

Interactive comment on “Assessment of Integrated Watershed Health based on Natural Environment, Hydrology, Water Quality, and Aquatic Ecology” by So Ra Ahn and Seong Joon Kim

Anonymous Referee #2

Received and published: 20 April 2017

This study assesses health condition of the Han River basin in South Korea based on monitoring data, water quantity and quality time series simulations of the SWAT model and an ensemble of indicators related to 6 components of the watershed landscape related to stream geomorphology, hydrology, water quality, aquatic habitat condition, and biological condition. The paper deals with an interesting topic which is watershed health condition. Indeed, there is a weak understanding of the complex processes and watershed components interactions that govern the healthy/unhealthy state of the watershed and such paper is needed to bridge the gap. This is a nice paper, well written and structured in a coherent way. But to my opinion, the approach needs to be

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improved by including an uncertainty assessment/analysis of the SWAT model.

Authors used SWAT model simulations for water quality and quantity time series reconstruction which in-turn were used for indicators and sub-index development, as stated in the first specific object of the paper. Rely on model simulation for developing these indicators may add uncertainty in the indicators and sub-indexes. In addition, the definition of the reference condition here is crucial and used as a kind of “threshold” to discriminate between healthy and unhealthy watershed condition. This choice is based on SWAT simulation without any uncertainty analysis. I would prefer to see an acceptable range of reference condition based on model uncertainty analysis rather a single value of reference indicator.

L.314-316. Authors mentioned that surface water and lateral groundwater flow interactions were of major importance for the water balance in the Han River basin. In particular, infiltration, return flow, groundwater recharge were important factors for the whole hydrological cycle. These results were based on SWAT simulations. Again, in absence of model uncertainty analysis the contribution of these components to the total water balance may vary or change depending on the parameter of the model. Therefore, I don't think that metrics developed based on the above results can be used for establishing specific management objectives as stated by the authors in line 323.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-88, 2017.

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