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Blue and green infrastructures implementation to solve stormwater management issues in a new urban development project – a modelling approach

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Concentrating buildings and socio-economic activities, urban areas are particularly vulnerable to hydrological risks. Modification in climate may intensify already existing issues concerning stormwater management (due to impervious area) and water supply (due to the increase of the population). In this context, water use efficiency and best water management practices are key-issues in the urban environment already stressed.

Blue and green infrastructures are nature-based solutions that provide synergy of the blue and green systems to provide multifunctional solutions and multiple benefits: increased amenity, urban heat island improvement, biodiversity, reduced energy requirements... They are particularly efficient to reduce the potential impact of new and existing developments with respect to stormwater and/or water supply issues.

The Multi-Hydro distributed rainfall-runoff model represents an adapted tool to manage the impacts of such infrastructures at the urban basin scale. It is a numerical platform that makes several models interact, each of them representing a specific portion of the water cycle in an urban environment: surface runoff and infiltration depending on a land use classification, sub-surface processes and sewer network drainage. Multi-Hydro is still being developed at the Ecole des Ponts (open access from https://hmco.enpc.fr/Tools-Training/Tools/Multi-Hydro.php) to take into account the wide complexity of urban environments. The latest advancements have made possible the representation of several blue and green infrastructures (green roof, basin, swale).

Applied in a new urban development project located in the Paris region, Multi-Hydro has been used to simulate the impact of blue and green infrastructures implementation. It was particularly focused on their ability to fulfil regulation rules established by local stormwater managers in order to connect the parcel to the sewer network. The results show that a combination of several blue and green infrastructures, if they are widely implemented, could represent an efficient tool to ensure regulation rules at the parcel scale.