ReSoil

Remediation case #2

Construction of vegetable garden with raised beds with remediated soil from city of Arnoldstein, Austria

Launch: August 2018

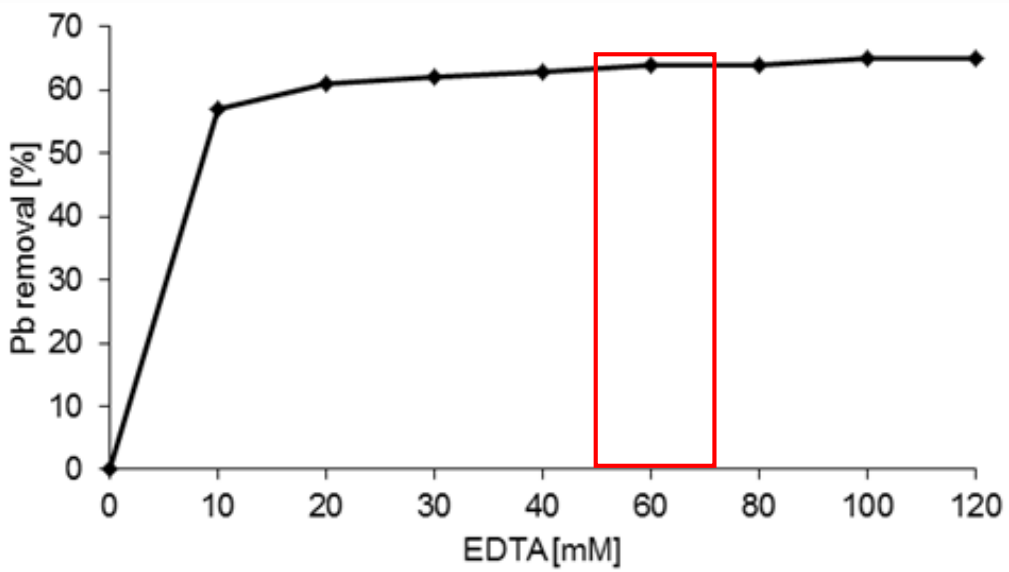
Location
(initial, small-scale study)

The soils were collected from the upper 30 cm layer of active farmland in Arnoldstein, Austria (latitude 46,5545; longitude 13,6828)

Lead mining and smelting for more than 300 years caused environmental accumulation of Pb, Zn and Cd. The extent of metal contamination in Arnoldstein is about 10 km², most of it in woody areas. Arable and grassland is affected in an area less than 1 km². The area used for housing and gardening in Arnoldstein and nearby Hohenturn is small (few ha) but highly contaminated.

Remediation efficiency
(initial, small-scale study)

Acidic soils are characterized by higher efficiency of toxic metal removal compared to calcareous soils. Medium EDTA dose of 60 ± 10 mmol EDTA ton^{-1} of soil was used in remediation process.

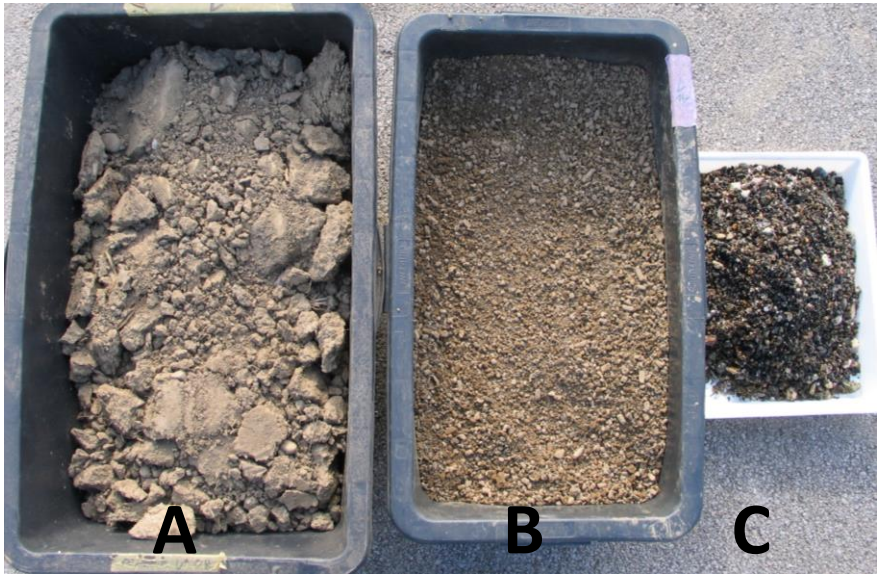


Concentration of toxic metals in original and remediated soil and metal removal efficiency.

Toxic metal	Original soil	Remediated soil	% removal
Pb (mg kg^{-1})	862 ± 8	191 ± 4	78
Zn (mg kg^{-1})	331 ± 5	263 ± 3	21
Cd (mg kg^{-1})	3.0 ± 0.1	0.5 ± 0.0	83

Remediation: effect on soil properties
(initial, small-scale study)

Original (A) and remediated (B) soil with complement rinsed oversize material (C).



Current activity: permits for soil excavation and transportation to remediation plant in Prevalje, Slovenia are obtained.

Forthcoming activity: remediation of 20 tons of contaminated soil from Arnoldstein in Prevalje remediation plant.

Soil properties were not significantly changed after remediation. Part of washed sand fraction was separated from remediated soil to improve soil gardening properties.

Pedological analysis	Original soil	Remediated soil
pH ($CaCl_2$)	5.1	5.9
Organic matter (%)	4.9	4.9
C/N	10.4	11.2
P_2O_2 (mg 100 g^{-1})	4	6.8
K_2O (mg 100 g^{-1})	20.7	21.4
Carbonates (%)	1	1
CEC ($mmol_c$ 100 g^{-1})	16.4	20
Sand (%)	42.5	31.5
Silt (%)	45.9	52.1
Clay (%)	11.6	16.4
Fe (mg kg^{-1})	35800	38300
Mn (mg kg^{-1})	931	672