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Hydrology and Earth System Sciences Discussions

Interactive comment on "Water harvest- and storage- location assessment model using GIS and remote sensing" *by* H. Weerasinghe et al.

Anonymous Referee #1

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This manuscript describes a globally-applicable, GIS-based, multi-criteria method to evaluate the potential to accommodate different water harvesting and storage techniques a the local scale. The method is demonstrated in the Sao Francisco River Basin and in the Nile River Basin. While the effort is valuable, I believe the methodological contribution is not novel nor substantial enough for this journal. Furthermore, the method has some shortcomings that may limit its value.

The authors use standard global datasets on elevation, land cover, soil type and soil depth at spatial resolutions ranging from 1 degree to 5 minutes and low class resolution. These datasets are used to resolve for processes that depend on very local soil and terrain characteristics such as those involved in the determination of local runoff

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patterns critical for the enhancement of soil moisture or in the use of percolation pits at the farm scale. I cannot see how the suitability of small scale water harvesting sites, that are often located in small cultivated relatively deep soil patches of local converging topography, can be determined from the datasets used. Determining high-resolution terrain features is especially difficult given that the elevation dataset used has been derived from 1 degree satellite images and inverse-distance interpolation.

Also, what 1 degree satellite images have been used to "develop the DEM data"? Have the authors developed a new elevation dataset, and if so why, or have they downloaded it from the CGIAR server? I do not understand why the authors extract contour lines from the DEM data or why they need to calculate the contour density, which they define as "the magnitude (number?) of contour lines per grid cell". Isn't it this information contained in the slope layer ?

Also, a major issue in water harvesting and management, especially in the areas where the authors are demonstrating the method, is that of salinity, which is not a criterion considered in their model. Some areas that may be indicated under their method as highly suitable for water harvesting techniques such as enhancing infiltration, terracing or percolation pits may be areas of high risk of salinization if the extra soil water resulting from these techniques leaves the soil through evapotranspiration. More information on the ratio of precipitation to evapotranspiration (so far this information is mainly determined from the land use and landcover data, according to the authors) and the quality of soil drainage should be included to asses this risk if the method is to be appropriate for semiarid regions.

Also, related to dams, no criteria regarding inundation of high-value land, population that needs to be displaced or other important social factors are included in the evaluation criteria. These issues are critical to select a site.

In the description of the Sao Francisco catchment, no citations are needed to support the area of the basins and length of the main river, which is information the authors

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should be able to obtain from the GIS coverage. In this section, the authors state that "only a few large scale irrigation systems exist in the catchment". So far as I know, the Sao Francisco River Basin is home to the most productive, large scale irrigation districts for high-value produce for export in Brazil. Also, note the reservoir is Tres Marias, not Trees Matias.

The validation is poor and insufficient to support the conclusions.

Overall, I believe the work is not yet ready for publication, at least in a journal such as HESS.

Other comments:

Some sections need clarification (e.g. the section on the DEM and the contour lines). Also the description of the multi-criteria evaluation was difficult to follow. Equation 1 did not show in the PDF.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 3353, 2011.