



GIS-based estimation of pesticide input into surface water in Switzerland

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According to rapid changing climatic and environmental condition in combination with water contamination from human sources an improved monitoring of surface water is required. In the present study an efficient screening method for estimating the pesticide input into surface water of Switzerland was developed. The potential pesticide distribution, one component of the pesticide input, was directly calculated from the allocation of arable land and yearly cultivation statistics.

In contrast estimating the processes of pesticide loss, including all site-related factors was done by an indirect approach, due to the lack of pesticide measurement data. Based on results of previous studies, the hydrological response of an area was used as a proxy variable for the pesticide loss. For 57 gauged catchments in the Midlands of Switzerland, the fast flow index, an indicator for the hydrological response, was calculated from discharge data. For national wide available data topographical, soil and climate attributes of the catchments were generated.

In a single linear regression analysis one of each attribute group (topography, soil and climate) were identified as major influence factors for the fast flow index. The highest coefficient of determination (R^2) was obtained for soil permeability (0.46), followed by river density (0.39) and precipitation frequency (0.36). Linear and non-linear models were screened with multi factors. Considering collinearity and plausibility, a non-linear model with two factors (soil permeability and river density) was used for predicting fast flow index in ungauged catchments. By overlaying the predicted fast flow index with the potential pesticides distribution risk areas are identified on national scale.