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(sub-)catchment delineation with different levels of geographical data: which effects on combined sewer overflow modelling?

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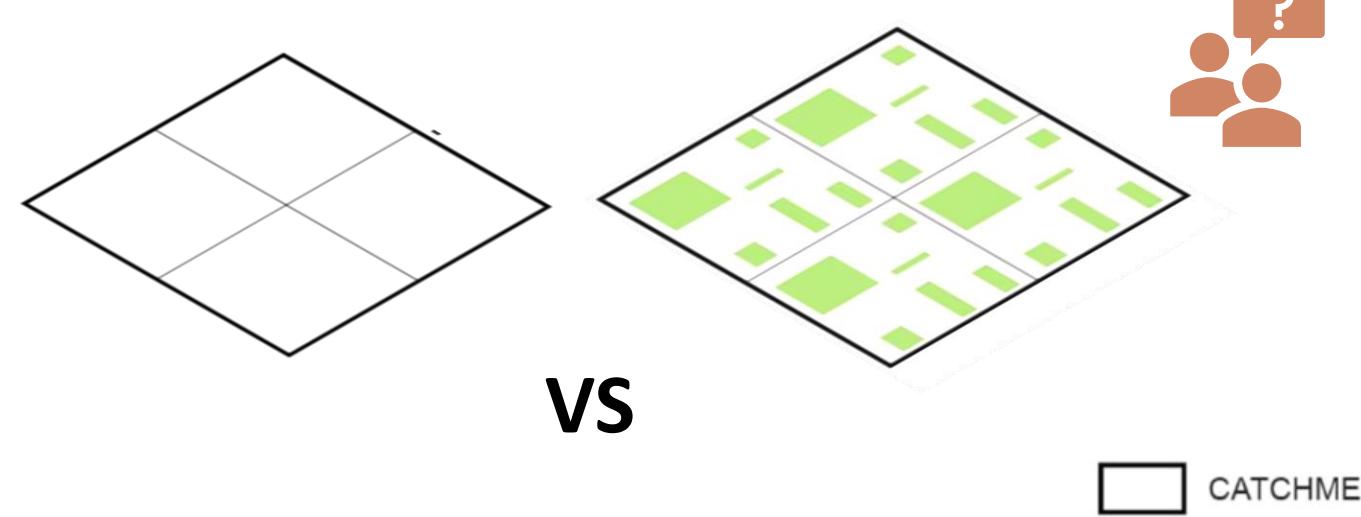
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Context

Combined Sewer Overflow impacts



Evaluate the effect of the spatial distribution of SUDS in urban catchment by modelling



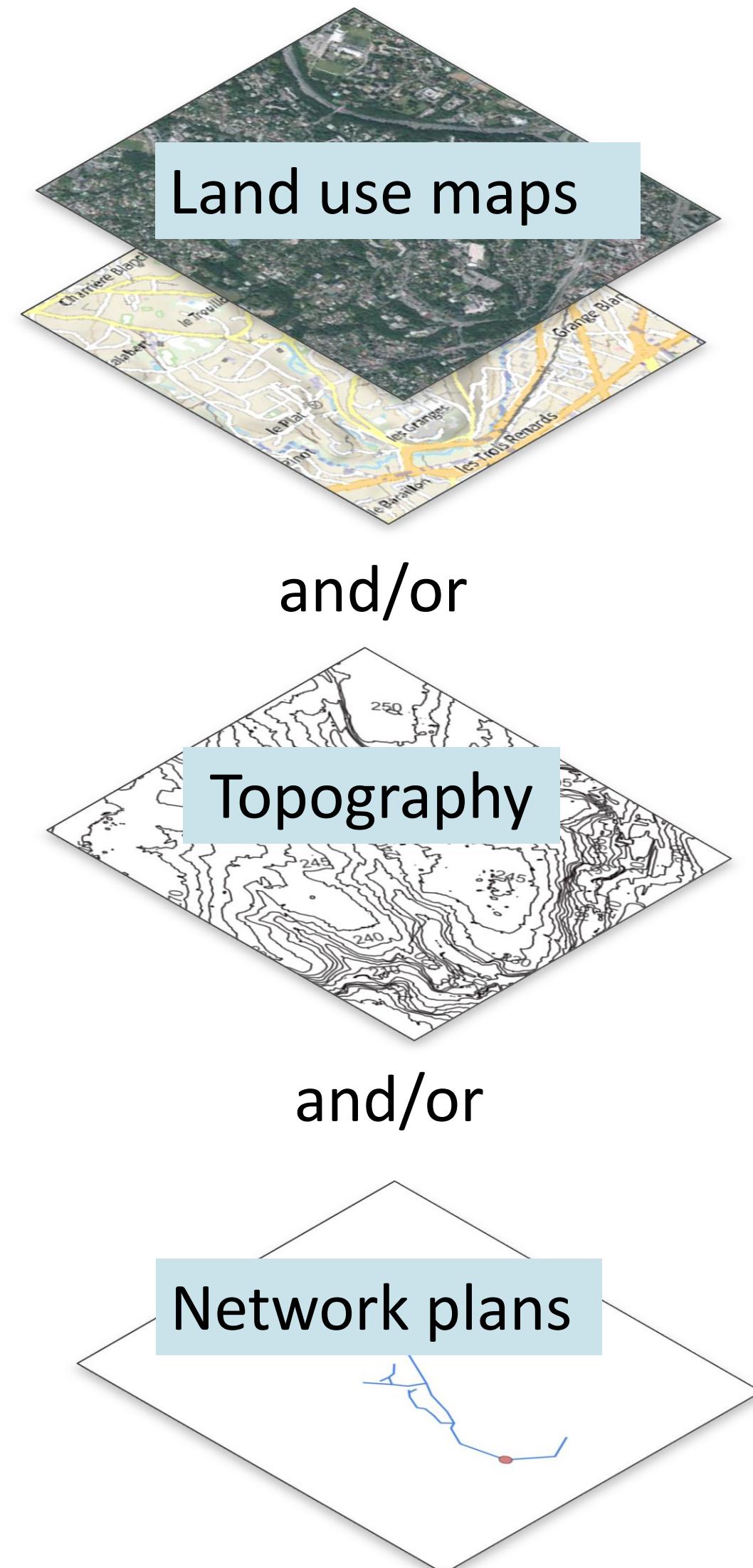
Need of a decision support tool for stormwater disconnection at urban catchment scale

1 Delineation of (sub)catchment areas according to available geographic information

Hydrological and hydraulic models require a minimal description of the territory and its characteristics, notably the catchment and sub-catchment delineation [1] and the appropriate level of sewer network plan [2], however, these data are not always reliable. The present study investigates the hydrological effect of different level of spatial data for catchment and sub-catchment delineation.

Methodology

Available data



Procedure for the delimitation of the catchment area and sub-catchment areas

Step 1: Catchment border based on available data

Land use maps and/or Topographic catchment border and/or Network catchment border

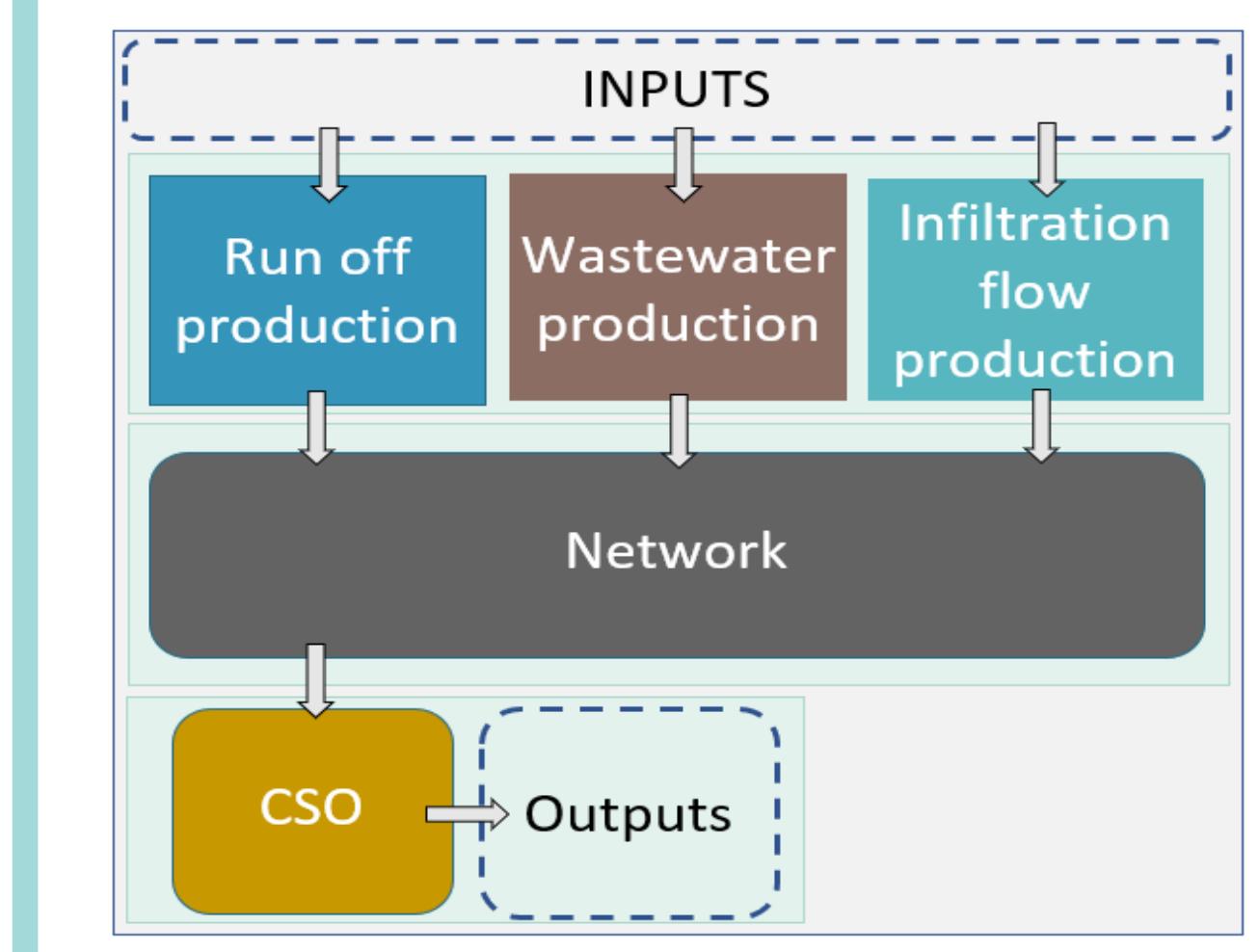
Step 2: Sewer network

Simplification of the existing network Or Creating an fictive network [3]

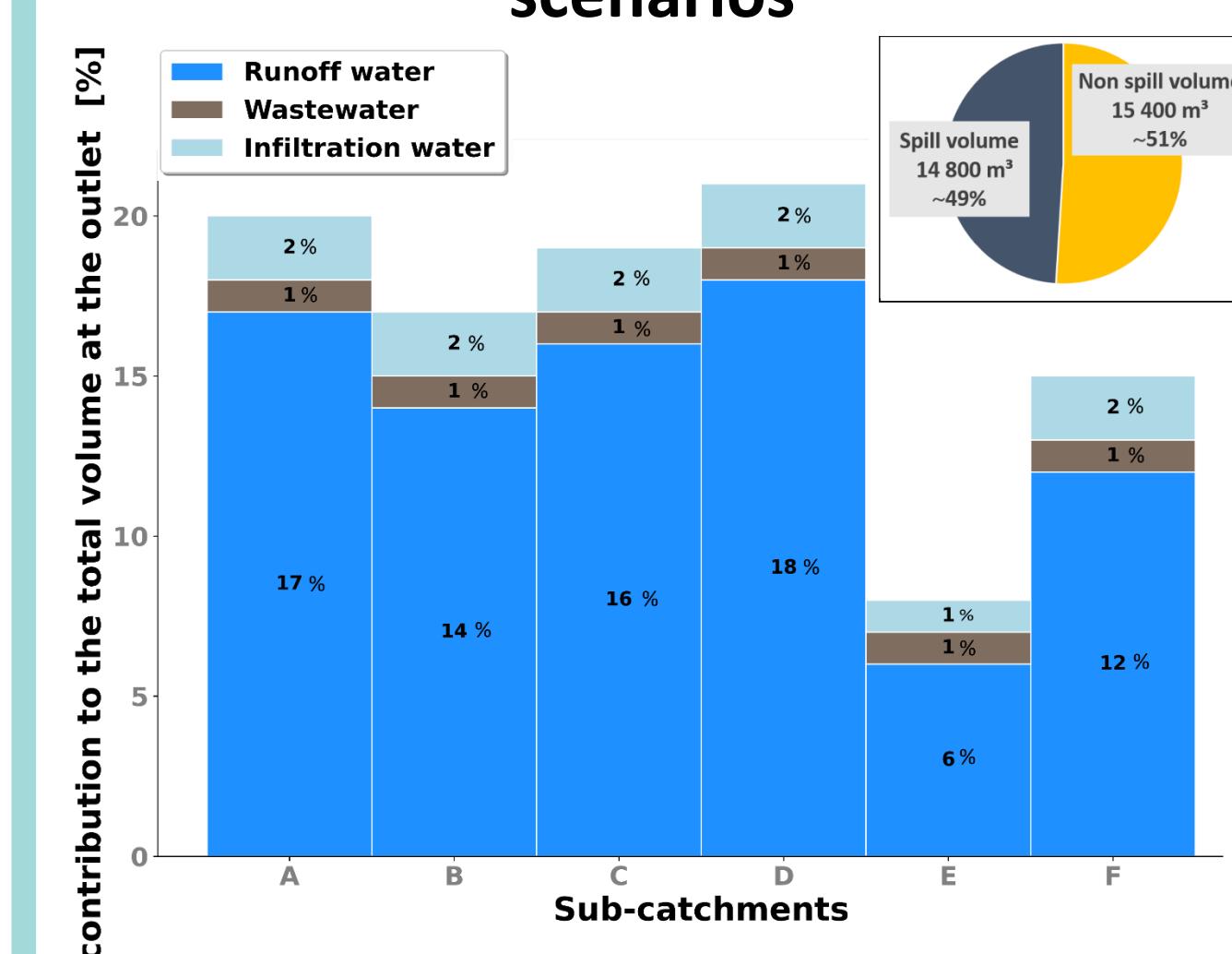
Step 3: Sub-catchment delimitation

Delimitation based on the closest drainage Or Delimitation based on topography

2 Hydrological & hydraulic model for CSO simulation



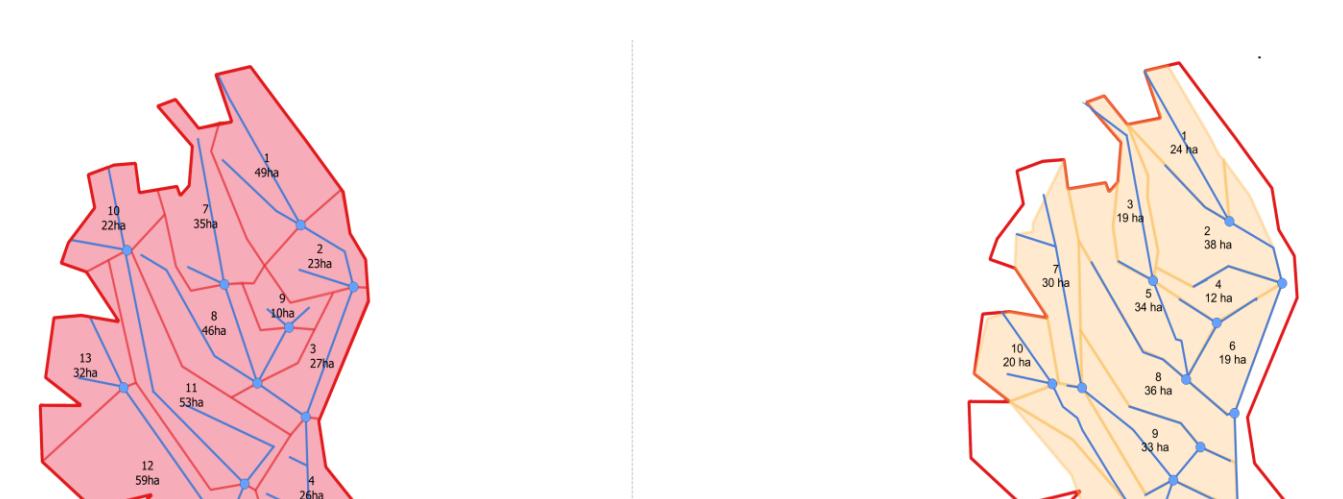
3 Optimization of disconnection scenarios



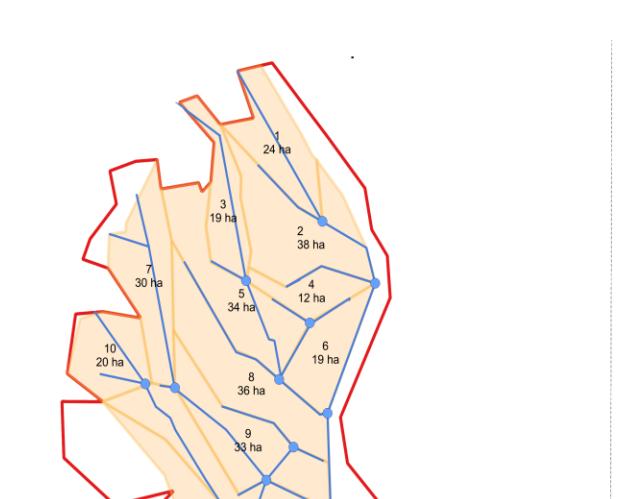
Case study n°1: Water balance during a 50 mm rainfall event

available data

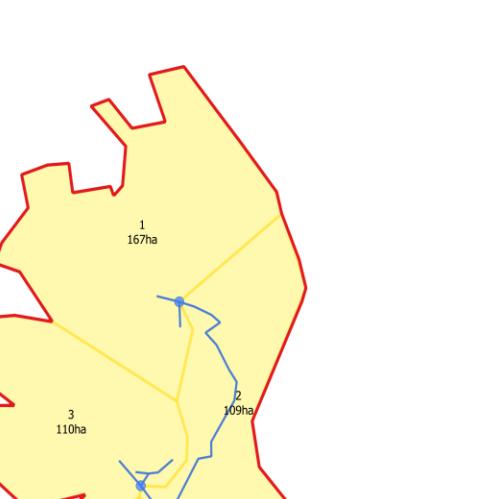
Scenario n°1
CSO structure position,
Land use maps



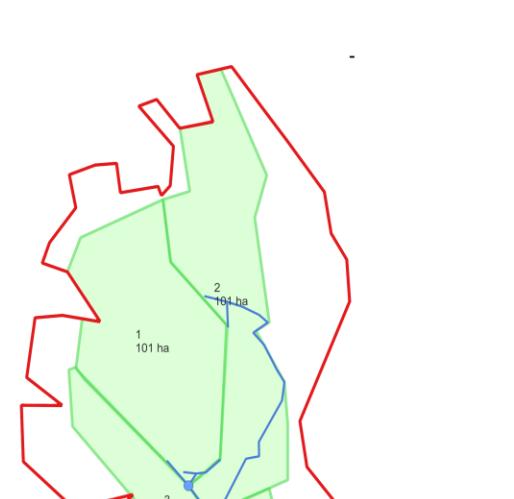
Scenario n°2
CSO structure position,
Land use maps
DEM 5m x 5m



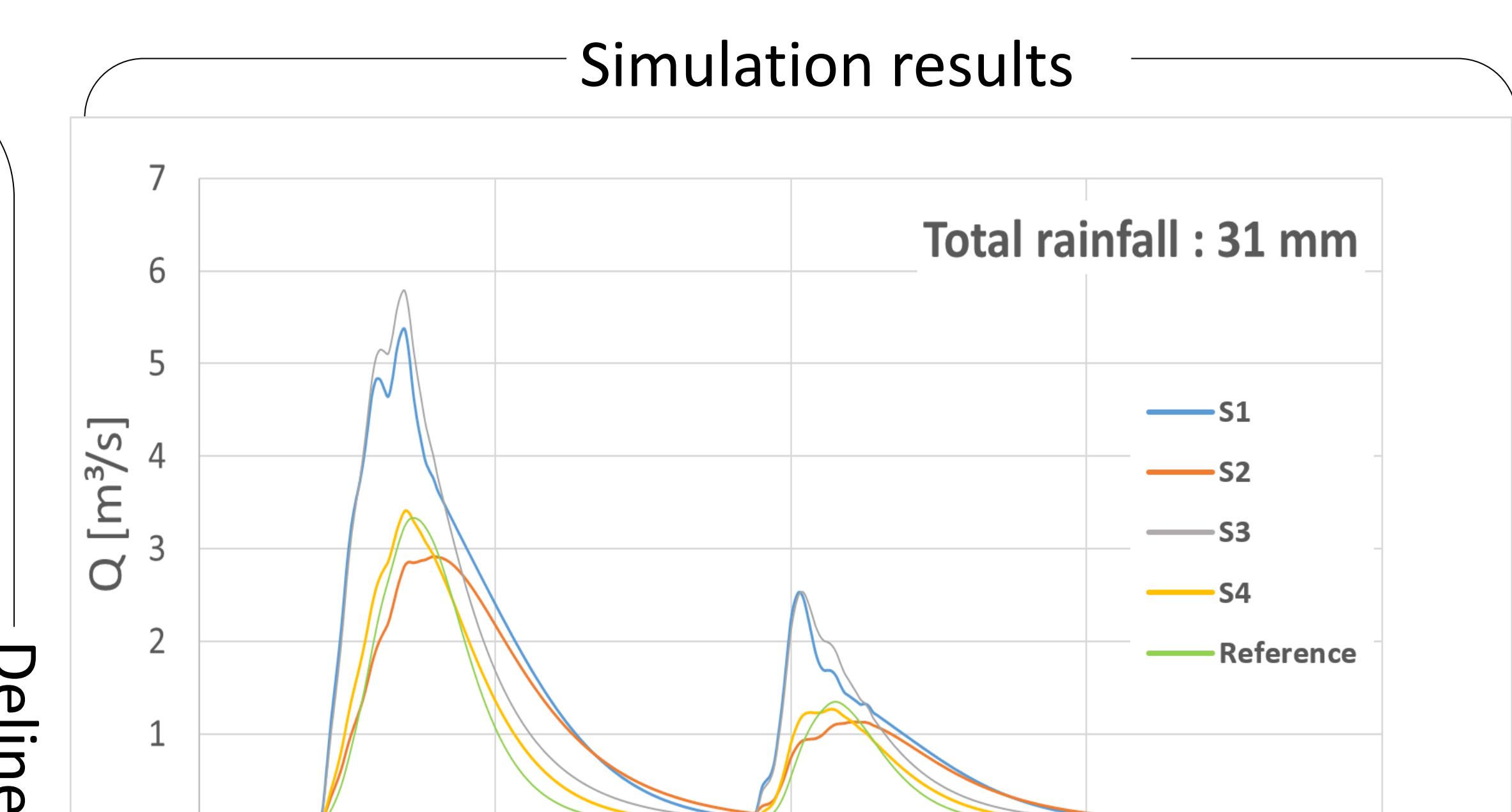
Scenario n°3
CSO structure position,
Land use maps
Network plans



Scenario n°4
CSO structure position,
Land use maps,
DEM 5m x 5m, Network plans



Delineation results



Simulation results

Conclusions

- Mimicking the network following the main roads provides a good approximation of the main branches of the network
- Current results show a better estimation of total runoff volume when topography is available.

References

- [1] Li, C., Fan, Z., Wu, Z., Dai, Z., Liu, L., Zhang, C., 2020. Methodology of Sub-Catchment Division Considering Land Uses and Flow Directions. ISPRS International Journal of Geo-Information 9, 634.
- [2] Ghosh, I., Hellweger, F.L., 2012. Effects of Spatial Resolution in Urban Hydrologic Simulations. J. Hydrol. Eng. 17, 129–137.
- [3] Blumensaat, F., Wolfram, M., Krebs, P., 2012. Sewer model development under minimum data requirements. Environ Earth Sci 65, 1427–1437.