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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessing the hydrologic restoration of an urbanized area via integrated distributed hydrological model" *by* D. H. Trinh and T. F. M. Chui

Anonymous Referee #1

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The Authors present a study to assess the possible effects that urbanization might have on catchment water balance. Using Mike-SHE and data from the Marina Bay catchment in Singapore, the Authors analyze the few scenarios to see the effect of green roofs and bio-retention systems on the water balance.

The manuscript addresses an important issue in urban hydrology and it is likely of interest to the audience of HESS.

The manuscript needs some editorial work because some phrases sound awkward and some parts are not very clear (see specific comments below). Some details about

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the model and its parameterization are not very clear as well as some of the results, as detailed in the following list of specific comments and suggestions.

- Page 4100, line 21: '. . .be intervened. . .'. I would rephrase this.

- Page 4100, line 24: '. . .impervious surfaces enhances. . .'

- Page 4101, lines 2-3: I would rephrase this.

- Page 4101, line 29: '..canals'. This sounds awkward.

- Page 4102, line 16: 'The model included. . .'

- Page 4102, line 18: 'and detailed the spatial. . .'

- Page 4103, lines 5-6: lumped models can have more than one parameter. This phrase also sounds awkward ('. . .truly reflective' of what?).

- Green roof: the description of green roofs lacks some details. It is said that green roofs function as micro-catchments; however, it looks like the only effect of green roofs is to delay peak runoff. What is the soil depth of the modeled green roof? This would determine the ability of roofs to store water; also, the type of vegetation is important to estimate evapotranspiration. How are these features embedded in the model? I could not understand it from Section 2.1. I do not think that imposing a constant delay of 3h is accurate, because the delay should depend on the time between rainfall events. This choice should be discussed and justified more in depth, maybe suggesting possible consequences if this assumption were relaxed or a model accounting for green roof soil depth were used.

- Page 4104, line 12: the Authors should provide a reference for the statement 'improving runoff quality'. In some environment, green roofs need to be fertilized to maintain healthy vegetation; this would cause pollutant leaching, thereby reducing runoff water quality.

- Page 4107, line 8: I cannot understand how the Authors have 89900 elements, when

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the catchment is 160 km2, each cell is 60 m by 60 m with 45 layers. How are green roofs and bio-retention systems accounted for in an area of 60 m by 60 m?

- Page 4108, line 23: the hydraulic conductivity of the soil is very similar to that of soil in bio-retention systems; I would have expected bioretention systems to have larger hydraulic conductivities, of the order of 150-200 mm per hour (instead of about 40 mm per hour as used by the Authors).

- Eq. 1: how is G calculated?

- Page 4111, lines 11-12: is setting a constant boundary at sea level correct? Are tidal effects important in the studied catchment? I would add a comment to acknowledge that tidal fluctuations are neglected.

- Page 4110, lines 15-16: assuming flat bedrock at a constant depth below the ground affects groundwater movement. Is this a reasonable assumption in the studied catchment? I would add a comment in this regard.

- Page 4110, lines 20-22: '. . .assumed to be rectangular. . .'. What is 'trickle channel'?

- Section 3.1: I would indicate precisely in the area of the catchment where the location of the results in Fig 4 is.

- Page 4113, lines 15-20: why is the flow in the scenarios with green roofs and bio-retention systems lower than that in pre-urban conditions? Is that due to the larger infiltration rates of bio-retention systems?

- Page 4115, lines 9-14: according to the chosen parameters, the hydraulic conductivity of bio-retention systems is similar to that of the surrounding soil. This allows water to percolate into the surrounding soil, without accumulating in the systems. I would consider to increase the soil hydraulic conductivity of bio-retention systems to see the effect of recharge.

- Section 3.2.2: one of the problems of infiltration systems in urban areas with shallow

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groundwater is localized recharge that might damage urban underground infrastructure. I would suggest the Authors to check the groundwater levels in the elements of their model where bio-retention systems are installed to see whether there are localized groundwater mounds.

- Table 1: the root depths are well below the water table; this is unlikely, since many species would suffer under such conditions. The Authors should provide a reference to justify this choice.

- Fig. 1: I do not think that there should be evaporation from groundwater.

- Fig. 5: 'Hybird' should be 'Hybrid'. Why is subsurface storage only in the urbanized and green roof scenarios?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 4099, 2013.