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The activity has been implemented within the framework of national project
***Information and providing advice on improving the quality of environment in Slovakia**.*
The project is cofinanced by Cohesion Fund of the EU under Operational programme Quality of Environment.

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Importance of environmental and toxicological availabilities of Cd and Pb in management of anthroposols from dredged sediments

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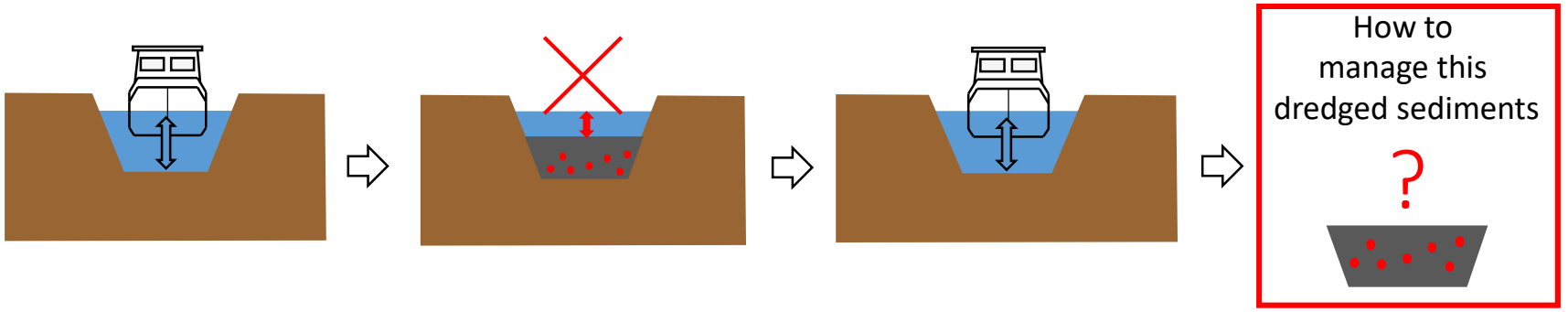
Global context



Willingness to develop inland waterway transport

- sustainable transport
- socio-economic value

Subject to significant sedimentation

- water erosion of soils
- low slope of waterways
- many obstacles to favor accumulation

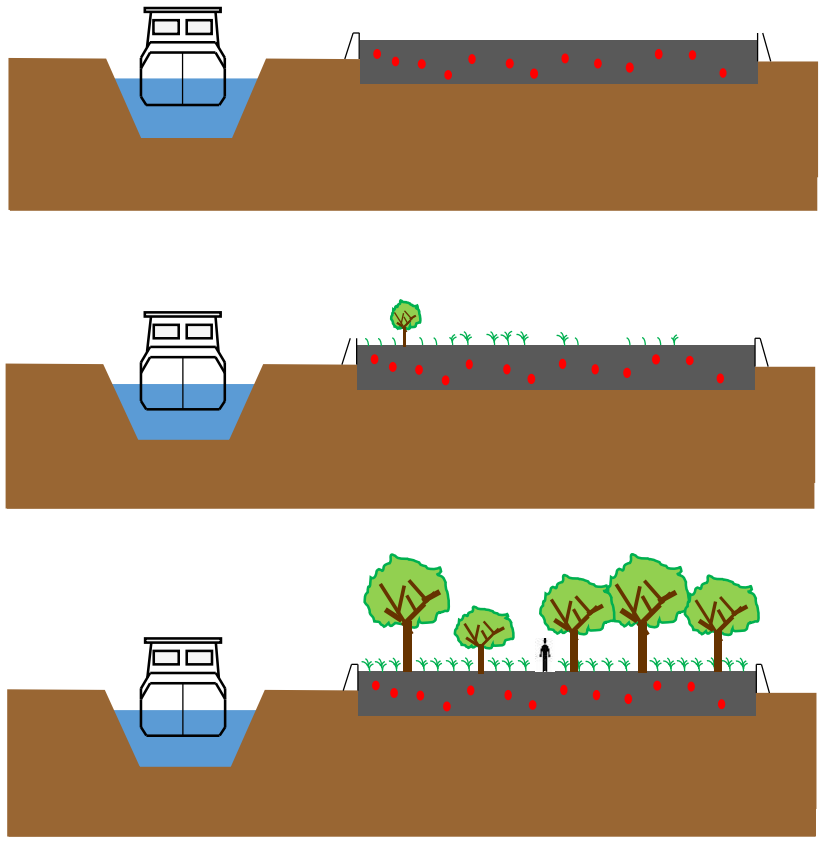
Need to dredge

- maintain a depth for navigation
- limit flooding

Problematic

- quantities
- qualities
- cost of treatment
- absence of a viable valorisation chain

From dredged sediments to anthroposols



Time

Drying

Oxidation

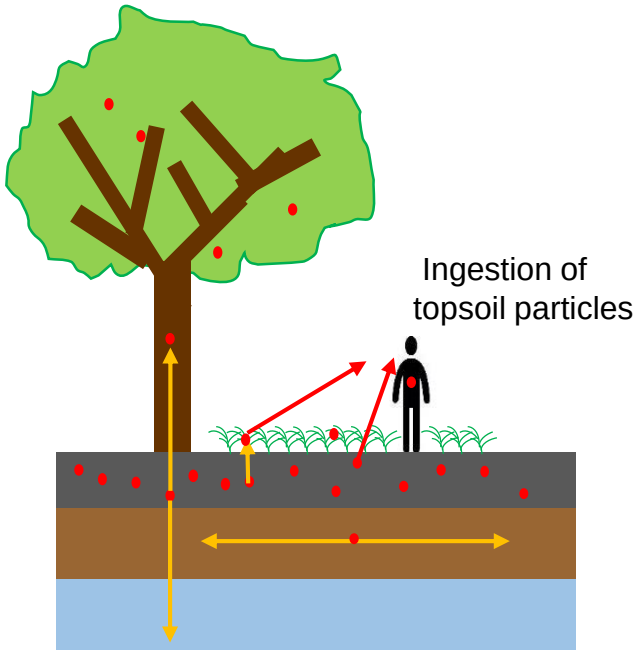
Pedogenesis

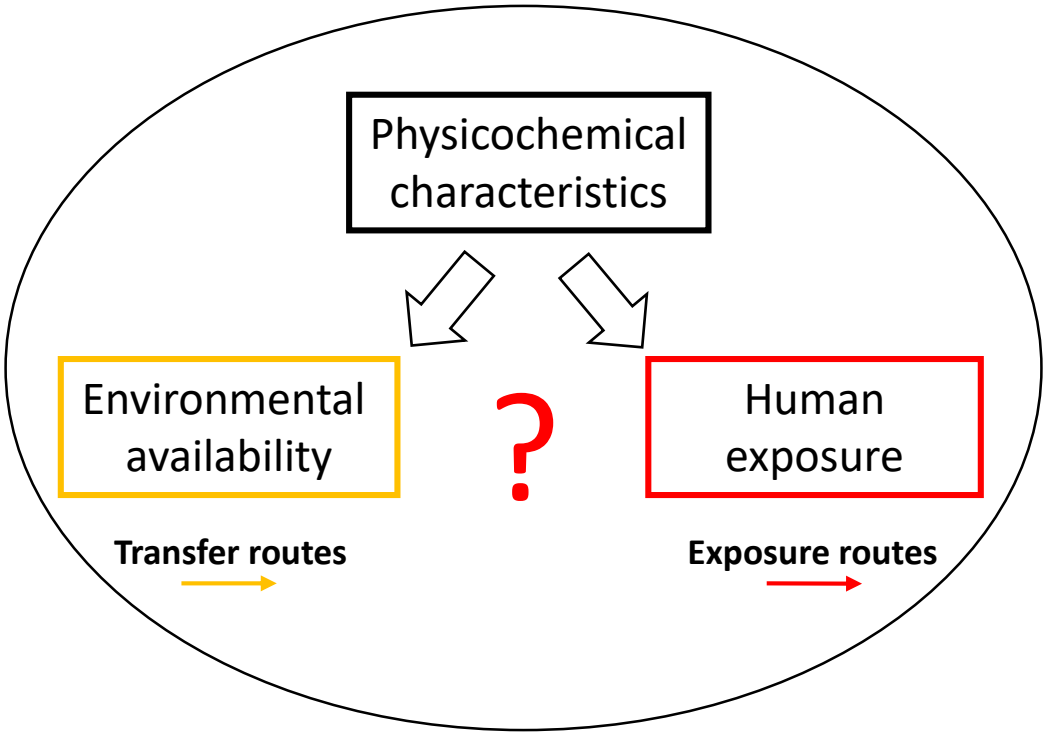
Development of spontaneous vegetation

Anthroposol development

Requalification

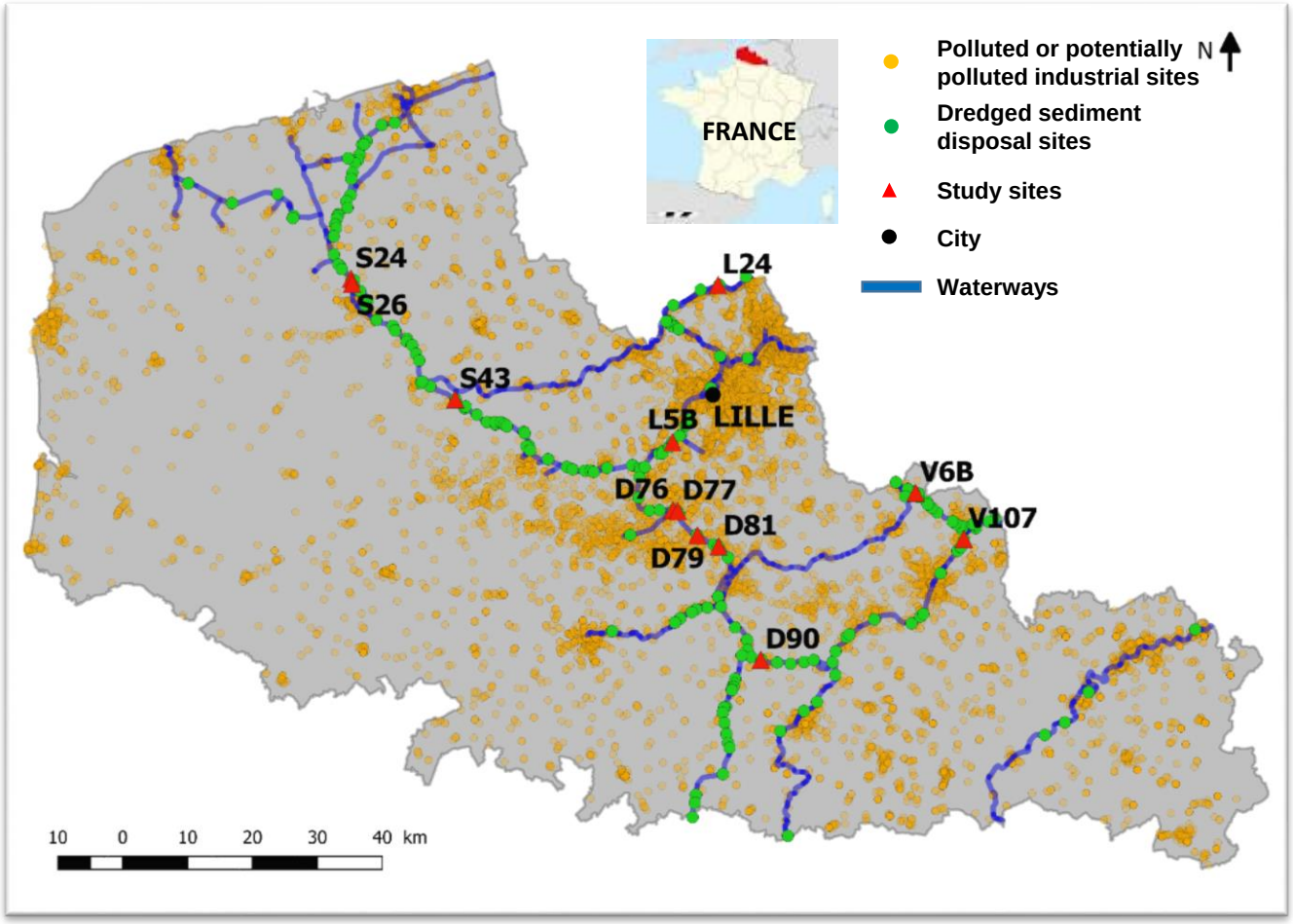
Objective





Study speciation and toxicological availability of Cd and Pb on topsoils from fluvial dredged sediments

Study area



High anthropogenic pressure (4 million people)

Significant industrial and coal-mining history

- 641 polluted sites of industrial origin (14% of French sites)

- 16 800 former industrial sites or service sites potentially polluted (6.7% of French sites)

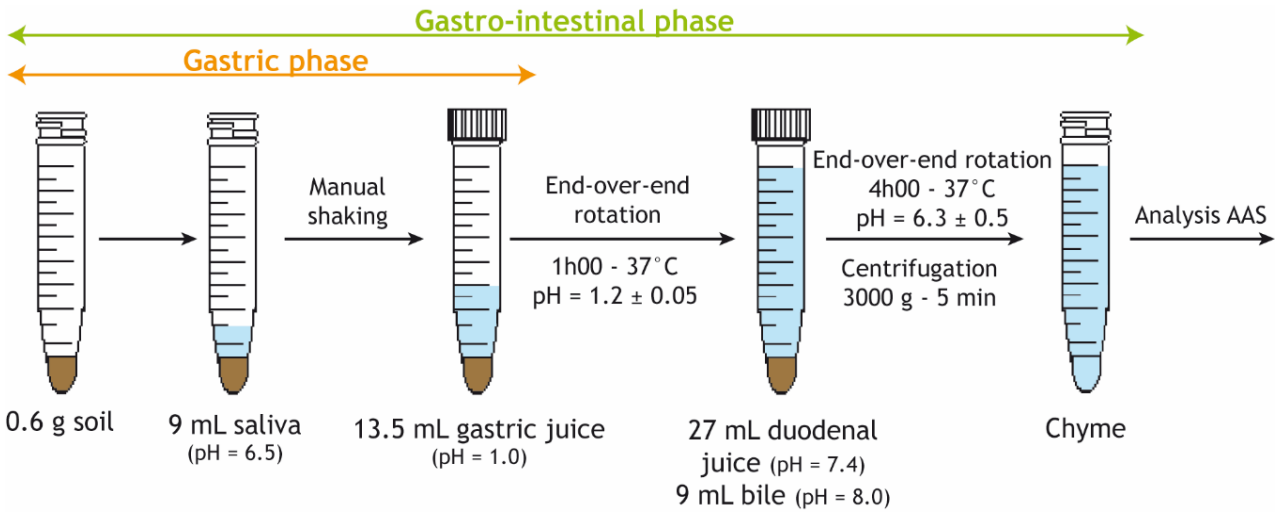
183 disposal sites
=
Land-reservoir 1600 ha

→

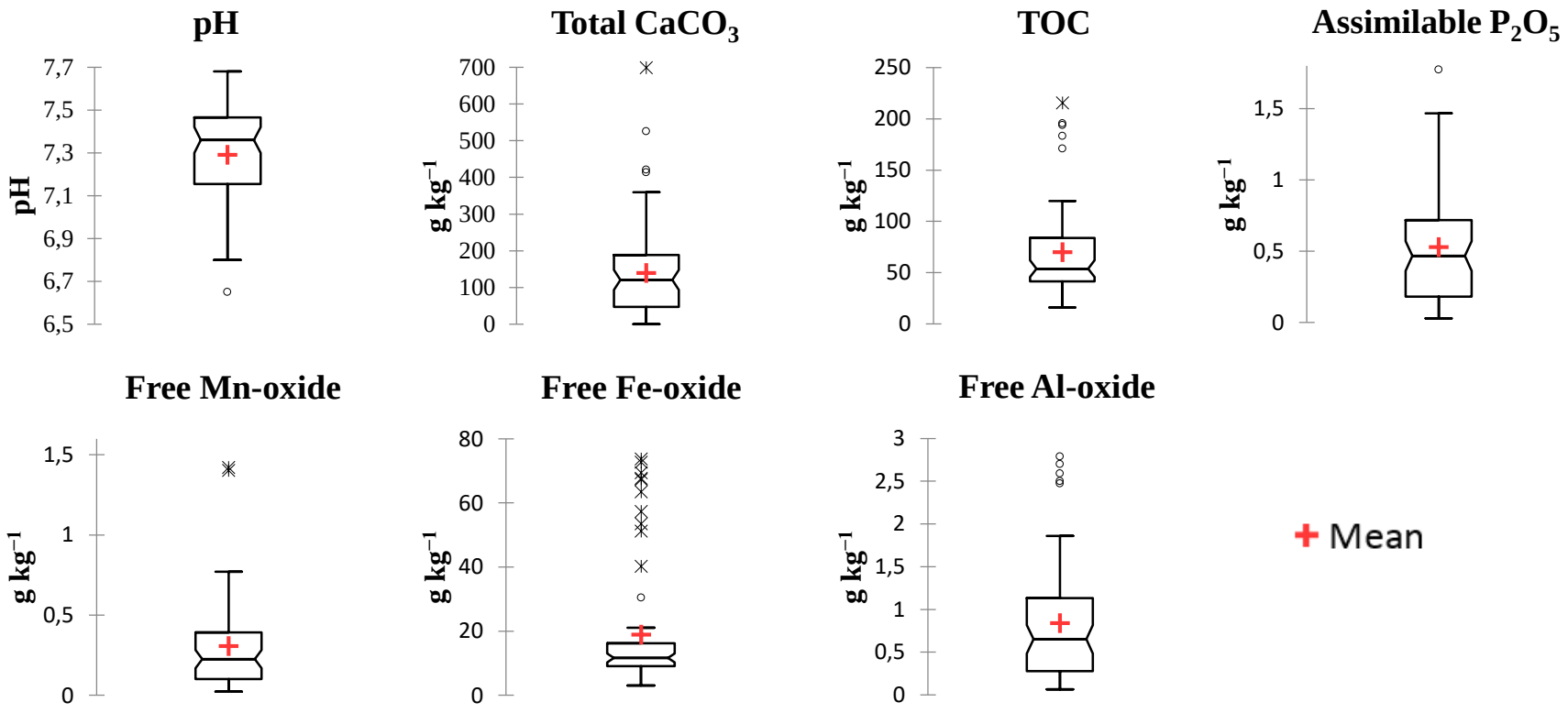
12 sites = 67 topsoil samples (between 5 to 8 per site)

Experimentation

- Physicochemical parameters: **pH, total $CaCO_3$, TOC, Free oxides (Fe, Mn, Al), assimilable P_2O_5**
- Contamination of Cd and Pb: **digested in *aqua regia***
- Environmental availability: **sequential extractions (adapted BCR method)**
- Toxicological availability: ***in vitro* oral bioaccessibility test (UBM=Unified BARGE Method)**

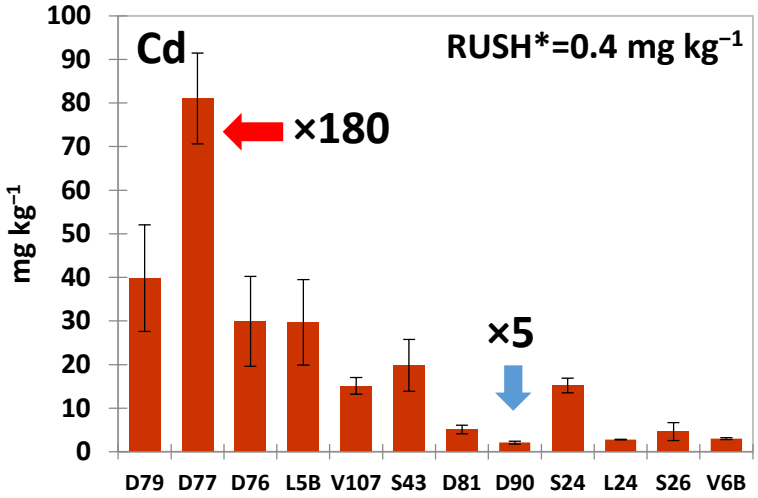


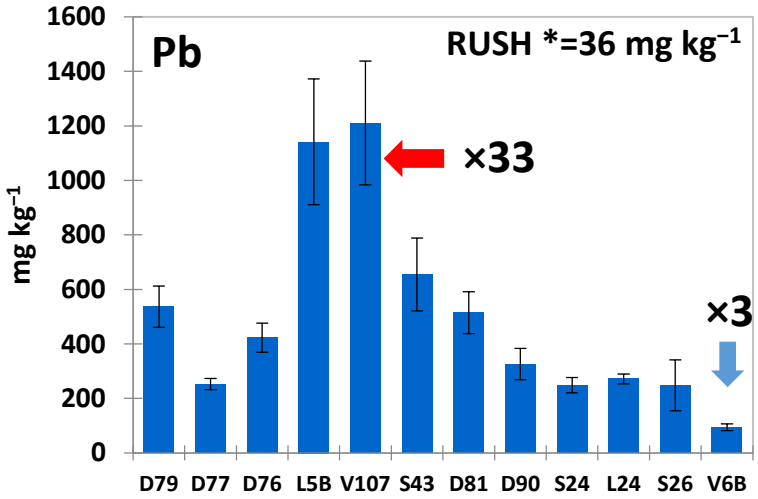
Physicochemical parameters of topsoil samples

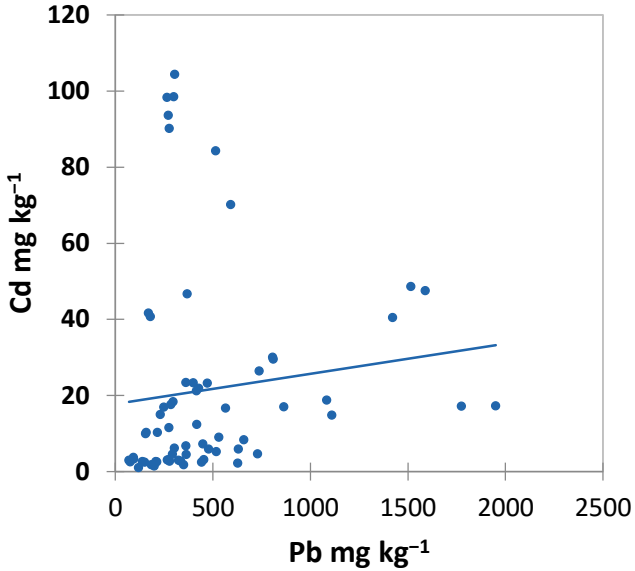


High variability of physicochemical parameters

Degree of contamination of Cd and Pb in topsoils for each site





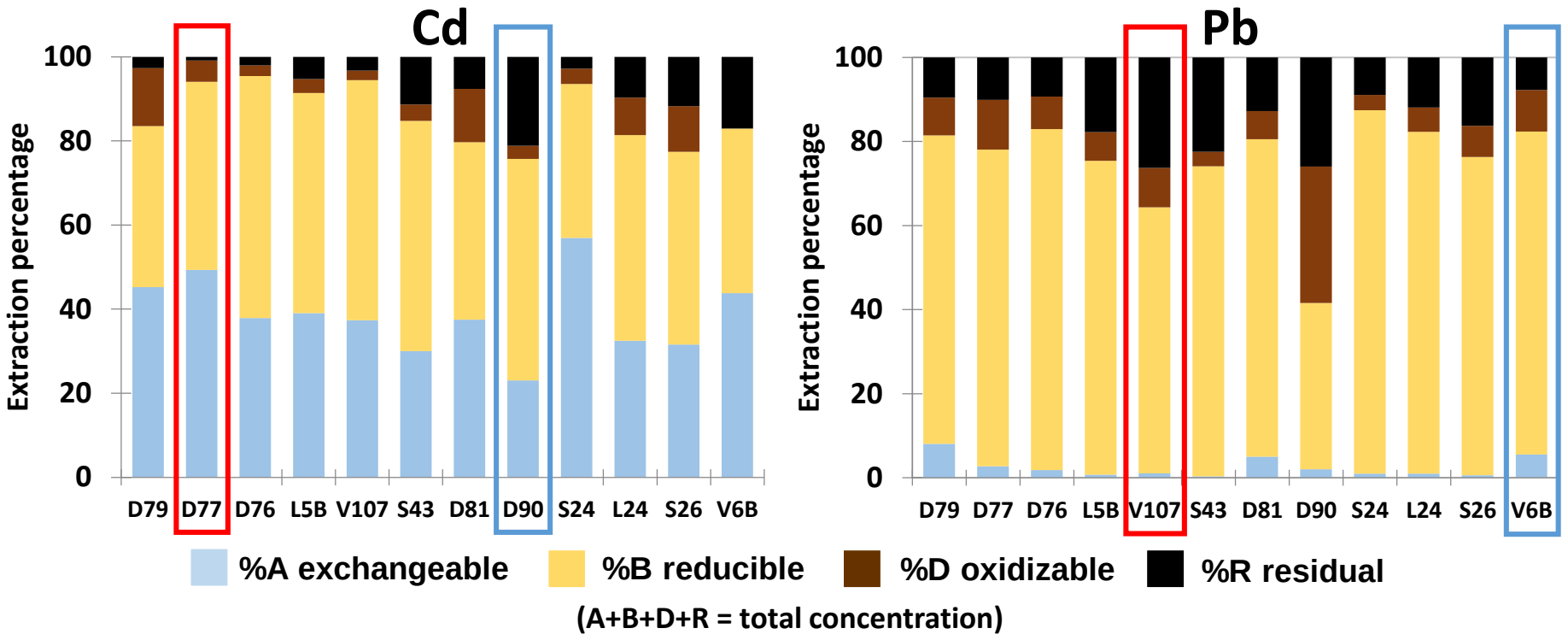


- Cd: from 2.1 to 81 mg kg^{-1}
- Pb: from 94 to 1 210 mg kg^{-1}
- No correlation between the two contaminants

Large scale of contamination

RUSH*= Regional Uncontaminated Surface Horizon (Sterckeman *et al*. 2002)

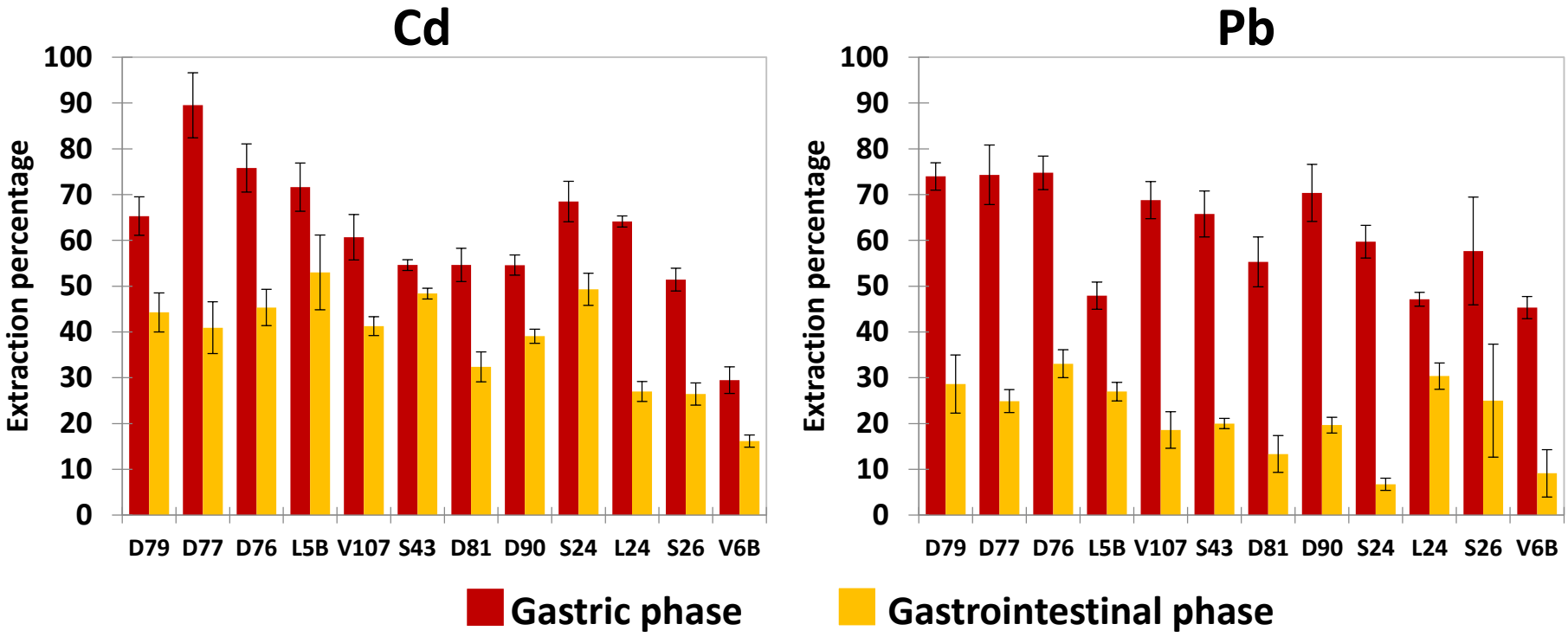
Distribution of Cd and Pb in different fractions in topsoils for each site



- Cd mainly present on fractions A and B
- Pb mainly present on fraction B
- Differences between sites

Environmental availability depends on total concentrations and physicochemical parameters

Oral Bioaccessibility of Cd and Pb in topsoils for each site



- % Gastric phase (G) > % Gastrointestinal phase (GI)
- Cd G ≈ Pb G (60%) but Cd GI (39%) > Pb GI (20%)
- Strong variation between sites for Cd and Pb in both phases

Toxicological availability depends on total concentration and physicochemical parameters

To resume

- Topsoils from dredged sediments are heterogeneous matrix
- Potentialy polluted with a large scale of contamination
- Cd and Pb present very different behaviours
  - Speciation
  - Oral bioaccessibility
- Need to integrate oral bioaccessibility into health risk assessment

Perspective

Study the effects of ageing of dredged sediments on toxicological availability of metals in topsoils

Thanks for your attention

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Région Hauts-de-France

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