Degraded peatlands of South East Asia: a source of Trace Metal to surface waters

Laure Gandois¹, Alison M. Hoyt², Stéphane Mounier³, Gaël Le Roux¹, Charles F. Harvey², Adrien Claustres¹, Mohammed Nuriman⁴, and Gusti Anshari⁴

¹EcoLab, Université de Toulouse, CNRS, INPT, UPS, Toulouse, France (laure.gandois@ensat.fr)
²Department of Civil & Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA 01239, USA
³PROTEE, Université de Toulon, F-83957, La Garde, France
⁴Magister of Environmental Science, and Soil Science Department, Universitas Tanjungpura (UNTAN), Pontianak, West Kalimantan Province, Indonesia

Worldwide, peatlands are important sources of dissolved organic matter (DOM) and trace metals (TM) to surface waters and these fluxes may increase with peatland degradation. In Southeast Asia, tropical peatlands are being rapidly deforested and drained. The black rivers draining these peatland areas have high concentrations of DOM. However, the fate of this fluvial carbon export is uncertain, and its role as a trace metal carrier has never been investigated. This work aims to address these gaps in our understanding of tropical peatland DOM and associated elements in the context of degraded tropical peatlands of Indonesian Borneo. We quantified dissolved organic carbon and trace metals concentrations in the dissolved, fine colloidal and coarse colloidal fractions and determined the characteristics (optical and isotopic) of the peatland-derived DOM as it drains from peatland canals, flows along black river and eventually mixes with the Kapuas Kecil River before meeting the ocean near the city of Pontianak in West Kalimantan, Indonesia. Black rivers draining degraded peatlands show significantly higher concentrations of Al, Fe, Pb, As, Ni, and Cd, compared the white river. A strong association is observed between DOM, Fe, As, Cd and Zn in the dissolved and fine colloid fraction, while Al is associated to Pb and Ni and present in a higher proportion in the coarse colloidal fraction. We additionally measured the isotopic composition of lead released from degraded tropical peatlands for the first time and show that Pb originates from anthropogenic atmospheric deposition. Degraded tropical peatlands are important sources of DOM and trace metals to rivers and a secondary source of atmospherically deposited contaminants.