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Hydrology and Earth System Sciences Discussions

Interactive comment on "A framework for the quantitative assessment of climate change impacts on water-related activities at the basin scale" *by* D. Anghileri et al.

Anonymous Referee #1

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General comments:

The paper is well written and the analysis is well structured. It addresses key issues relating to the assessment of climate change impacts on water-related activities at Lake Como basin (Italy). One important feature in this study is the consideration of uncertainty in modeling the physical system (climate and hydrology) and the socio-economic system (management policy). Upon the successful prediction of the water system reservoir network and catchment response to climate conditions with the computation of a set of performance indicators, the model was used to assess the impact of climate change on the water system and management in the future. It focused on

the most conflicting water-related activities within the basin (i.e. hydropower production and agriculture). The analysis explicitly takes into account the water-user preferences and links the stakeholder expectations to decision making. The subject falls within the general scope of the journal. The aims of the study are clearly set. The obtained results are discussed adequately.

In order to warrant the publication, however, the manuscript needs to address the following specific issues:

Specific comments:

Page 587, Line 9: The study by Abbaspour et al., 2009, is not a qualitative and expert based assessment on impact of human activities but represents climate change impacts on water resources with explicit quantification of green-blue components and flooding-drought analysis.

Page 591, Line 25: In this study the authors use different types of modeling approaches (catchment, management, and climate). Please mention which of them can be found in the article referred?

Page 594, Line 26: Why did you derive annual-seasonal correction functions (CF) instead of monthly CF. The annual CF derived for PCP in this study may not correspond to the intra-annual variation of precipitation (PCP) in the past and future. The variation of hydropower production within a year is high. So, how do you think the annual CF can appropriately present the intra-annual change of PCP in the future scenarios which directly influence hydropower production?

Page 595, Line 1-5: How did you measure the goodness of fit between observed and downscaled data for the calibration and validation periods? I suggest you to add a figure (as an example) to show the observed and downscaled data of PCP and Temp for the baseline period.

Page 595, Line 11: Please give a brief explanation on your model selection. There are

quite a number of semi-distributed, semi-physical models to simulate a catchment with a reasonable accuracy. Why you chose the lumped conceptual HBV model?

Page 595, Line 25-28: R2 (Coefficient of determination) may not be a proper criterion for comparing the efficiency of the observed and simulated data. It is an efficient criterion to show the trend of the simulated variables but not closeness to the observed data. It might be worthwhile to use other criterion (e.g. br2 in Krause et al., 2005) rather than R2. Can you show the calibration validation performance and results on a graph?

Page 595, last paragraph: Please list the parameters optimized for the calibration in a table.

Page 598, Line 17: Please list the pareto optimal policies reported in Anghileri et al. (2011) and used here in this paper.

Page 598, section 3.5: Please list the objective functions and constraints with respect to inflow (probability distribution), etc. in a table (or figure)

Page 600, Line 2 and Line 20: How were the different simulation horizons of 10 or 14 years alternatives selected? Was the selection based on a systematic procedure? This might significantly change the uncertainty in Fig 5 and 6. How the upper and lower limits of uncertainty band were computed?

Page 600, Lines 22-26: You are comparing a single backcast scenario of 30 years with a single future scenario of 30 years. How do you consider the uncertainty due to time horizon in climate change impact assessment? Why do not you consider h=14 years for the future period (2071-2100)? This may make more sense in the comparison, as the results are sensitive to h length. In this case the uncertainty ranges will be compared rather than single predictions.

Page 613, Fig 3: The unit for Fig3b shows mean monthly (mm/d), not total monthly (mm). As well, the Y axis (Fig3c) does not seem to be annual PCP (mm). The values

are extremely large and show an increasing trend. Please check this in the figure.

Page 616, Fig 6: Why was simulation horizon of 14 years selected for the analysis of uncertainty?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 585, 2011.