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Comment on hess-2021-443

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Referee comment on "Opportunities for seasonal forecasting to support water management outside the tropics" by Leah A. Jackson-Blake et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2021-443-RC2, 2021

This is an interesting article, reporting results of a research project on the value of seasonal forecasting for water management across different study sites in Europe. The article is very well structured and enjoyable to read, and I think it makes a good contribution to HESS, where studies on the linking between forecasts-hydrology-water mangagement have become relevant to a growing community. I would thus recommend it for publication after some revisions. Below are some comments and suggestions for improving the manuscript.

[1] Sec 2.2 - The authors mention "water managers" being involved in the design and testing of the tools. Similarly on P. 10 L. 245, the authors mention "stakeholders were asked to choose a historic season ..." It would be useful to give more information about whom specifically was involved: how many people for each study site, and their role and responsibilities in their organisation (and clarify whether "stakeholders" mentioned on P. 10 are the same as the "water manager" in Sec. 2.2). I suppose the term may refer to either technical staff (who is responsible for running models and analysing data, but often does not have direct responsibility to make decisions) or executive managers (who do take decisions but often do not directly analyse data or apply models). Most likely, the views and opinions of these two groups are different, even if they all work in the same organisation, as they have different expertise and different responsibilities (see for example the analysis reported in Höllermann and Evers, 2019). A bit more information about whom specifically was involved in this study would be very useful here to put the results into context.

[2] P. 6 L. 130: "A workshop on communicating and visualising seasonal forecast uncertainty". What were the outcomes of this workshop? Uncertainty communication and visualisation is a very interesting topic and any new insights would be useful to share. Why not reporting some of the key findings on this topic too?

[3] P. 16 L. 329: "... managers were often enthusiastic about the new system knowledge gained in doing so and for the workflows to be more generally useful". It would be interesting to know more about how the knowledge and workflows generated in this project will be used beyond the project duration. Are forecasting and impact models (or at least, some elements of them) going to be transferred to the water agencies, so that they can keep using them in the future? What challenges did the authors face in such knowledge transfer, and how they plan to overcome barriers to adoption? If models are not going to be directly embedded into the practice of water agencies, have these at least been influenced by the project results, and how? Again, these would be interesting experiences to share. Most research projects in this field produce interesting insights but are rarely followed up by a sustained uptake of the project outputs - some discussion of these problems would be very interesting in my opinion.

[4] P. 16 L. 338 "A reduction in uncertainty and higher historic skill are therefore still likely to be general requirements for increased uptake of seasonal forecasts in operational management" and P. 19 L. 417: "Reduced uncertainty and higher historic skill were identified as key requirements for the operational use of forecasts..."
This conclusion may be formulated in a more nuanced way. My experience from being involved in studies (e.g. Penuela-Fernandez et al 2020 and Ficchi et al 2016) where forecasts were directly incorporated into operational decision-making procedures via optimisation, is that the link between forecast skill (how accurate the forecast is in predicting inflows) and forecast value (how useful it is to improve decisions) is quite complex. When using optimisation to generate decisions, the real "game changer" is whether forecast uncertainty is explicitly represented and accounted for (for example through probability distributions or ensembles) or not. If it is, optimisation performances significantly improve and can even approximate performances delivered by "perfect" forecasts (at least for shorter lead times, as shown in Ficchi et al 2016 with 10-days-ahead inflow forecasts). I appreciate that in practical settings optimisation is still relatively unaccepted/unused, and most managers will use forecasts in a qualitative way - i.e. to support their thought process and decision-making, not to feed into optimisation routines. Still, I think it is important to convey the message that forecasts can have value even if their skill is relatively low - as the studies cited above have shown. I think the conclusion that "high historic skill .... is a key requirement for operational use of forecasts" has more to do with gaining trust of users, rather than an "objective" requirement for forecasts to be useful.

[5] P. 17 L. 355 'the initial indication is that those variables that are most sensitive to climate over the target season are the hardest to generate reliable seasonal forecasts for (due to low seasonal climate model skill in our study areas), and yet are also the variables which are most useful for management."
I wonder if this conclusion may be the result of some ambiguity in the answers collected here. When water managers said which forecasts would be more useful, did they think of those variables whose foresight would really be key for better decisions, or did they think of the variables they currently find more difficult to predict? Put it another way, when managers said that certain forecasts are less useful, did they say so because they genuinely do not need to know about those variables, or because they are already able to guess them reasonably well, as they strongly depend on antecedent conditions? If this confusion was present, that may be the (self-evident) reason why "those variables that are most sensitive to climate ... are most useful for management"

Minor specific points

p.3 l. 86: " real life management situations" the wording here may suggest that the use of forecasts was tested in real life - for instance to manage an extreme event occurring during the project duration. Studies of this kind are rare but they do exist (see for example Emerton et al 2020). As this is not the case here, and this is a simulation-based study only, it would be worth clarifying.

P. 8 L. 171: so I understand the algal bloom risk model does not use seasonal weather forecasts but only antecedent conditions. Is that correct? Please clarify

P. 10 L. 241: "5% significance does not necessarily reflect the practical decision-making value of forecasts" Unclear. How is the "practical decision-making value" defined and/or assessed then?

Table 2, row 3, the "management opportunity" for Burrishoole site is defined as "Being prepared for data collection during key migration period is very important to reduce fish mortality" This comes a bit unexpected. I am clearly not an expert of fish management, but why being prepared reduces fish mortality? Is data collection harmful to fishes? please clarify

P. 11 L. 260: "Impact model forecasts... suggesting a lack of sensitivity to seasonal climate". This hypothesis could be easily tested by calculating the skill of an ensemble streamflow prediction systems (or equivalent concept for the ecological models). The authors mention this possibility in the Discussion, but I suppose it should be relatively easy to actually run the simulation and calculate the skills, given that all the models and datasets to do so are available?

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