

## ***Interactive comment on “An assessment of land use change impacts on the water resources of the Mula and Mutha Rivers catchment upstream of Pune, India” by P. D. Wagner et al.***

### **Anonymous Referee #3**

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General The paper tackles a topical issue related to the impact of land use changes on hydrological systems. This is an important area of research as many parts of the world are going through changes in land use. The drivers for land use changes are many and their impacts are more or less site specific hence the need for a wide range of research to better understands these processes.

The paper is generally well written and is well backed by references. However, the methods used and the scientific arguments presented leave questions on the part of the reader and, although the authors attempt to justify some of these shortcomings I am inclined to believe that with better methods, those weaknesses could have been

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avoided.

I would also have expected a discussion on the effect of climate change in the whole process as the paper is very silent on this yet climate change and/or variability can also affect the runoff from the studied catchment.

Specific comments 1. Section 2.2 describes three different methods used for classification based on satellite data. One wonders why three different approaches had to be used instead of one. Furthermore, it is not explained if the satellite pictures were taken during the same period or at different times of the year and what implications this would have on the final analysis. This seems to have been addressed further on on page 1951 (last paragraph) when it should have been presented earlier. 2. Similarly, on page 1950 (line8) classification of water bodies was conducted in November yet it is not clear which month was used for the other land use analyses. Line 23 indicates that in November fields would have been harvested which means that this is not the best time to classify vegetation in general. 3. Page 1952 (i) assumes a linear growth of cropping. While this may be fine for the purposes of research, the authors should acknowledge that the selection of crops and possibly cropping areas is largely a farmer's choice and is generally driven by economics. 4. Section 2.3: only one weather station at Pune was used for weather input parameters. What are the implications given that the catchment area is 2036 km<sup>2</sup> with high variability yet Pune is on one end of the catchment? For the rainfall stations, an idea of the spread of the rainfall stations and its representativeness would be appreciated. 5. Section 2.3: it would be appreciated if the authors described the degree of missing data and the process of data filling that was applied. 6. Page 1954, second paragraph: the input parameters were not based on observed data; values from literature and/or default values may allow the model to run but may not mimic reality as accurately. A sensitivity analysis of the default values used in the model should also be presented. Why did the authors choose not to include a figure to support the presented good performance of the model? 7. Section 3.1: I do not fully agree with the interpretation of the results; from Fig 3, about a third of

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the study area has gone greener which suggests more cropland, forest cover or shrub land. However, when compared against Fig 2 this does not seem to tally as cropland has only marginally increased (about 3%) while semi-natural has lost 10% to cropland and urbanisation. This may also suggest that urbanisation is exaggerated in Fig 3 and has minimum effect on sub basins 8 and 9 as presented on page 1956 line 21. 8. Page 1956 last paragraph: why discuss about variations between classes when there is too much overlap to deduce anything meaningful? 9. Section 3.2: I think there is need to revisit the arguments presented by the authors. I argue that two-thirds or so of the study area has gone greener which should suggest more evaporation and transpiration in these parts and not necessarily sub-basins 2, 3 and 14 as presented. Besides, urbanisation has increased significantly at the lower end of the catchment only. How do the authors view and reconcile this? In addition what are the influences of temperature and moisture availability on this?

How is yield defined in this study? Are the authors referring to reliable outflow from the catchment per given time or this is simply measured outflow from the catchment?

The linear regression analyses presented are very weak and possibly emanate from the loose assumptions made and default model input parameters as presented under the methods section. Fig 6 and 7 do not present strong relationships as evidenced by the weak R<sup>2</sup> values hence firm conclusions cannot be drawn from this. It would seem the authors forced straight line relationships where they are not necessarily evident. 10. I find the conclusion rather generalised and sometimes mixed with recommendations.

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