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Green-roof as a solution to solve stormwater management issues? Assessment on a long time period at the parcel scale

P.-A. VERSINI[1], G. PETRUCCI[1,2] & B. DE GOUVELLO[1,3]

1 LEESU-ENPC, 6-8 avenue Blaise Pascal 77455 Champs sur Marne, France
pierre-antoine.versini@leesu.enpc.fr
2 Vrije Universiteit Brussel (VUB), Earth System Sciences (ESSc), Pleinlaan, 2, 1050 Brussels, Belgium
3 CSTB, 84 avenue Jean Jaurès 77447 Champs-sur-Marne, France

Abstract Experimental green-roof rainfall–runoff observations have shown a positive impact on stormwater management at the building scale; with a decrease in the peak discharge and a decrease in runoff volume. This efficiency of green-roofs varies from one rainfall event to another depending on precipitation characteristics and substrate antecedent conditions. Due to this variability, currently, green-roofs are rarely officially used as a regulation tool to manage stormwater. Indeed, regulation rules governing the connection to the stormwater network are usually based on absolute threshold values that always have to be respected: maximum areal flow-rate or minimum retention volume for example. In this context, the aim of this study is to illustrate how a green-roof could represent an alternative to solve stormwater management issues, if the regulation rules were further based on statistics. For this purpose, a modelling scheme has been established at the parcel scale to simulate the hydrological response of several roof configurations: impervious, strictly regulated (in terms of areal flow-rate or retention volume), and covered by different types of green-roof matter. Simulations were carried out on a long precipitation time period (23 years) that included a large and heterogeneous set of hydrometeorological conditions. Results obtained for the different roof configurations were compared. Based on the return period of the rainfall event, the probability to respect some regulation rules (defined from real situations) was assessed. They illustrate that green-roofs reduce stormwater runoff compared to an impervious roof surface and can guarantee the respect of the regulation rules in most of the cases. Moreover, their implementation can appear more realistic than that of other infrastructures strictly complying with regulations and demanding significant storage capacity.

Key words green-roof; storm water source control; hydrological modelling; SWMM