MarksaneringsCentrum Norr

Stabilization of contaminated soil using soil additives

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Stabilisation of contaminated soil –

Using soil amendments and vegetation *(phytostabilisation)*

- aluminosilicates
- organic matter
- iron and manganese (hydro)oxides
- alkaline material (eg coal fly ash)
- phosphate minerals

Metal tolerant species capable to immobilise metals within root zone

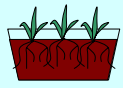
Treatment of CCA contaminated soil from *Robertsfors bruks*

Concentrations mg/kg dw

As = **5904**±194
Cr = **3829**±161
Cu = **1509**±90
Zn = **79**±6

Experimental design

Iron (Fe^0) **H_2O**



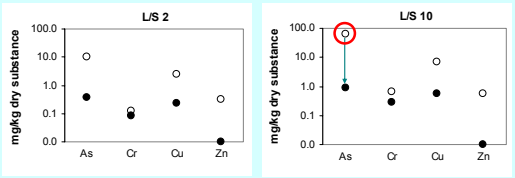
Untreated Soil **Treated Soil**

$Fe + O_2 + H_2O \rightarrow Fe(OH)_3$

- Compliance batch leaching test (NT 005)
- Sequential chemical extraction
- Physiologically based extraction test (PBET)
- Pore water (soil solution) analysis
- Plant biomass and element accumulation

Results

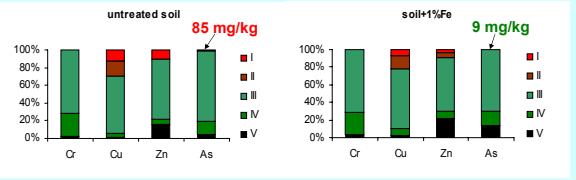
Batch leaching test – waste characterisation



	L/S 2 l/kg				L/S 10 l/kg			
	As	Cu	Cr	Zn	**As**	Cu	Cr	Zn
	mg/kg dry substance							
HW	6	50	25	90	25	100	70	200
NHW	0.4	25	4	25	2	50	10	50
IW	0.1	0.9	0.2	2	0.5	2	0.5	4

Results

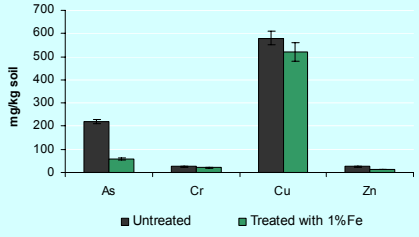
Sequential chemical extraction – detail information about contaminant mode



I – exchangeable
II – bound to carbonates
III – bound to Fe-Mn oxides
IV – bound to organic matter
V – residual

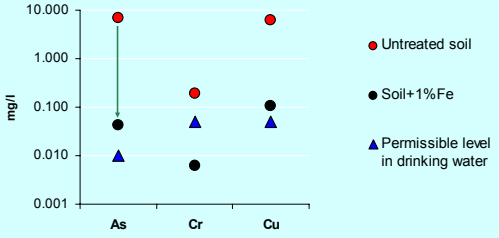
Results

Physiologically based extraction test (PBET)



Results

Pore water (soil solution) analysis

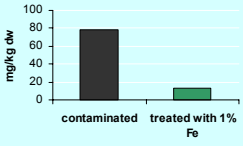


Results

Plants

Biomass

As concentration in plants



Small scale field trial

Soil solution (pore water)

100 kg of soil + 1 kg of iron

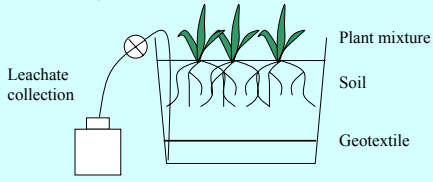
Leachate

Lysimeter experiment

Small-scale field trial

Slagnäs – Cu ore transshipment station

Lysimeter experiment



Biomass

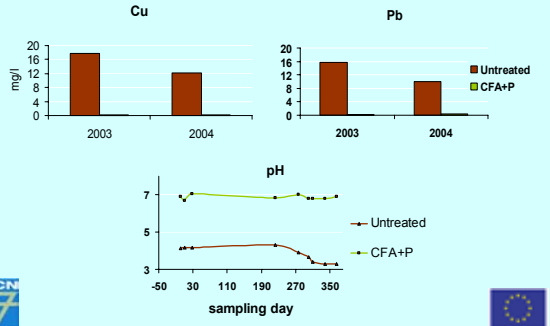
0.06 kg dw/m^2

0.22 kg dw/m^2

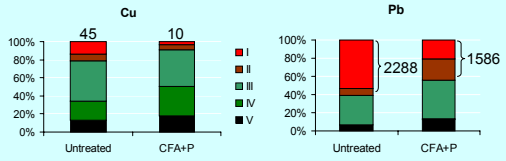
Untreated

Amended with 4.6% peat + 5% CFA

Metal emissions



Sequential extraction



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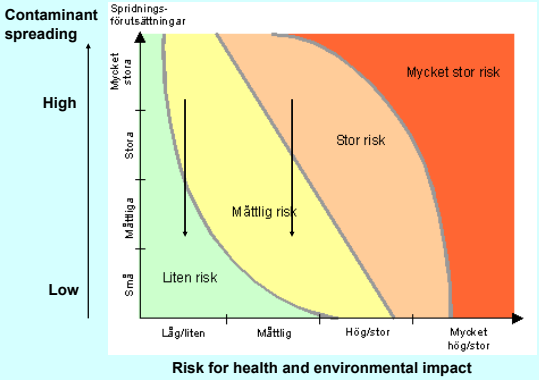
Risk evaluation



Conclusions

- The tested soil amendments were effective for the stabilistion of trace element contaminated soil:
  - Coal fly ash and peat significantly reduced the mobility of Cu and Pb.
  - Zerovalent iron significantly reduced As concentrations in all extracts and analyzed media.
- Stabilisation can reduce the risk class of the contaminated soil.