

Joint Global Change Research Institute (JGCRI)

Pacific Northwest National Laboratory (PNNL)

5825 University Research Ct,

College Park, MD 20740

August 18, 2022

**Response to reviewer comments for:**

“Global monthly sectoral water use for 2010-2100 at 0.5° resolution across alternative futures” (Manuscript ID: SDATA-22-00583), submitted to Nature Scientific Data

**Reviewer Comments Received: 01 August 2022**

Dear Guy Jones,

We would like to thank you and the reviewers for your invaluable feedback and comments. Please find a list of all editor and reviewers’ comments we received followed by an explanation of where and how each comment has been addressed in the revised manuscript. We think that with the suggested changes the paper has become much stronger.

Adasasdas

Sadasdq

Thank you for the guidance,

Sincerely,

Zarrar Khan

Contents

[List of All Reviewer Comments 3](#_Toc110504305)

[E1 Comment 1 6](#_Toc110504306)

[E1 Comment 2 6](#_Toc110504307)

[E1 Comment 3 6](#_Toc110504308)

[E1 Comment 4 6](#_Toc110504309)

[E1 Comment 5 7](#_Toc110504310)

[R1 Comment 1 7](#_Toc110504311)

[R1 Comment 2 7](#_Toc110504312)

[R1 Comment 3 8](#_Toc110504313)

[R2 Comment 1 8](#_Toc110504314)

[R2 Comment 2 9](#_Toc110504315)

[R2 Comment 3 9](#_Toc110504316)

[R2 Comment 4 9](#_Toc110504317)

[R2 Comment 5 9](#_Toc110504318)

[R2 Comment 6 9](#_Toc110504319)

[R2 Comment 7 10](#_Toc110504320)

[R2 Comment 8 10](#_Toc110504321)

[R2 Comment 9 10](#_Toc110504322)

[R2 Comment 10 10](#_Toc110504323)

[R2 Comment 11 10](#_Toc110504324)

[R2 Comment 12 11](#_Toc110504325)

# List of All Reviewer Comments

The following is a list of all reviewer comments received on **31 May 2022**. Each comment has been addressed in the text as described in the corresponding section. Comments are numbered by referee as R1 for Referee 1, and E1 for Editor.

E1 Comment 1: Please ensure that your references conform fully to the Nature style. See the examples at the link below: <http://www.nature.com/sdata/publish/submission-guidelines>#refs

E1 Comment 2: Note that "meta-repository" is not a widely understood term at this journal. If I understand correctly, this provides wider explanations of the methods used and external links to other deposited resources (e.g. Tethys v1.3.1 at Zenodo). Please note that:

* All experimental methods relating to this work should be available in the manuscript itself. I understand that a lot of this content may be duplicated in the paper, but if not, I would encourage you to share any additional workflow, validations, Basin examples, etc within the paper. A single supplementary document can be used if there are large amounts to add. Data visualizations are fine to share soley on this site as long as the underlying data has been been formally deposited
* All external resources should be cited in the manuscript - use the reference list for any citable objects with formal metadata (i.e. DOIs, author names, etc) and simply embed the ULRs in the text in ()s for websites without these. From quick inspection it looked like all the links were in the former category (i.e DOI'd objects that can be formally cited). Again, it looks like a number of these are already included in the paper (e.g. the Code Availability statement), but please check and confirm there is nothing exclusively shared at the met repository.

E1 Comment 3: Please change the Custom licence terms for the Dataverse dataset to a recognizable open licence (CC0 and CC-BY are usually required for this journal).

E1 Comment 4: Please add a data citation for the Dataverse dataset to the reference list using these instructions (https://www.nature.com/sdata/publish/submission-guidelines#data\_citations - note that a DOI URL should be used). Please add the reference number to wherever the dataset is mentioned in the text - the main position should be the first part of the Data Record in a sentence describing where the data has been deposited.

E1 Comment 5: Please also formally cite the items listed in the table in the Code Availability sections in the reference list. Please also note that all tables need a table label and a legend.

R1 Comment 1: Please provide a more detailed description of basin boundaries and selection principles in the manuscript.

* Discovery of the problem: Irrigation water accounts for a higher proportion of the total water consumption in the region, and the combination of region and basin can indeed be better constrained. But I am confused about the basin boundary in Figure 2 and how to select the basin for constraints. For example, the boundary of the Yangtze River Basin in Asia is not correct ([1], etc.), and the Yukon River Basin in North America [2] mentioned in the background that there is irrigation in the Basin, but is not isolated in Figure 2.
* References:

[1] Zhang Q, Xu C, Becker S, et al. Sediment and runoff changes in the Yangtze River basin during past 50 years. Journal of hydrology, 2006, 331(3-4): 511-523.

[2] Yang D, Zhao Y, Armstrong R, et al. Yukon River streamflow response to seasonal snow cover changes. Hydrological Processes: an International Journal, 2009, 23(1): 109-121.

R1 Comment 2: Please give a reasonable explanation for the degree to which the historical data results deviate from the 45° curve, and add the verification of the historical water data in time and space.

* Discovery of the problem: The dataset is to serve users, and the first consideration of users should be more about the quality of the dataset. When verifying the reliability of downscaling, the downscaled data must be compared to the original input data. However, the quality of the dataset also includes the accuracy of the water withdrawal/consumption data in time and space, this needs to be verified and should be reflected in the manuscript [3]. (1) Since neither the manuscript nor the meta-repository has found the result data used for the verification of this paper, the data verification has not been carried out. It is recommended to add the result data of the historical period of this article in the data set to facilitate the verification of the historical period for users and reviewers. (2) Through the comparison of two similar datasets in the meta-repository (Huang et al. 2018, Mekonnen, M.M and Hoekstra, A.Y. 2011), the discrete differences between regions can be explained,but the degree of deviation from the 45° curve doesn't seem to be well answered. (3) Therefore, it is further suggested to supplement the manuscript validation section with the available tabular data or integration results of government departments (such as USGS water withdrawal, water resource bulletins in China, etc.) or international organizations (FAO-AQUASTAT data). Comparison with the regional statistical results in this manuscript [4].
* References:

[3] Chiarelli D D, Passera C, Rosa L, et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Scientific data, 2020, 7(1): 1-9.

[4] Zhang, K., Li, X., Zheng, D., Zhang, L., Zhu, G. (2021). Satellite-based Global Irrigation Water Use data set (2011-2018). National Tibetan Plateau Data Center, DOI: 10.11888/Hydro.tpdc.271220. CSTR: 18406.11.Hydro.tpdc.271220.

R1 Comment 3: Please add the verification of future forecast data in the manuscript.

* Discovery of the problem: There may not be a similar combination method and cannot be accurately compared for the future sector's forecast data. But the similarities, differences ,trends or ranges of its predictions can still be compared in some aspects [5-6]. Future forecast data is another key content in the manuscript, and the availability needs to be further analyzed.
* References:

[5] Wada Y, Bierkens M F P. Sustainability of global water use: past reconstruction and future projections[J]. Environmental Research Letters, 2014, 9(10): 104003.

[6] Fujimori S, Hanasaki N, Masui T. Projections of industrial water withdrawal under shared socioeconomic pathways and climate mitigation scenarios. Sustainability Science, 2017, 12(2): 275-292.

R2 Comment 1: First, the methods of temporal downscaling are similar to Huang et al., 2018. The authors were required to demonstrate the manuscript's novelty.

R2 Comment 2: Second, there are no detailed description that can be applied to future water withdrawals and consumption in the Methods chapter.

R2 Comment 3: Third, the authors do not provide rigorous verification. The content of the technical validation section does not guarantee the accuracy and availability of this dataset.

R2 Comment 4: The manuscript describes the importance of water withdrawals and consumption, but the research progress on spatial and temporal downscaling methods is insufficiently described. Authors should explain the limitations of existing spatial and temporal downscaling methods and clearly explain how they have addressed them in this manuscript.

R2 Comment 5: L30-63 This paragraph is about the models and datasets used in this manuscript, which is more like what is in the Methods chapter. The authors should have organized the logical structure of the Background & Summary chapter.

R2 Comment 6: The Region/Basin Scale (Electricity and Irrigation) in figure 3 shows a very large differences in water withdrawals between adjacent regions, so how did authors deal with making the spatial distribution smooth in the Gridded Scale in Figure 3, because there are some regions with clear boundary in the northern Africa and in the northern North America. Meanwhile, many methods of spatial downscaling are average methods, how did authors ensure the accuracy of results between adjacent regions. In addition, how did authors eliminate the impact of some cross-regional water transfer projects and water facilities on the spatial downscaling of water withdrawals and consumption.

R2 Comment 7: L361-370 Authors did not validate the accuracy of the water withdrawals and consumption. Although the spatial and temporal downscaling methods were validated, the results of this validation verification are obvious according to the methods presented earlier by authors. It is recommended that authors increase the comparison results with statistics published by government agencies to prove the accuracy of the historical part of this dataset.

R2 Comment 8: L375-402 Authors explains some differences between this dataset and the other two datasets, but do not explain in detail whether these differences will affect the accuracy of the results. Furthermore, although the authors list the scatterplots of the validation with other datasets on a meta-repository, they do not give detailed explanations. The correctness of the validation results is not known only from Figure 5 and 6. Using the data of only one year (2010) is not very convincing. It is recommended that the author extend the period (e.g., 2005-2010) of validation results of this dataset and other datasets in detail to prove the stability of the prediction data.

R2 Comment 9: There are some regions with clear boundary in the Gridded Scale of Figure 3, such as in Sahara in Africa and in northern North America. What is the reason for this situation?

R2 Comment 10: In the formula 15 and 16, two identical “tempmax” appear in the denominator.

R2 Comment 11: There is no label in the first figure of “Temporal” of Figure 4b.

R2 Comment 12: L238 What is the meaning of “pρ values”?

# E1 Comment 1

**E1 Comment 1: Please ensure that your references conform fully to the Nature style. See the examples at the link below:** [**http://www.nature.com/sdata/publish/submission-guidelines**](http://www.nature.com/sdata/publish/submission-guidelines)**#refs**

**Response:**

**Edits Made:**

# E1 Comment 2

**E1 Comment 2: Note that "meta-repository" is not a widely understood term at this journal. If I understand correctly, this provides wider explanations of the methods used and external links to other deposited resources (e.g. Tethys v1.3.1 at Zenodo). Please note that:**

* **All experimental methods relating to this work should be available in the manuscript itself. I understand that a lot of this content may be duplicated in the paper, but if not, I would encourage you to share any additional workflow, validations, Basin examples, etc within the paper. A single supplementary document can be used if there are large amounts to add. Data visualizations are fine to share soley on this site as long as the underlying data has been been formally deposited**
* **All external resources should be cited in the manuscript - use the reference list for any citable objects with formal metadata (i.e. DOIs, author names, etc) and simply embed the ULRs in the text in ()s for websites without these. From quick inspection it looked like all the links were in the former category (i.e DOI'd objects that can be formally cited). Again, it looks like a number of these are already included in the paper (e.g. the Code Availability statement), but please check and confirm there is nothing exclusively shared at the met repository.**

**Response:**

**Edits Made:**

# E1 Comment 3

**E1 Comment 3: Please change the Custom licence terms for the Dataverse dataset to a recognizable open licence (CC0 and CC-BY are usually required for this journal).**

**Response:**

**Edits Made:**

# E1 Comment 4

**E1 Comment 4: Please add a data citation for the Dataverse dataset to the reference list using these instructions (https://www.nature.com/sdata/publish/submission-guidelines#data\_citations - note that a DOI URL should be used). Please add the reference number to wherever the dataset is mentioned in the text - the main position should be the first part of the Data Record in a sentence describing where the data has been deposited.**

**Response:**

**Edits Made:**

# E1 Comment 5

**E1 Comment 5: Please also formally cite the items listed in the table in the Code Availability sections in the reference list. Please also note that all tables need a table label and a legend.**

**Response:**

**Edits Made:**

# R1 Comment 1

**R1 Comment 1: Please provide a more detailed description of basin boundaries and selection principles in the manuscript.**

* **Discovery of the problem: Irrigation water accounts for a higher proportion of the total water consumption in the region, and the combination of region and basin can indeed be better constrained. But I am confused about the basin boundary in Figure 2 and how to select the basin for constraints. For example, the boundary of the Yangtze River Basin in Asia is not correct ([1], etc.), and the Yukon River Basin in North America [2] mentioned in the background that there is irrigation in the Basin, but is not isolated in Figure 2.**
* **References:**

**[1] Zhang Q, Xu C, Becker S, et al. Sediment and runoff changes in the Yangtze River basin during past 50 years. Journal of hydrology, 2006, 331(3-4): 511-523.**

**[2] Yang D, Zhao Y, Armstrong R, et al. Yukon River streamflow response to seasonal snow cover changes. Hydrological Processes: an International Journal, 2009, 23(1): 109-121.**

**Response:**

**Edits Made:**

# R1 Comment 2

**R1 Comment 2: Please give a reasonable explanation for the degree to which the historical data results deviate from the 45° curve, and add the verification of the historical water data in time and space.**

* **Discovery of the problem: The dataset is to serve users, and the first consideration of users should be more about the quality of the dataset. When verifying the reliability of downscaling, the downscaled data must be compared to the original input data. However, the quality of the dataset also includes the accuracy of the water withdrawal/consumption data in time and space, this needs to be verified and should be reflected in the manuscript [3]. (1) Since neither the manuscript nor the meta-repository has found the result data used for the verification of this paper, the data verification has not been carried out. It is recommended to add the result data of the historical period of this article in the data set to facilitate the verification of the historical period for users and reviewers. (2) Through the comparison of two similar datasets in the meta-repository (Huang et al. 2018, Mekonnen, M.M and Hoekstra, A.Y. 2011), the discrete differences between regions can be explained,but the degree of deviation from the 45° curve doesn't seem to be well answered. (3) Therefore, it is further suggested to supplement the manuscript validation section with the available tabular data or integration results of government departments (such as USGS water withdrawal, water resource bulletins in China, etc.) or international organizations (FAO-AQUASTAT data). Comparison with the regional statistical results in this manuscript [4].**
* **References:**

**[3] Chiarelli D D, Passera C, Rosa L, et al. The green and blue crop water requirement WATNEEDS model and its global gridded outputs. Scientific data, 2020, 7(1): 1-9.**

**[4] Zhang, K., Li, X., Zheng, D., Zhang, L., Zhu, G. (2021). Satellite-based Global Irrigation Water Use data set (2011-2018). National Tibetan Plateau Data Center, DOI: 10.11888/Hydro.tpdc.271220. CSTR: 18406.11.Hydro.tpdc.271220.**

**Response:**

**Edits Made:**

# R1 Comment 3

**R1 Comment 3: Please add the verification of future forecast data in the manuscript.**

* **Discovery of the problem: There may not be a similar combination method and cannot be accurately compared for the future sector's forecast data. But the similarities, differences ,trends or ranges of its predictions can still be compared in some aspects [5-6]. Future forecast data is another key content in the manuscript, and the availability needs to be further analyzed.**
* **References:**

**[5] Wada Y, Bierkens M F P. Sustainability of global water use: past reconstruction and future projections[J]. Environmental Research Letters, 2014, 9(10): 104003.**

**[6] Fujimori S, Hanasaki N, Masui T. Projections of industrial water withdrawal under shared socioeconomic pathways and climate mitigation scenarios. Sustainability Science, 2017, 12(2): 275-292.**

**Response:**

**Edits Made:**

# R2 Comment 1

**R2 Comment 1: First, the methods of temporal downscaling are similar to Huang et al., 2018. The authors were required to demonstrate the manuscript's novelty.**

**Response:**

**Edits Made:**

# R2 Comment 2

**R2 Comment 2: Second, there are no detailed description that can be applied to future water withdrawals and consumption in the Methods chapter.**

**Response:**

**Edits Made:**

# R2 Comment 3

**R2 Comment 3: Third, the authors do not provide rigorous verification. The content of the technical validation section does not guarantee the accuracy and availability of this dataset.**

**Response:**

**Edits Made:**

# R2 Comment 4

**R2 Comment 4: The manuscript describes the importance of water withdrawals and consumption, but the research progress on spatial and temporal downscaling methods is insufficiently described. Authors should explain the limitations of existing spatial and temporal downscaling methods and clearly explain how they have addressed them in this manuscript.**

**Response:**

**Edits Made:**

# R2 Comment 5

**R2 Comment 5: L30-63 This paragraph is about the models and datasets used in this manuscript, which is more like what is in the Methods chapter. The authors should have organized the logical structure of the Background & Summary chapter.**

**Response:**

**Edits Made:**

# R2 Comment 6

**R2 Comment 6: The Region/Basin Scale (Electricity and Irrigation) in figure 3 shows a very large differences in water withdrawals between adjacent regions, so how did authors deal with making the spatial distribution smooth in the Gridded Scale in Figure 3, because there are some regions with clear boundary in the northern Africa and in the northern North America. Meanwhile, many methods of spatial downscaling are average methods, how did authors ensure the accuracy of results between adjacent regions. In addition, how did authors eliminate the impact of some cross-regional water transfer projects and water facilities on the spatial downscaling of water withdrawals and consumption.**

**Response:**

**Edits Made:**

# R2 Comment 7

**R2 Comment 7: L361-370 Authors did not validate the accuracy of the water withdrawals and consumption. Although the spatial and temporal downscaling methods were validated, the results of this validation verification are obvious according to the methods presented earlier by authors. It is recommended that authors increase the comparison results with statistics published by government agencies to prove the accuracy of the historical part of this dataset.**

**Response:**

**Edits Made:**

# R2 Comment 8

**R2 Comment 8: L375-402 Authors explains some differences between this dataset and the other two datasets, but do not explain in detail whether these differences will affect the accuracy of the results. Furthermore, although the authors list the scatterplots of the validation with other datasets on a meta-repository, they do not give detailed explanations. The correctness of the validation results is not known only from Figure 5 and 6. Using the data of only one year (2010) is not very convincing. It is recommended that the author extend the period (e.g., 2005-2010) of validation results of this dataset and other datasets in detail to prove the stability of the prediction data.**

**Response:**

**Edits Made:**

# R2 Comment 9

**R2 Comment 9: There are some regions with clear boundary in the Gridded Scale of Figure 3, such as in Sahara in Africa and in northern North America. What is the reason for this situation?**

**Response:**

**Edits Made:**

# R2 Comment 10

**R2 Comment 10: In the formula 15 and 16, two identical “tempmax” appear in the denominator.**

**Response:**

**Edits Made:**

# R2 Comment 11

**R2 Comment 11: There is no label in the first figure of “Temporal” of Figure 4b.**

**Response:**

**Edits Made:**

# R2 Comment 12

**R2 Comment 12: L238 What is the meaning of “pρ values”?**

**Response:**

**Edits Made:**