Rehabilitation of a (techno)soil contaminated by trace elements and PAH in a Phytomanagement perspective: The outlet of the Chaban-Delmas Bridge, Bordeaux, France

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27-04-17
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Faisability of phytomanaging marginal lands suspected to be contaminated by TE and PAH?

Amendments?

Will we remove « all » the contamination?

Costs?

Which species?

How long will the public have access to the site?
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Trace Elements (Cu, Zn, As, etc.)

PAH

≈ 4.5 Ha
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2013

Total soil TE Concentrations (mg/kg) in the 0-30 cm layer

Sum of (16) PAH
Ingestion of soil by children

Particles spread

Transfer via the trophic chain

Leaching toward the ecosystems (Garonne River)
ERI (in french *Excès de risques individuels*): Risks due to PAH exposure

HI (Hazardous Index): Risks due to TE exposure

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Solutions for rehabilitating?

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Biotest

Phaseolus vulgaris

05/09/13 (J7)

07/09/13 (J9)

09/09/13 (J11)

12/09/13 (J14)
Figure 12 (suite) Concentrations en éléments traces (mg kg$^{-1}$) dans les parties aériennes de Phaseolus vulgaris (H) sur la fraction fine (< 2 mm) des sols de 8 parcelles du site Chaban-Delmas (H1, 4, 6, 8, 10, 11, 12, 18); dans les parties aériennes de Medicago sativa (L) en croissance in situ sur 8 des parcelles du site Chaban-Delmas (L6, 7, 8, 9, 10, 11, 12, 14) et concentration moyenne en élément traces dans les parties aériennes de Populus sp. (Populus) sur l’ensemble du site Chaban-Delmas (n=3).

**Foliar ionome**

(mg/kg)

**Phytotoxicity threshold value**

(Chaney, 1989)

**Phytotoxicity threshold value**

(Allen, 1989)

**Common values in aerial plant parts**

(Blum, 2012)
Concentrations in the soil pore water ($\mu$g/l)

SPW TE concentrations at a TE contaminated site (Hasselt, Greenland, WP3)

SPW TE concentrations at a TE contaminated site (Moreno Jimenez 2011)

SPW TE concentrations in an uncontaminated sandy soil (Gradignan, Greenland, WP3)
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Spring 2013: *Medicago sativa* sowing
April 2014: Sowing of two species known to be tolerant to TE exposure: *Agrostis capillaris* (Cu) and *Festuca pratensis* (Zn)

*Agrostis capillaris*

*Festuca pratensis*

Pioneer vegetation
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Juin 2014
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April 2016
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April 2016

March 2017
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Evolution of risk indices

[Graph showing the evolution of risk indices from 2013 to 2015 with various points representing different locations (e.g., P14, P16, P22, P38, P46, P48, P35) with different scales for HI (riverain) and ERI (riverain).]
Biomass produced in fall 2015

The graph shows the shoot dry weight yield (in Tons DW Ha\(^{-1}\)) for different locations (p38, p48, p35, p16, p22, p46, P13, p14) and distinguishes between Medicago sativa and Others. The data indicates varying yields across these locations, with some showing higher biomass production than others.
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Rhizobium sp.
Total soil TE and PAH concentrations

Risk indices

TE concentration in aerial parts of *Medicago sativa*

PAH concentrations in/on aerial parts of *Medicago sativa*

TE concentrations in the soil pore water

PAH in the soil pore water

Vegetative cover

Total soil N concentrations

Particle spread

TE bearing phases
Rehabilitation
Ecological restoration

Ecological engineering