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Vulnerability of river bed sediments in karstic areas for persitant organic pollutants

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Urban inputs to river systems include persitant organic pollutants (POPs) such Polycylic Aromatic Hydrocarbons (PAH) or Polichlorinated Biphenyls (PCB). Suspended sediment particles act as transport vehicles for such hydrophobic pollutants which, finally, may get trapped in river bed sediments and pose a risk to invertebrates residing within the sediments and fish feeding upon the invertebrates. Recently, it was demonstrated for a suite of catchments in Germany that the loading of river bed sediments with PAH is more or less time invariant and may be predicted based on the ratio of inhabitants living within the catchment and the catchment's sediment yield. The supply of more or less clean background particles from the catchment area leads to a dilution of the contaminated urban particles. Consequently, the hypothesis was raised that catchments with low sediment yield are more vulnerable to contamination of river bed sediments with hydrophobic urban pollutants. We tested this hypothesis in karstic areas in Southwest-Germany, including river catchments, that receive low sediment fluxes due to weak erosion processes, as well as karst springs. Here, sediments suspended during high discharge events as well as river bed sediments were sampled and analysed for PAH and PCB. The results confirm that sediments in these systems are impacted above-average even if the proportion of urban area in the catchments is low. The results demonstrate that a sustainable urban hydrology management needs to take into account catchment-specific particularities and vulnerabilities. Measurement of sediment fluxes should be part of monitoring programs as they allow to assess potential contaminations with particle-related pollutants especially in rivers with low sediment yield. Pollutant concentrations determined from suspended sediments proved to be more reliable than from river bed sediments as the latter are much more affected by heterogeneities.