

HEAVY METAL PARTITIONING AND ORAL BIOACCESSIBILITY IN MINE SOILS OF THE ITALIAN ALPS

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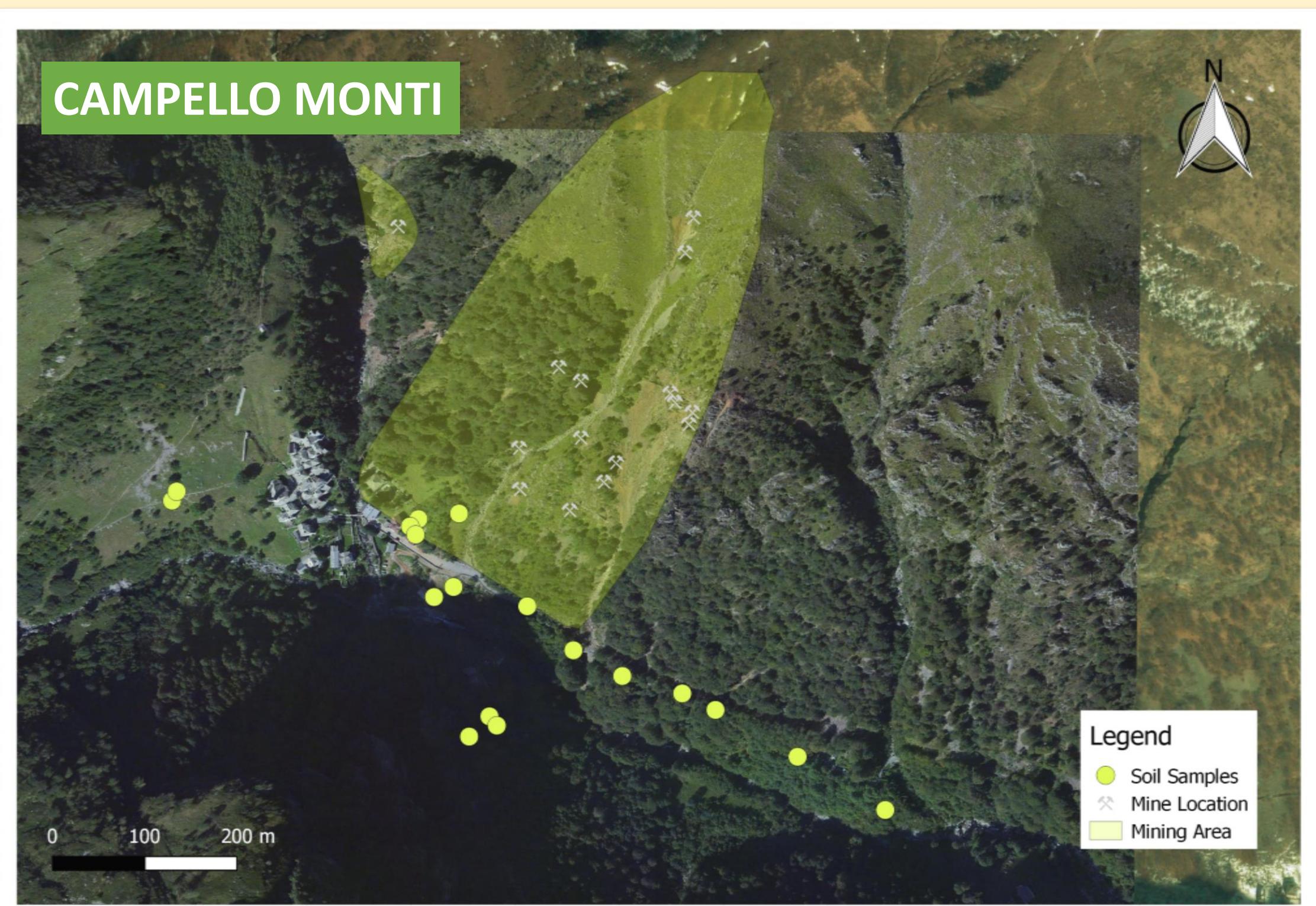
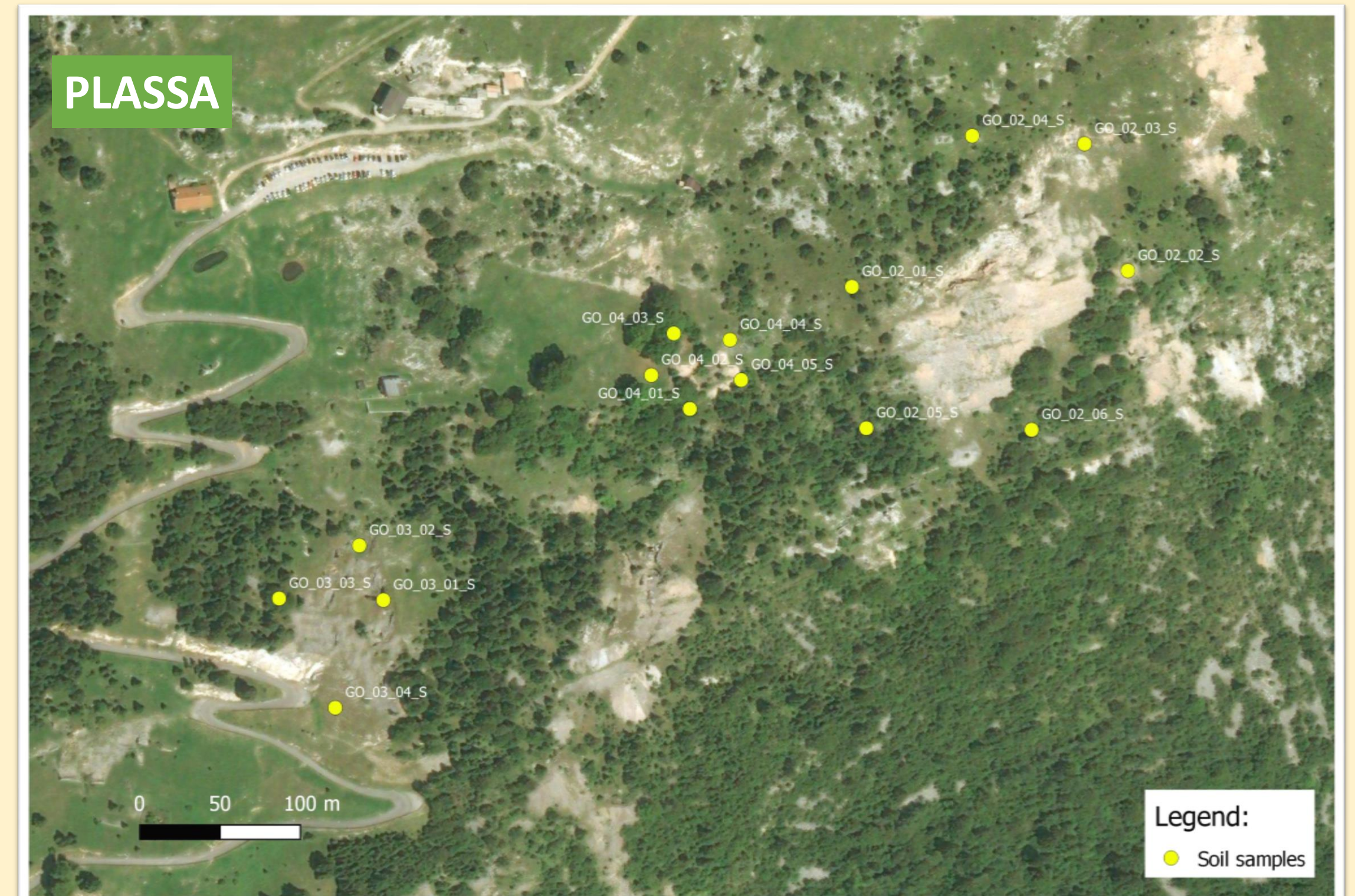
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INTRODUCTION

The impact of past mining activities on the surrounding environment has been documented in several locations around the world.

To understand the risk posed by metals and the dynamics in the surrounding environment the key features are the bioaccessible concentrations along with the information on metals mobility and speciation.

The aim of this study was to assess the environmental impact of the abandoned mine sites on the surrounding soils and the potential impacts of metals on other environmental compartments.



MATERIALS & METHODS

In this research, we assessed the impact of two mining sites located in the Alps in Northern Italy; the Campello Monti site (CM, above), in the Piemonte Region (45°06'59" N; 8°14'13" E), exploited for Fe-Ni-Cu-Co sulphide deposits and the Plassa site (PL, left), in Lombardia (45°54'35"N; 9°47'47"E), a large area where Zn and Pb have been extracted since Roman times.

RESULTS

Table 1: Bio-accessible metals in Plassa soils.

Values represent metal concentration and the proportion of the element with respect to its pseudo-total content

Sample	Co		Cd		Cu		Pb		Zn	
	mg/kg	% tot	mg/kg	% tot	mg/kg	% tot	mg/kg	% tot	g/kg	% tot
PL02_01	4.0	20	40	52	10.2	6.9	49	25	3.4	23
PL02_02	2.7	19	21	46	2.7	8.6	105	27	1.6	16
PL02_03	3.6	22	45	92	6.0	18	46	16	18.1	---
PL02_04	3.3	24	38	59	4.9	13	50	35	9.0	74
PL02_05	3.7	19	50	59	13.9	19	52	48	16.0	58
PL02_06	4.5	21	53	53	12.7	20	34	34	19.5	75
PL04_03	7.2	58	212	43	55.8	32	96	50	56.0	42
PL04_04	2.2	12	43	61	7.2	19	141	36	10.0	47
PL04_05	2.1	12	48	46	11.0	18	119	40	16.6	51
PL04_01	1.1	4.6	7	56	3.3	14	103	39	0.7	10
PL04_02	0.5	2.6	24	59	4.6	12	92	31	3.5	40
PL03_01	10.8	89	63	51	12.9	18	48	36	19.5	64
PL03_02	1.0	14	140	52	30.7	28	59	45	46.8	54
PL03_03	0.8	5.7	47	46	11.2	19	55	43	19.5	72
PL03_04	2.0	17	75	59	31.3	34	65	52	21.5	38

Table 2: Bio-accessible metals in Campello Monti soils.

Values represent metal concentration and the proportion of the element with respect to its pseudo-total content

Sample	Co		Cr		Cu		Ni		Pb		Zn	
	mg/kg	% tot	mg/kg	% tot	mg/kg	% tot	mg/kg	% tot	mg/kg	% tot	mg/kg	% tot
CM_01	0.39	1	0.0	0.0	6.8	18	7.0	21	51.0	35	30	18
CM_02	0.68	2	0.0	0.0	8.5	24	5.9	18	31.1	37	17	11
CM_03	5.27	9	6.7	0.9	237	7	132	23	22.8	44	12	12
CM_04	2.51	4	11.8	2	58.3	30	14.2	3	2.5	14	2.2	5
CM_05	1.62	3	14.6	2	22.0	13	12.3	3	2.2	12	2.4	4
CM_06	4.23	10	2.2	0.7	12.4	17	16.8	13	32.6	46	12	12
CM_07	6.93	10	3.2	0.2	29.5	12	67.4	12	32.8	52	17	18
CM_08	8.80	19	1.3	0.2	37.2	27	59.8	22	20.7	40	16	20
CM_09	0.85	3	1.9	0.8	11.3	20	6.8	7	37.3	50	12	12
CM_10	6.88	15	1.7	0.3	19.3	14	56.5	20	62.8	61	11	14
CM_11	0.70	4	1.9	1	7.1	6	7.6	10	64.6	55	12	18
CM_12	1.05	4	2.2	1	10.3	14	4.3	5	31.0	50	13	13
CM_13	0.11	0.4	0.0	0.0	0.4	0.2	0.8	0.1	0.4	1.3	0.2	0.3
CM_14	0.33	0.5	0.3	0.1	7.5	0.8	14.0	1.3	0.4	1.5	0.2	0.2
CM_15	0.00	0.0	1.8	0.3	3.7	0.4	33.2	0.3	0.4	1.6	0.2	0.1
CM_16	0.04	0.4	0.0	0.0	0.2	0.4	0.9	0.7	3.0	1.9	1.2	1.4
CM_17	0.08	0.3	0.0	0.0	0.2	0.6	7.5	1	0.7	0.9	0.2	0.2
CM_18	0.00	0.0	5.8	1	4.0	0.8	274	13	0.4	0.8	0.2	0.3

CONCLUSIONS

The soils of both sites are heavily contaminated by metals. The CM soils are especially polluted by Ni, Cr and Cu. In PL the soils are particularly contaminated by Cd and Zn and their bio-accessible fraction is very high. This depicts a potentially dangerous situation in both locations.