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Risk Assessment former powerplant Lake Mälaren



Goal of the project

- Former power plant, housing planned
- Polluted soil and ashes (metals, PAH)
- Assessment of actual ecological risks

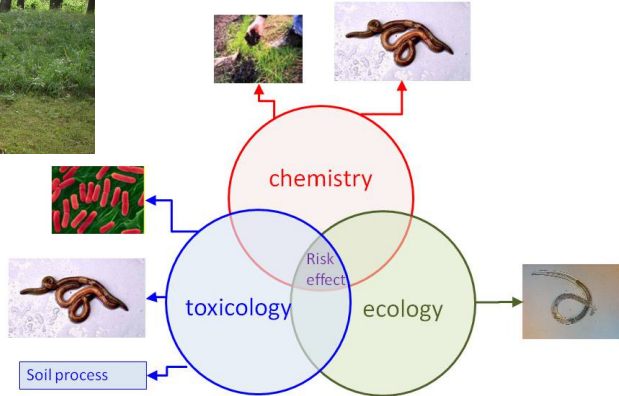


Activities soil



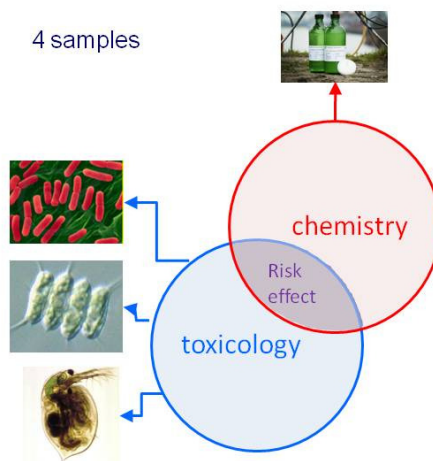
7 soil samples

Leaching tests



Activities ground water

4 samples



Results soil: chemistry

Component	unit	SP9	SP8	SP6	SP5	SP1	SP10	SP3
<i>Topsoil (XRF)</i>								
Zinc	mg/kg dw	30	150	90	1,500	1,400	40	3,100
Lead	mg/kg dw	-	15	-	-	-	-	24
<i>Subsurface</i>								
Zinc	mg/kg dw	52	51	65	76	130	190	320
Lead	mg/kg dw	9.7	24	16	15	36	110	28
Arsenic	mg/kg dw	2.6	2.7	-	3.9	21	1	9.3
Cadmium	mg/kg dw	-	-	-	-	-	-	0.99
Vanadium	mg/kg dw	17	150	19	17	28	25	31
Copper	mg/kg dw	11	38	25	19	25	67	31
Chromium	mg/kg dw	15	24	13	11	5.9	19	20
nickel	mg/kg dw	8.7	35	7.4	7.8	15	11	22
<i>Bioaccumulation (calculated risk)</i>								
PAF zinc	%	0	0	0	-	0	-	0

	Below KM value (land with sensitive use) or no negative effect
	Above KM value (land with sensitive use) or moderate effect
	Above MKM value (land with less sensitive use) or severe effect



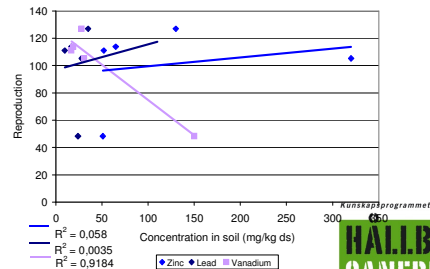
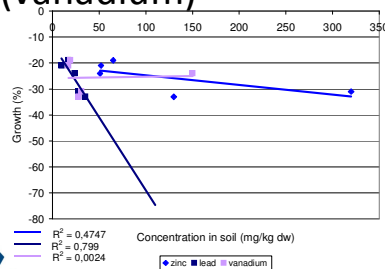
Experts in biological solutions

Kunskapsprogrammet



Results soil: toxicology

- No negative effects Microtox
- No negative effects nitrification
- Negative effects growth earthworms (lead)
- Negative effects reproduction earthworms (vanadium)



Experts in biological solutions

Kunskapsprogrammet



Results soil: ecology

- Negative effects found in nematode population
- No correlation with zinc
- Effects caused by soil use and plant coverage



Conclusion soil

Component	SP9	SP8	SP6	SP5	SP1	SP10	SP3
<i>Environmental chemistry</i>							
Subtotal environmental chemistry	0	0.14	0.07	0.92	0.82	0.05	1
<i>Ecology</i>							
Subtotal ecology	0	0.19	0.20	0.43	0.25	0.22	0.70
TOTAL Integrated Risk topsoil	0	0.17	0.14	0.67	0.53	0.13	0.85
Deviation	0	0.06	0.15	0.61	0.70	0.20	0.36

Component	SP9	SP8	SP6	SP5	SP1	SP10	SP3
<i>Environmental chemistry</i>							
Subtotal environmental chemistry	0	0	0.02	0.05	0.09	0.23	0.30
<i>Toxicology</i>							
Subtotal toxicology	0	0.19	0.01	0	0.16	0	0.13
TOTAL Integrated risk subsurface	0	0.09	0.02	0.02	0.12	0.11	0.21
Deviation	0	0.23	0.01	0.06	0.08	0.28	0.21

No risk (< 0,2)
 Low risk (0,21 – 0,5)
 Moderate risk (0,51-0,75)
 High risk (> 0,75)

Results groundwater: chemistry

component	unit	KAGV02	KAGV04	KAGV09	TA008
pH	-	7.9	7.6	8.3	7.8
Arsenic	µg/l	3.2	0.3	17	0.4
Vanadium	µg/l	12	1.5	130	< 0,2

	No difference compared to background value or below SRC _{eco} for groundwater
	Clear differences compared to background value
	Large differences compared to background values or above SRC _{eco} for groundwater

Results groundwater: toxicology

Analyses	unit	KAGV02	KAGV04	KAGV09	TA008
<i>Microtox</i>					
EC ₂₀	vol % sample	> 45	> 45	> 45	> 45
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<i>Daphnia Magna</i>					
LC ₅₀ mortality	vol % sample	> 100	> 100	66	> 100
NOEC mortality	vol % sample	100	100	32	100
EC ₅₀ reproduction	vol % sample	> 100	> 100	63,9	> 100
NOEC reproduction	vol % sample	100	32	32	100
<i>Pseudokirchneriella subcapitata</i>					
EC ₅₀ growth	vol % sample	> 100	> 100	> 100	> 100
NOEC growth	vol % sample	100	25	25	50

	No negative effect
	Moderate negative effect
	Serious negative effect

↑
vanadium

Summarized

- In topsoil locally no ecological risks, locally moderate to high risk caused by zinc
- No ecological risks in subsurface
- In soil no remediation based on Triad results
- Highly negative effects in groundwater caused by vanadium
- Positive relation between vanadium in soil and groundwater
- Locally remediation necessary

Recommendation

