

Reply to RC1 (Wouter Knoben)

Dear authors,

I finished my review of your revised paper and am happy to say that I believe my comments are all thoroughly addressed. I appreciate the change to the "ISIMIP2b-complete" phrase, and the addition of the process description. I understand that it is difficult to go much beyond what you have already done given the scale and organization of the process. The addition of the progress in diagrams in the SI is a nice touch.

Below are a handful of minor suggestions, but I see nothing that would stand in the way of publication.

Kind regards,
Wouter Knoben

Answer: Thank you for your general positive statement and the time to re-review the manuscript and for providing your comments and suggestions. We will reply to the referee comment, indicated by **R1** (in black), by our answer indicated by **Answer** (in green), and corresponding actions, indicated by **Action** (in blue) and textual changes in *italic font*.

R1: Section 4.4 Recommendations for similar exercises: one key component that appears in the added text about the process is the differences in perspectives between the modellers and the various stakeholders. Having a (number of) recommendation(s) on navigating this aspect of the process might be very helpful.

Answer: Thank you for raising this important point. Indeed, the perspective differs between stakeholders and modellers. We have added two recommendations in that manner.

Action: We have added as last two items of the recommendations:

- *summarize the outcome and ideas of such discussions and sketch the consequences of the recommendations (pros and cons) for the diagram itself but also for the scope of the exercise to have a basis for discussing the next steps for diagram design*
- *discuss this outcome openly with the participants of the exercise and decide as a team the way forward*

R1: Section 4.4 Recommendations for similar exercises: it might be worthwhile to expand some of the bullet points slightly to emphasize why they are important. E.g.: "Formally document each stage and discussion, to [avoid later confusion? prevent arguments]?"

Answer: Thanks, this is also very helpful. We identified two bullet points that might require expanding.

Action: We have extended two bullet points:

- formally document each stage and discussion *so that there is a record of (and reasons for) decisions, which will help when new people join the collaboration and also for clarity in later stages (which may be many years later)*
- consider sustainability from the beginning (e.g. by designing a tool for automatic diagram generation) *to focus using funding for the design of the prototype rather than for the individual diagrams*

R1: Section 4.4 Recommendations for similar exercises: some of these recommendations seem a little specific to me. For example, "Obtain funding (at least for 3 years) for a group of staff to coordinate the effort" sounds more like something that in hindsight would have been good for this particular project, than something that necessarily generalizes to other initiatives. Perhaps consider merging it with the next bullet point into something more generally applicable such as: "It is difficult to organize projects such as this as unfunded 'side-of-desk' activities. We recommend securing funding to support a (group of) dedicated staff member(s) for the project, and to pay the main contributors (modeling groups in our case) for the time needed to commit to the project."

Answer: Thank you, you really pointed out what we wanted to recommend with the two bullet points – to be able to commit time to such a project.

Action: We have followed your suggestion and have combined the two bullet points and write instead

- *unfunded 'side-of-desk' activities such as this can be challenging to manage and complete, so we recommend securing funding to support a (group of) dedicated staff member(s) for the project, and to pay the main contributors (modeling groups in our case) for the time needed to commit to the project, if possible.*

R1: The Supporting info could be a little cleaner if the data formatting in the different tables were standardized.

Answer: Thanks.

Action: We have modified the tables accordingly and consistently write in the first column Month and Year.

R1: Two full stops are missing at the end of the "Data availability" and "Competing interest" sentences.

Answer: Thanks.

Action: We added full stops accordingly.

Reply to RC2

The authors have improved the manuscript following the reviewer's comments. The methodology section has improved, although the lack of structure in the process makes using it as a reference challenging. However, it shows the complexity that lies behind a process like the one described, so it may be useful to people willing to replicate the process in a different field.

Answer: Thank you for your general positive statement and the time to re-review the manuscript and for providing your comments and suggestions. We will reply to the referee comment, indicated by **RC2** (in black), by our answer indicated by **Answer** (in green), and corresponding actions, indicated by **Action** (in blue) and textual changes in *italic font*.

RC2: I would say that Figure 1 should be streamlined. There is a lot of text -not specially big- and a lot of information that may not be so illuminating. The personal references may be removed, since knowing who was doing what, or what leading role changes took place is not important. I would suggest the authors to focus the information on the Figure around the state of the diagrammatic description itself. Knowing when the idea was born, how many meetings and discussion phases took place, when the diagram moved from a pen scribble to a more developed phase, etc. is the important information here. Also, if the information was gathered from a similar group size always, or if more people were involved as the process developed could also be useful information. If the information is going to be presented textually and linearly, I would suggest to transform the figure into text, since it would help to assimilate the content better.

Answer: Thank you for this recommendation. The idea of the figure is to summarize the milestones and major activities that led to the final generation of the diagrams, i.e. to highlight the process itself. From the view of the particular process, in particular to get to the diagrams as we show them, we feel it is important to add also some background information. We do acknowledge that some information may not have been necessary, so we have streamlined it more towards a focus on diagram generation and reduced the content. Also we acknowledge the small font size and have increased it. Indeed, the number of people and modelling groups increased over time and it would be wonderful to be able to indicate exactly how many people/groups have been involved over time but we have no particular records of the numbers over time, so we cannot insert such a quantitative number (please see also our response to the editors of the previous revision). With regards to the linearity and text-rich features of the diagram, we believe that by streamlining it (as suggested) the figure is more effective – we still consider a figure to be preferable over main text for summarising the process; the full information is presented in Supplementary Material.

Action: We have streamlined the figure and removed some aspects (including personal information) and increased font size.

Year	Milestone/Activity	Meetings
2016	<ul style="list-style-type: none"> Submission of ISlpedia proposal with HMS as Co-PI 	
2017	<ul style="list-style-type: none"> ISlpedia was funded (and a 0.5 FTE position to work with HMS) by German Federal Ministry of Education and Research (grant no. 01LS1711F) At EGU2017, Ted Veldkamp presented a collection of model schemes from different models and all agreed it is hard to relate differences of model output to the model schemes when they differ so much. This could be seen as seed for this activity. Discussion within ISIMIP modelling teams and agreement to start the activity. 	<ul style="list-style-type: none"> ISIMIP/ISlpedia Workshop Potsdam
2018	<ul style="list-style-type: none"> SNG, HMS and CET submitted a proposal to ISIMIP to host a paper writing workshop Presentation of the overall idea in a working group and 1) collect all components of the hydrological cycle that are important for the models, 2) find a symbol, 3) form a diagram as a “puzzle” and 4) to draw a diagram of the water cycle on a paper Information to modelling teams with outline of the idea and the invite to collaborate In-depth discussion about the activity at the paper writing workshop, Frankfurt Presentation of workshop results to the ISIMIP audience and discussion Discussion about diagram styles, abstraction level and presentation to stakeholders Call for information from modelling teams to fill out information for each model in tables 	<ul style="list-style-type: none"> ISIMIP paper writing workshop Frankfurt ISIMIP strategy group meeting ISlpedia stakeholder workshop Krakow
2019	<ul style="list-style-type: none"> Presentation and discussion with broad scientific audience at EGU2019 and AGU2019 Decision to split the activity into two contributions: the model review and the generation of diagrams and as the whole effort became much larger than anticipated Developing a common mathematical notation and a definition and collecting from all modelling teams the equations for the fluxes and storages 	<ul style="list-style-type: none"> EGU, AGU ISIMIP workshop Paris ISlpedia stakeholder workshop Burkina Faso
2020	<ul style="list-style-type: none"> Submission of the review paper to the journal Geoscientific Model Development 	<ul style="list-style-type: none"> EGU, JpGU-AGU ISIMIP workshop online
2021	<ul style="list-style-type: none"> Model review paper published: 10.5194/gmd-14-3843-2021 Arrangement with the graphics designer to support the activity Evolving from pen and paper to first professional drawn version of the diagram Continued discussion of diagrams with modelling teams via E-Mail and virtual meetings, feedback loops to graphics designer and modelling teams 	
2022	<ul style="list-style-type: none"> Next version of the diagrams, and WaterGAP model as example with greyed out components that represent missing parts of a “ISIMIP2b-complete” model as example for discussion Drafts of individual model diagrams with marks what to grey out for each model Several interactions with co-authors to provide information what to grey out Discussion of the diagrams and the manuscript at a paper writing workshop 	<ul style="list-style-type: none"> ISIMIP paper writing workshop Frankfurt
2023	<ul style="list-style-type: none"> E-Mail interactions to reach consensus about the ISIMIP2b-complete diagram Developing the idea of a script-based generation of the individual model diagrams First draft circulated in the core writing team (HMS, SGN, LM) 	
2024	<ul style="list-style-type: none"> Circulation of the manuscript draft to all co-authors and subsequent improvements Script-based generation of the individual model diagrams used as basis for diagram creation 	<ul style="list-style-type: none"> ISIMIP paper writing workshop Mainz EGU ISIMIP workshop Potsdam

RC2: After reading the answers of the authors, I would also suggest them to modify the title of the paper. From the title alone, originally I understood that the paper was more general than it really is. I thought that any model could be represented with this scheme, what would have been almost revolutionary. It is not the case, however, so I would say that including in the title ISIMIP2b somehow would be more honest and a better reflection of the contents. "Graphical representation of ISIMIP2b global water models" would make more justice to the contents of the article.

Answer: We agree that a diagram that could be used to represent *any* global water model would be revolutionary, but this is likely to be unachievable given the heterogeneity that exists in process representations and model structures (e.g. empirical, conceptual, physics-based) between *all* extant models. We also understand your argument for changing the title to include “ISIMIP2b”. After careful consideration of your comment, we have decided to keep the title as it is, however. We are open to further discussion on this, and our reasoning is as follows.

Firstly, while all the models in our exercise are ISIMIP2b models, they are not models that only participate in ISIMIP2b exclusively. We think it would be misplaced to label all these models as “ISIMIP2b models” since they are in fact independent of the project – ISIMIP is just one of many activities that these models are participating in.

Secondly, the focus of the paper is specifically on the graphical representation of global water models, which is what the original title states. We are careful to not overstate our achievements, such as, for example, having a title along the lines of “Graphical representation of *any* global water model”. Rather, the title is clear that this is a paper about how global water models can be represented graphically. This is done with respect to models participating in the ISIMIP2b project.

Thirdly, many of the issues that we discuss in the paper, regarding the development of a model diagram, are applicable to models both participating and not participating in ISIMIP2b. A concern with titling the paper “ISIMIP2b models” is that modelling teams interested in developing a model diagram, but who are not engaged with ISIMIP, will ignore our paper as they will see it as ISIMIP-centric. Issues with ‘side of desk’ activities, project management, and engaging designers, which we were helpfully encouraged to discuss during the review process, are issues that are likely to occur in any approach with developing a model diagram, and so the more general title is appropriate.

Finally, related slightly to the point above, experience shows us that reviewers and readers of ISIMIP-generated papers sometimes have a perception that such papers are only seeing things from the ISIMIP viewpoint. We have deliberately attempted to avoid this, by considering the issues that exist in the development of a model diagram outside the confines of the ISIMIP framework. Having a title that specifically refers to ISIMIP would in our opinion feed into the perception that we are trying to avoid, so we prefer to keep the title broader.

Action: We have not modified the title. We have modified the abstract slightly to not narrow too much on ISIMIP2b so that the 4th sentence of the abstract is split and now reads as:

Here, we address this gap by presenting a *community-driven process that developed a framework to visualize several global water models. The models considered participate in the Inter-Sectoral Impact Model Intercomparison Project phase 2b (ISIMIP2b).*

Furthermore, we added in the penultimate sentence of the abstract the following:

An open source tool has been developed and published jointly with the diagrams, which allows someone to generate a diagram for their own global water model by adapting the diagrams presented here.

RC2: I also would like to highlight that the changes in the code have made it more approachable than it originally was.

Answer: Thanks a lot.

Action: -