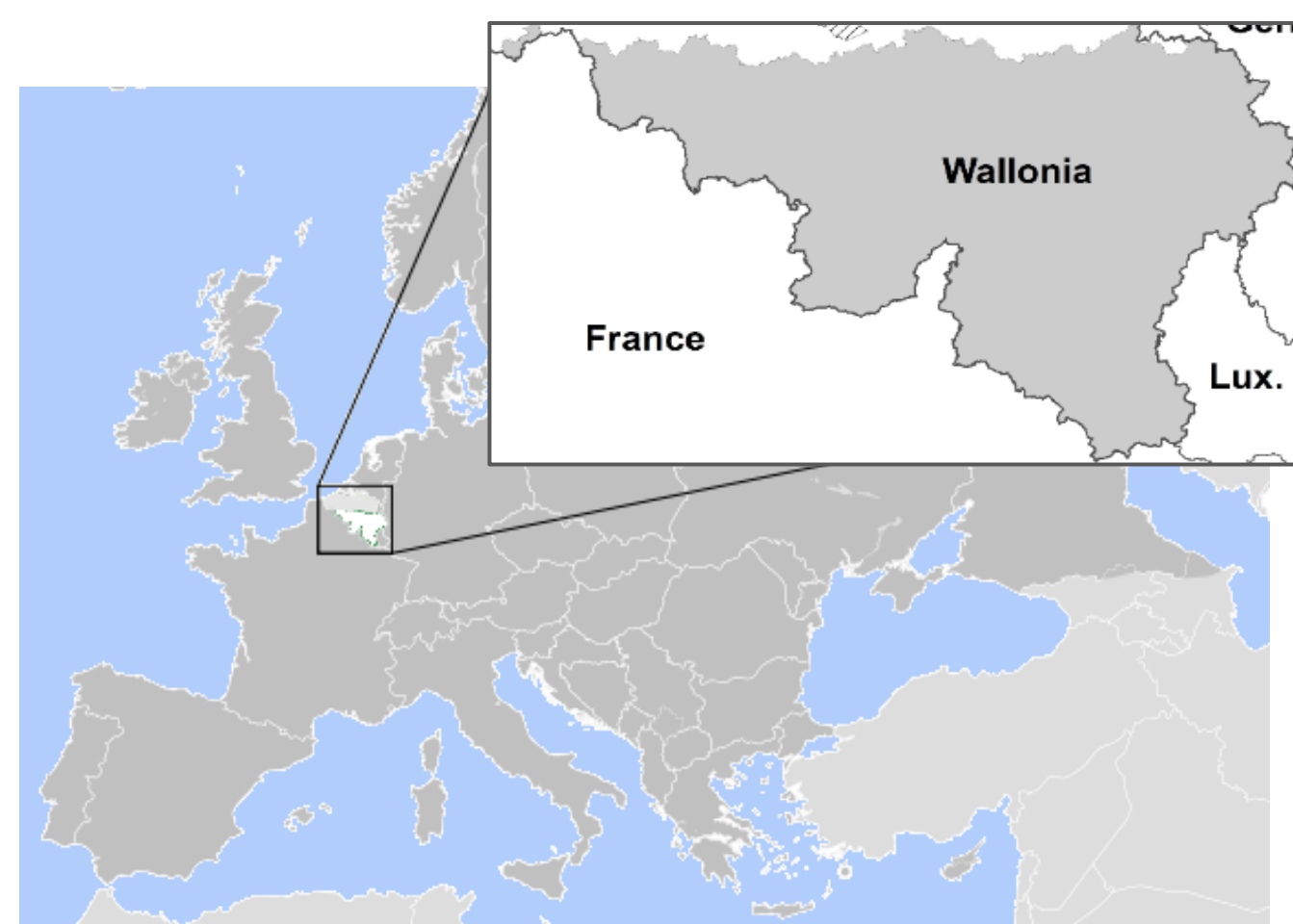


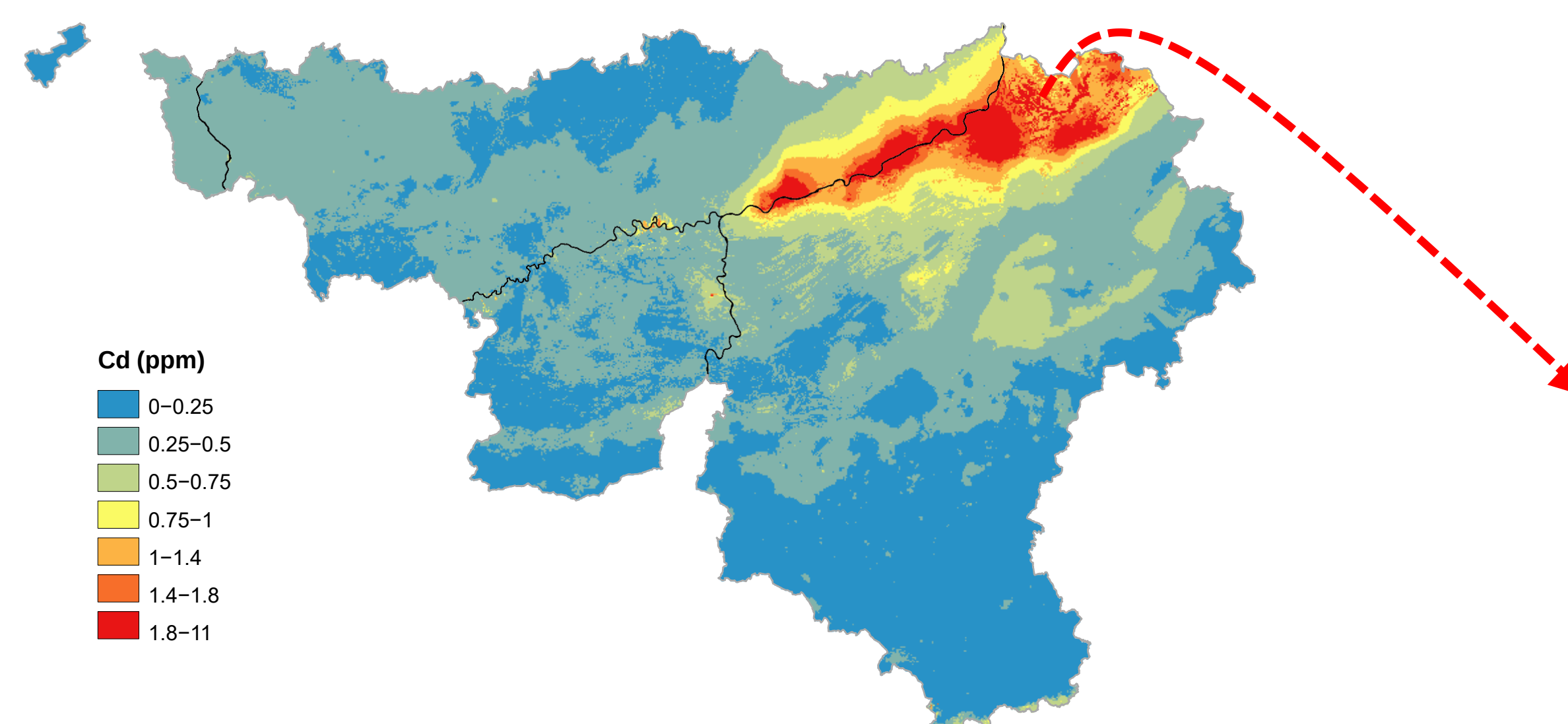
Context and objective

Vegetables grown on contaminated soils can have high levels of potentially toxic elements (PTE), which can lead to health risks

Study area : Wallonia



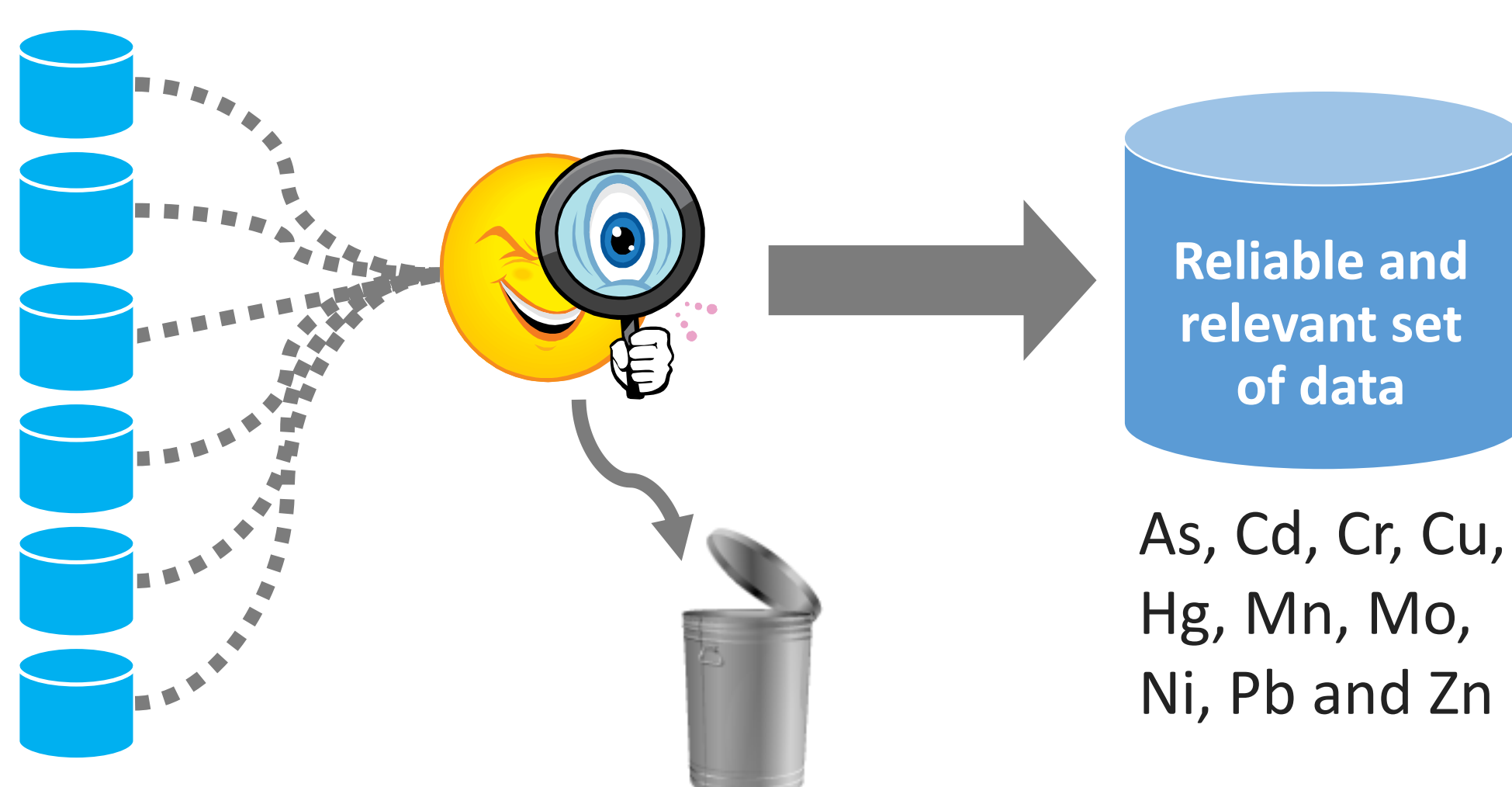
High metal soil background content



Vegetables frequently exceed European quality standards (EC 1881/2006)



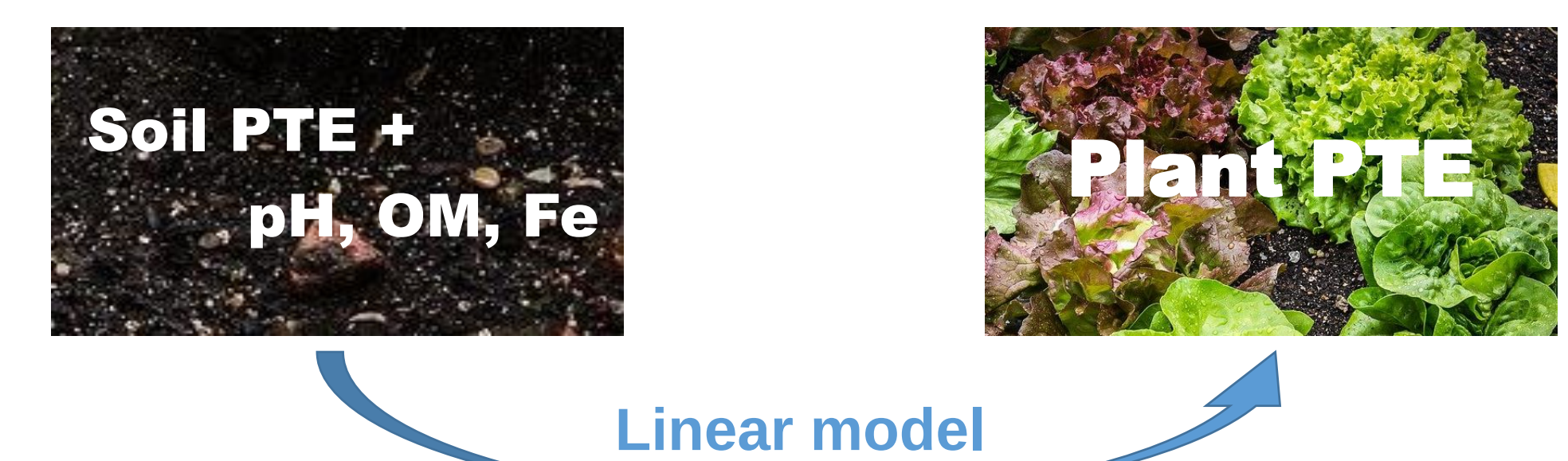
Dataset of soil and vegetable analyses from Wallonia



1718 soil and plant analyses:

- **Vegetables** : salad, carrot, bean, zucchini, potato, chard, cabbage, leek, bell pepper, tomato
- **Fruits**: strawberries and raspberries
- **Aromatic herbs**: parsley and mint

Modeling work (R language)



Step 1: **robust dataset creation** with covMCD (robustbase)

Step 2: **model selection** with regsubsets (leaps)

Step 3: **linear model computation** with lmrob (robustbase)

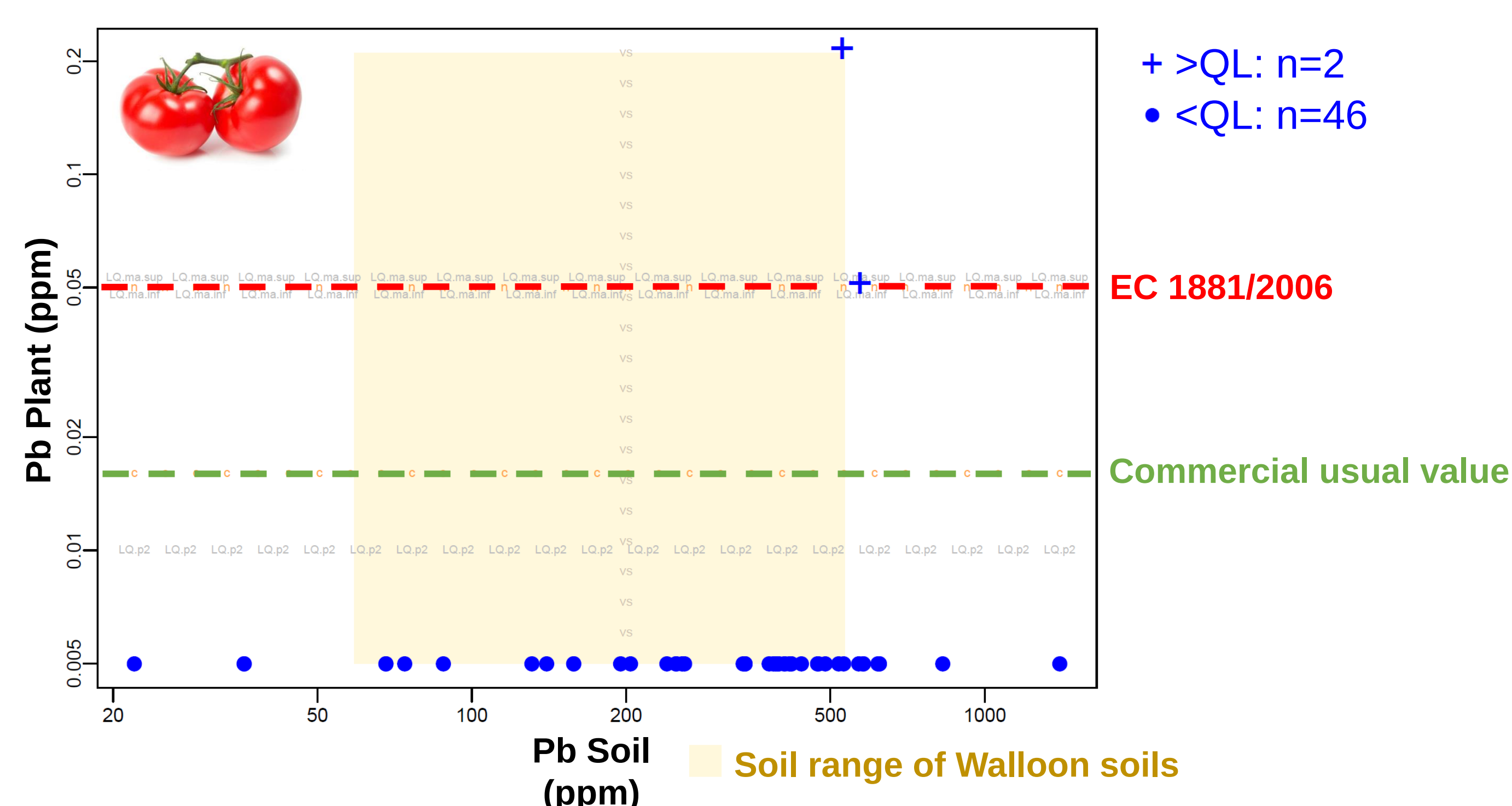
Results

From 0 (Hg) to 10 (Zn) statistically significant prediction models

	Models for Zn	MAE (ppm)	R ²
Chards	$\log_{10}(Vg) = 1.35 + 0.692 \log_{10}(Zn) - 0.287 \text{ pH}$	53.30	0.63
Carrots	$\log_{10}(Vg) = 1.24 + 0.345 \log_{10}(Zn) - 0.245 \text{ pH} - 0.0116 \text{ C}$	1.96	0.66
Zucchini	$\log_{10}(Vg) = 1 + 0.204 \log_{10}(Zn) - 0.172 \text{ pH}$	1.88	0.33
Beans	$\log_{10}(Vg) = 0.845 + 0.121 \log_{10}(Zn) - 0.097 \text{ pH} + 0.00377 \text{ C}$	1.66	0.24
Mint	$\log_{10}(Vg) = -1.39 + 1.23 \log_{10}(Zn) - 0.143 \text{ pH}$	34.90	0.59
Parsley	$\log_{10}(Vg) = 1.4 + 1.13 \log_{10}(Zn) - 0.555 \text{ pH} + 0.053 \text{ C}$	23.70	0.78
Potatoes	$\log_{10}(Vg) = 0.653 + 0.155 \log_{10}(Zn) - 0.0826 \text{ pH} + 0.00641 \text{ C}$	1.40	0.40
leek	$\log_{10}(Vg) = 1.49 + 0.249 \log_{10}(Zn) - 0.259 \text{ pH} + 0.031 \text{ C}$	1.30	0.83
Bell pepper	$\log_{10}(Vg) = 3.32 + 0.355 \log_{10}(Zn) - 0.609 \text{ pH} - 0.0182 \text{ C}$	1.96	0.55
Salad	$\log_{10}(Vg) = 1.19 + 0.402 \log_{10}(Zn) - 0.225 \text{ pH} - 0.0129 \text{ C}$	8.16	0.36

No model found ?

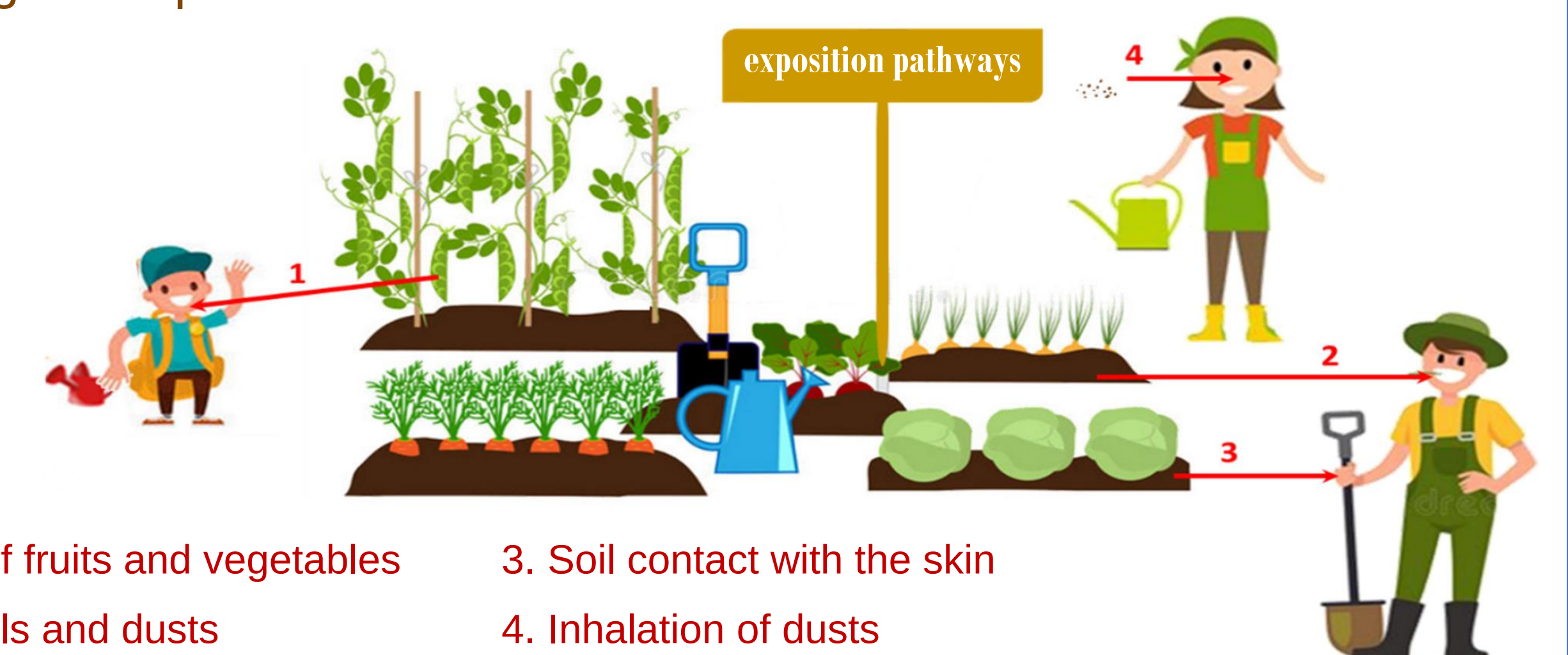
→ metal content in vegetables approximated from graphical examination



SANISOL web tool

Provides recommendations for users of vegetable gardens in Wallonia

Part I: Is there any possible **health risk** related to vegetable gardening and the consumption of garden products ?



Part II: what is the expected **metal content in vegetables** ?

Illustrative results	Cadmium	Lead	Chromium	Copper	Nickel	Zinc
Carrot	Higher than the maximum levels for contaminants in foodstuffs (CE 1881/2006)	Higher than the maximum levels for contaminants in foodstuffs (CE 1881/2006)	Similar to commercial products	Similar to commercial products	Similar to commercial products	Similar to commercial products
Potato	Higher than the maximum levels for contaminants in foodstuffs (CE 1881/2006)	Higher than the maximum levels for contaminants in foodstuffs (CE 1881/2006)	Similar to commercial products	Similar to commercial products	Similar to commercial products	Similar to commercial products
Tomato	Similar to commercial products	Similar to commercial products	Similar to commercial products	Similar to commercial products	Similar to commercial products	Similar to commercial products

- Similar to commercial products
- Higher than the commercial products, no health risk
- Higher than the commercial products, potential health risk
- Higher than the maximum levels for contaminants in foodstuffs (CE 1881/2006)

More information/documentation: <http://environnement.sante.wallonie.be/>

Web tool : <http://sanisol.wallonie.be/>