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Title: The role of catchment characteristics, sewer network, SWMM model parameters in urban catchment management based on stormwater flooding: modelling, sensitivity analysis, risk assessment

Authors: Bartosz Szeląg*, Adam Kiczko, Grzegorz Wałek, Ewa Wojciechowska, Michał Stachura⁵, Francesco Fatone

Comments

This manuscript presents a model to simulate specific flood volume considering both catchment and stormwater network characteristics, and including a module to calculate and indicate possible failure of the stormwater network, which is an interesting topic. The presented model algorithms consist of nine modules (Section 3 methodology): eight modules are a replication of what were developed and published by the same lead author; i.e., Szeląg et al. 2021 (e.g., hydrodynamic model- module 2 in the manuscript, sensitivity test considering uncertainty- modules 3, 4, 6, 7) and Szeląg et al. 2022 (Logistic regression and its application to stormwater network - modules 5, 8) over the same catchment. Module 1 in this manuscript addresses 9 sub-catchments (Table 1, though mentioned as 8 in line 128) to be simulated, which the items of characteristics are applied the same way as above-mentioned articles but the resulted values shown in Table 1 are slightly different depending on the differently selected sub-catchment.

Szeląg, B., Kiczko, A., Łagód, G., De Paola, F.: Relationship between rainfall duration and sewer system performance measures within the context of uncertainty, *Water Res Manage.*, 35, 5073 – 5087, <https://doi.org/10.1007/s11269-021-02998-x>, 2021

Szeląg, B., Suligowski, R., De Paola, F., Siwicki, P., Majerek, D., Łagód, G.: Influence of urban catchment characteristics and 760 rainfall origins on the phenomenon of stormwater flooding: Case study, *Environ. Model. Softw.*, 150, 105335, <https://doi.org/10.1016/j.envsoft.2022.105335>, 2022

It is OK to replicate a method, particularly if it is a part of a system (of several modules) that requires to be run to test newly proposed hypotheses and questions or in quite different catchments for the model adaptation, given both clear objectives and well-explained results. However, this manuscript lacks clear presentations of objectives, newly focused methods and results, and solid evidence of impact: e.g.,

- Some presentations of modules 1 to 8 and corresponding results were adopted too much from the two articles above with slight changes in sample events, sub-catchments, and letters in the equation without providing clear explanation written in this manuscript; e.g., specific flood volume is defined in this manuscript as κ in eq.1 without referring as “specific flood volume”, then later appears in line 97 and in line 87 as λ , (which was used and better explained in Szeląg et al. 2021). This example can be a trivial, but such way of presenting the adopted methods and results on modules 1 to 8 (Section 2 – missing explanations on DC, S1, boundary of sub-catchments, and why divided in this way; more can be found in Sections 3.1 to 3.7 as well as Sections 4.1-4.5) made the manuscript unclear and confusing if the results were obtained from this work or speculated from the previous work. This made the Section of conclusion weak as well; e.g., the authors conclude “no other previous study has included such a broad scope of analysis” (line 550), however they adopted their previous work and presented similar results here providing similar messages and interpretation.

- Module 9 (section 3 methodology, section 3.8 and section 4.7) looks newly incremented in this presented work. Although the authors mention briefly in the introduction of Methodology (line 145) its needs, this section is short and lacks clear explanation of the method and the results. In particular, section 4.7 needs better writing.
- Title and abstract address the risk assessment. However, there are no corresponding works/materials presented. Either adding more work on this part or revising the title and abstract is expected.
- It was not clearly explained on certain threshold/coefficient values mentioned in the text (e.g., the threshold value of specific flood volume used $13 \text{ m}^3 \cdot \text{ha}^{-1}$ (line 69), is this derived also from one of the modules? If the method is applied to another catchment, how this threshold should be set?
- The analyses regarding different sub-catchments (mostly Section 4.6, with the rainfall duration time of 30 min) need better explanation and writing. When selecting the different sub-catchments to decide the modernization of stormwater network in practice, would the presented set-up of comparisons in different sizes but inclusive way (e.g., wouldn't J affect M as well?) be necessary and useful?
- Too many supplement materials are added. Some may better fit to the main text (e.g., sub-catchment domain with clearer indication of boundary as used in the presented analyses).

Therefore, I would recommend the rejection of the current manuscript and encourage the authors to resubmit the improved manuscript focused on more new findings (e.g., module 9 with better explanations and interpretation of the results) and clarify module outputs from 1 to 8 more relevant to the focused work.