

Interactive comment on “Multi-objective optimization using evolutionary algorithms for qualitative and quantitative control of urban runoff” by S. Oraei Zare et al.

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Dear Referee #2,

The authors wish to thank the reviewers for their accurate and constructive comments on the manuscript entitled "Multi-objective optimization using evolutionary algorithms for qualitative and quantitative control of urban runoff".

Most of the revisions in the article have been performed in the following sections:

I: Abstract and Introduction sections were modified and innovations were highlighted.

C1705

II: The language of the text has been revised and many parts were rewritten.

III: Formulations and the methodology of the paper was rewritten for sake of more clarity.

IV: In the Results and Discussion section, more interpretations were added such as on k-means method for classification, how to reduce pareto for selection of appropriate scenarios (for planners and policy makers in urban management), introducing an indicator for convergence evaluation. Moreover, the results were explained with more clarity.

V: Tables and figures were upgraded according to referees' comments

VI: More references relevant to some of the employed methods were added.

VII: The response to each referees' comments were carefully prepared as attached. The revised paper is also attached for further consideration.

Response to Referee 2:

1) English must be seriously revised to reconsider the paper publication. There are too much syntax and grammar mistakes. Since Referee #1 has reported a very detailed list of items to be corrected, I will not go through it again.

Answer: Yes, the whole text of the paper was revised.

2) Objectives and novel contributions of the paper are not clear at all in the abstract, introduction and conclusions sections.

Answer: In abstract, introduction and conclusions, contributions and distinct goals of the research were described.

3) Hydrological and hydraulic modeling. Hydrological, hydraulic and water quality parameters have been calibrated and validated in the study area? Could these parameters strongly affect the optimization results?

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Answer: The models were not calibrated in this study since no observed systematically-collected data on quantity/quality was available. However, by using the recommendations in the literature as well as the sparse local studies conducted in the study area, parameters of the models were estimated.

4) Definition of decision variables and objective functions. Section 3.4 is unclear. Too many ideas and formulations are supposed to be obvious, so that, it's quite difficult for readers to go through the paper easily.

Answer: The description of the objective function and decision variables as well as the constraints associated with the optimization algorithm were revised and presented in Section 3.4.

5) Results and discussion. In my opinion, this section is very poor and should be enlarged and improved since new ideas and contributions of the paper must be highlighted and justified here. Conclusions must be clear, sound and backed up by results.

Answer: The results and conclusions sections were revised to accommodate for contributions of the paper.

Specific Comments

1) P778 L10. " :aimed at finding optimal solution: : ." What is the aim of this optimal solution? What are the objectives that justify the optimization the authors performed?

Answer: The optimal solution represents the optimal flood/quality management scenarios. Details were added to the "objective function" section.

2) P782 L3-4. Why the authors use the kinematic wave approximation of full Saint-Venant equations?

Answer: Since the main goal of this paper was to study a multi objective optimization problem, we used similar experiences for modeling hydraulic and hydrologic aspects of urban drainage networks. It is suggested in the literature that where no appropriate

C1707

data for calibration of routing models is available, the KW approximation may be sufficient for flow routing in urban stormwater predictions. Some of the papers on this issue are as follows:

Cheng, J.Y.C.: Modification of Kinematic Wave cascading model for low impact watershed development, Ph.D., University of Colorado at Denver, 242 pp.,2011.

Guo, J.C.Y. and Urbonas, B.: Conversion of Natural Watershed to Kinematic Wave Cascading Plane, Journal of Hydrologic Engineering, 14(8), 839-846, 2009.

3) P782 L22. "Mass is expressed:" Do the authors really think that these kinds of clarifications are necessary?

Answer: The specified units are based on SWMM users guide, suggested for two different systems.

4) P783 L23. An initial screening of BMPs alternatives seems to have been done since optimization only deals with rain barrels, porous pavements and bio-retention. What criteria have been used to do that?

Answer: Relevant descriptions in Section 3.3 (Selection of BMPs) were added. In this section authors explain restrictions in choosing the appropriate BMPs

5) P785 and P786. Equations 5 to 10. Some variable units are not properly defined.

Answer: The variables in Equations 5 to 10 were defined in Sections 3.4.

6) P788. Equations 11 to 14. Some variables are undefined.

Answer: The definition of variables in Equations 11 to 14 was added.

7) P790 L12-15. This conclusion is obvious. In my opinion, there is no need of a multi-objective optimization to conclude that using solutions that promote infiltration will reduce runoff production ...

Answer: This statement (In Section 4.1) was revised.

C1708

8) P790 L24. " since the build-up and wash-off parameters depend on land use". Again an obvious statement: : :

Answer: This statement was revised completely (Section 4.2).

9) P792 L7-9. "The MOPSO and NSGAI are ... management" What do the authors refer to? This sentence is confusing.

Answer: The statement was revised.

10) Tables 3, 4, 5 and 6 are not referred in the text.

Answer: All tables are now cited in the text.

11) Tables 7 and 8. The SI symbol for liter is "l". The SI symbol for kilogram is "kg". Please correct "Lit" and "Kg". Also add units for standard deviation.

Answer: The units were corrected.

12) Figure 3, 5, 6 and 11. These figures are not cited in the text.

Answer: These figures are now cited in the text.

13) Figure 4. This figure is not cited in the text. Moreover this figure is copied from SWMM manual and in my opinion is not necessary.

Answer: This figure was removed.

14) Figure 7. In my opinion this figure is not necessary.

Answer: This figure was removed.

15) Figures 8, 9, 11 and 13. The SI symbol for liter is "l". The SI symbol for kilogram is "kg". Please correct "Lit" and "Kg".

Answer: These units were corrected.

16) Figure 11. I suppose "LID" refers to Low Impact Developments. Please explain or

C1709

clarify.

Answer: The LID was first referred to in the Introduction.

17) Figures 14 and 15. What do these figures add? Are they relevant to conclude?

Answer:

These figures were removed.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/9/C1705/2012/hessd-9-C1705-2012-supplement.zip>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 777, 2012.

C1710