Sensitivity of urban hydrological modeling to land-use mapping and very fine-scale precipitation variability

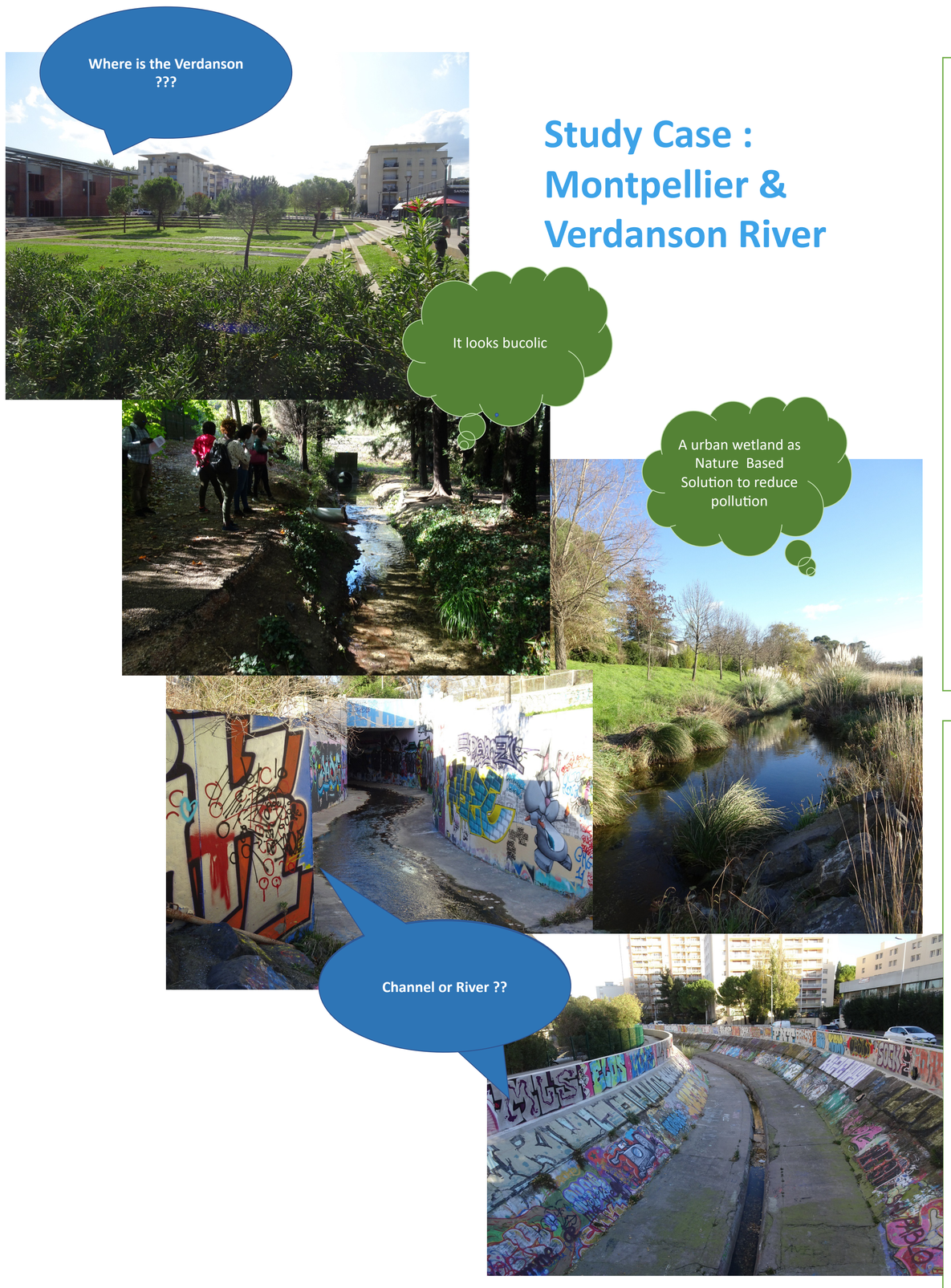
…Urban hydrology modelling for Resilient Cities…

Societal issues :

Human communities have always settled along rivers. With the expansion of towns, rivers have been integrated into the urban landscape, and their watersheds modified by soil sealing. Riverscape and hydrological regimes have been largely transformed. To limit the impact of global change and meet society's new expectations, the current challenge is to restore urban rivers. However, urban rivers are not well known.

Scientific Challenges :

The aim of urban hydrology modelling is to estimate water and material flows and test the impact of land use changes on the urban water cycle. In addition to precipitation, which is the forcing variable, it is therefore necessary to know the land use and be able to transform each class into a runoff coefficient. The rapid water dynamics of urban sub-basins require a detailed description of land use, enabling us to distinguish spatial units that are meaningful in terms of pollution export and/or runoff coefficient. **What are the influence of the rainfall mapping and land use mapping in such modelling ?**



Study Case : Montpellier & Verdanson River

Challenge « Land Use mapping for Urban Hydrological Modelling »

The production of such a map is time-consuming, and it is legitimate to rely on existing cartographies. Rio et al (2020) have developed an original method for producing such maps. This method is based on existing fine mapping, but its nomenclature is not adapted to hydrological modelling. It considers 1 ha training plots whose land use is compatible with hydrological modelling. A first modeling attempt has been made, with relevant results.

Your Mission : assess the impact of sampling the training plots on the land use map produced, and then on the modelling results. The method chosen is a jack-knife approach, applying the principle of dummy variables.

Challenge « very fine-scale precipitation mapping for Urban hydrological modelling »

Taking account of the spatial variability of rainfall in hydrological modelling is often tricky. This is due to the nature of the data, which often comes from a network of ground-based rain gauges, or radar images whose spatial resolution is sometimes too wide for the size of urban catchments. In order to characterize small-scale rainfall spatiotemporal variability, a dense rain gauges network (18 tipping bucket rain gauges) is deployed at Montpellier (France) with inter-gauges distances from 100m to 1km.

Your Mission : Test the influence of the precipitation mapping assessed from the high spatio-temporal density network of rain gauges of the HSM Urban Observatory on the hydrological modeling.

References :

Rio M., 2020. Flux de contaminants dans un bassin versant côtier méditerranéen lors d'évènements pluvieux : quels bénéfices de la désimperméabilisation des espaces urbanisés ? Etude à différentes échelles sur la zone de Montpellier. *Doctorat, Université de Montpellier*

Rio, M., Salles, C., Cernesson, F., Marchand, P., & Tournoud, M.G., 2020. An original urban land cover representation and its effects on rain event-based runoff and TSS modelling. Journal of Hydrology, 586, pp. 1-14. https://doi.org/10.1016/j.jhydrol.2020.124865

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