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

Giger W., Berg M., Pham H.V., Duong H.A., Tran H.C., Cao T.H., Schertenleib R.

Swiss Fed. Inst. Environ. Sci./T., ??berlandstrasse 133, CH-8600 D?bendorf, Switzerland; Ctr. Environ. Technol./S., Hanoi University of Science, Vietnam National University, 334 Nguyen Trai Street, Hanoi, Viet Nam

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 ?g/l (average 159 ?g/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 ?g/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: Scorpus Link

Chemicals/CAS: arsenic, 7440-38-2
Correspondence Address: Giger, W.; Swiss Fed. Inst. Environ. Sci./T., ??berlandstrasse 133, CH-8600 D?bendorf, Switzerland; email: giger@eawag.ch
ISSN: 94293
CODEN: CHIMA
Language of Original Document: English
Abbreviated Source Title: Chimia
Document Type: Article
Source: Scopus
Authors with affiliations:

1. Giger, W., Swiss Fed. Inst. Environ. Sci./T., ??berlandstrasse 133, CH-8600 D?bendorf, Switzerland
2. Berg, M., Swiss Fed. Inst. Environ. Sci./T., ??berlandstrasse 133, CH-8600 D?bendorf, Switzerland
3. Pham, H.V., Ctr. Environ. Technol./S., Hanoi University of Science, Vietnam National University, 334 Nguyen Trai Street, Hanoi, Viet Nam
4. Duong, H.A., Ctr. Environ. Technol./S., Hanoi University of Science, Vietnam National University, 334 Nguyen Trai Street, Hanoi, Viet Nam
5. Tran, H.C., Ctr. Environ. Technol./S., Hanoi University of Science, Vietnam National University, 334 Nguyen Trai Street, Hanoi, Viet Nam
6. Cao, T.H., Ctr. Environ. Technol./S., Hanoi University of Science, Vietnam National University, 334 Nguyen Trai Street, Hanoi, Viet Nam
7. Schertenleib, R., Swiss Fed. Inst. Environ. Sci./T., ??berlandstrasse 133, CH-8600 D?bendorf, Switzerland

References:

1. Duong, H.A., Berg, M., Hoang, M.H., Pham, H.V., Gallard, H., Giger, W., Von Gunten, U., (2003) Water Research, 37, p. 3242
2. Berg, M., Tran, H.C., Nguyen, T.C., Pham, H.V., Schertenleib, R., Giger, W., (2001) Environ. Sci. Technol., 35, p. 2621
3. Nguyen, H.M., Pham, H.V., Giger, W., Berg, M., (2001) Anal. Sci., 17, pp. a375
4. Espino, M.P., Aga, D.S., Nguyen, H.M., Singer, H., Berg, M., M?ller, S.R., (2001) Kimika, 17, p. 13
5. Schmidt, T.C., Duong, H.A., Berg, M., Haderlein, S.B., (2001) Analyst, 126, p. 405
6. Pham, H.V., Tran, H.C., Cao, T.H., Hoang, V.H., Berg, M., Schertenleib, R., (2003) Arsenic Exposure and Health Effects, 5. , Eds. W. R. Chappell, C. O. Abernathy, R. L. Calderon, Elsevier, Oxford, UK
7. Tran, H.C., Nguyen, T.H., Berg, M., Pham, H.V., (2003) Arsenic Exposure and Health Effects, 5. , Eds. W.R. Chappell, C.O. Abernathy, R.L. Calderon, Elsevier, Oxford, UK
8. Nguyen, H.M., Pham, N.H., Pham, H.V., Giger, W., Berg, M., (2000) J. of Analytical Sciences of the Vietnam Analytical Sciences Society, 5 (3), p. 39
9. Duong, H.A., Hoang, M.H., Pham, H.V., Berg, M., Giger, W., (2000) J. of Analytical Sciences of the Vietnam Analytical Sciences Society, 6 (2), p. 31
10. Duong, H.A., Pham, H.V., Gallard, H., Berg, M., (2000) J. of Analytical Sciences of the Vietnam Analytical Sciences Society, 6 (4), p. 63
11. Pham, H.V., Tran, H.C., Nguyen, T.C., Berg, M., Giger, W., Schertenleib, R., (2001) Bulletin of Geology and Minerals of Vietnam, 57
12. Tran, H.C., Vu, V.T., Pham, H.V., Hoang, V.H., (2001) Bulletin of Geology and Minerals of Vietnam, 81

13. Vu, D.N., Nguyen, T.N., Vo, T.L., Cao, T.H., Pham, H.V., Schertenleib, R., Giger, W., Berg, M., (2002) Proceedings of the 2nd Conference on Environmental Science and Technology, p. 30. , Hanoi University of Science
14. Duong, H.A., Pham, H.V., Lam, N.T., (2002) Proceedings of the 2nd Conference on Environmental Science and Technology, p. 53. , Hanoi University of Science
15. Berg, M., (2002) EAWAG News, pp. 53e
16. Smedley, P.L., Kinniburgh, D.G., (2002) Appl. Geochem., 17, p. 517
17. Nickson, R.T., McArthur, J.M., Ravenscroft, P., Burgess, W.G., Ahmed, K.M., (2000) Appl. Geochem., 15, p. 403
18. Berg, M., Hug, S., Van Der Meer, J.R., Zobrist, J., (2002) Aqua Press International, 4, p. 15
19. Trafford, J.M., Lawrence, A.R., Macdonald, D.M.J., Nguyen, V.D., Tran, D.N., Nguyen, T.H., (1996) BGS Technical Report WC/96/22, , British Geological Survey, Keyworth, UK
20. www.eawag.ch/arsenicBellar, T.A., Lichtenberg, J.J., Kroner, R.C., (1974) J. Am. Water Works Ass., 66, p. 703
21. Singer, P.C., (1993) Safety of Water Disinfection: Balancing Chemical and Microbial Risk, , Ed. G. F. Craun, ILSI Press, Washington, DC
22. Palacios, M., Pampillon, J.F., Rodriguez, M.E., (2000) Water Research, 34, p. 1002
23. Mitch, W.A., Sedlak, D.L., (2002) Environ. Sci. Technol., 36, p. 588
24. Beltran, J., Lopez, F.J., Hernandez, F., (2000) J. Chromatogr. A, 885, p. 389