. It is more pertinent to regional water and trade policies. We will make these points more clearly in the revision of the manuscript.
<i>5. P. 3546, Line 17-18 – Suggest “study contribute to a better understanding: : provide scientific bases for”</i>	The suggestion is taken.
<i>6. P. 3546, Line 23– Cite the China Statistical Yearbook here</i>	The citation is added.
<i>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.</i>	The suggestion is taken. The sector classifications are removed in the revised manuscript.
<i>8.P. 3549, line 5 – Check if this should be “matrices”</i>	The error is corrected.
<i>9. P. 3549, line 10 – “is known as” should be followed by either “a” or “the”</i>	The suggestion is taken.
<i>10. P. 3550, line 2 – Here “freshwater” actually means just the blue water.</i>	The suggestion is taken. A note is added here.

11. P. 3551, line 9 – Remove the repeated “table”.	The suggestion is taken. The repeated “table” is deleted.
12. P.3551, line 18 – Suggest the following improved phrasing: “is the proportion of the final demand that is composed of the total: : :”	This part is rewritten for clarity.
13. P. 3552, lines 8-10 – Please revise this sentence to remove the repetition.	The repetition is deleted.
14. P. 3552, line 19 – Should be “stage of the”	The suggestion is taken.
15. P.3555, line 2 – Specify which ratio.	The suggestion is taken. The ratio is specified.
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”.	The sentence is rewritten to avoid confusions.
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.	8% is the ratio of the net virtual water export to the annual renewable water resources (not water supply) in the HHH region. For the water scarce HHH region, we consider that this ratio is high.
18. P. 3556, line 22 – I assume this should be “severe” (not ‘server’)	The error is corrected.
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?	Here, the downstream industries refer to those using the raw materials provided from the agricultural sector as input. The human labor nourished on agricultural outputs is not considered as downstream industry.
20. P. 3558, lines 17-19 – “Smelting” is repeated here	The error is corrected.
21. P. 3558, lines 21-23 – “In essence: : :” I like this sentence.	Thanks.
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.	a. “Wearing” is revised to “Clothing” to avoid confusion. b. The virtual water export of “restaurant and hotel” means the water used in providing catering and accommodation services for people from other countries outside China. Thus, it makes sense that Beijing, an international city visited by many foreign people every year, has “hotel and restaurant” as a large contributor to its virtual water export. The relevant explanation is added.
23. Table 2 – What is the logic for the ordering of the	The ordering of the provinces accords

<i>provinces here? Consider ranking based on one of the data sets shown.</i>	with China Statistical yearbook.
<i>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 region; are these data the same as in that paper? If so, sources should be clarified in the Table caption.</i>	The provincial names in each region are listed in Table 3. The regional NVWE (Net virtual water export) in Tables 3 is the summation of the corresponding provincial results shown in Table 2. The data of WR/cap and WR are obtained from China Statistical yearbook 2003-2009. An instruction about the table is provided in the note below the table.
<i>25. Figure 3 is not cited (or described) in the text.</i>	The citation of Figure 3 is added in the text.
<i>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.</i>	The suggestion is taken. A short description on the criteria determining water scarce regions is added in the revised manuscript.