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Quantification and transferability of decentralised Nature-based Solutions' effects for pluvial flood mitigation

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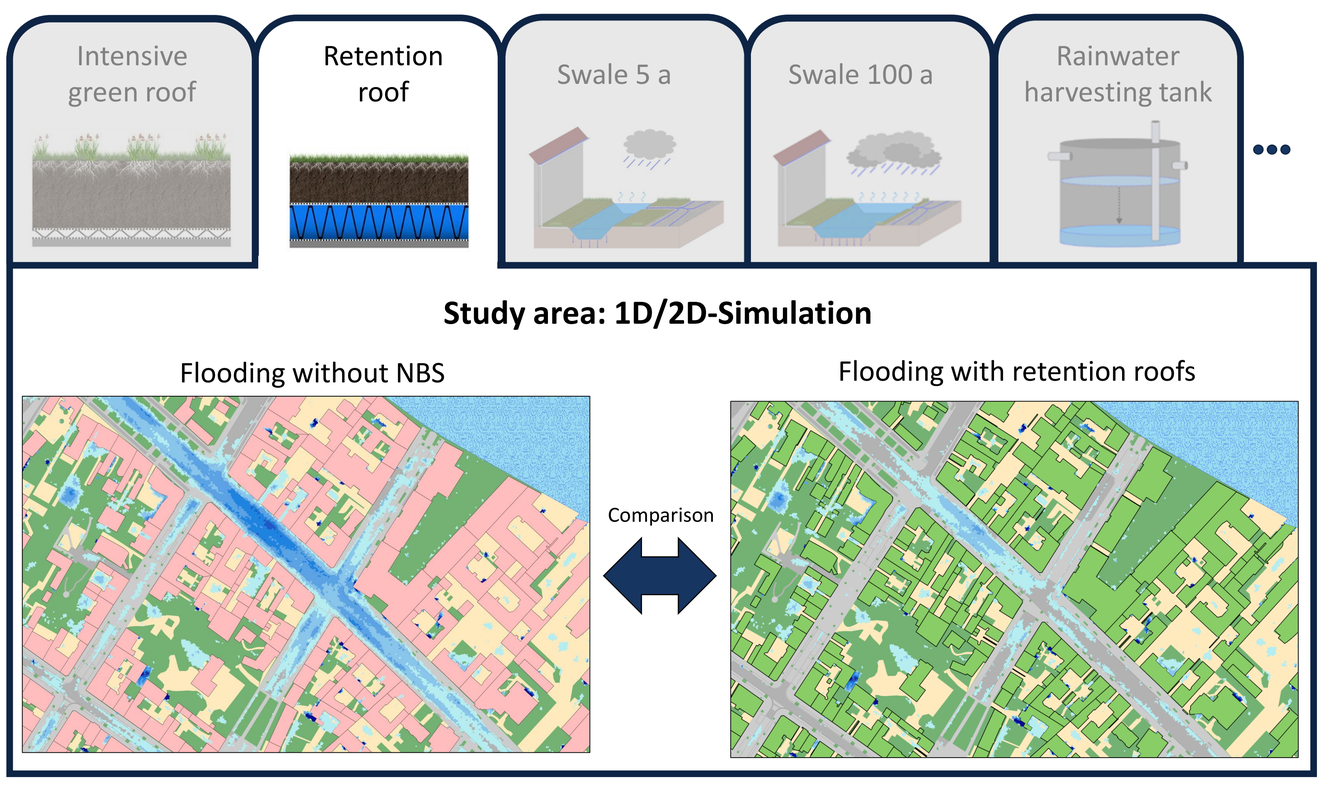
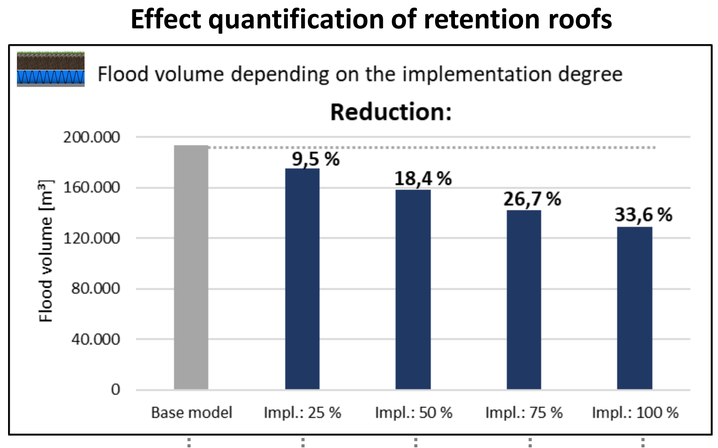
Problem Statement and Objective

- Climate change is causing more frequent heavy rainfall events, with inner-city areas particularly affected by an increasing risk of flooding
- **Nature Based Solutions (NBS)** like swales and green roofs can contribute to flood protection
- However, quantifying the flood reducing effect of NBS with a model is complex and requires a solid (geo)data basis
- **Objective:** To present a methodology for deriving effect curves based on detailed NBS quantification in a study area, transferring them to other catchments to estimate their impacts and validating the results



Data basis and modelling

- Detailed simulation results regarding flood mitigation effects of **14 types of NBS** in a study area
- Evaulated NBS: Infiltration systems, green roofs and rainwater harversting tanks; the **roof areas** (97,8 ha) are managed by the NBS
- 1D/2D-Simulation, modelling of the NBS with the SWMM LID approach



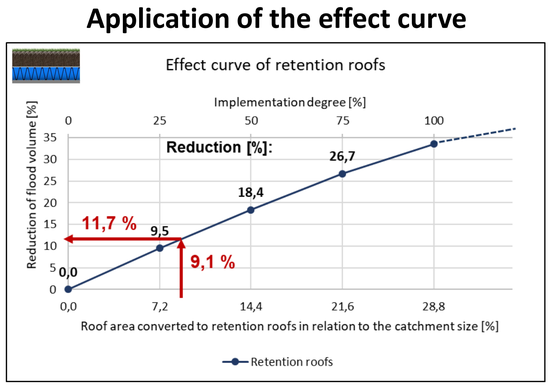
Effect curves

Derivation of the effect curve :

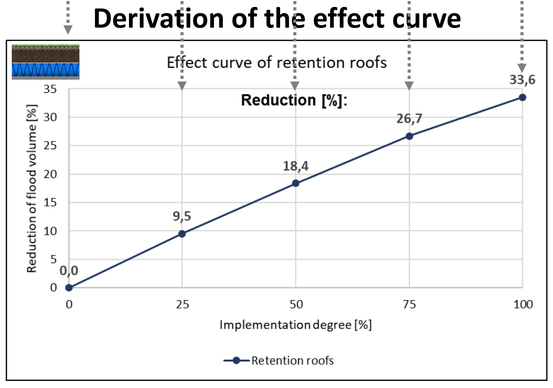
- Flood reduction due to retention roofs depending on the implementation degree

Application of the effect curve:

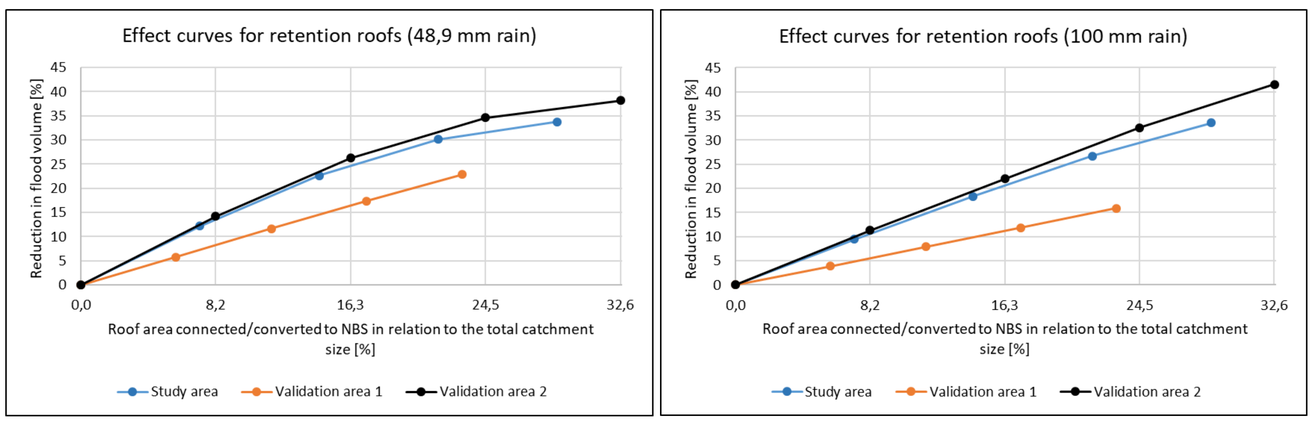
- X-axis: roof area converted to retention roofs relative to the total catchment area → 97,8 ha of retention roofs corresponds to 28,8 % of the total study area (340 ha)
- Transfer to new catchment (220 ha):
  Retention roofs: 20 ha, corresponds to 9,1 % of the catchment size
- Mapping onto the effect curve: Flood reduction of 11,7 %



Transfer to new catchment



Comparison with effect curves of 2 Validation areas



Effect curves for retention roofs under a precipitation load of 48,9 mm (left, T = 100 a) and 100 mm (right) in the study area (blue), validation area 1 (orange) and validation area 2 (black)

Validation of the effect curves

- Effect curves are also generated for two validation areas, following the same approach as in the study area
- **Comparison of the curves:** Agreement between the curves indicates that flood reduction in the validation areas can be reliably assessed using the effect curve from the study area
- **Results:** Mixed picture, transferability is inconsistence, detailed quantification of the flood reduction of NBS for other catchments is not possible with effect curves

➢ **However:** The relative effectiveness of NBS is valid independently of the catchment and can thus support measure prioritization

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