

Interactive comment on “Relating trends in streamflow to anthropogenic influences: a case study of Himayat Sagar catchment, India” by R. Nune et al.

R. Nune et al.

rajeshnune@gmail.com

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We thank the referee for their thoughtful comments on our paper and respond to each in turn as follows.

Referee 1: As general comments on the manuscript, the following suggestions are made,

1: It is suggested that some restructuring of the abstract should be considered to be more specific with the general findings of the work.

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We have restructured the abstract to include more specific results.

2: Restructure the introduction to have flow to the reader

We have carefully edited the paper with the aim of improving its flow.

3: Editing of the whole document to improve grammar and sentence construction to create flow to the reader

We have carefully edited the paper and improved the expression in many places. We have also carefully proofread the paper. Hopefully this improves the readability.

4: Better have figures and tables immediately where they are mentioned rather at the end of the document to allow better contextual communication by the reader.

This will be addressed in the final production stage.

Referee 1: A relationship is not clearly established between the decreasing trend and the anthropogenic activities- it is clear that the streamflow trends are not associated to rainfall as it does not show any trends, how has the individual anthropogenic activities at their different change years, contributed to decrease in streamflow- Assuming the streamflow is at the pristine state of the catchment how has the anthropogenic activities sequentially as they happened or took place, caused a decrease in streamflow up to present.

We have provided a detailed explanation of the available data about anthropogenic changes in the catchment in section 3 of the paper. The data is naturally limited in terms of both uncertainty and availability over time. It was not possible to examine a detailed timeline of changes and associated hydrologic responses. We believe we have done the best we can in terms of attributing causes of change with the available data.

Referee 1: May it should be considered to indicate in the water balance, the most dominant hydrological component contributing to streamflow reduction at different times,

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and make a relation to the anthropogenic activities.

We have edited the paper to try to make conclusions about the relative importance of the different potential causes of streamflow decline. This is mainly to be found in the discussion (section 6). We have concluded that evapotranspiration losses associated with irrigation supplied from expanded groundwater extractions are the most important cause of declining stream flows. We have also found that groundwater mining also supplies some of the increased evapotranspiration and that hydrological structures have a smaller impact than the changes in irrigation. These conclusions are summarised in the last paragraph of section 6 as follows.

" Finally it is worth summarising the likely relativities between the various changes in the catchment. Increasing evapotranspiration due to land use and water management change has primarily resulted in decreased streamflows, with some of the water coming from mining of groundwater systems. The changes in irrigation/evapotranspiration/groundwater extraction are clearly larger than the impacts of hydrologic structures developed in the catchment, although it is likely those structures do lead to some beneficial increase in groundwater recharge, as well as there being significant evaporative losses as found in other studies (Sakthivadivel et al., 1997; Sylvain et al., 2008)."

Referee 1: It is not clear of why the processes or components considered in the water balance and how they relate to the anthropogenic activities.

We have made clear that we chose potential anthropogenic drivers of change based on the literature and our knowledge of the catchment by adding the following sentence to the last paragraph of the introduction.

"Potential drivers of hydrologic change in HSC were identified from the literature and our knowledge of the catchment and they included changes in land use, changes in surface water interception by hydrological structures and changes in groundwater extractions as potential drivers of hydrologic change."

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 9295, 2012.

HESD

9, C5489–C5492, 2012

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