Mapping of soil-sediment systems contaminations around a metal-ore smelter. The example of Cu in Lubumbashi (R.D. Congo)

Mpundu M.[1,2], Kaya D. [1,2], N'Gongo M. [1], Meerts P. [3], Mahy G. [2], Colinet G. [2]

1 : UNILU

2: Gembloux Agro-Bio Tech / University of Liège

3: ULB

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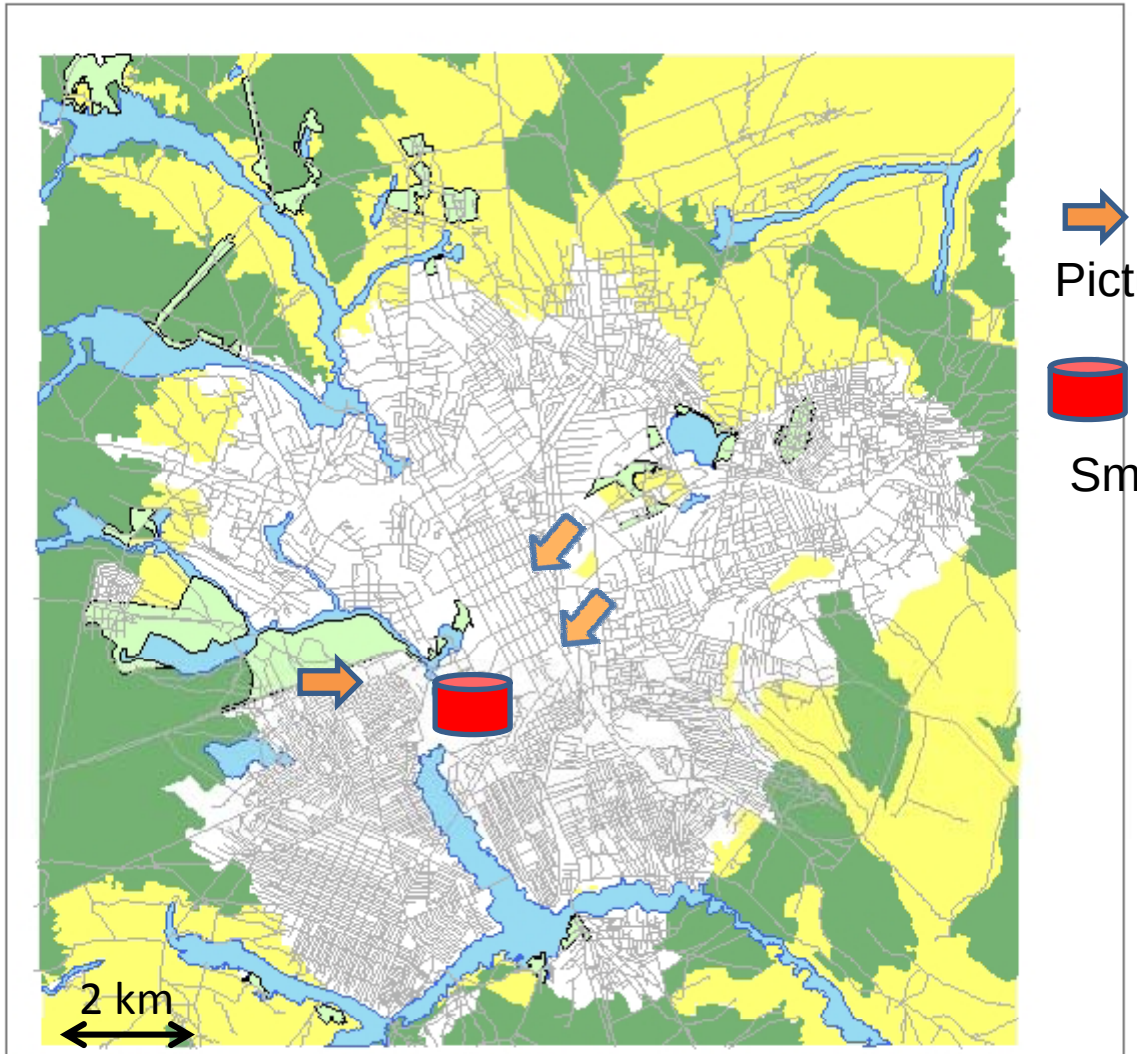
PIC : REMEDLU : multiscalar soil remediation in Lubumbashi

Lubumbashi



Localization of the Gecamines smelter inLubumbashi


Bulbostyllis sp.

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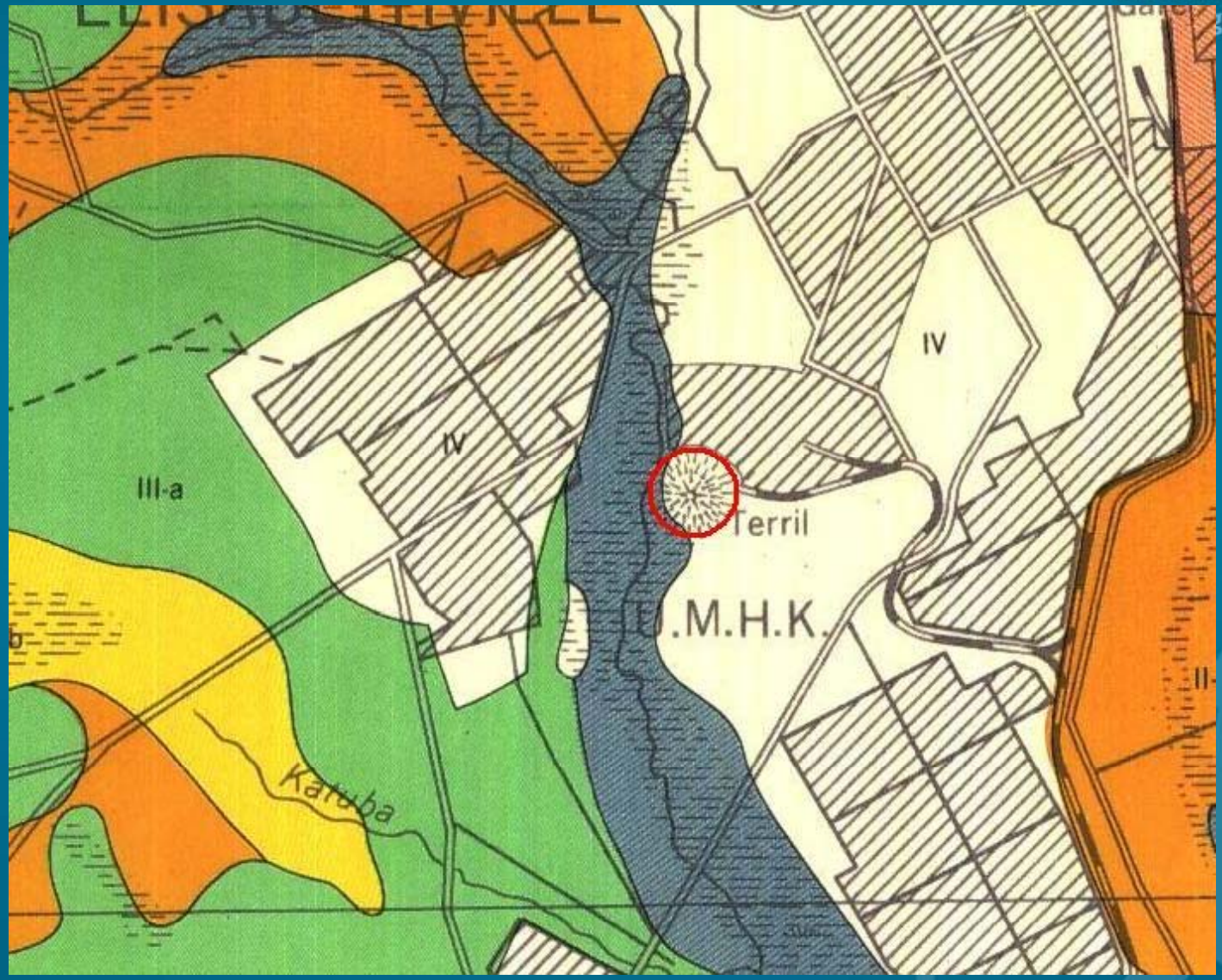

Soil occupation in 1955 (Sys & Schmitz, 1959)

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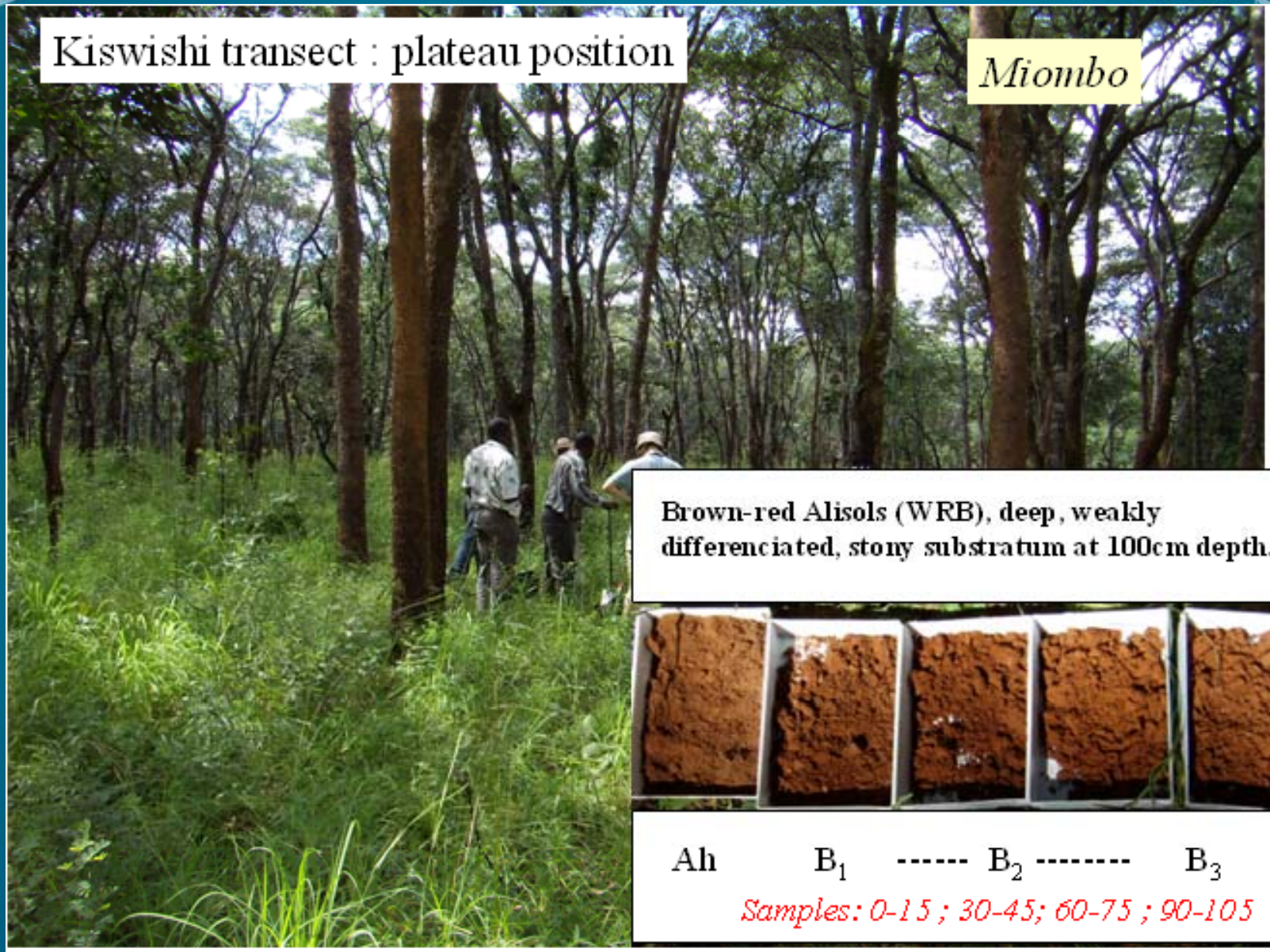
Kiswishi transect : plateau position

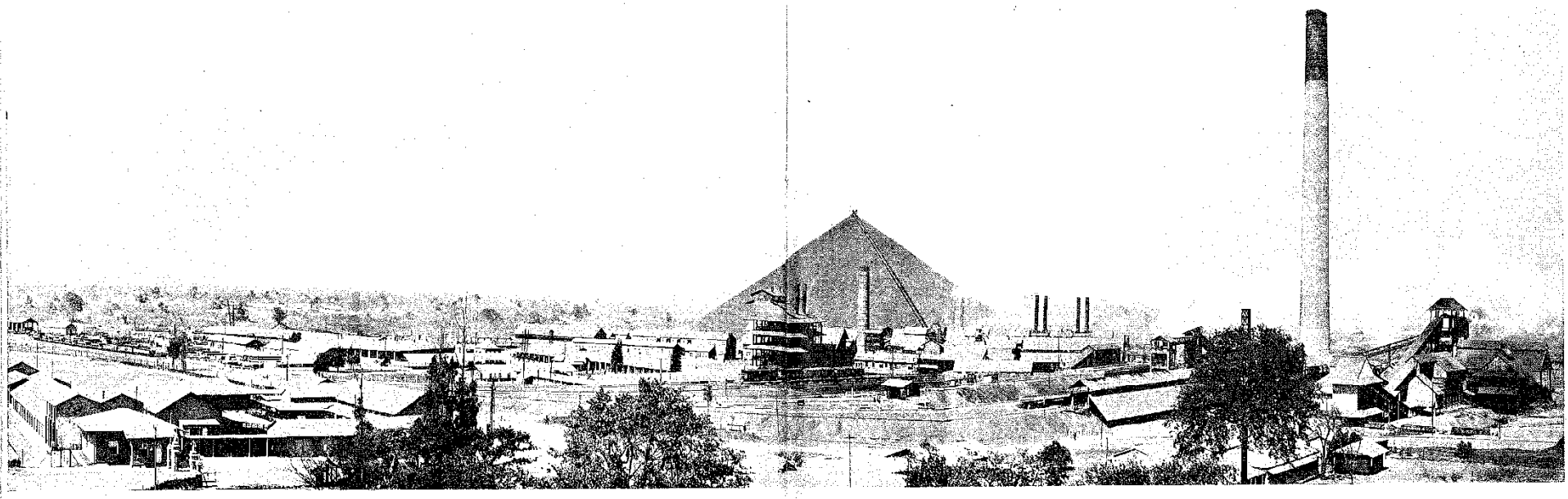


Brown-red Alisols (WRB), deep, weakly differenciated, stony substratum at 100cm depth.

Ah B_1 ------ B_2 -------- B_3

Samples: 0-15 ; 30-45; 60-75 ; 90-105

PLANCHE XIII.



Usines de Lubumbashi. — Vue panoramique. CHEMINÉE DE 150 M. DE HAUTEUR *Cliché U. M. H. K.*

Robert (1946)

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The « Katanga syndrom »

- ❑Contamination
- ❑Acidification
- ❑Death of vegetation
- ❑Erosion

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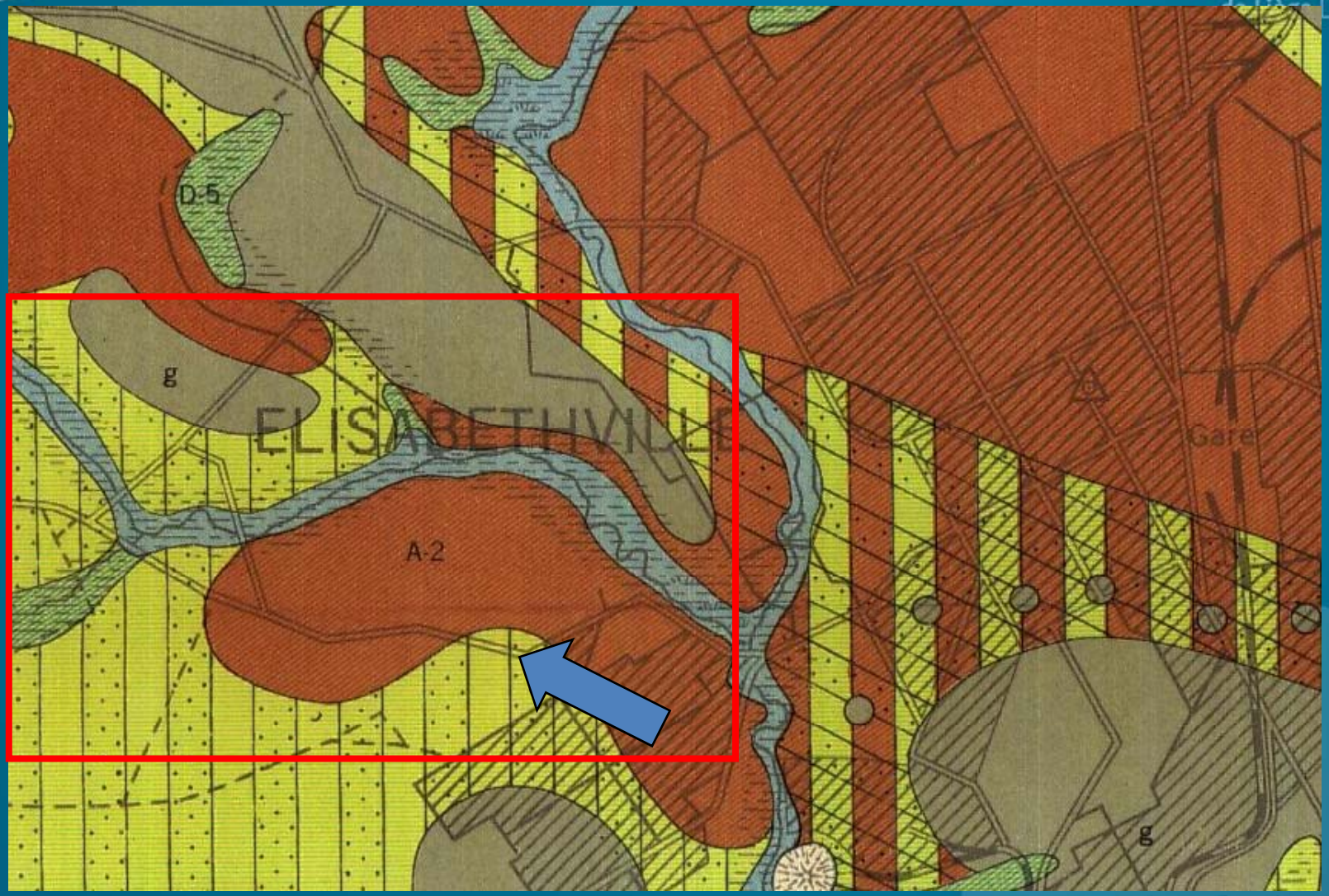
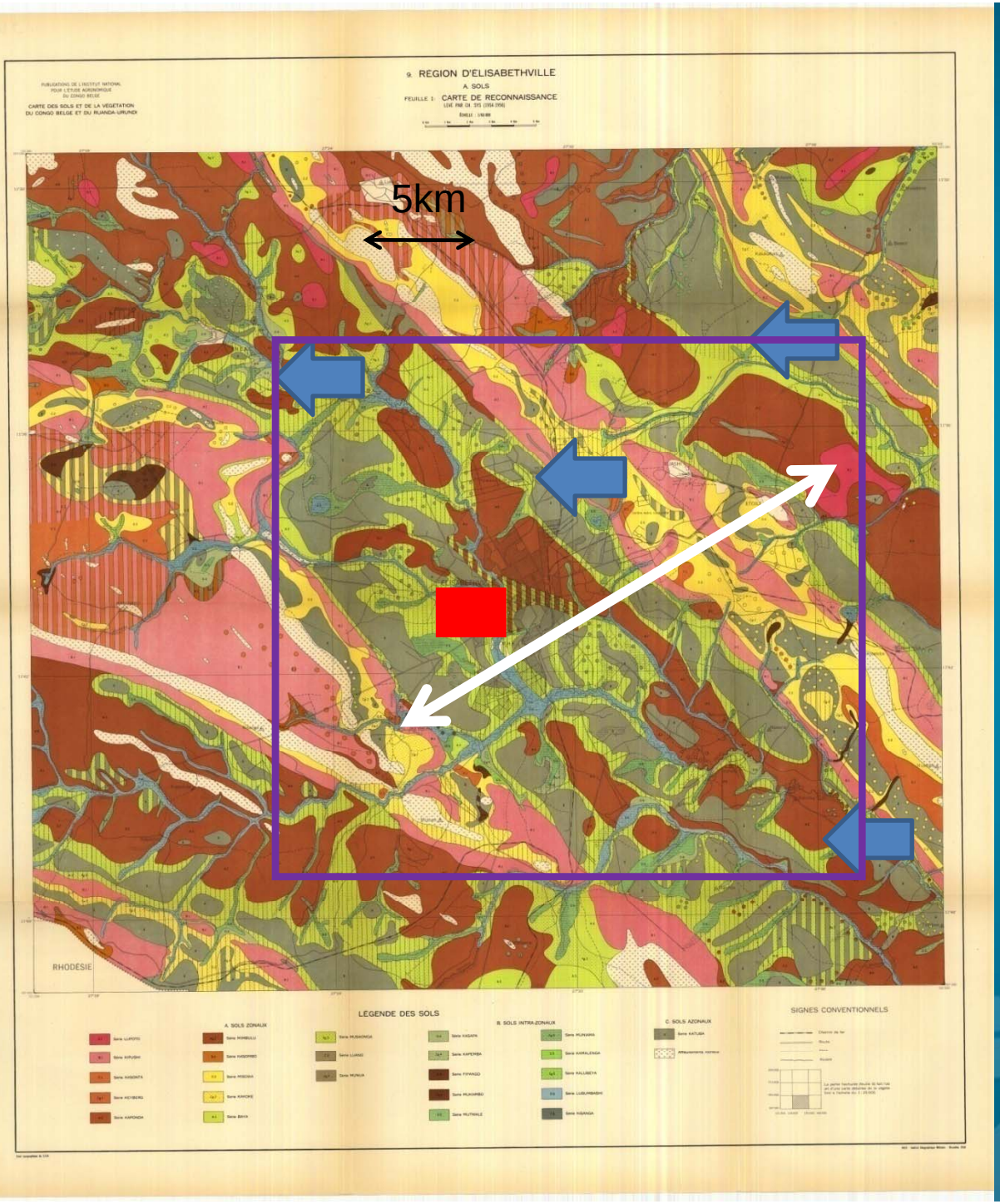
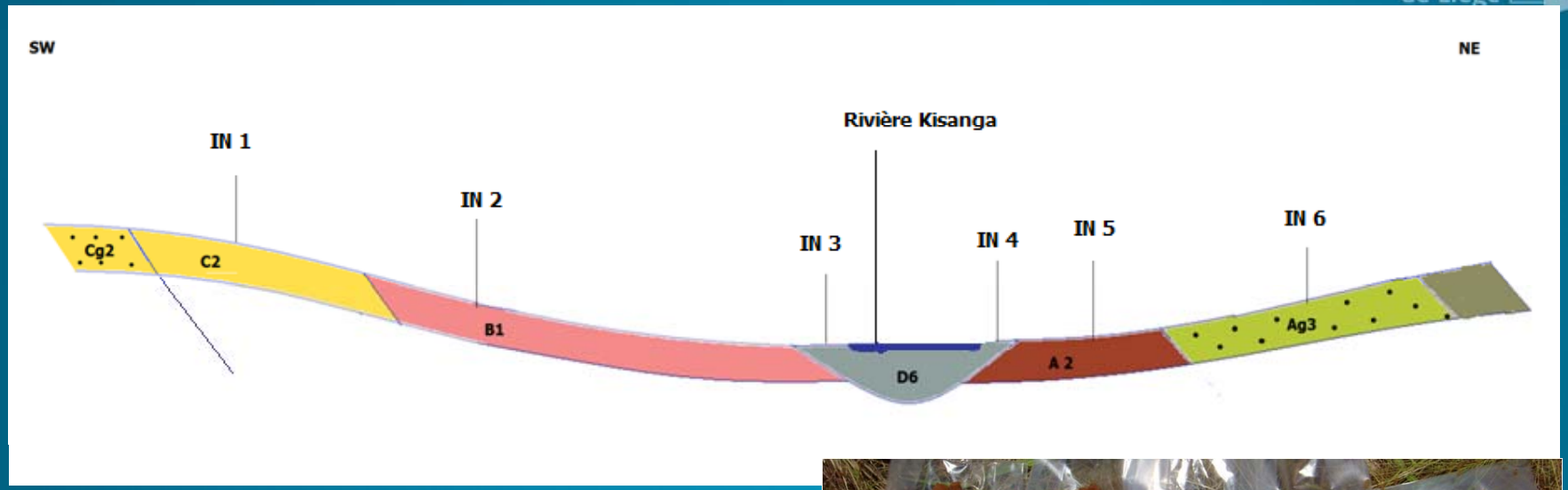
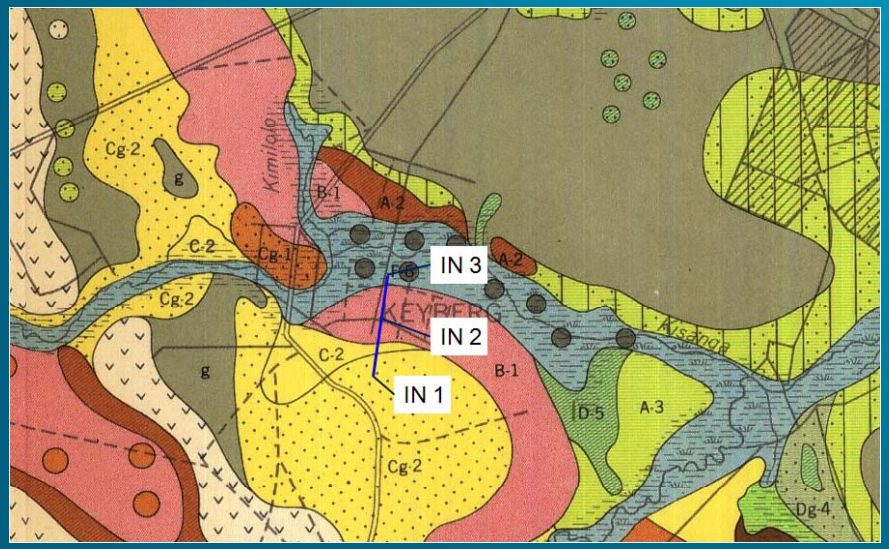


Soil map extract (original scale 1:20,000) (Sys & Schmitz, 1959)


9. REGION D'ELISABETHVILLE
A. SOLS
FEUILLE 1: CARTE DE RECONNAISSANCE
CARTE DES SOLS ET DE LA VEGETATION DU CONGO BELGE ET DU RUANDA-URUNDI
5km
RHODESIE
LEGENDE DES SOLS
A. SOLS ZONAUX
B. SOLS INTRA-ZONAUX
C. SOLS AZONAUX
SIGNES CONVENTIONNELS


SW
NE
Rivière Kisanga
IN 1
IN 2
IN 3
IN 4
IN 5
IN 6
Cg2
C2
B1
D6
A 2
Ag3


Cg-2
g
Kimilolo
B-1
A-2
C-2
Cg-1
IN 3
A-2
Cg-2
KEYRIERE
IN 2
Kisanga
C-2
B-1
IN 1
D-5
A-3
Cg-2
Dg-4


Cg2
IN 1
B1
IN 2
D6
IN 3

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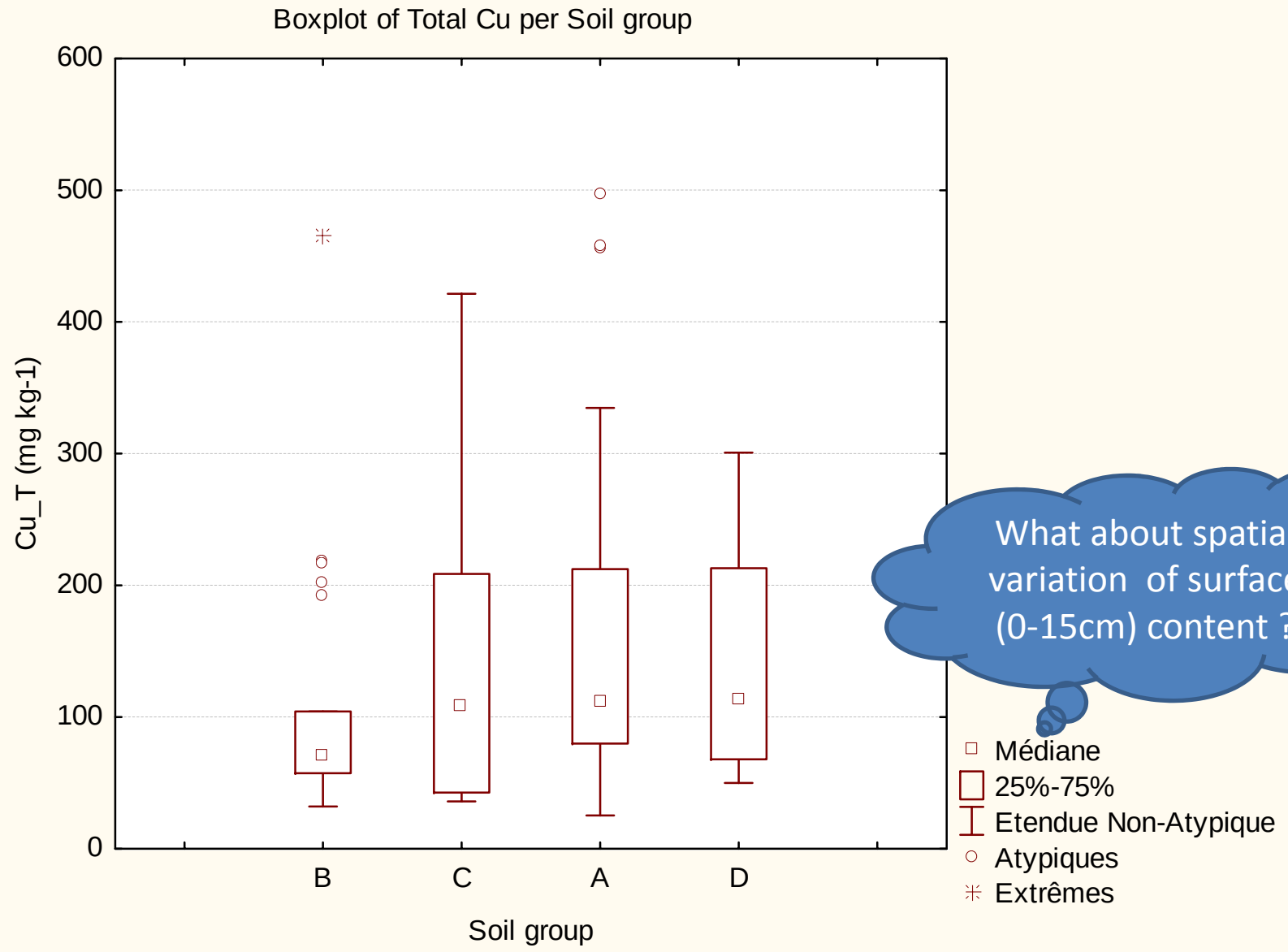
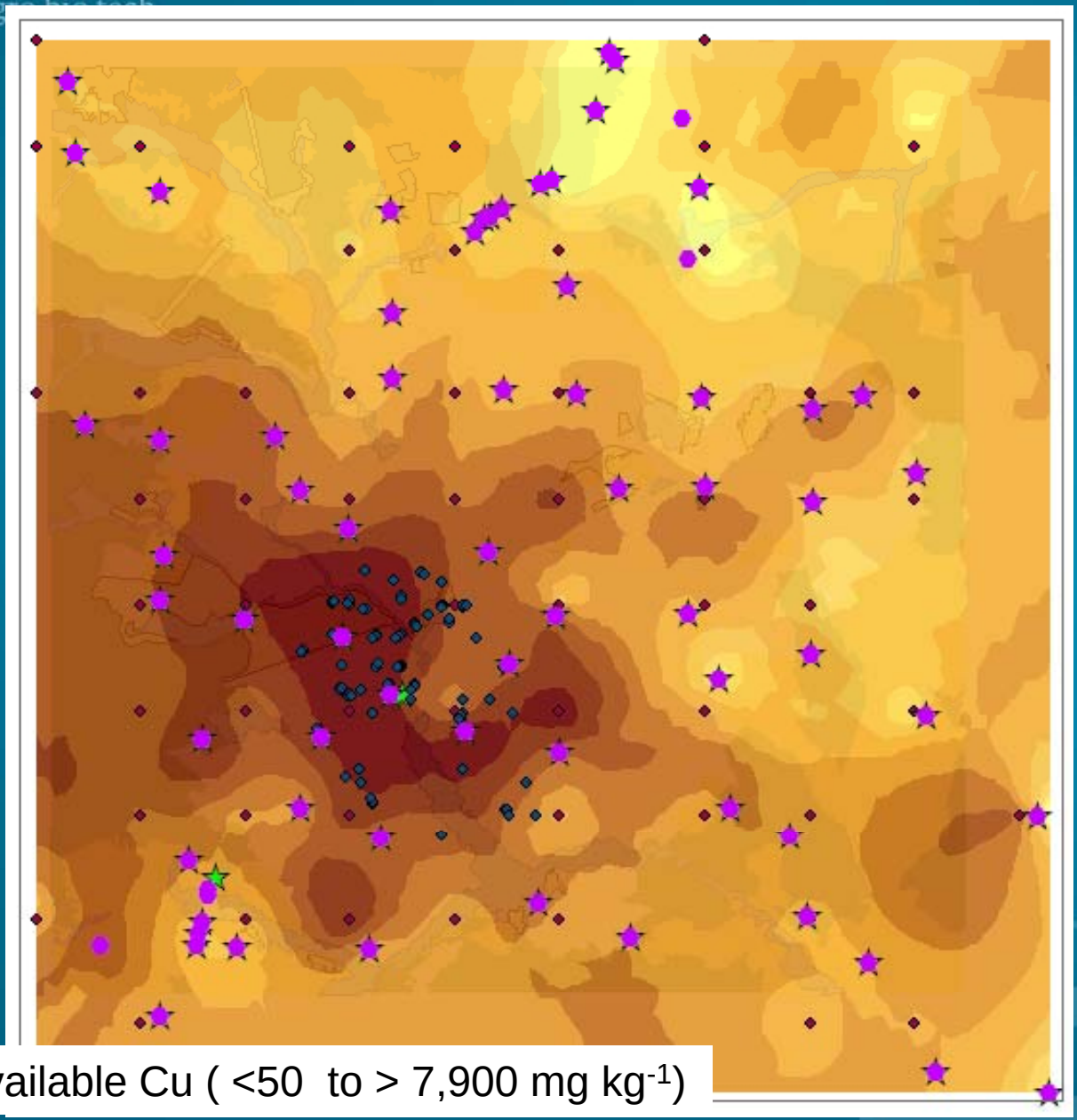
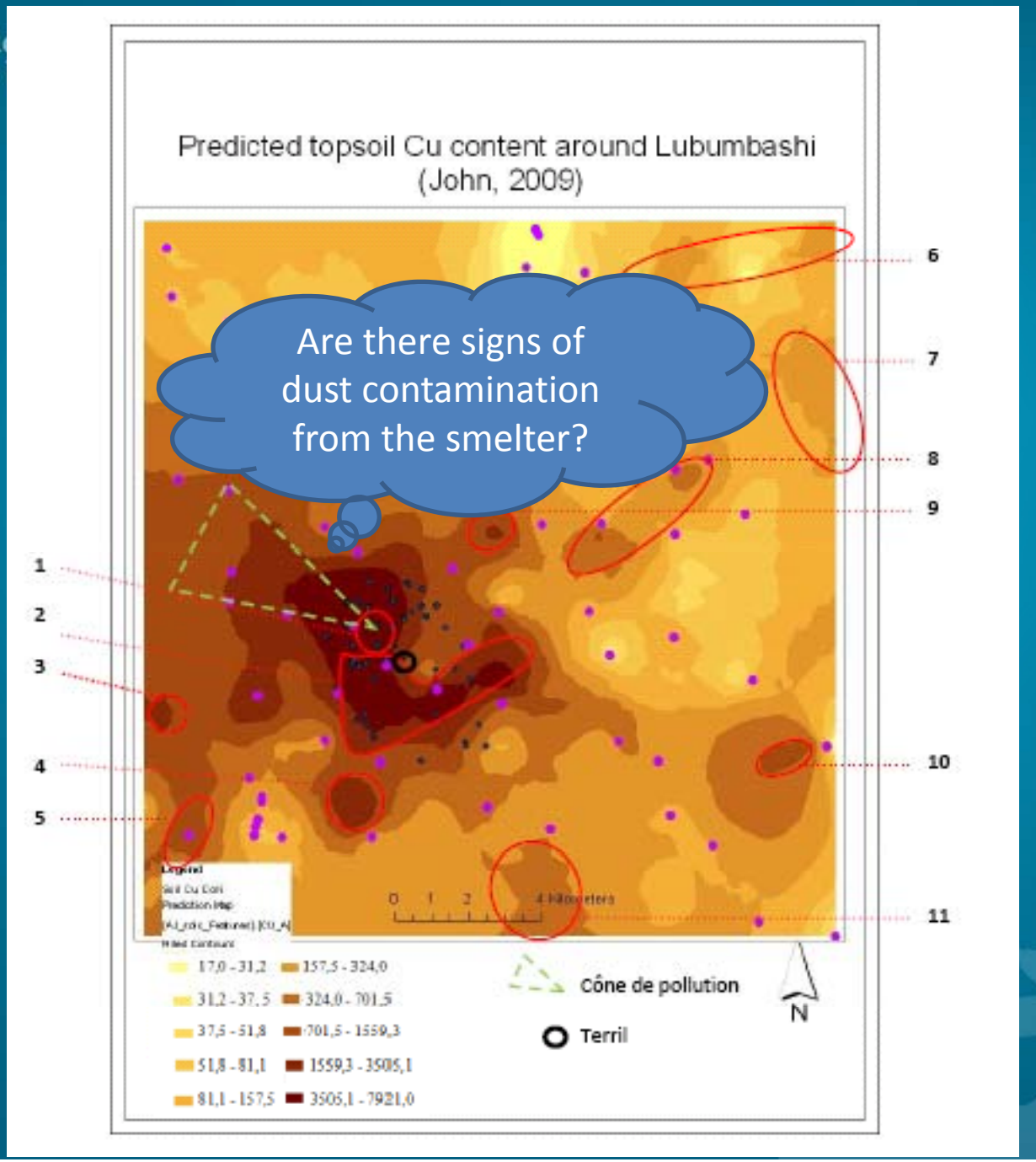
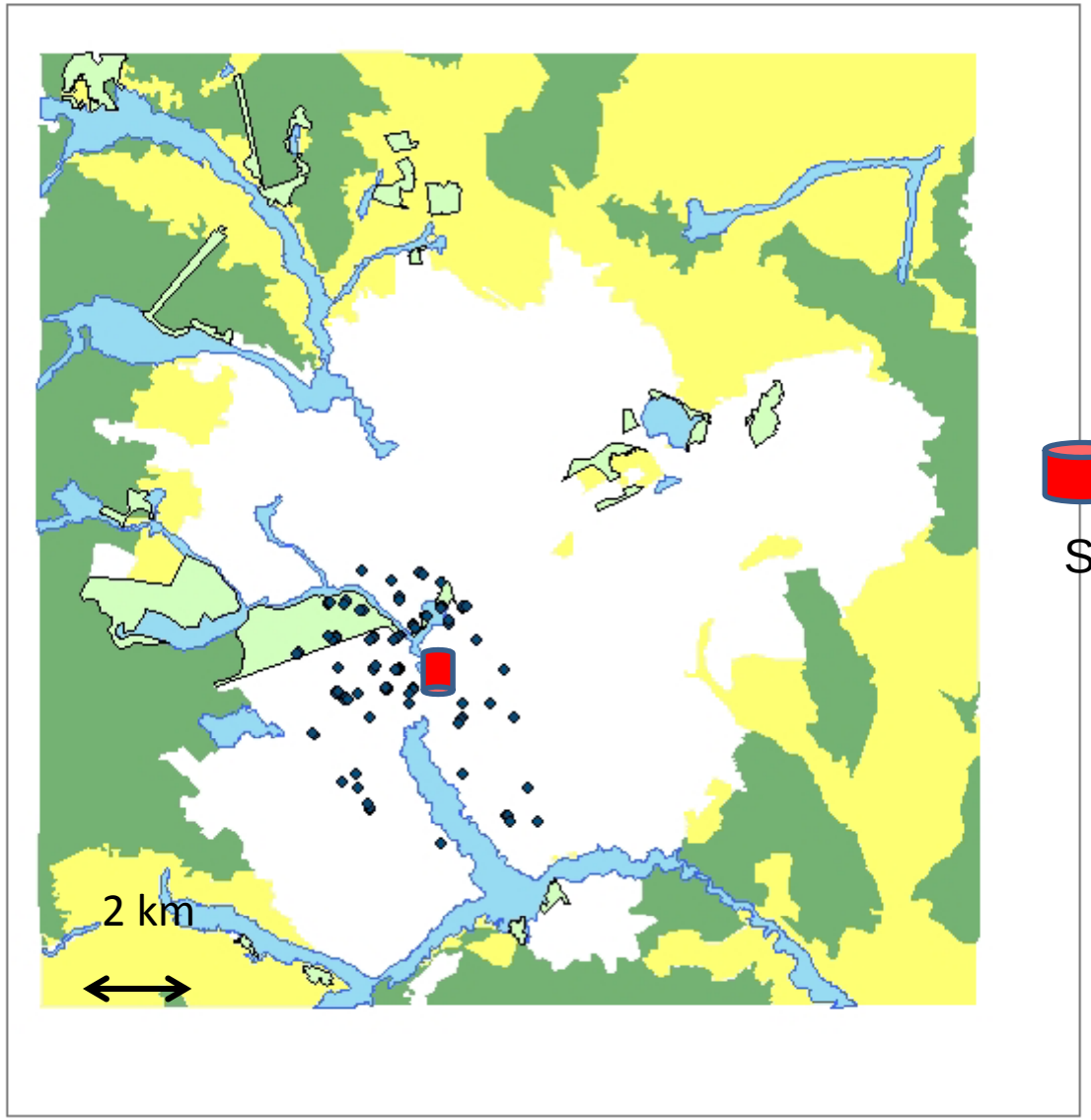


What about spatial variation of surface (0-15cm) content ?



Soil available Cu (<50 to > 7,900 mg kg^{-1})

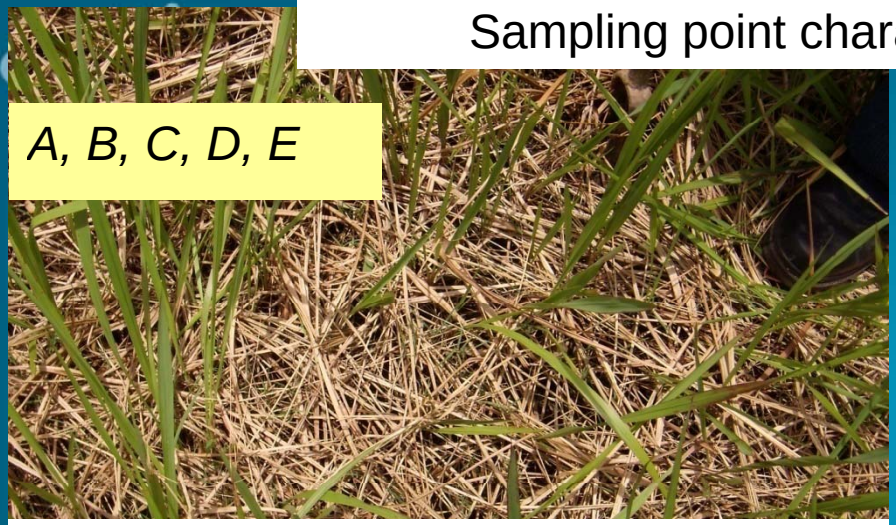

Predicted topsoil Cu content around Lubumbashi
(John, 2009)
Are there signs of dust contamination from the smelter?
1
2
3
4
5
6
7
8
9
10
11
17,0 - 31,2
31,2 - 37,5
37,5 - 51,8
51,8 - 81,1
81,1 - 157,5
157,5 - 324,0
324,0 - 701,5
701,5 - 1559,3
1559,3 - 3505,1
3505,1 - 7921,0
Cône de pollution
Terril
N



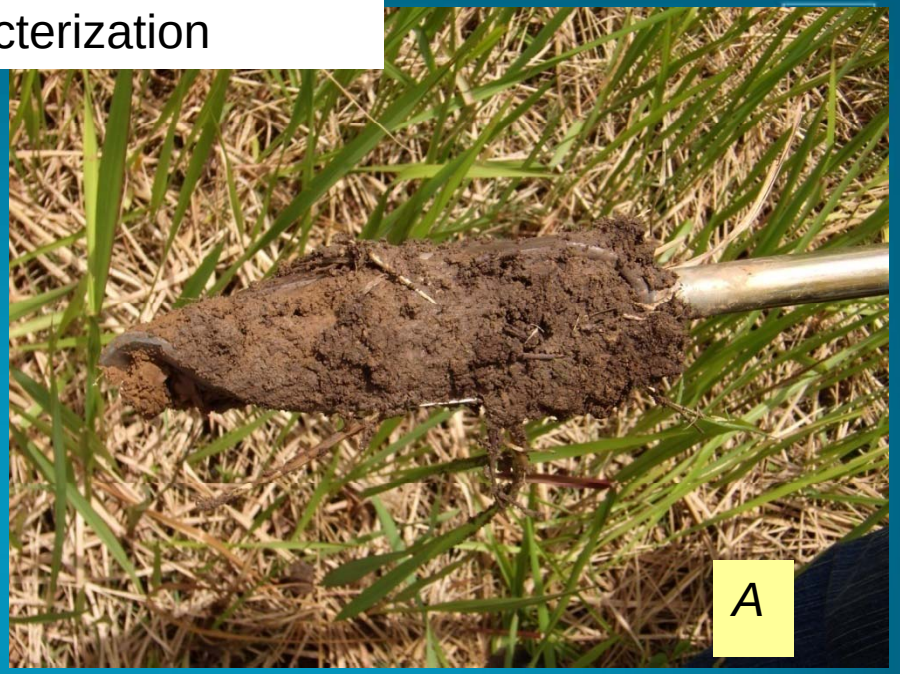
Detailed mapping (Mukobo, 2007)

Sampling point characterization

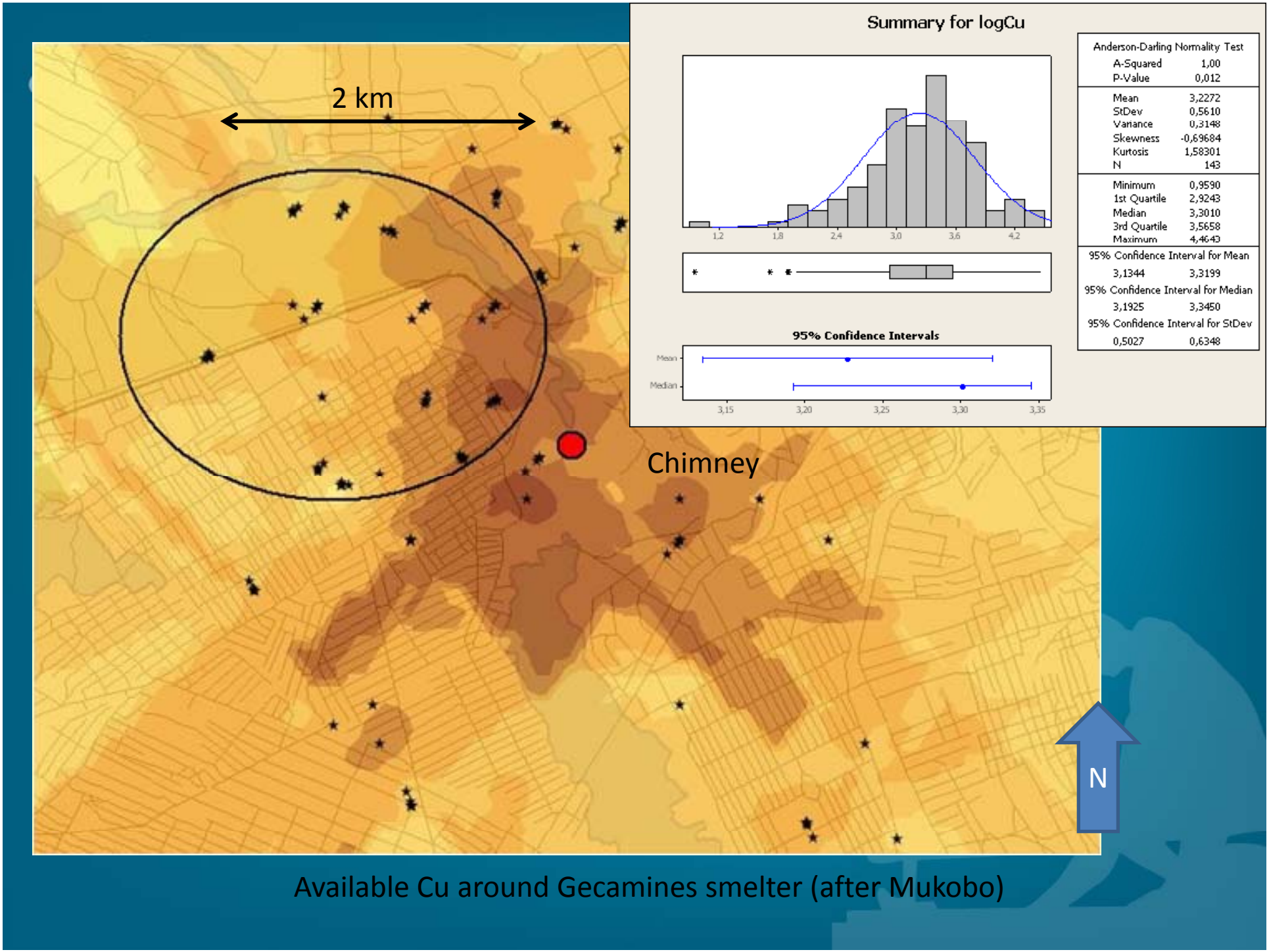
A, B, C, D, E



Prairie à imperata,
Sol brun-rouge à brun-jaune (E) (Ah > 5cm)
Pente de 5% ou plus



24/02/2007



Available Cu around Gecamines smelter (after Mukobo)

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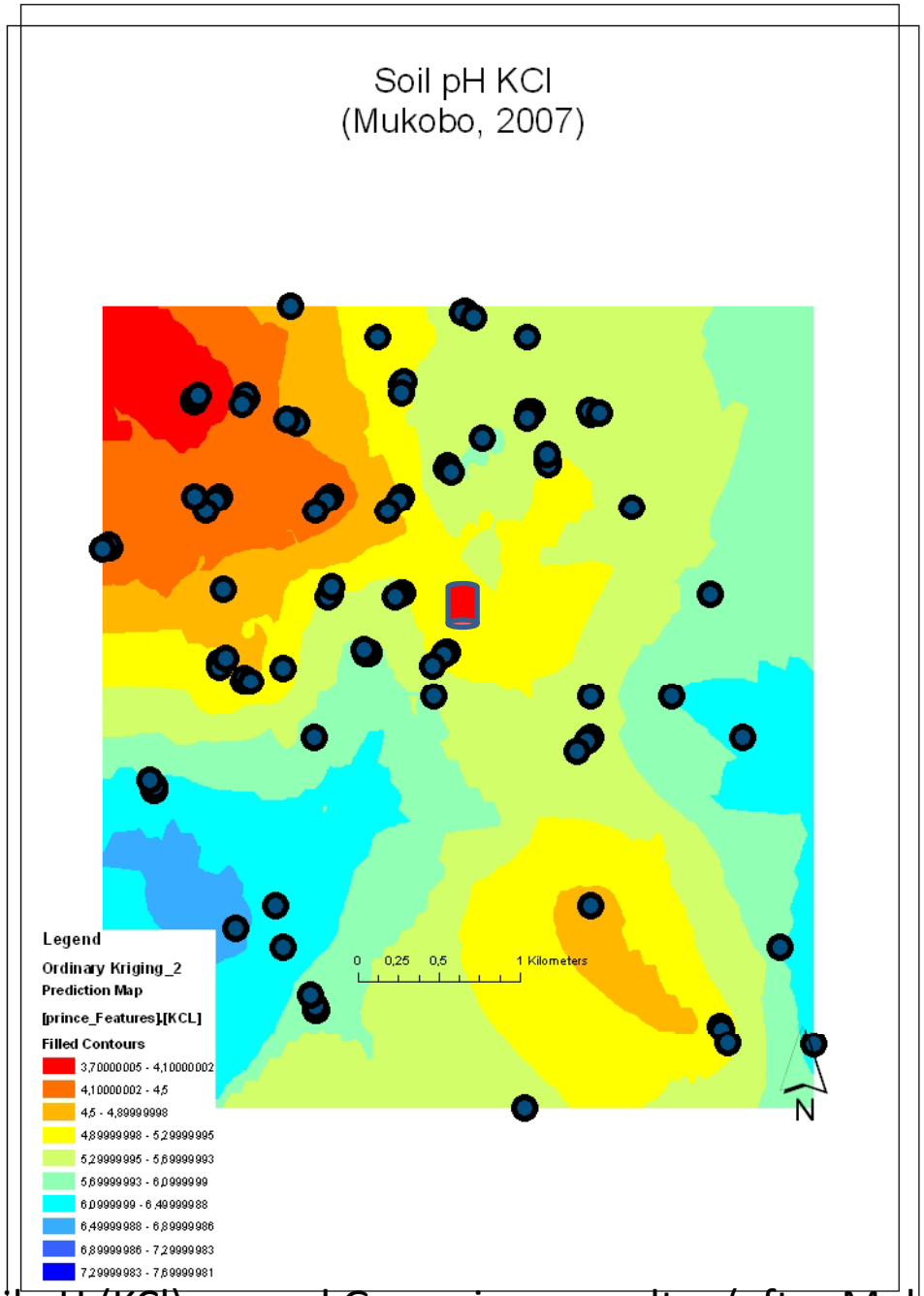
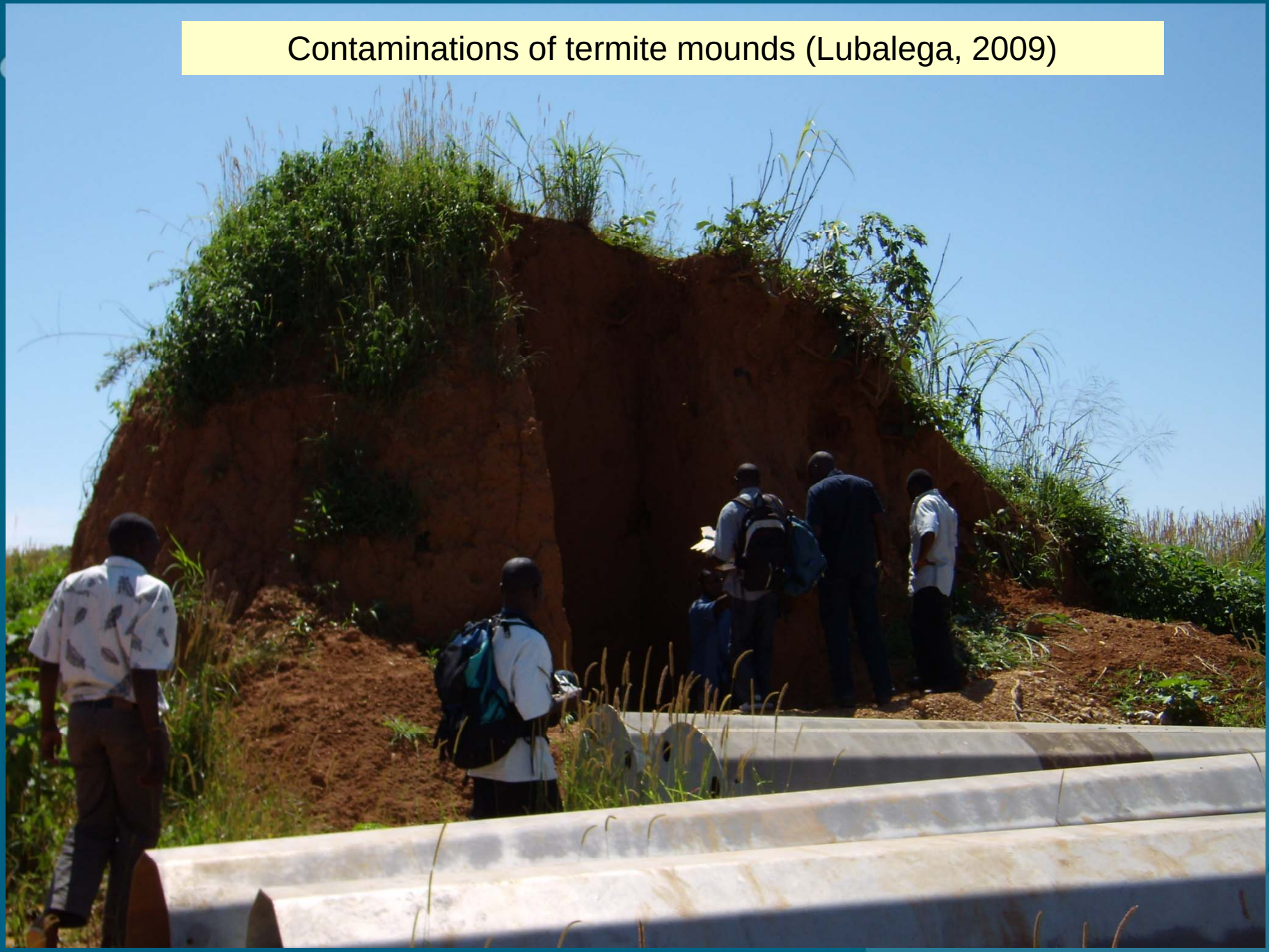


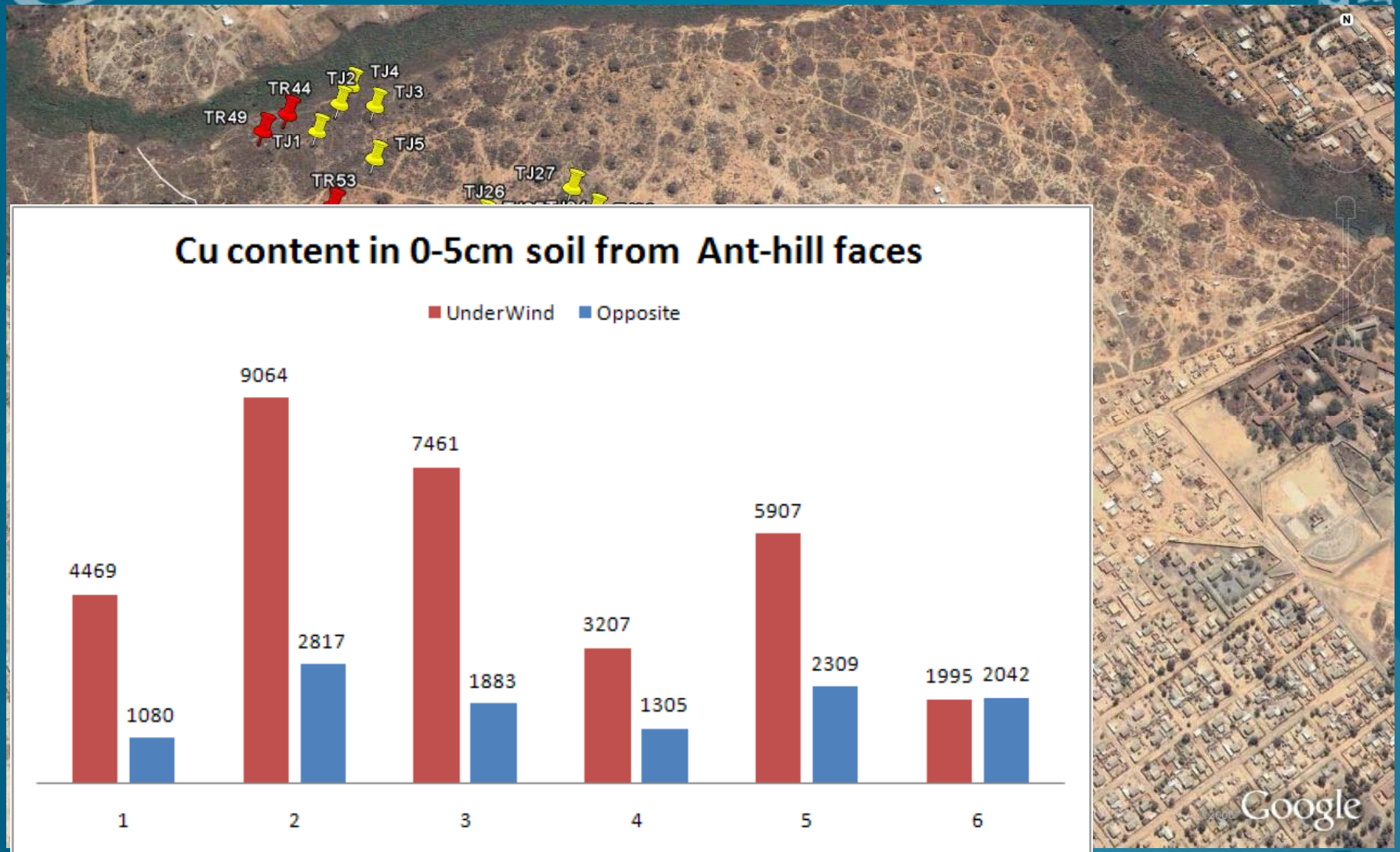
Smelter

Soil pH (KCl) around Gecamines smelter (after Mukobo)

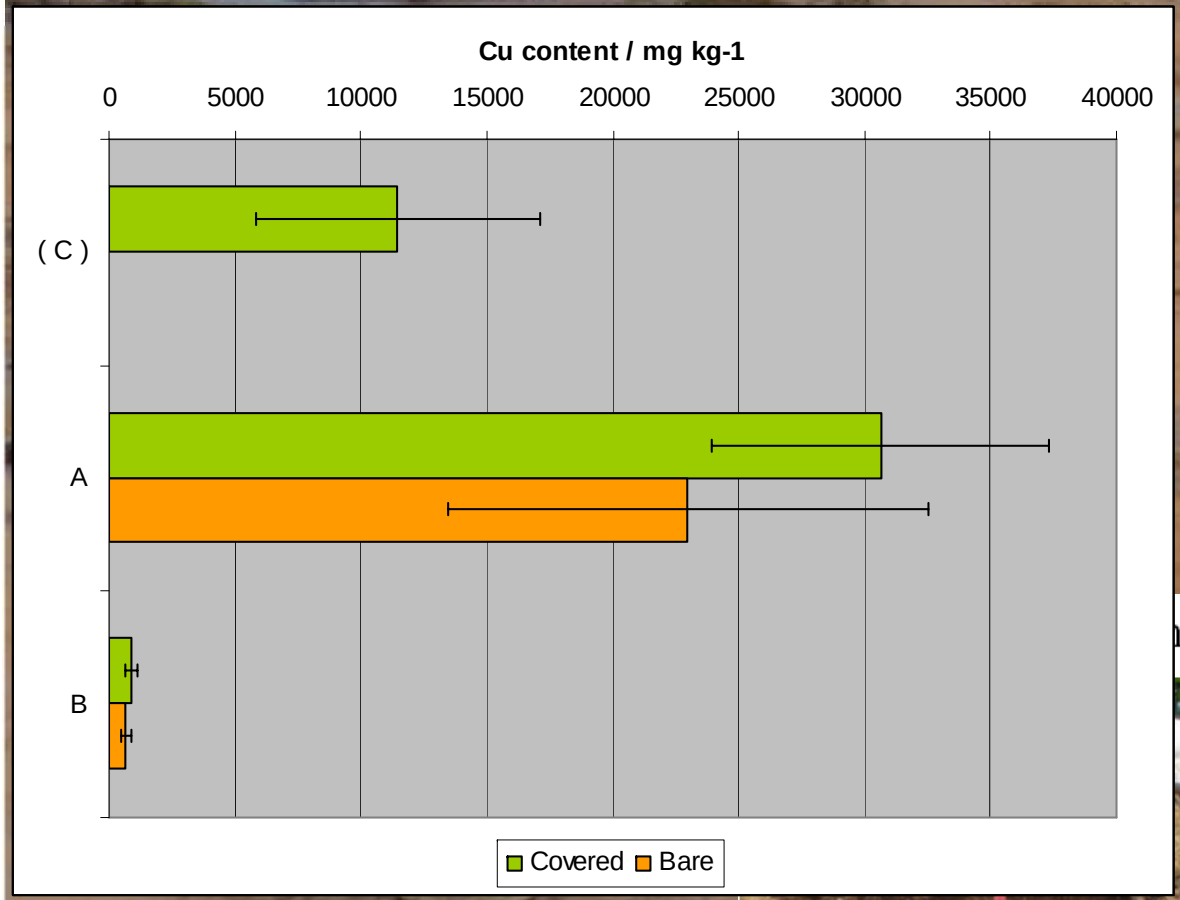
Contaminations of termite mounds (Lubalega, 2009)



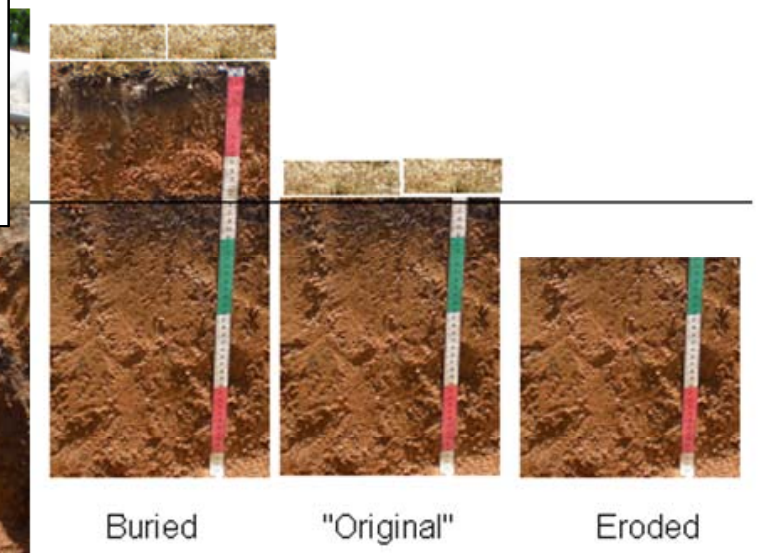
Contaminations of termite mounds (Lubalega, 2009)



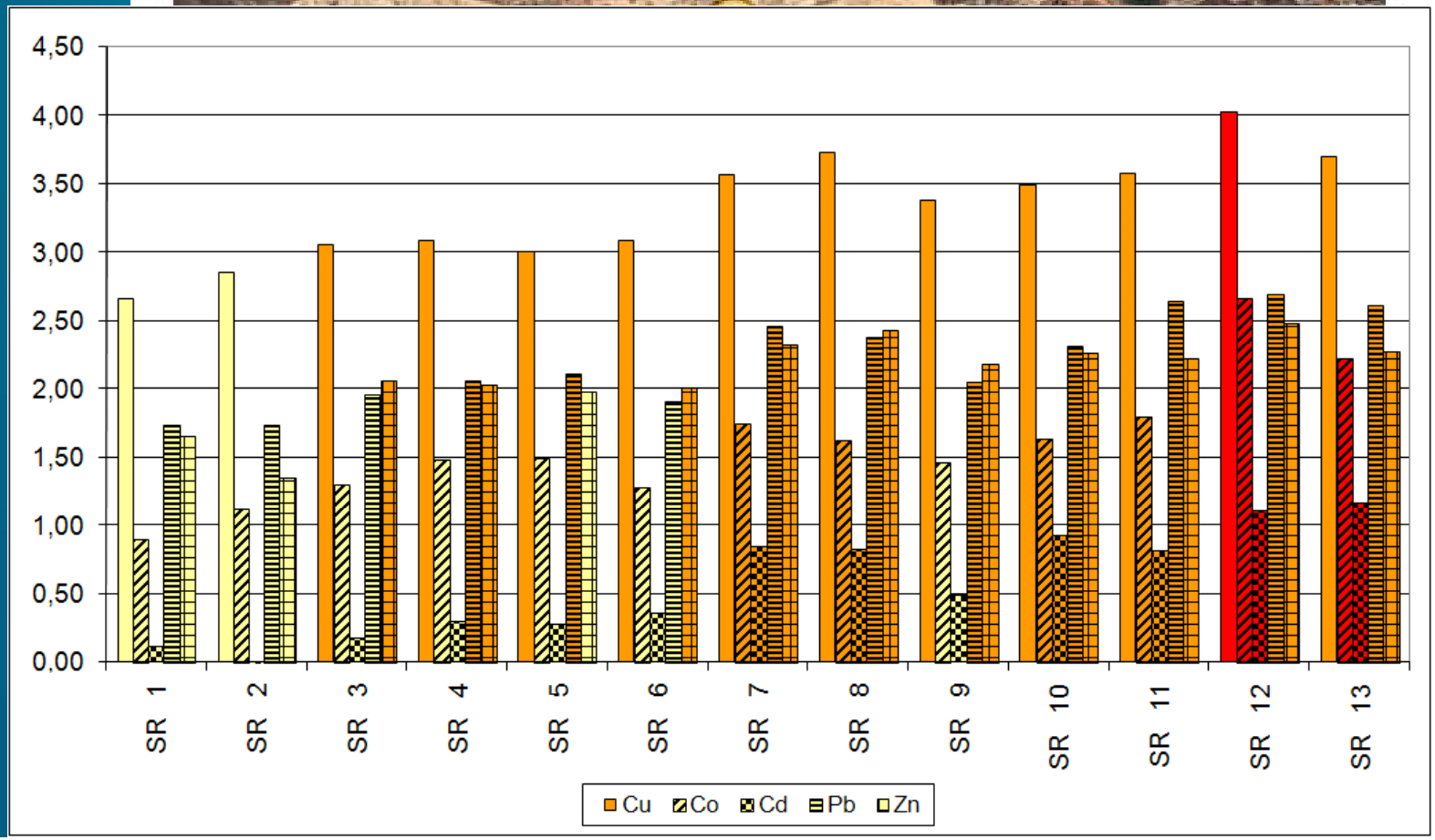
Importance of redistribution processes (Kaya, 2008)



he state of soil surface : Lubumbashi



Importance of redistribution processes (Kaya, 2008)

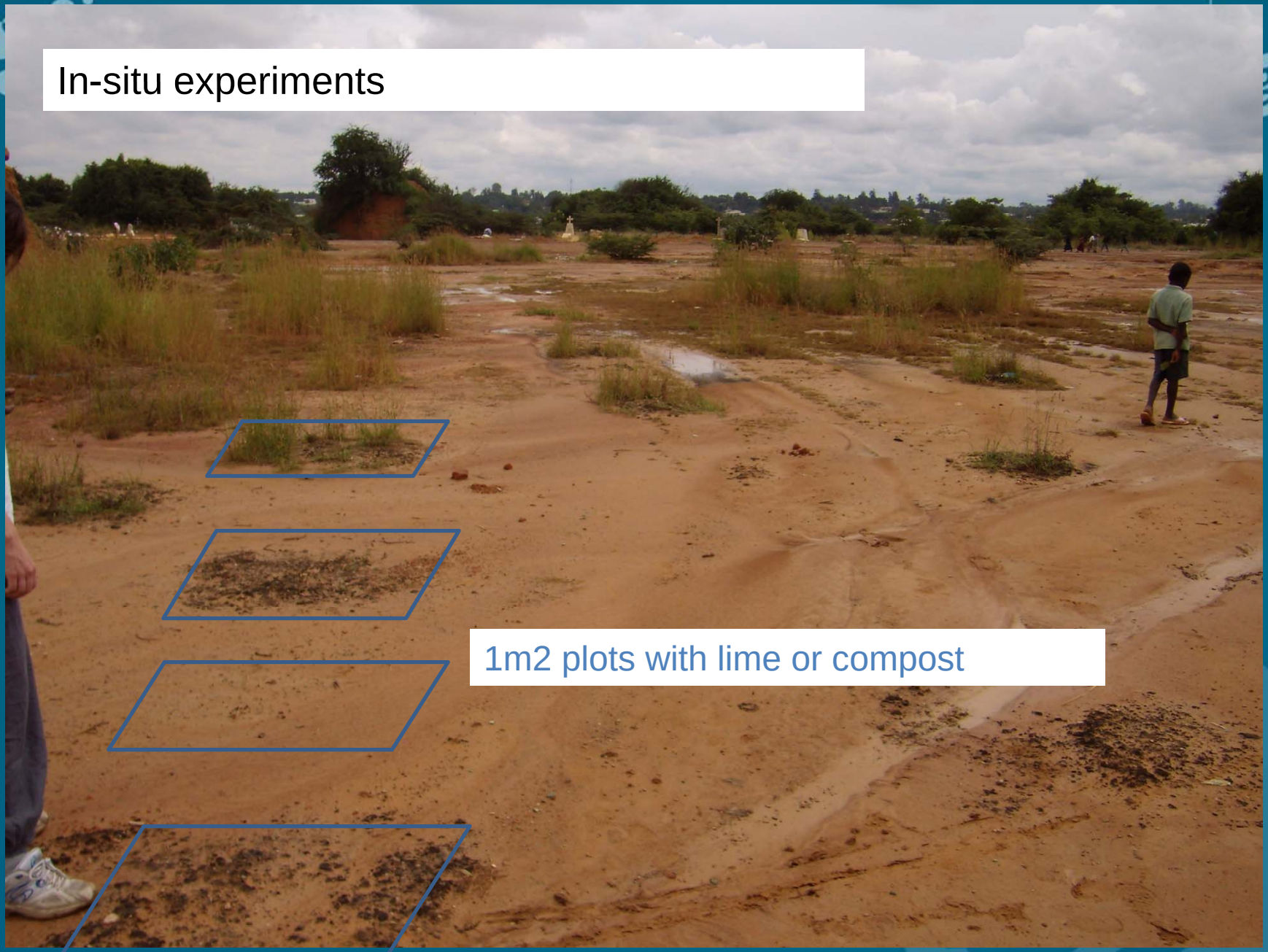


Growth experiments under greenhouse

Future prospects:

1. Ecodynamics of MTE in contaminated landscapes
2. Evaluation of risks of soil-plant transfers
3. Vegetalization experiments

In-situ experiments



1m2 plots with lime or compost