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Metals and arsenic in sediment and fish from Cau Hai lagoon in Vietnam:  
ecological and human health risks

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1 **Metals and arsenic in sediment and fish from Cau Hai lagoon in Vietnam: ecological and human**  
2 **health risks**

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7 **Highlights:**

- 8
- EF and I-geo values indicate that surface sediments are contaminated by As and Bi.
  - Ecological risk (ER) are ranked as  $ER_{As,Cd} > ER_{Pb} > ER_{Ni} > ER_{Cr, Cu, Zn}$ .
  - Farm fishes are slightly more contaminated by As than wild fishes.
  - THQ and TR values reflect a potential health risk for regular fish consumers.
- 11

12 **ABSTRACT**

13 Concentrations of Al, As, Bi, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, U, V and Zn were quantified in  
14 surface sediments collected from 13 different sampling sites from Cau Hai lagoon in Central  
15 Vietnam, and in 8 wild and farmed-fishes involving both pelagic and benthic species.  
16 Multivariate analysis shows that these trace elements are mainly associated with lithogenic  
17 matter, and are most likely the result of alteration and erosion processes in the lagoon.  
18 Enrichment factors and geo-accumulation indices reveal substantial sediment enrichments for  
19 both As and Bi with respect to the mean composition in the upper continental crust. As is  
20 enriched in the edible portion of fish tissue with values up to 10 times higher than the allowed  
21 limits set up by Health Canada. Target hazard quotient and target carcinogenic risk for As were  
22 assessed through fish diet and were greater than 1 and  $10^{-4}$ , respectively, indicating potential  
23 health risks for fish consumers in Cau Hai lagoon.

24 **Key words:** trace metals, arsenic, sediment, fish, Cau Hai lagoon

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