

## ABSTRACT for DGT CONFERENCE 2015

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**TITLE:** Environmental impact assessment of a metal alloy production plant on the water quality of a tributary of the largest Brazilian river (São Francisco River)

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### ABSTRACT

Over more than 50 years, the activity of one of the world's largest metal alloy producers, located in the margins of São Francisco River (SF), Brazil, have produced tailings that have been accumulated in the surrounding area. The lack of an environmental concern lead to a heavy metal contamination, much above the critical levels, which accumulate in the soils of the drainage area and in the sediments and water column of the nearby waterways.

To reverse the negative impact of this contamination and to prevent its extension to the largest Brazilian river, under the request and payment of the company, it has been conducted an extensive study to characterize the area affected by the industrial activity, with particular emphasis on the geochemistry of the soils, sediments and water column. This work aims to discuss the heavy metal contamination level of the water of a small waterway, tributary of SF, which receive all the drainage coming from the affected area. Beside the knowledge of its extent, this study also sought to discuss its linkage with the levels and chemical forms in which metals occur in the sediments accumulated in the bottom and alluvial plains.

The analysis of the waterway was performed in the rainy and dried season. Two different studies had been done: (1) water sampling; (2) placing DGT (Chelex and Fe-oxide Gel) at various depths in water for 5 days. At the time of the sampling and of the placement/collection of DGT, it was recorded the time and measured physical-chemical parameters (temperature, pH, conductivity, redox potential). Water samples (acidified) and DGT, were chilled since the time of collection until the analysis in laboratory. The resin of the DGT was placed in acid solutions to give the passage of ions into the aqueous phase (1) 1M HNO<sub>3</sub> solution, 24h for Chelex DGT and (2) 0,25M H<sub>2</sub>SO<sub>4</sub> solution, followed by shaking for 2h, for Fe-Oxide DGT. The solutions and the filtered water samples were analyzed for metallic elements (As, Cd, Cr, Cu, Fe, Mn, Ni, Pb and Zn) by ICP-OES in axial view mode, coupled with an ultrasonic nebulizer.

The analysis of physic-chemical parameters showed higher values of Eh and conductivity and a pH reduction in the dried period. Among the analyzed elements, Cd, Cu, Mn and Zn are in failure in respect of the limit allowed for fresh waters, in particular Zn which has contents about a hundred times higher. These values are in agreement with the high concentrations found in sediments and the chemical forms in which metals preferably occur, soluble phase in pore water and as exchangeable cations, demonstrating the high mobility of these elements and their environmental hazard. For the effectiveness of the environmental remediation of this area and for the improvement of the water quality, it's urgent to prevent the migration of toxic elements to São Francisco River. To do this, it's necessary to cease all contamination sources and to establish a soil and alluvium recovery strategy, which lead to the chemical immobilization of these metals.