

Environmental analytical research in Northern Vietnam - A Swiss-Vietnamese cooperation focusing on arsenic and organic contaminants in aquatic environments and drinking water

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Abstract: A long-term education and research partnership has been established between the Swiss Federal Institute for Environmental Science and Technology (EAWAG) and two university institutes in Hanoi. Here we give a summary report on environmental analytical investigations conducted in cooperation with the Hanoi University of Science focusing on (i) arsenic contamination in ground and drinking water, (ii) volatile organic compounds (VOCs) including disinfection by-products and chlorination practice in drinking water, (iii) analysis and occurrence of organophosphorus pesticides in rice growing areas, and (iv) chlorinated phenols and other chlorinated pollutants in wastewater of a pulp and paper mill. Arsenic concentrations ranged from 1 to 3050 µg/l (average 159 µg/l) in groundwater from the city of Hanoi and surrounding rural areas. The high arsenic levels indicate that several million people consuming untreated groundwater might be at a considerable risk of chronic arsenic poisoning. Water produced by the Hanoi waterworks is partly affected by arsenic, but VOCs and disinfection by-products were below international guideline limits. However, the current chlorination practice was found to be critical regarding water quality issues. Chlorinated pollutants were particularly abundant in wastewater effluents of pulp bleaching, suggesting that point-of-source treatment options should be implemented. The high pesticide concentrations measured in rice fields (>500 µg/l) were rapidly flushed into ambient surface waters, where beneficial organisms could be affected.

Author Keywords: Arsenic; Groundwater; Organophosphorus pesticides; Trihalomethanes; Wastewater

Index Keywords: arsenic; chlorine derivative; drinking water; ground water; organophosphate pesticide; phenol derivative; surface water; volatile organic compound; aquatic environment; arsenic poisoning; article; chlorination; disinfection; effluent; organic pollution; paper industry; pulp processing; rice; rural area; Viet Nam; water contamination; water quality

Year: 2003

Source title: *Chimia*

Volume: 57

Issue: 9

Page : 529-536

Cited by: 11

Link: [Scopus Link](#)

Chemicals/CAS: arsenic, 7440-38-2

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ISSN: 94293

CODEN: CHIMA

Language of Original Document: English

Abbreviated Source Title: *Chimia*

Document Type: Article

Source: Scopus

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