

Leaching of two northern France slag heaps: Influence on the surrounding aquatic environment

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After the exploitation of coal mines in the 19th and 20th centuries in northern France, many mining slag heaps (SH) were left without any particular management or monitoring. Currently, the influence of these SHs on the quality of surrounding wetlands is hardly known. The purpose of this work is to determine the water quality in the neighbourhood of two SHs located near the city of Douai and its influence on the distribution of aquatic invertebrates in local wetlands. Our approach involves (1) the spatial and temporal characterization of the water composition (anions, major elements, sulphide, DOC and alkalinity) and of the biological diversity (aquatic invertebrates) and (2), based on this chemical and biological screening, the establishment of relationships between water quality and biodiversity distribution through multivariate data analysis. The results clearly indicate that substantial leaching from the slag heaps occurs, given the very high concentrations of dissolved sulphates (in the range of 2 g L⁻¹). While the pH remains weakly basic, indicating that the leaching water has been neutralized by the highly carbonated regional substratum, high levels of biodegradable organic matter and sulphate contents have been noticed. They sporadically cause significant drops in dissolved oxygen and the occurrence of dissolved sulphides that massively reduce biodiversity, qualitatively and quantitatively. In Summer, oxygen saturation is generally lower due to the higher rate of organic matter degradation, and the risk of anoxic episodes therefore increases. Finally, as wetlands are vulnerable environments, these preliminary results suggest that monitoring and management of these sites must be attempted quickly to avoid the degradation of those valuable habitats. [Display omitted] •Wetlands are widely enriched in sulphates, caused by slag heap leaching. •Impact of leaching on wetlands was assessed using chemical & biological approaches. •The water composition reveals a typical example of a neutralized acid mine drainage. •Combination of high S²⁻, low O₂ and pH may lead to a loss of biodiversity. •Variations in DOC and lixivate composition induce spatio-temporal changes. Leaching of slag heaps introduces in the surrounding wetlands high amounts of sulphates that influences the aquatic biodiversity through redox processes