EXPERIMENTAL CHARACTERIZATION OF A PERMEABLE PAVEMENT USING SIMULATED RAIN

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Abstract

Permeable pavements are among the most common Sustainable urban Drainage Systems (SuDS) techniques implemented on urban catchments, but their long-term performance has not been yet studied deeply and there is a great uncertainty about permeable pavements clogging and its effect on stormwater management. This study assessed the impact of retrofitting an impermeable concrete surface using a porous asphalt superficial layer. Initial records of the runoff routed to the drainage system during simulated rainfalls of 5 minutes and different intensities (30, 50 and 80 mm/h) over a full-scale street section physical model have been compared before and after surface retrofitting. In the next steps of the research, the long-term performance of the porous asphalt will be assessed both in terms of runoff peak reduction and pollution mobilization.

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Keywords: Urban drainage, SuDS, permeable pavement, rainfall simulator.

Methods

- Full-scale street section physical model.
- Dripper-based rainfall simulator. Realistic and uniform precipitations of 30, 50 and 80 mm/h of rain intensity.
- Measuring of gully pots inflow before and after the installation of a permeable asphalt layer.

Results

- The permeable asphalt layer reduces by 50% the peak of the drained flow in the worst case studied (rain intensity of 80 mm/h during 300 s).
- The hydrographs with the permeable pavement presented a lag in the runoff peak of more than 3 minutes in case of the highest rain intensity tested.

Figure 1: (a) Street section physical model employed. (b) New test bench for clogging studies.

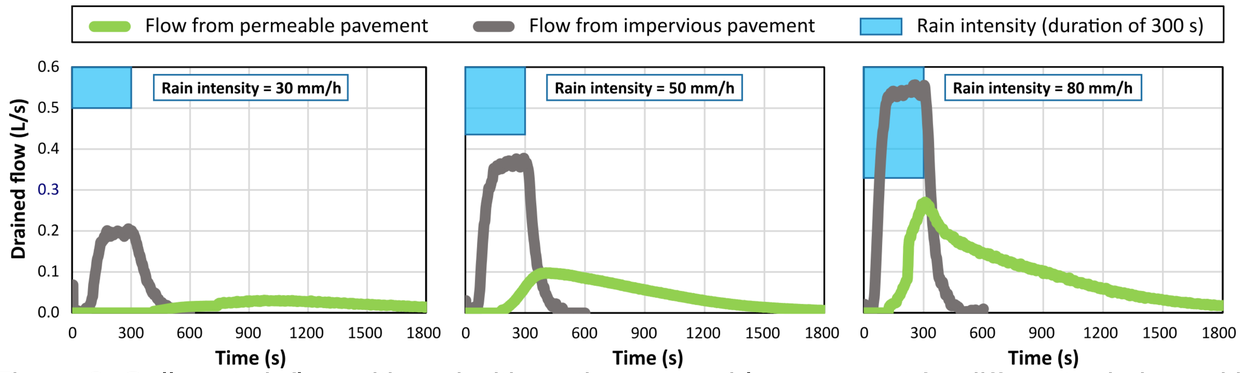

Figure 2: Gully pots inflow with and without the permeable pavement for different rain intensities.

Conclusions

- These first results confirmed and quantified the benefits of permeable pavements in urban stormwater management.
- Next research will focus on the pollutant removal efficiency of the permeable pavement and the influence of clogging in hydraulic, sediment wash-off and water quality results.
- A new test facility has been developed to complement the evaluation of the long-term performance of permeable pavements towards more efficient implementations and maintenance strategies.

Bibliography

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