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Hydrology and Earth System Sciences Discussions

Interactive comment on "The water footprint of electricity from hydropower" *by* M. M. Mekonnen and A. Y. Hoekstra

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Dear Dr. Engeland,

Thank you very much for your comments.

We can take different measures regarding ET. Each measure has a different meaning and requires a different interpretation. We can basically distinguish three relevant indicators: (1) total ET from the reservoir, (2) net ET from the reservoir, and (3) the difference of ET before and after the reservoir (i.e., the difference between the 'ET from the reservoir' and the 'ET from the area before the reservoir was built'). We reflect on these three measures in detail in our response to reviewer #2 (see point 6). The WF

definition that we use in this paper on the WF of hydroelectricity is consistent with the definition of the WF in Hoekstra et al. (2011).

Re #1: Natural land has ET, but this ET is not productive. WF refers to consumptive water use related to production of goods and services. Therefore ET from natural land is not called WF.

Re #2: The water footprint is an indicator of water consumption; it's an important indicator when interested in how water is allocated to different purposes. Water consumed by one purpose cannot be consumed for another purpose. The WF shows the water volume consumed for one particular purpose. The water footprint is not a broad indicator of all hydrological, environmental, social and economic impacts in a catchment as a result of human activities. This requires not an indicator but a full impact assessment study.

Re #3: You are right. Evaporation from natural lakes is not WF. In our study we only studied evaporation from artificial reservoirs.

Re #4: Water consumption and economic benefits go together indeed. Artificial storage of water in reservoirs brings about evaporation, i.e. a water footprint. This water footprint (consumption) relates to the purpose of the reservoir. If water in the reservoir is stored in the wet period and released in the dry period, the river flow is manipulated such that water availability in the dry period is larger. This is done in order to abstract the water in the dry period (from or downstream of the reservoir), which leads to additional evaporation of that water, so again a water footprint. The total water footprint of the activity is the water consumption when stored plus when used. The river flow mitigation itself means that the water availability over time is influenced. This is relevant when comparing WF to water availability. The WF in the dry period can only be that large because water has been stored in the wet period to make available for consumption in the dry period.

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