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CDD Project Engineers : DEGOUT project, simulation of sewer overflow in a flooded city and creation of a dataset.

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Intense precipitation events are becoming increasingly frequent as a result of climate change worldwide, but even more so in urbanized areas. Pollutant discharges coupled with increasing urbanization are accentuating the phenomenon of precipitation, and particularly extreme events. With this urbanization, soils in urban areas tend to be increasingly impermeable. This poses more and more problems for the evacuation of rainwater, which is no longer absorbed by the soil, as its infiltration capacity is no longer sufficient for this type of event. Rainwater storage areas (meadows, parks, etc.) are becoming increasingly rare in cities. City sewer systems are generally designed to compensate for this shortage. However, with the increasing number and intensity of extreme rainfall events, these systems are no longer sufficiently effective. They no longer evacuate rainwater efficiently enough, and the sewage system saturates to the point of overflowing. Overflows rise to the surface in city streets, flooding some of the areas most at risk. The water then stagnates or runs off down the street towards another, more efficient drainage point. This sewage, originally rainwater, is mixed with wastewater, which also reaches the surface (street). Pollutants, waste and excrement travel along the streets during floods.

Based on the aforementioned issues, the DEGOUT project aims to create a dataset that can be used to anticipate areas at risk during such events, enabling cities to put in place the necessary resources to mitigate these problems. To do this, the dataset will be created on the basis of a model of a neighborhood with its sewer system, called MURI (Maquette Urbaine pour l'étude des Risques d'Inondation). This model, created in 2017, is on the INRAE Lyon-Villeurbanne site in the HHLab. It has 3 longitudinal streets, 3 transverse streets and 16 building blocks for a length of 5.4 m and a width of 3.8 m. The platform is elevated so that the sewer network can be directly beneath the streets, and can be inclined longitudinally and/or transversely by up to 5%. It can therefore be used to model the flow of water in surface streets, as well as in the sewer system, on a neighborhood scale. The sewer network has not yet been extensively exploited, which is why one of the main challenges is to successfully couple surface flows with sewer flows. The project will be organized as follows: Initially, the aim will be to reproduce the work of Chibane T. et al. (2021) on the same platform. In other words, concentrate on a single street with two drainage orifices connected to the sewer system, allowing water to drain or overflow through them. In a second stage, the aim will be to create a drainage and an overflow orifice, one for drainage and the other for overflow, all within the framework of a single street. Finally, the last objective will be to produce a dataset based on the complete neighborhood, with drainage and overflow orifices, so that it can be applied to other cities.

Chibane T. et al. 2021. Experimental study of the flow patterns in a street during drainage or overflow to or from drains. Urban Water Journal. Volume 18. No. 7. p.542-555. http://dx.doi.org/10.1080/1573062X.2021.1913612