

Interactive comment on “The influence of constrained fossil fuel emissions scenarios on climate and water resource projections” by J. D. Ward et al.

Anonymous Referee #1

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The authors of this paper tie together four distinct but interrelated points surrounding climate change and natural resources. First, that climate change projections contain different sources of uncertainty, arising in essence from socioeconomic inputs that feed into emissions scenarios, and from the response of the physical models to those input emissions pathways. The second point is that some of the emissions pathways appear to be unlikely to arise due to limits on available fossil fuel resources. Thirdly, the ability of regional climate models, downscaled from global models, to give reliable information about future climatic conditions is somewhat limited. Finally, after taking note of these limitations, an attempt is made to analyze and set bounds on potential

effects of a changing climate on water availability in one watershed. A key point for the authors is that the elimination of some very-high emissions scenarios can significantly constrain the potential changes in climate. A fair amount of time in the paper is spent in a criticism of the IPCC emissions scenarios, both those from the Special Report on Emissions Scenarios (SRES) and the more recently adopted Representative Concentration Pathways (RCP). In principle, their point about the unlikelihood of the higher emissions scenarios could have been made by simply taking their favored scenario(s) as the basis for further analysis. The starting point for modeling based on IPCC scenarios is that on one scenario is more likely than another, i.e. no probabilities are assigned to different emissions pathways. In their analysis of watershed streamflow, the authors compare the stream flow for one year with the output from the model in the three different CSIRO-perturbed cases. However, it would be useful to see what the range of results for streamflow is currently, to get a sense of whether the climate change scenarios represent not only a shift in mean value but also a change in distribution or extreme values. This is my main technical comment about the content of the paper. As a general matter, the two sources of uncertainty in IPCC-reported projections (emissions pathway and model uncertainty) are dominated by the emissions scenario. The authors seem to find a contrary conclusion to some extent, but based on analysis of one sub-regional watershed, and on notoriously uncertain precipitation-derived parameters. Therefore it is difficult to make a more general statement. Overall it appears that there are several extraneous points being made in the paper, none of which are irrelevant to the bigger question of resources and climate change. However, the short discussion of resource limits and potential economic disruption, for example, does not seem to add to the analysis at the heart of the paper. As indicated above, the amount of time spent on the discussion of IPCC scenarios seems to be too great compared to what is used for the central point of the paper. Overall the paper is acceptable, but perhaps not as strong as it could have been.

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