

## **Heavy metal enrichment in the riparian sediments and soils of the Three Gorges Reservoir, China**

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**Abstract** The Three Gorges Reservoir encompasses a riparian zone with a vertical height of 30 m and a total area of 349 km<sup>2</sup> that has been subjected to alternate inundation and exposure due to regular impoundment. Sedimentation on the riparian landforms constitutes an important pathway for riverine contaminant redistribution. In an attempt to understand heavy metal enrichment since water inundation, riparian sediments and soils were sampled along five transects in a typical riparian zone composed of cultivated bench terraces in the middle reaches. Heavy metals (Cr, Ni, Cu, Zn, As, Cd and Pb) were determined to characterize the lateral distribution and vertical transfer ratio. The results indicated that all heavy metals were enriched to varying extents both in the riparian sediments and soils, compared with regional background contents in soils and the reference levels in sediments. However, heavy metal levels in the riparian sediments were generally higher than those in the riparian soils, while those in the upper riparian soils (0–5 cm) were overall slightly higher than those in the lower riparian soils (5–10 cm). There was a decreasing trend of heavy metal contents with increasing elevation. The elevated levels of heavy metals in the riparian sediments may be attributed to sediment yields from upstream anthropogenic sources, especially during major rainstorms in the wet season when large loads of contaminated sediment may be produced from diffuse source areas. Heavy metals can also be adsorbed to pure sediment in the course of mobilization or after deposition. Considering that the riparian soils are local weathering products without mobilization, the enrichment of heavy metals may principally be ascribed to chemical adsorption from dissolved fractions or vertical transfer from overlaid sediments. Heavy metal enrichment may further be affected by the specific type of hydrologic regime such that relatively long flooding duration caused by water impoundment and natural floods was responsible for the relatively higher levels of heavy metals in the lower portions of the riparian zone.

**Key words** sedimentation; heavy metal; diffuse contaminants; riparian zone; Three Gorges Reservoir