Hydrol. Earth Syst. Sci. Discuss., 10, C8211–C8219, 2014
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Hydrology and Earth System Sciences Discussions
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Interactive comment on "Decomposition analysis of water footprint changes in a water-limited river basin: a case study of the Haihe River Basin, China" *by* Y. Zhi et al.

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Received and published: 18 March 2014

Thank you very much for your careful comments on our manuscript. We have carefully considered the comments and have modified the manuscript accordingly. The comments and detailed responses can be summarized as follows:

1 The language of this manuscript should be polished by a native expert; Response: We are aware of our limitation in English language, and the following strategy is used to improve the English expression in this manuscript: 1) We rephrase most of the sentences in our draft revision process; 2) We adjusted the language with the help

of a native speaker, Paul Hamilton, who is a scientist in Canadian Museum of Nature and has published 4 books and 82 scientific articles. His number and E-mail are: Tel.: 613-566-4228, Email: phamilton@mus-nature.ca

2 The length of background in the abstract should be shortened; Response: The length of background in the abstract was long indeed. As suggested, we have shortened the background about decomposition analysis of WF changes to make it brief. We simplified some of the background about decomposition analysis of WF changes and evaluation on it. We deleted two sentences: "However, conventional studies focus on WF from the perspective of administrative region rather than river basin. Decomposition analysis of WF changes from the perspective of the river basin is more scientific." The detailed information that these two sentences described was kept in the introduction part. We think this is suit to both professional and semi-professional readers. The expanded details please see below:

"Instead of focusing on WF from the perspective of administrative region, we built a framework in which the input-output (IO) model, the Structural Decomposition Analysis (SDA) model and the Generating Regional IO Tables (GRIT) method are combined to implement decomposition analysis for WF in a river basin."(Page 1, line 13-17) Although we shortened the background information, we still highlighted the innovative part of our work. We introduced the overview of our work and its meaning. We implemented decomposition analysis for WF in a river basin scale, and provides insights about water challenges in not only HRB but also other water-limited river basins. The expanded details please see below: "Instead of focusing on WF from the perspective of administrative region, we built a framework in which the input-output (IO) model, the Structural Decomposition Analysis (SDA) model and the Generating Regional IO Tables (GRIT) method are combined to implement decomposition analysis for WF in a river basin."(Page 1, line 13-17) "This study provides insights about water challenges in the HRB and proposes possible strategies for the future, and serves as a reference for WF management and policy making in other water-limited river basins." (Page 1, line 25-27) 3 There are too many abbreviations, which should be list in the end of the manuscript; Response: We listed all the nine abbreviations as Appendix A, which includes EWF, GRIT, HRB, IO, IWF, SDA, VW, WAD, and WF. We also explained them in the main text where they first appeared. The expanded details please see below:

Appendix A: List of abbreviations EWF: external water footprint GRIT: Generating Regional IO Tables HRB: Haihe River Basin IO: input-output IWF: internal water footprint SDA: Structural Decomposition Analysis VW: virtual water WAD: weighted average decomposition WF: water footprint (Page 19, line 9-18)

4 The title of 2.1 should be changed as Study area, and a location map should be supplemented in this part; Response: Following this comment, we have changed the title of 2.1 to “Study area” (see page 4, line 21). We have also added the location map as follows, which was adapted from website of Haihe River Water Conservancy.

5 In equation 10&11, Page14599, what are IWF, EWF, g, and h, respectively? Response: IWF means the internal WF, which is the domestic water resources used to produce goods and services consumed in the studied region. EWF means the external WF, which is the VW contained in imported goods and services. g is the vector of internal consumption volume, which is the products produced and consumed in the study area. h is the vector of import volume, which is the products produced in other regions and finally consumed in the study area. Since the readers may have the same confusion, we explained all of these symbols in the revised manuscript where they first appeared. IWF (internal WF) was in page 8, line 11; EWF (external WF) was in page 8, line 12; g (the vector of internal consumption volume)was in page 7, line 12; h (the vector of import volume) was in page 7, line 16. The expanded details please see below: “g (RMB) is the vector of internal consumption volume, which is the products produced and consumed in the HRB ($n \times 1$ dimensional vector), whose element, gi (RMB), is the internal consumption volume of sector i” (page 7, line 13-15) “h (RMB) is the vector of import volume, which is the products produced in other regions and finally consumed in the HRB ($n \times 1$ dimensional vector), whose element, hi, (RMB) is the import volume

of sector i" (page 7, line 16-19) "The total WF consists of internal and external WFs (Hoekstra and Chapagain, 2007). The internal WF (IWF) is the domestic water resources used to produce goods and services consumed in the studied region. The external WF (EWF) is the VW contained in imported goods and services." (page 8, line 11-14)

6 In line 23, Page14599, what does "the three factors" refer to? Response: "The three factors" means the three contribution factors of the WF changes: Technological effect, economic structural effect, and scale effect. In the revised paper, we explained these three factors in the first paragraph of section 2.2.3 Factor decomposition analysis for WF changes. The expanded details please see below: "The contribution factors of the WF changes in the HRB from 2002 to 2007 are resolved into technological, economic structural, and scale effects." (page 8, line 23-24)

7 In equation 12-15, the unit of each coefïňĄcient should be given; Response: We added the missed units of coefficients in equation 12-15. The units of T1, T0 (m3), E(∆t) , E(∆B), and E(∆m) are all m3. The units of m1 and m0 are RMB. The units of t1 and t0 are m3RMB-1. The expanded details please see page 9, line 16-27.

8 The author should explain why you choose year 2002 and 2007 as start period and the end period; Response: We have three main reasons to choose the period 2002-2007. Firstly, Haihe River Basin experienced rapid industrial transformation and economic growth in this period, which would affect its water use obviously, so this analysis will be representative. Moreover, the official data in this period is the latest available. The Chinese national and regional statistics bureaus make IO tables each five years, and the latest statistics was published for the year of 2007 (the table of 2012 has not been published yet). Finally, this case study is mainly conducted as a proof of the effectiveness our methodology framework, whose data could be updated in the future studies. Since the readers may have the same question, in the manuscript we added more detailed justifications for choosing 2002-2007 as our study period. During 2002 to 2007, the HRB experienced rapid industrial transformation and economic growth so

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this was an important period. For our methodology, the IO table is necessary. The IO data for Beijing, Tianjin, Hebei, and the national data come from the latest available official publishment of China. Chinese national and regional statistics bureaus make IO tables each five years, and the latest IO table was published for the year of 2007. The illustration of our methodology in 2002-2007 proved its effectiveness, and serves as a reference for WF management and policy making in other water-limited river basins. These explanations have been added into the introduction and data parts. The expanded details please see below:

“To test its effectiveness, this GRIT-IO-WAD framework is illustrated with the example of the Haihe River Basin (HRB), which is a water-limited river basin in north China. The computation is made for the period 2002 to 2007, when the HRB experienced rapid industrial transformation and economic growth and the official data in this period is the latest available. This study analyzes WF changes in the HRB, and serves as a reference for water resource management and policy-making in this and other water-limited river basins.” (page 4, line 13-19) “The IO data for Beijing, Tianjin, Hebei, and the national data, which contain the 17 main sectors (see Table 1), come from the latest available official publishment of China (Beijing Statistics Bureau, 2003, 2008; Tianjin Statistics Bureau, 2003, 2008; Hebei Statistics Bureau, 2003, 2008; National Bureau of Statistics, 2003, 2008). Chinese national and regional statistics bureaus make IO tables each five years, and the latest IO table was published for the year of 2007.” (page 10, line 15-20) “The changes in the IWF and EWF of the HRB and the decomposition of the contribution of each factor could be useful for evaluating the achievements of past management and policies and for supporting future work on solving the water problems in the HRB.” (page 15, line 24-27)

9 The name of X-axis and Y-axis in Fig.1 should be marked. Response: The names of X-axis and Y-axis in Fig.1 (Fig. 2 in the revised version) were added. X-axis meant the number of sectors, and Y-axis meant their water footprints (108 m3).

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Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C8211/2014/hessd-10-C8211-2014-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 14591, 2013.

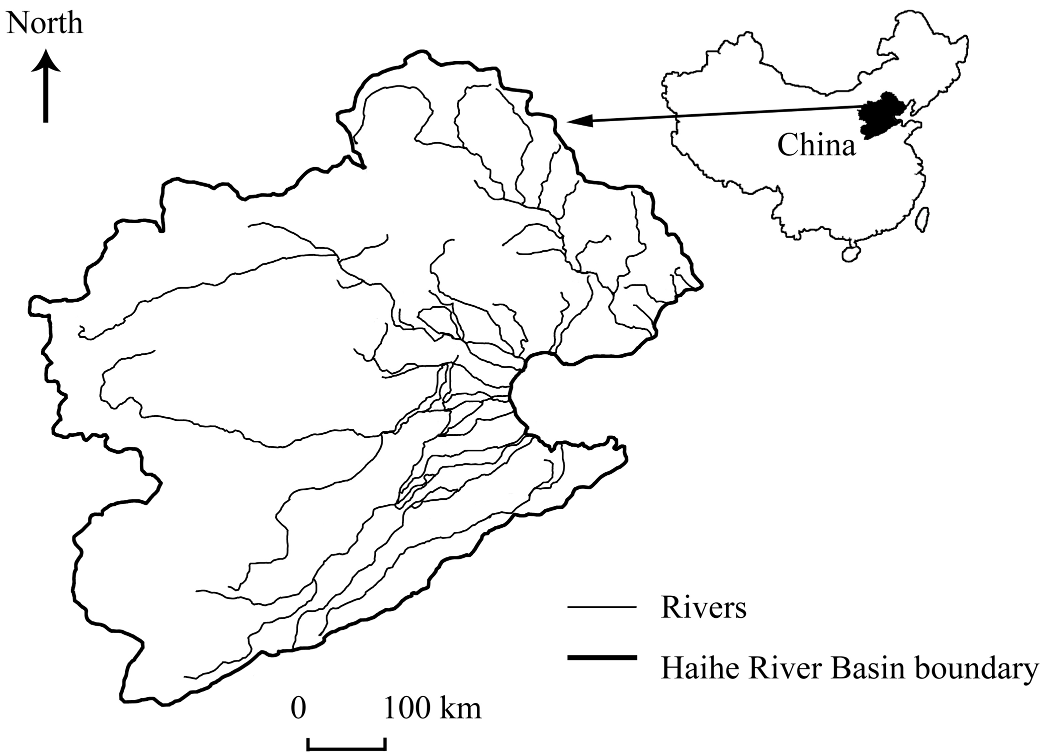

Fig. 1. Location of study area (adapted from website of Haihe River Water Conservancy Commission http://www.hwcc.gov.cn/pub/hwcc/static/szygb/gongbao2011/)

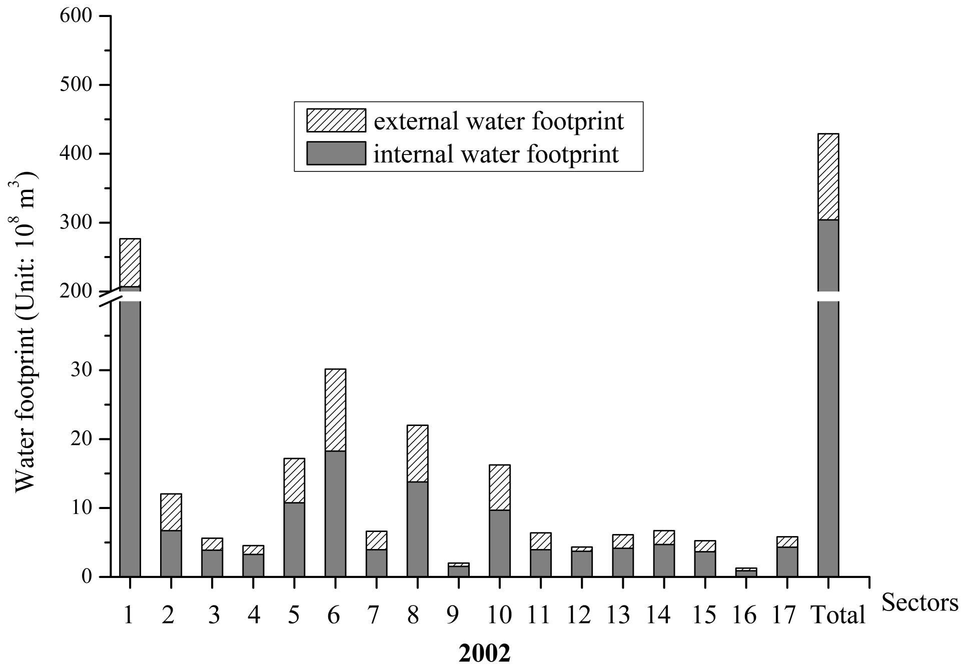

Fig. 2. WFs in the HRB in 2002

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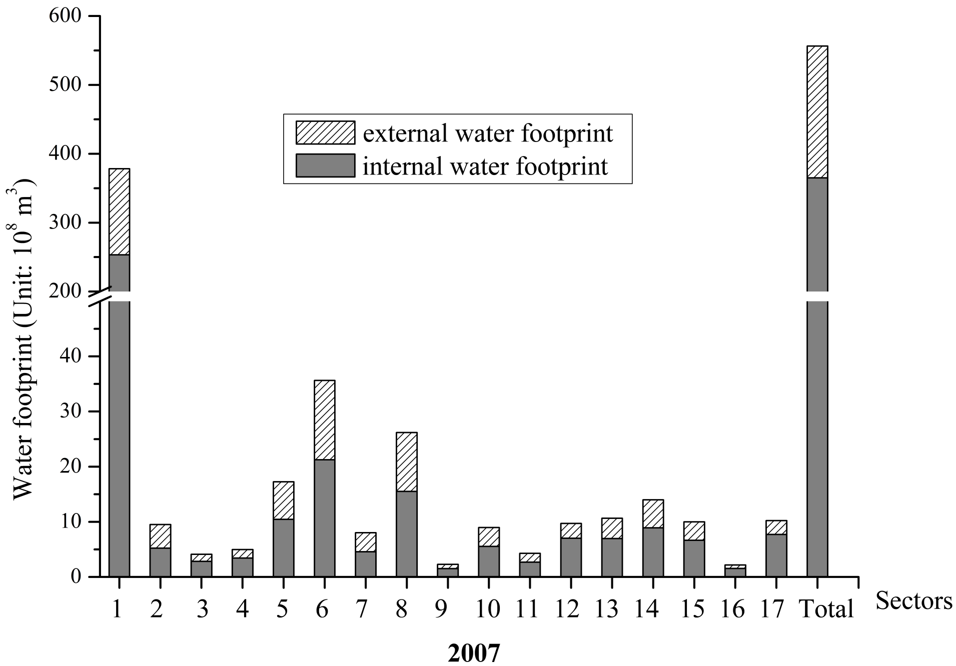

Fig. 3. WFs in the HRB in 2007

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