



Analysis of heavy metal sources in storm water from urban areas

U. Scherer (1) and S. Fuchs (2)

(1) TU Munich, Institute for Water and Environment, München, Germany (u.scherer@bv.tum.de, +49 89 28923172), (2)
University Karlsruhe, Karlsruhe, Germany

The input of heavy metals into surface waters is a serious impairment of the aquatic environment. The emissions of heavy metals via point and diffuse pathways into the German river basins were thus quantified for the period of 1985 through 2005. The total emission into the German river systems decreased for each metal during the observed period. This reduction is mainly caused by the decline of emissions via point sources. The measures taken by industry and implemented within the scope of a stringently water legislation have decisively contributed to an improvement of environmental conditions. Today's emissions of heavy metals into river basins of Germany are dominated by the input via diffuse pathways. One of the most important diffuse input is the storm water discharged from paved urban areas into the surface waters via storm sewers and combined sewer overflows especially for the metals copper, zinc and lead. The objective of this project was to identify the sources of these three heavy metals washed off from paved urban areas.

The use of copper, zinc and lead on the outsides of buildings results in emissions to water and soil via rainwater due to weathering and runoff of soluble and insoluble metallic compounds. Copper and zinc are traditionally used materials in the building sector especially for roofs, gutters and facades. Lead, in contrast, plays only a subordinate role due to its more limited outdoor use. The corrosion rates vary widely. Climatic factors (temperature, humidity etc.), above all the presence of corrosive gases (sulphur dioxide, nitrogen oxide, ozone etc.) influence the corrosion processes. Estimates of industrial associations were referred to in order to determine the corrosion relevant metal surfaces. Heavy metal emissions caused by traffic are complex and depend on many parameters which vary by locality, time and substance. In principle, substances can be emitted by vehicles, the road surface and by maintenance. Emissions of copper, lead and zinc are mainly caused by wear and tear of tyres and brake pads. The reference figures of the environmental emissions are usually the kilometres driven per vehicle. The emissions can then be calculated based on the road performance. Furthermore atmospheric deposition on paved urban areas was considered.

The heavy metal emission from each individual source and the portion discharged into surface waters via storm sewers and combined sewer overflows was quantified. The emission sum of all sources was validated using emission data of storm sewers based on measured heavy metal concentrations and the discharge volume showing a good agreement.