

DepolLowC

Développement de liants bas carbone pour la stabilisation/solidification de polluants présents sur les friches industrielles et les sols pollués

Ontwikkeling van koolstofarme bindmiddelen voor de stabilisatie van verontreinigende stoffen die aanwezig zijn in brownfields



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Priorité 2.7. Renforcer la protection et la préservation de la nature, de la biodiversité et des infrastructures vertes, y compris dans les zones urbaines, et **réduire toutes les formes de pollution**



Doelstelling 2.7: Het versterken van de bescherming en instandhouding van de natuur, de biodiversiteit en de groene infrastructuur, ook in stedelijke gebieden, en **het beperken van alle vormen van verontreiniging**



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Over 20,000 ha
Sites to be redeveloped
(Wallonia, Flanders,
Hauts-de-France)

Ecological transition challenges

Climate

Resources optimization

Control of health and environmental risks

Economic challenges

Revitalization of the local economy

Attractiveness

New activities on rehabilitated sites

Cross-border cooperation

Sharing knowledge and expertise

Developing transferable remediation solutions

Philosophie du projet- Projectfilosofie

Matières secondaires (scories, cendres volantes, boues de dragage, ...)

Secundaire materialen (staalslakken, vliegassen, baggerspecie, ...)



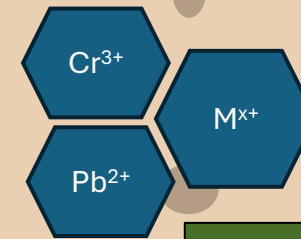
Liants bas-carbone :

- Liants sursulfatés
- Liants alcali-activés
- Liants à base de sous-produits argileux calcinés

Koolstofarme bindmiddelen :

- Supergesulfateerde binder
- Alkali-geactiveerde binder
- Binder op basis van gecalcineerde restromen

Mécanismes de stabilisation de la matrice sol/hydrates Stabilisatiemechanismen van bodems door bindmiddelen



Encapsulation physique
Fysische encapsulatie

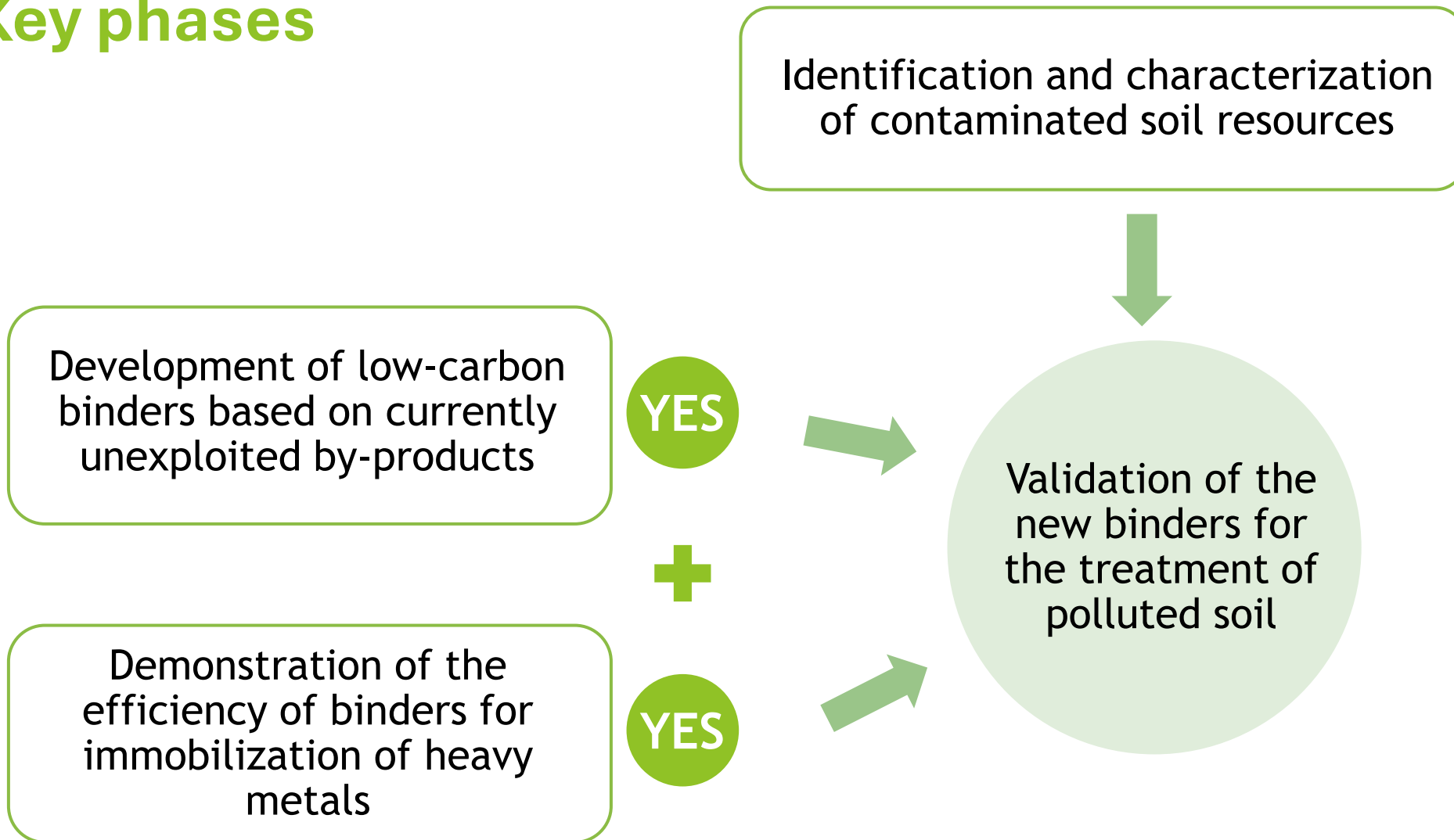
Précipitation
Precipitatie

Substitution
Substitutie

Adsorption
Adsorptie

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Key phases



Low-carbon binders

Supersulfated cements

► Composition as defined by NF EN 15743

- Blast Furnace Slag $\geq 75\%$ ----->
- $5\% \leq \text{CaSO}_4 \leq 20\%$
- Portland cement clinker $\leq 5\%$
- Other constituents $\leq 5\%$

Replacement by
industrial by-products
from brownfield sites

► Hydration process of SSC



Ettringite : Contributes to early-age strength development (first 7 days)

C-S-H : Responsible for \nearrow compressive strength at later ages

Low-carbon binders

Alkali-activated binders

- ▶ Precursors : metakaolin and other calcined clays, fly ash, Ground Granulated Blast Furnace Slag
- ▶ Activators : alkali silicates, alkali hydroxides

Binders based on calcined clay by-products

- ▶ Overburden soils, dredging sludge, ...

Development of low-carbon binders

Laboratory-scale methodology

- ▶ Development and optimisation of three low-carbon binders
 - Assessment of binder properties: fineness, water demand, setting time, compressive strength (R_c), ...
 - Optimisation of binders based on their sorption capacity (tests performed on artificially contaminated solutions)
 - Validation of binders based on their sorption performance on contaminated soils, with assessment of the impact on mechanical properties

Development of low-carbon binders

Laboratory-scale methodology

► Demonstration of effective immobilization of heavy metals

- Percolation tests
- Leaching tests



► Hydration process

- Thermogravimetry tests
- Calorimetry tests
- Setting time
- X-ray Diffraction



► Stabilization/solidification

- Proctor tests
- Immediate Bearing Index (IBI > 15 %)
- Leaching tests



On-site validation

- ▶ 3 test plots: $\geq 2 \text{ m}^3$ of stabilised soil (surface area: 5 m^2 , depth: 0.5 m)
- ▶ Monitoring over a minimum period of 6 months: lysimetry and periodic sampling



Additional applications for the binders

- ▶ Construction and road engineering
- ▶ Alternative to conventional binders for the stabilisation of specific waste streams in technical landfill facilities



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Merci pour votre attention!

Dank u voor uw aandacht!

Website

<https://www.interreg-fwvl.eu/fr/projets/developpement-de-liants-bas-carbone-pour-la-stabilisationsolidification-de-polluants>

