

**Valorisation of (un)contaminated sites for biomass production –  
feedback from the REGENERATIS project applied on metallurgical  
wastelands and application for urban agriculture**

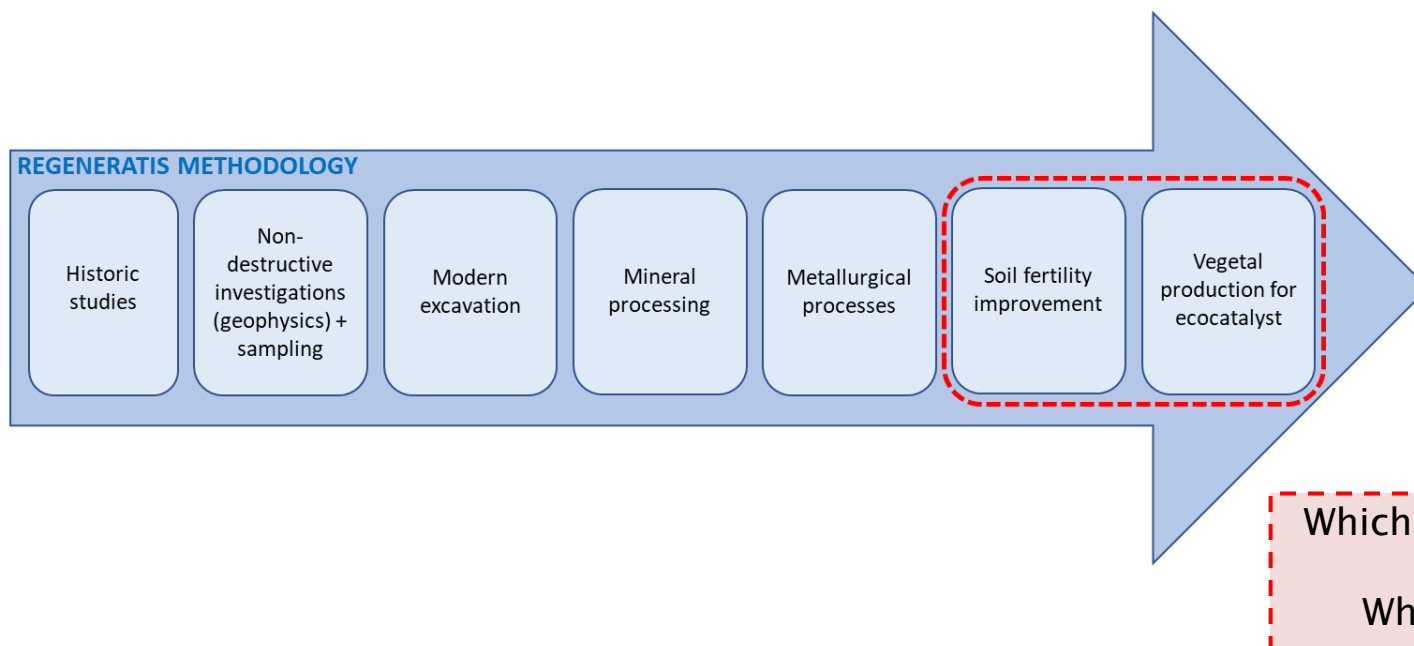
*Dr. Adeline JANUS – IXSANE*

*March 28<sup>th</sup>, 2023*

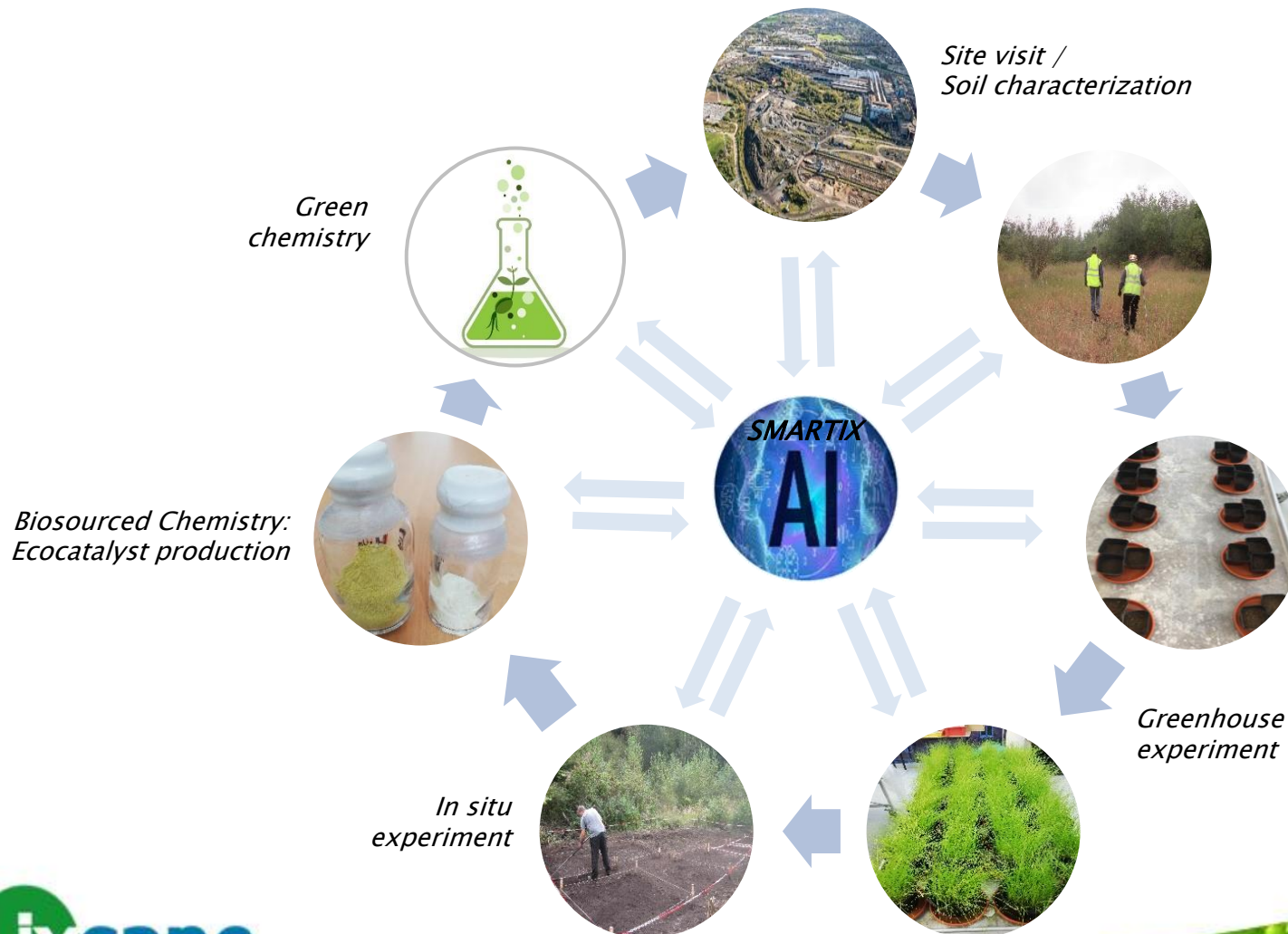


# REGENERATIS project

*“REGENERATIon of past metallurgical Sites and deposits through innovative circularity for raw materials” (2020–2023)*



# Methodology



# Pilot site

“La Louvière” in Belgium – owned by DUFERCO  
Metallurgical activities (iron and steel plant) since 1850



- Soil sampling for soil characterization (5 areas)
  - ✓ Metal contamination
  - ✓ Soil fertility

→ Selection of two areas of interest

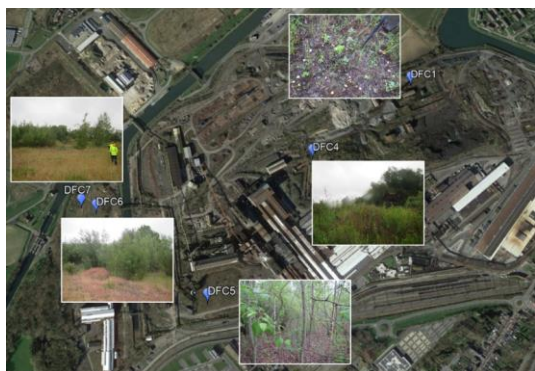
## DFC 4:

- High metallic contamination
- Low fertility



## DFC 5:

- Uncontaminated soil
- High fertility

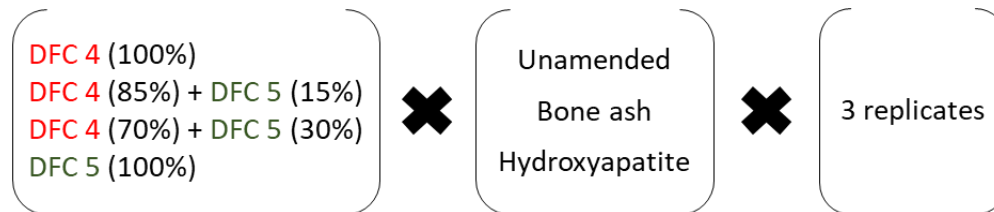




# Greenhouse experiment

## Objectives:

- Test amendments to increase soil fertility or decrease metal toxicity
- Evaluate plant development
- Determine metal (especially Zn) phytoavailability
- Produce ecocatalysts with aerial biomass and test their efficiency in chemical reactions

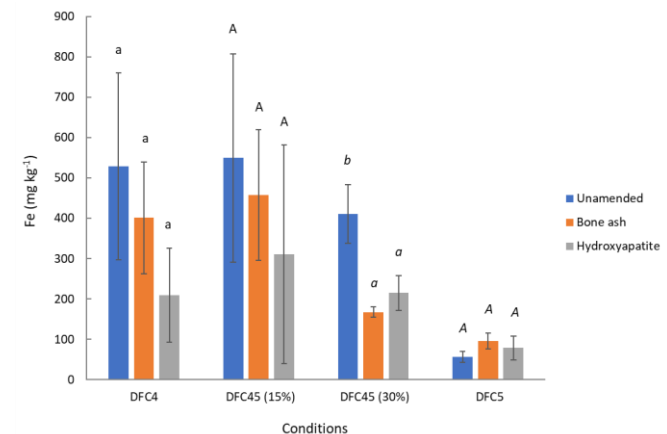


## Results:

- Good ryegrass development for the all conditions
- Mean zinc accumulation for the conditions with the contaminated soil
- No effect of the amendments on ryegrass or soil characteristics

## BUT

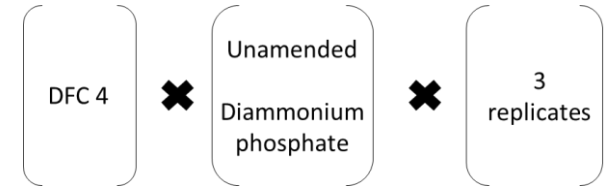
- High Fe concentration in ryegrass cultivated on DFC4
- High Ca concentration in ryegrass cultivated on DFC5



# In situ experiment

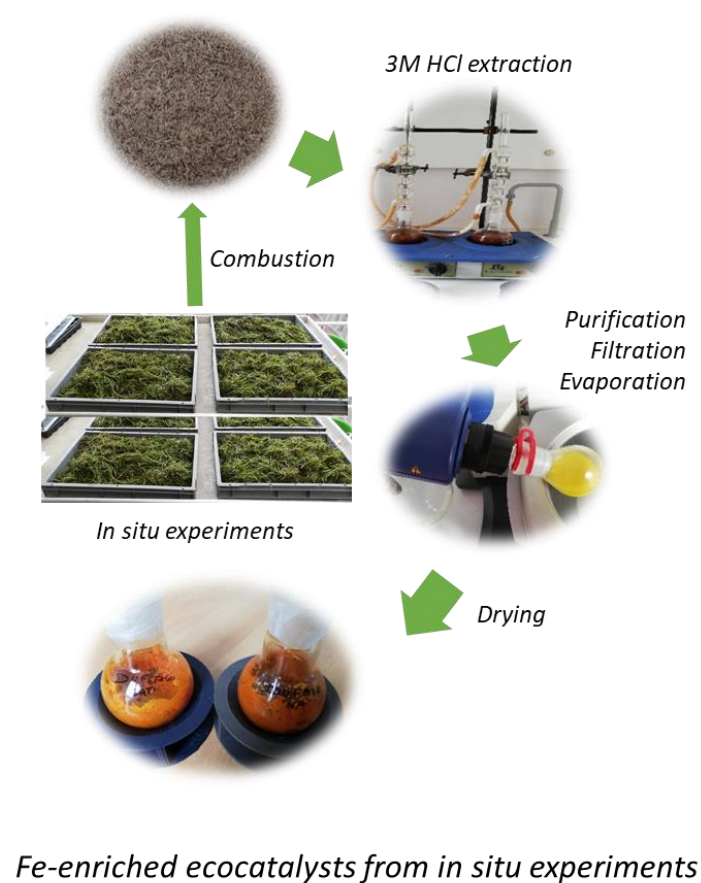
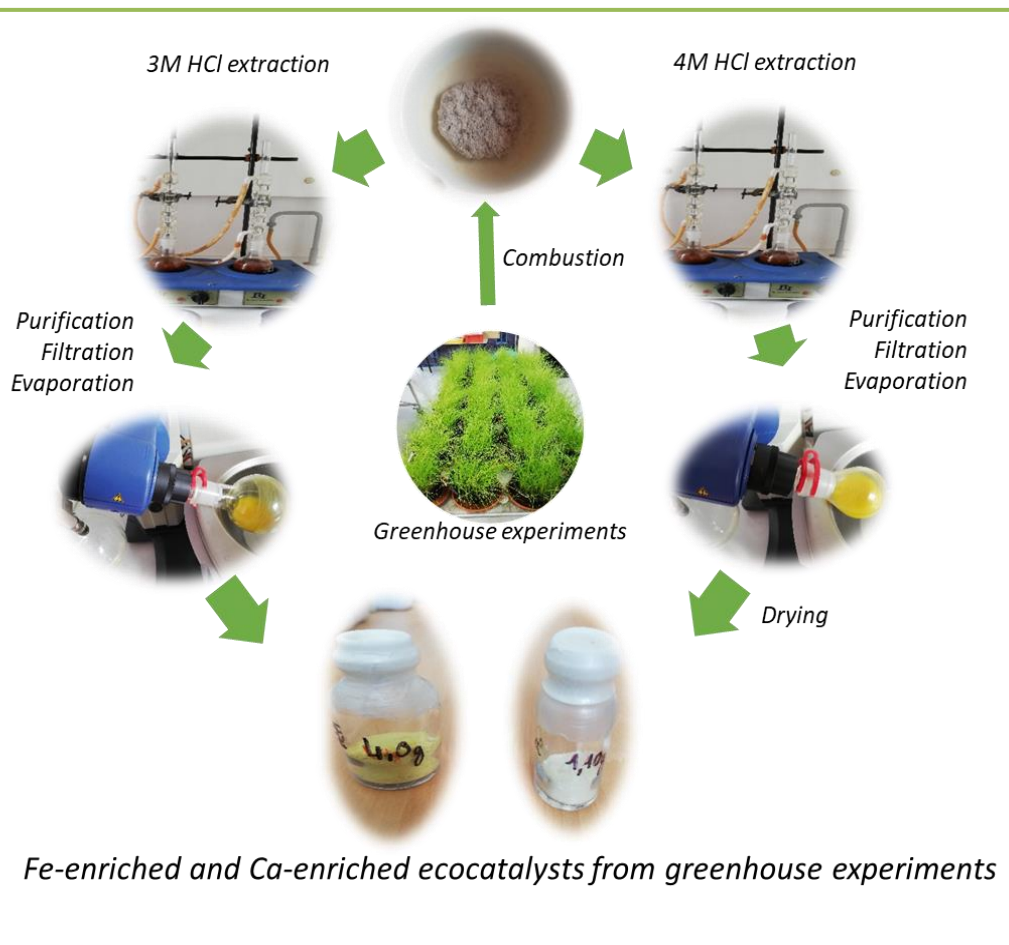
## Objectives:

- Test another amendment to increase Zn phytoavailability
- Evaluate plant development in real conditions
- Determine metal phytoavailability
- Produce ecocatalysts with aerial biomass and test their efficiency





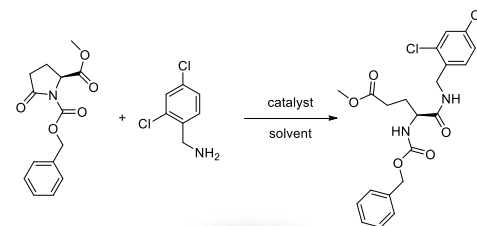
# Production of ecocatalysts



# Ecocatalysis for the synthesis of high value-added molecules

## Objectives :

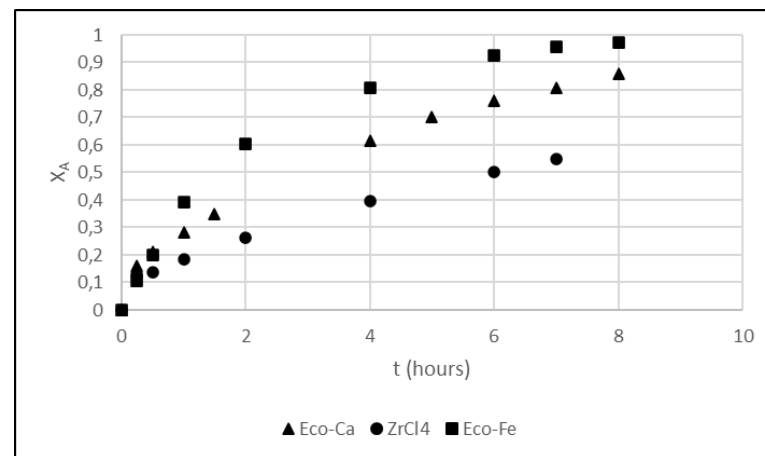
- Study of ecocatalysts in the green synthesis of therapeutic amides
- Comparison of the performances of classical Lewis acids (petrochemistry) to **ecocatalysts** (REGENERATIS)



| Experiment | Catalyst          | solvent | T (° C)     | C <sub>A0</sub> (M) | C <sub>B0</sub> (M) | Molar ratio (A:B) |
|------------|-------------------|---------|-------------|---------------------|---------------------|-------------------|
| 9          | Eco-Ca            | ACN     | 83 (reflux) | 0.368               | 0.361               | 1:1               |
| 10         | ZrCl <sub>4</sub> | ACN     | 83 (reflux) | 0.387               | 0.361               | 1:1               |
| 11         | Eco-Fe            | ACN     | 83 (reflux) | 0.425               | 0.361               | 1:1               |

## Reaction conditions of catalyst effect experiments

- ZrCl<sub>4</sub> → lowest reaction rate (53% yield)
- Eco-Fe → best reaction rate (96% yield)
- Reason → synergetic effect of different metal chlorides improve reaction rate





# Conclusion and perspective

## Conclusions

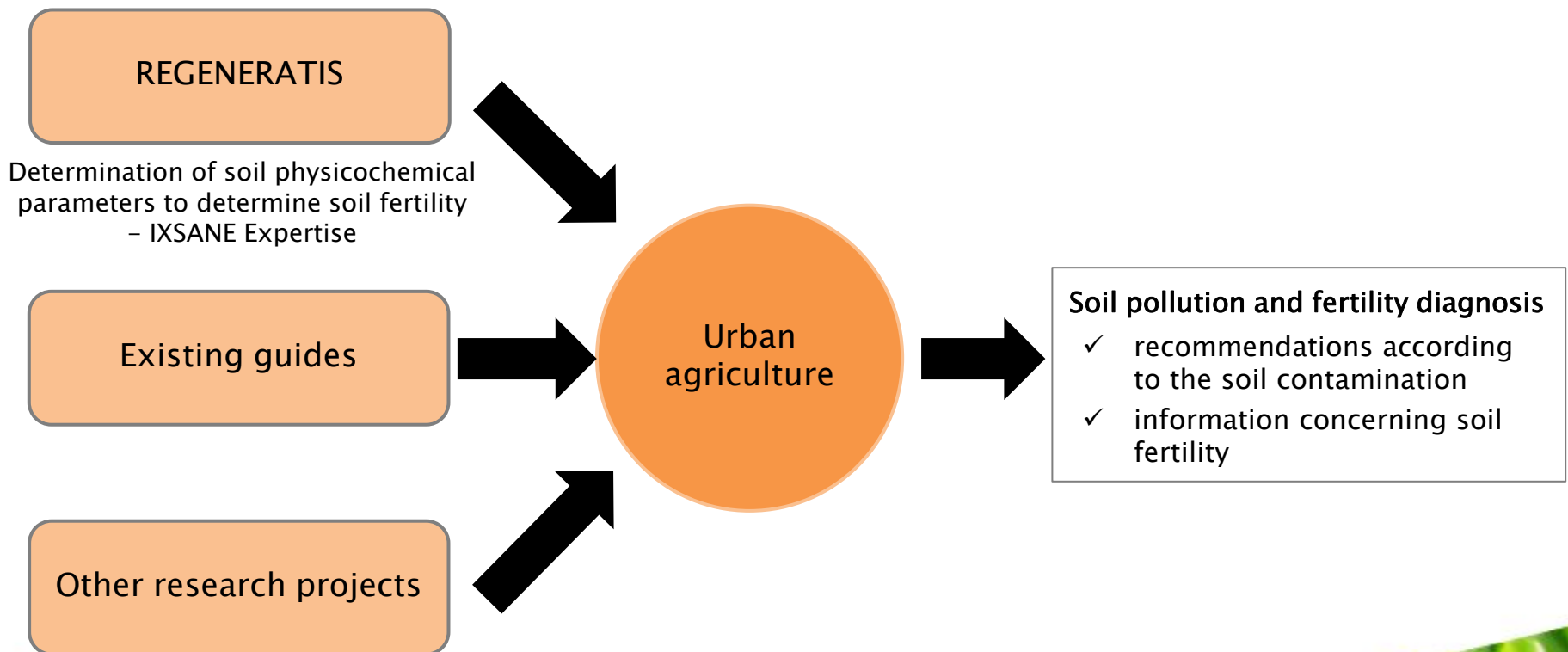
- Extensive bibliographic research to collect usable data for AI
- Greenhouse and in situ experiments realized with several sites in Europe
- Production of ecocatalysts from lab-pilot and in situ experiments
- Validation of the efficiency of ecocatalysts from lab-pilot experiments for some reactions

## Perspectives

- Evaluation of ecocatalysts obtained from field experiments
- How to reuse and valorize the data obtained from bibliographic research and experiments ?

# Urban agriculture

How to reuse and valorize the acquired data obtained from bibliographic research and experiments ?



**Thank you for your attention**



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