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Impact of land-use on water pollution in a rapidly urbanizing catchment in China

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Many catchments in developing countries are undergoing fast urbanization which is usually characterized by population increase, economic growth as well as drastic changes of land-use from natural/rural to urban area. During the urbanization process, some catchments experience water quality deterioration due to rapid increase of pollution loads. Nonpoint source pollution resulting from storm water runoff has been recognized as one of the major causes of pollutants in many cities in developing countries. The composition of land-use for a rapidly urbanizing catchment is usually heterogeneous, and this may result in significant spatial variations of storm runoff pollution and increase the difficulties of water quality management in the catchment. The Shiyan Reservoir catchment, a typical rapidly urbanizing area in China, is chosen as the study area, and temporary monitoring sites were set at the outlets of its 6 sub-catchments to synchronously measured rainfall, runoff and water quality during 4 storm events. Three indicators, event pollutant loads per unit area (EPL), event mean concentration (EMC) and pollutant loads transported by the first 50% of runoff volume (FF50), were used to describe the runoff pollution for different pollutants (such as COD, BOD, NH3-N, TN, TP and SS) in each sub-catchment during the storm events; and the correlations between runoff pollution spatial variations and land-use patterns were tested by Spearman's rank correlation analysis. The results indicated that similar spatial variation trends were found for different pollutants (EPL or EMC) in light storm events, which strongly correlate with the proportion of residential land-use; however, they have different trends in heavy storm events, which correlate with the different proportional combination of residential, industrial, agricultural and bare land-use. It is also shown that it is necessary to consider some pervious land-use types in runoff pollution monitoring or management for a rapidly urbanizing area, particularly in heavy storm.