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Runoff and associated transport processes in urban areas

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Runoff is the most important component of the hydrological cycle, being of the highest importance in hydrological studies of drainage basins, design of urban drainage systems, water erosion, and soil and water conservation measures. During the last decades, population growth and consequent urban expansion led to an increase in soil occupation, resulting in profound changes of the natural hydrological cycle and threatening the sustainable development of human habitat.

This study presents results of laboratorial work aiming at analyzing the influence of rain on the dynamics of sediment and pollutant transport by runoff in urban areas, namely on bare soils, impermeable areas and grasslands. The laboratory work allowed the study of the effect of non-moving and moving rain (wind driven rain) on these processes. The data obtained allowed to quantify the processes involved: precipitation, runoff, and sediment and pollutant transport. A simple kinematic-wave model was used to compare the numerical results with the ones obtained in the laboratory. This study was complemented with field experiments in urban areas.

The temporal and spatial evolution of an urbanized area in Portugal near Lisbon (Vila de Sobral de Monte Agraço) was analyzed in order to understand the potential effects on runoff and sediment and pollutant transport of the urban expansion.