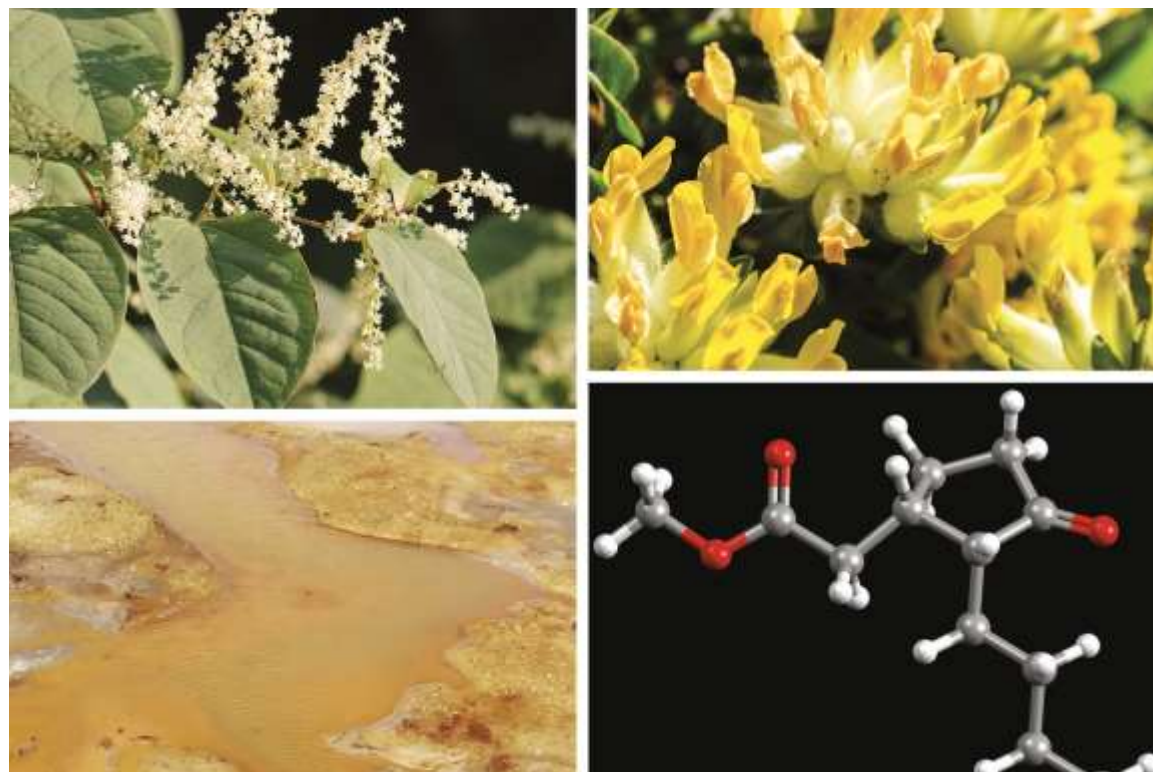


Les espèces végétales, des usines vivantes et inspirantes



@RoySocChem

5 key drivers of the nature crisis



1. Changes in land and sea use



Photo by CIFOR/ Axel Fassio

2. Climate change



Photo by UNEP/Olle Nordell

3. Direct exploitation of natural resources



Photo by Pixabay/ Reijo Telaranta



4. Pollution



5. Invasive alien species



1. Changes in land and sea use



Photo by CIFOR/ Axel Fassio

2. Climate change



Photo by UNEP/Olle Nordell

3. Direct exploitation of natural resources



Photo by Pixabay/ Reijo Telaranta

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5. Invasive alien species



How can we take up these two challenges?



Developing Nature-based Solutions (NbS)



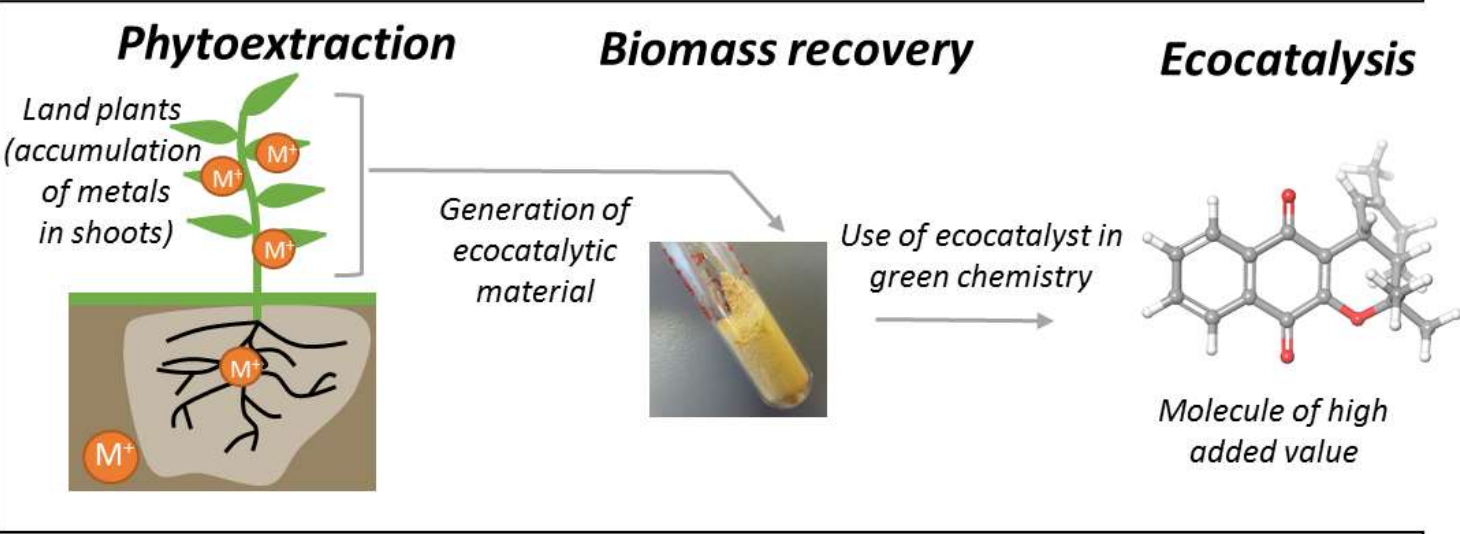
Making these solutions economically viable



[International Union for Conservation of Nature](https://www.iucn.org/)

4.1. Pollution of land ecosystems

Ecological restoration based on the remarkable adaptative capacity of specific land plants



- France
- Greece (Crete)
- China
- Gabon
- New Caledonia

4.1. Pollution of land ecosystems

New Caledonia: an exceptional biodiversity



- Caledonian lagoon: classified as one of Unesco's World Heritage sites.
- Its Mangrove: the Voh heart
- Biodiversity hotspot (>74% of endemic plant species)
- Example: the tree with the blue sap



4.1. **Pollution** of land ecosystems

Contrasting situations in New Caledonia:
exceptional biodiversity and degraded sites



- High environmental impacts: loss of biodiversity, erosion: <23 000 ha degraded

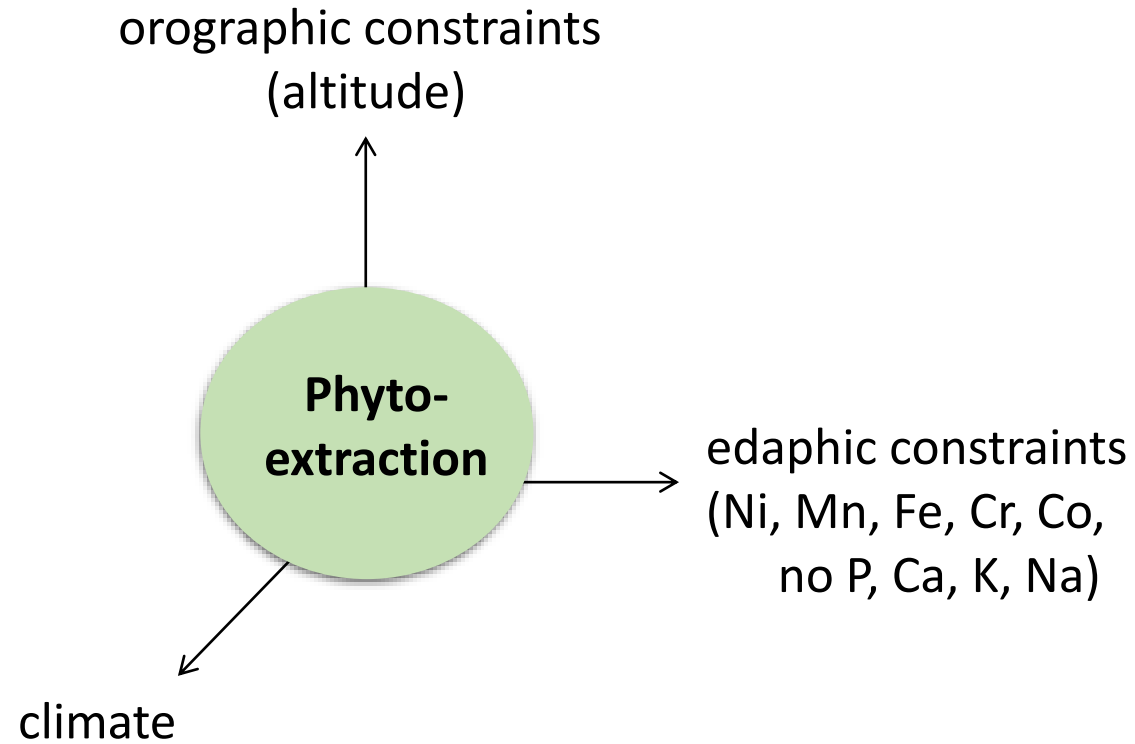


6 ha of rehabilitation based on endemic species



Environ. Sci. Pollut. Res. 2015, 22, 5592-5607.
Environ. Sci. Pollut. Res. 2015, 22, 5608-5619.
Environ. Sci. Pollut. Res. 2015, 22, 5620-5632
G. Losfeld, B. Fogliani, L. L'Huillier, T. Jaffre, C. Grison

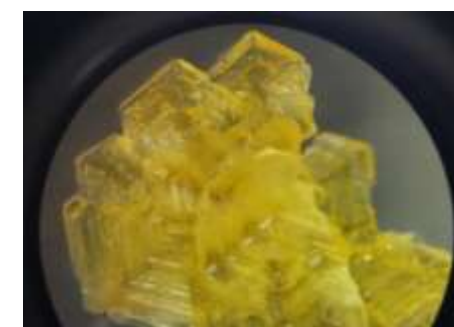
Towards a real program of ecological restoration



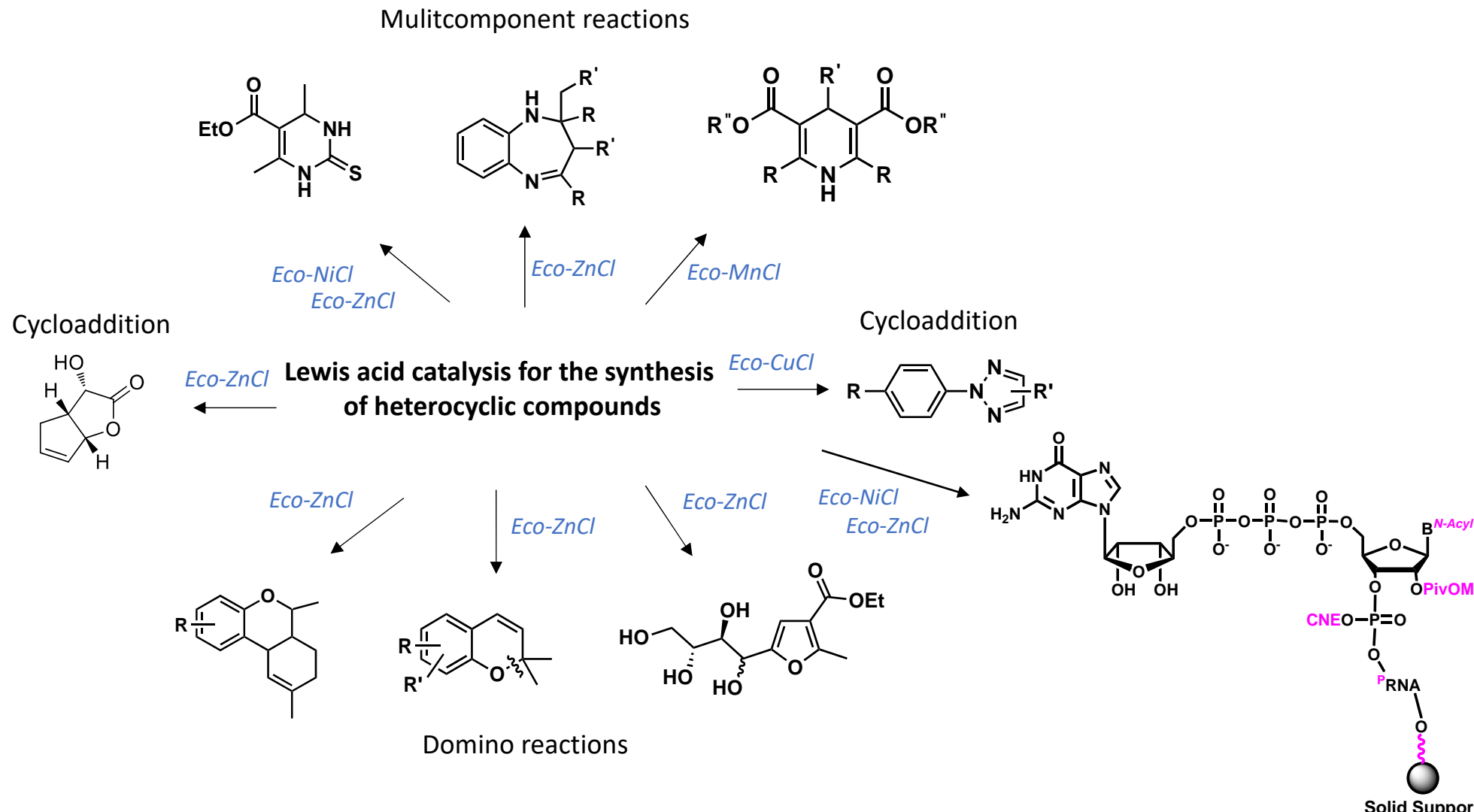
1. *Development of Pioneering species*
2. *Adapted legumes*
3. *Increase of local biodiversity*

4.1. Pollution of land ecosystems

Ecocatalysts[®]: the first bio-sourced metallic catalysts



- Brønsted acid, hard Lewis acid and/or soft Lewis acid properties



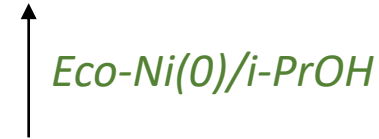
4.1. Pollution of land ecosystems

Ecocatalysts[®] : the first bio-sourced metallic catalysts

➤ Reducing properties



Regioselective reductions
 α,β -unsaturated aldehydes and ketones

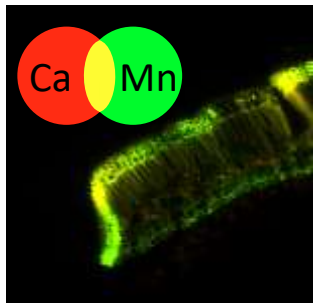


Reductions



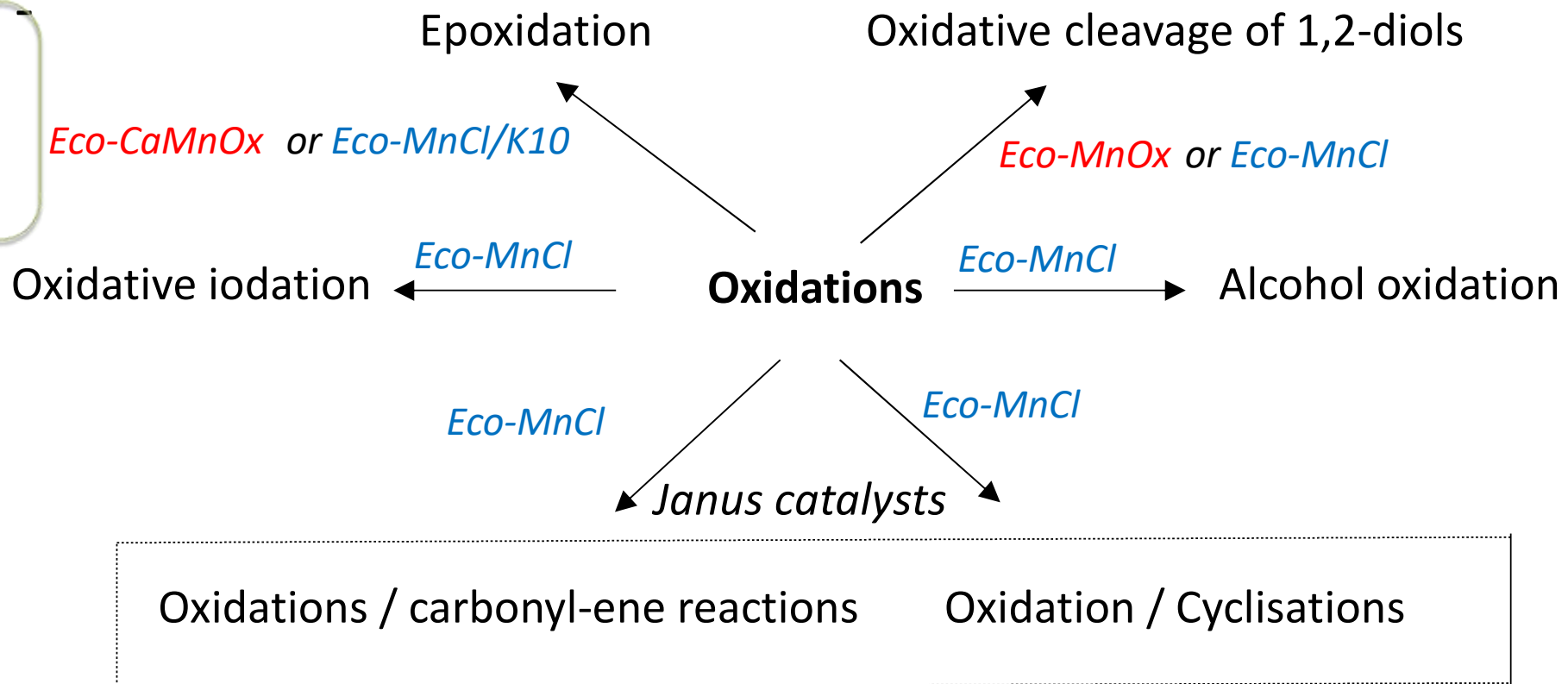
Aminoreductions of
aldehydes and ketones

4.1. Pollution of land ecosystems



Ecocatalysts[®] : the first bio-sourced metallic catalysts

➤ Oxidative properties



4.1. Pollution of land ecosystems

How useful is this research?

Development of a large industrial project in New Caledonia

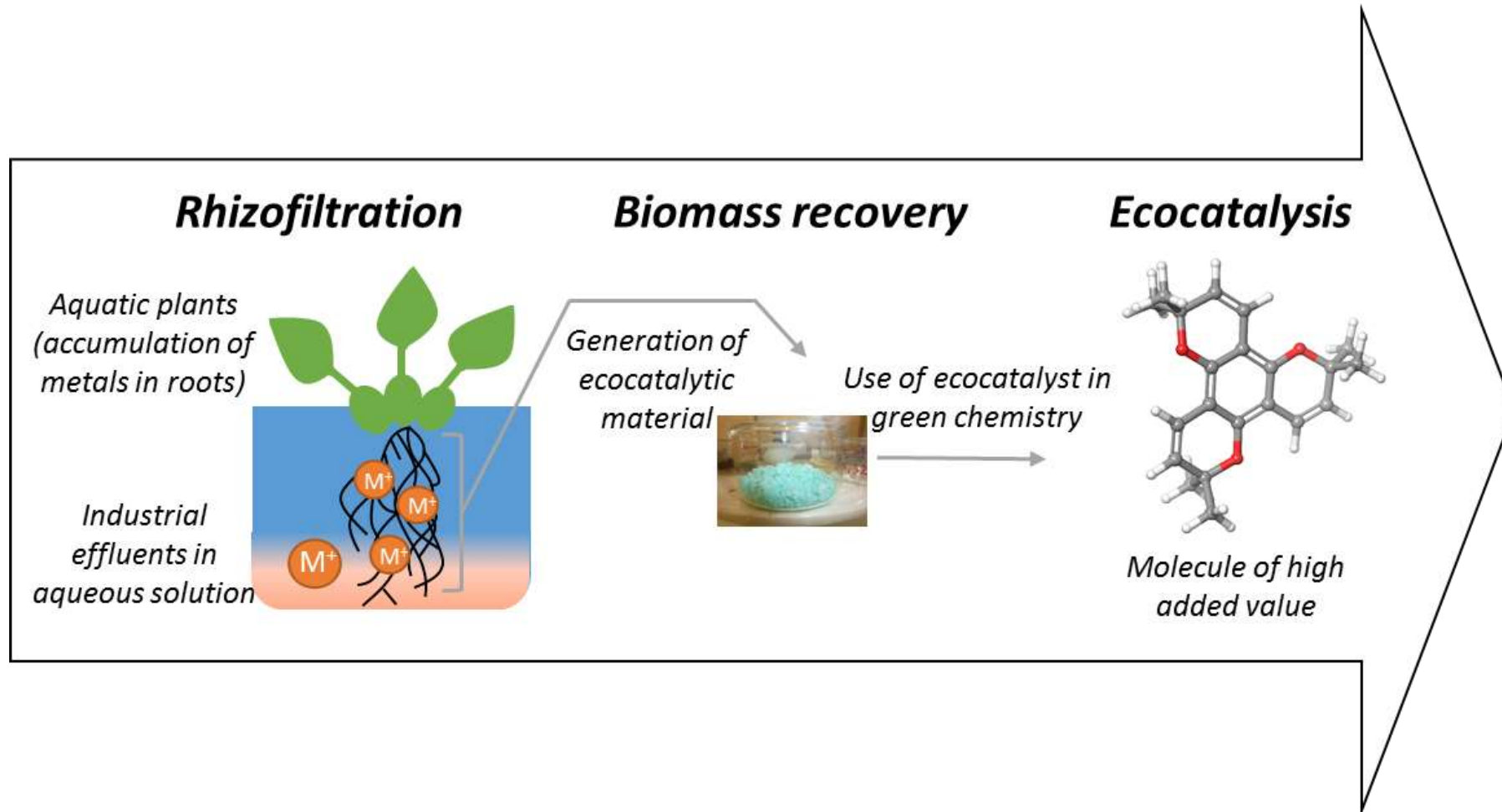


Eco-CaMnOx:
Biomimetic oxidant



4.2. Pollution of aquatic ecosystems

Ecological treatment of industrial effluents by **rhizofiltration**



4.2. Pollution of aquatic ecosystems

Ecological treatment of industrial effluents by **biosorption** based on plant filters



- Strategic Metals:

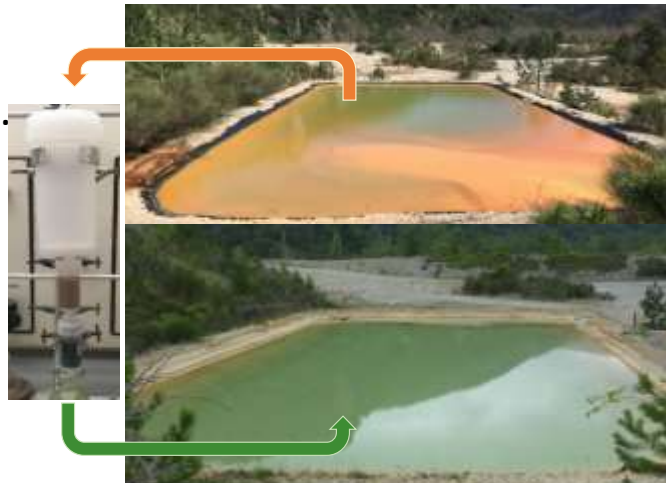
Pd, Pt, Ce, Eu, Yb, Sc, ...

- Primary Metals:

Mn, Ni, Cu, Zn, Fe, ...

- Toxic Metals:

As, Co, Pb, Cd, ...



Plant Filter
- Batch mode
- Continuous process

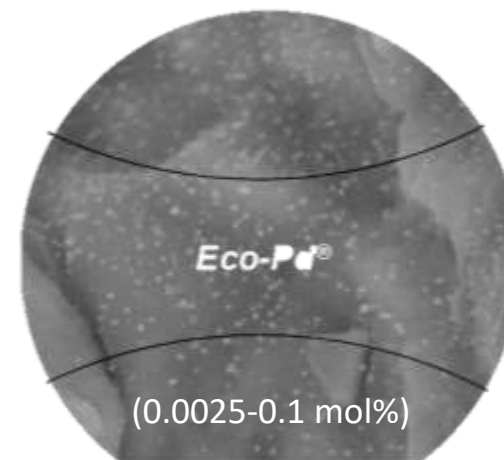
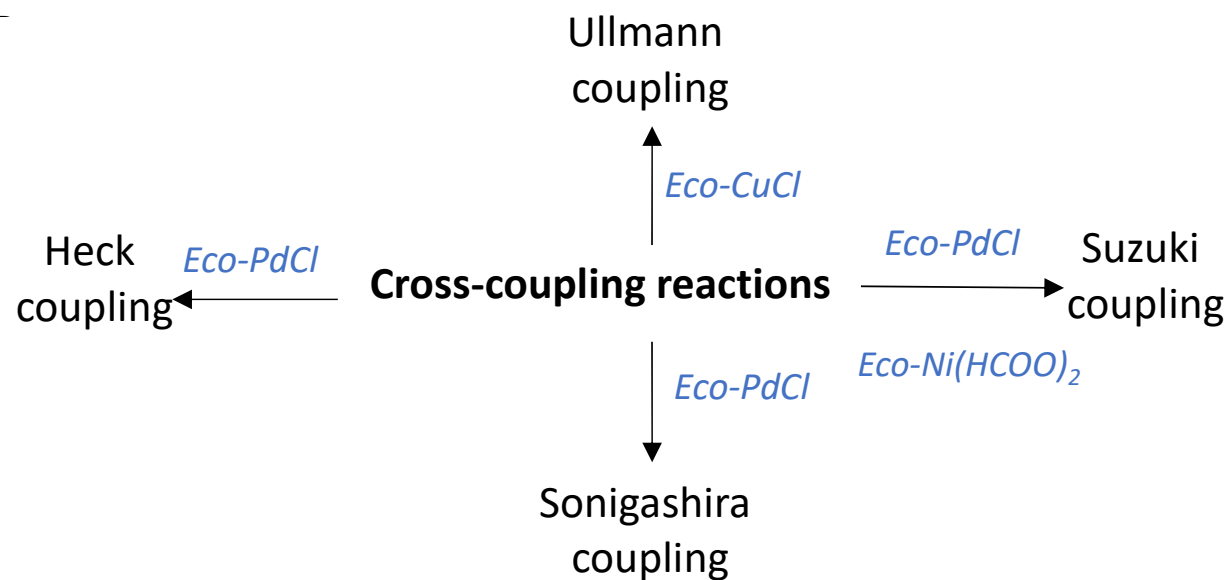
4.2. Pollution of aquatic ecosystems

Transposition of research results to demonstrators



Rhizofiltration and biosorption for a new generation of ecocatalysts

- Lewis acid catalysis: ✓
- Oxidations: ✓
- Reductions: ✓
- Cross-coupling reactions:



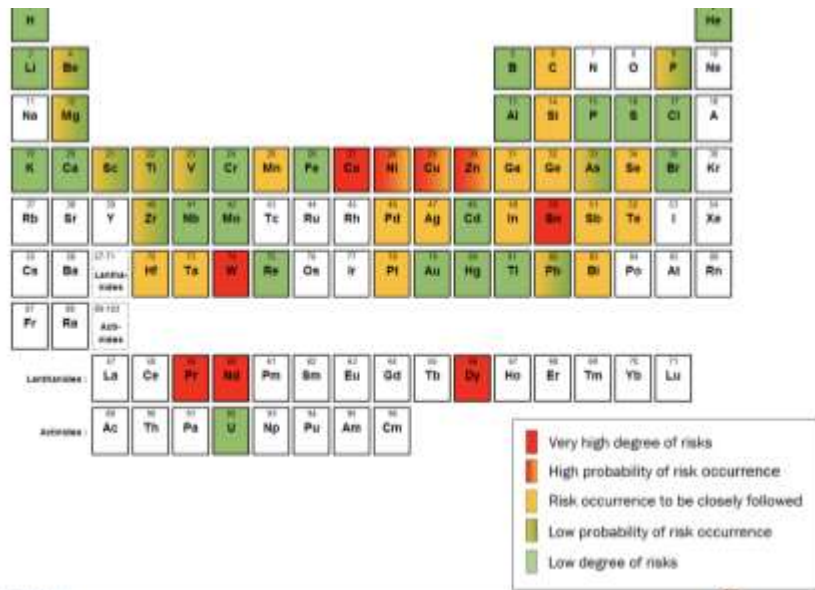
4.2. Pollution of aquatic ecosystems

Ecological treatment of industrial effluents by biosorption based on plant filters

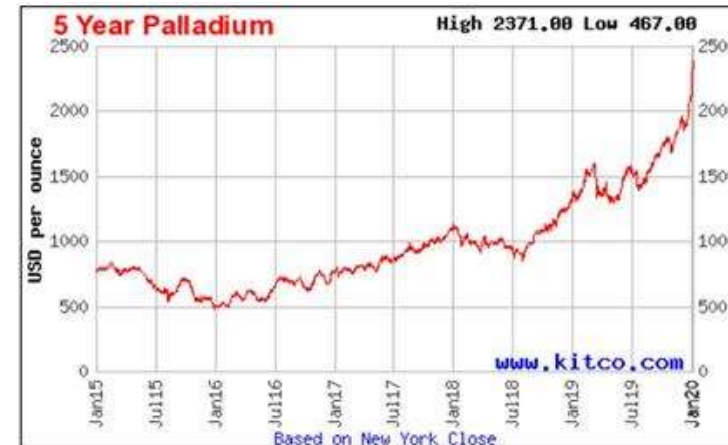
What is the use of this research?



Ecological recycling of strategic metals from industrial effluents



Preparation of medicines in France



A life cycle analysis for decarbonization

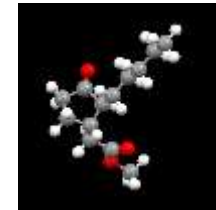
Classical Catalysis



- Landscape impacts
- Loss of biodiversity
- Carbon destocking
- Mass production of mining waste
- Soil erosion
- Pollution of aquatic systems



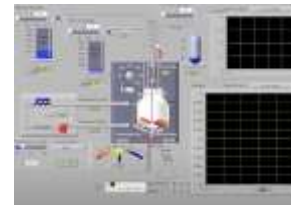
- Metallurgical treatments
- Waste production
- High environmental footprint



Ecocatalysis



- Effluent depollution
- Sustainable and useful management of Invasive Alien Species
- Preservation of water resources and aquatic life



- Sober processes
- Green and automated syntheses
- Recyclable catalysts



 **BIOINSPIR**

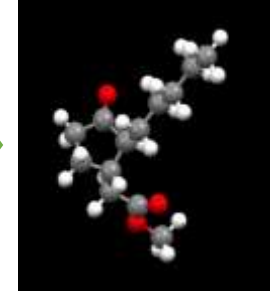


5.1. Invasive alien plants



The demonstrative example of *Fallopia japonica*
1 of the 100 most harmful invasive species in the world (IUCN)

1. Massive harvests in accordance with regulations + Ecological monitoring 2. Recovery of biomass by ecocatalysis



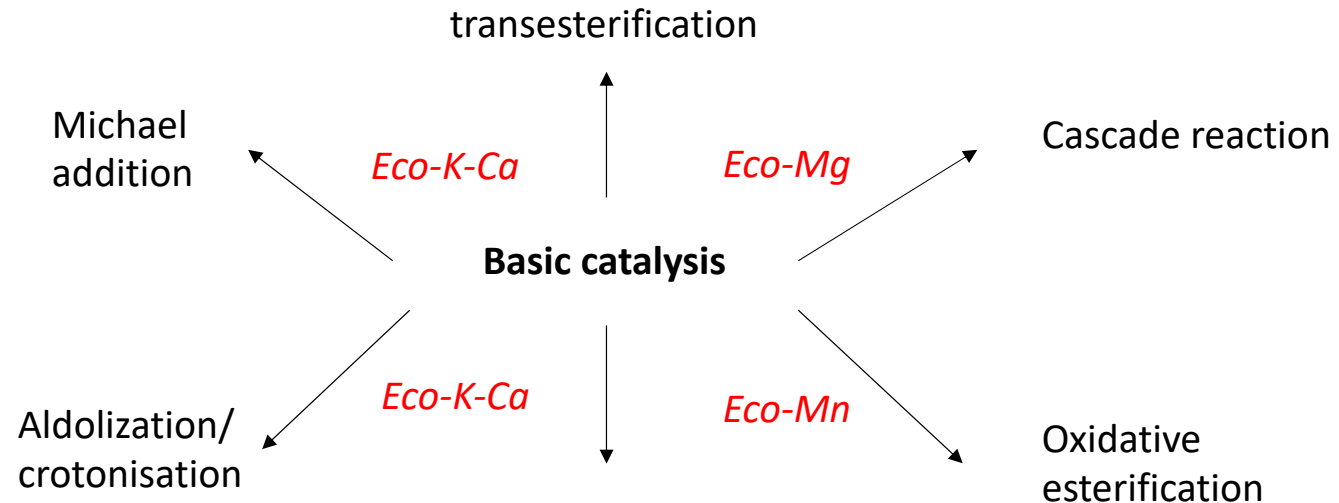
Molecule
with high
added
value

5.1. Invasive alien plants



The recovery of Invasive Alien Species

➤ **Basic ecocatalysis**



5.1. Invasive alien plants

What is the use of this research?

BIOINSPIR

Creator of ecocatalysts® and biosourced molecules

At BIOINSPIR, we believe in the power of nature to build a more responsible and sustainable world. Our molecules are synthesized by ecocatalysis®, an innovative process combining ecology and chemistry.

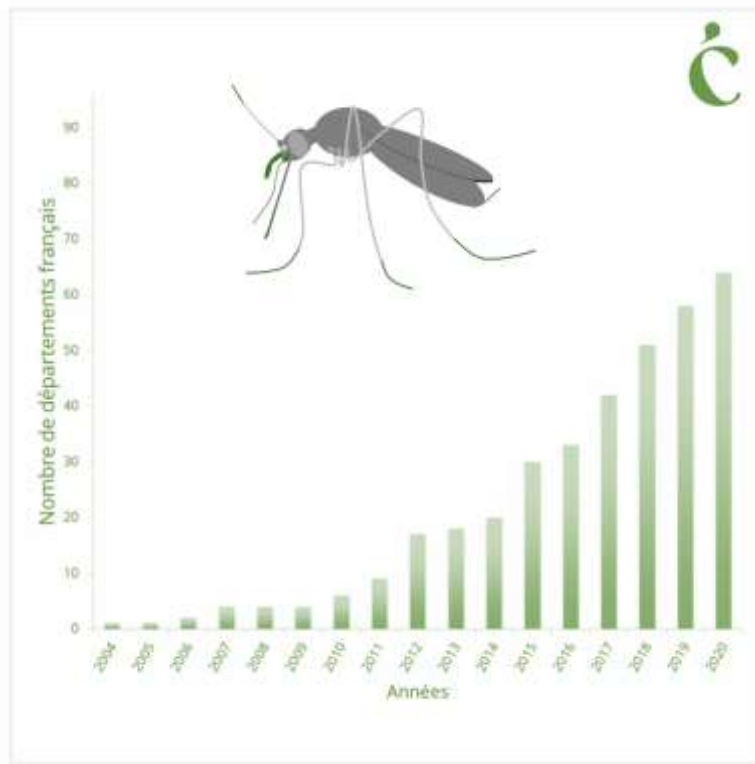


COSMOS
ORGANIC



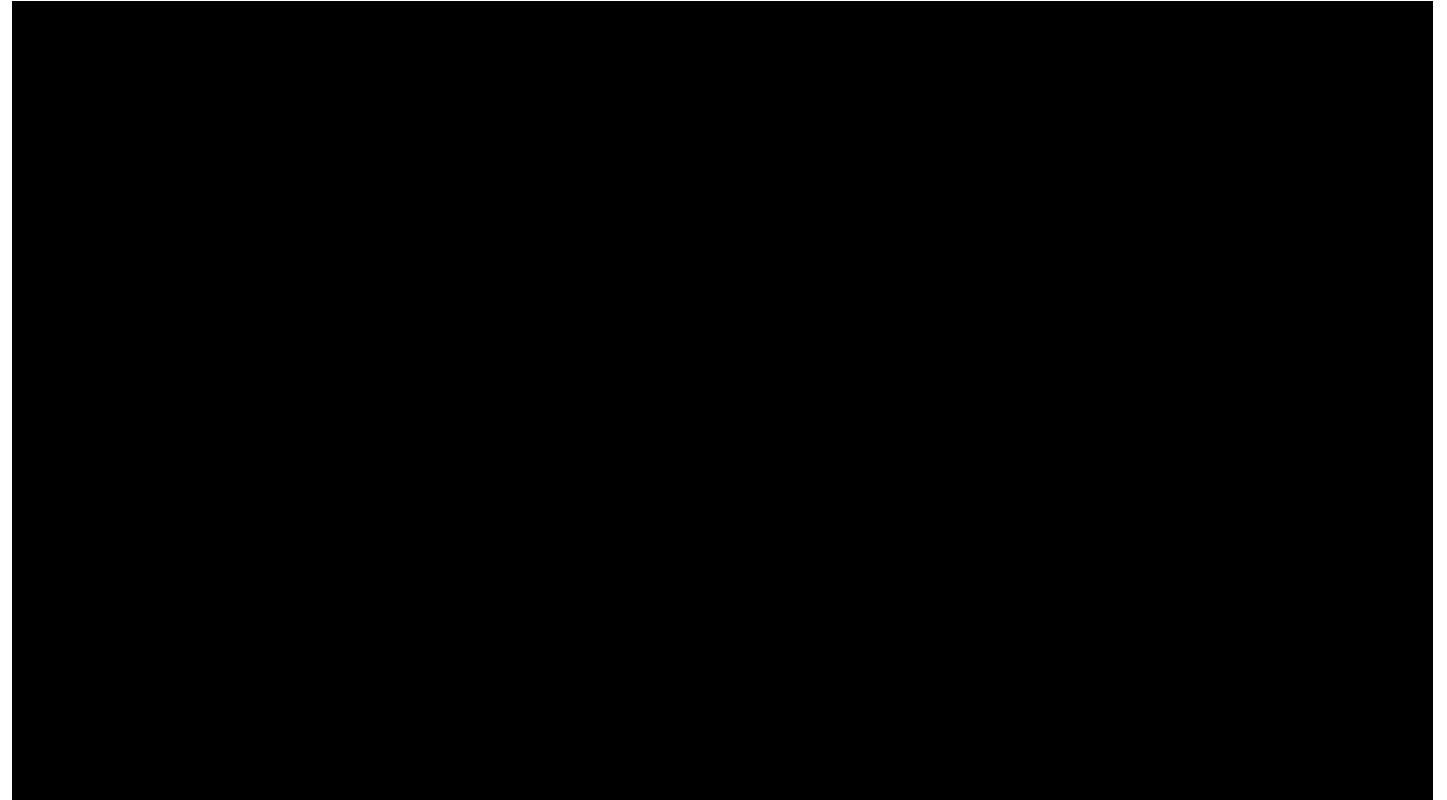
5.2. Invasive alien insects

Mosquito-borne diseases currently account for 17% of infectious diseases (WHO)



The progress of *Aedes albopictus* in France

Taking inspiration from the language of nature



Hypothesis: attraction and repulsion are based on similar molecular mechanisms

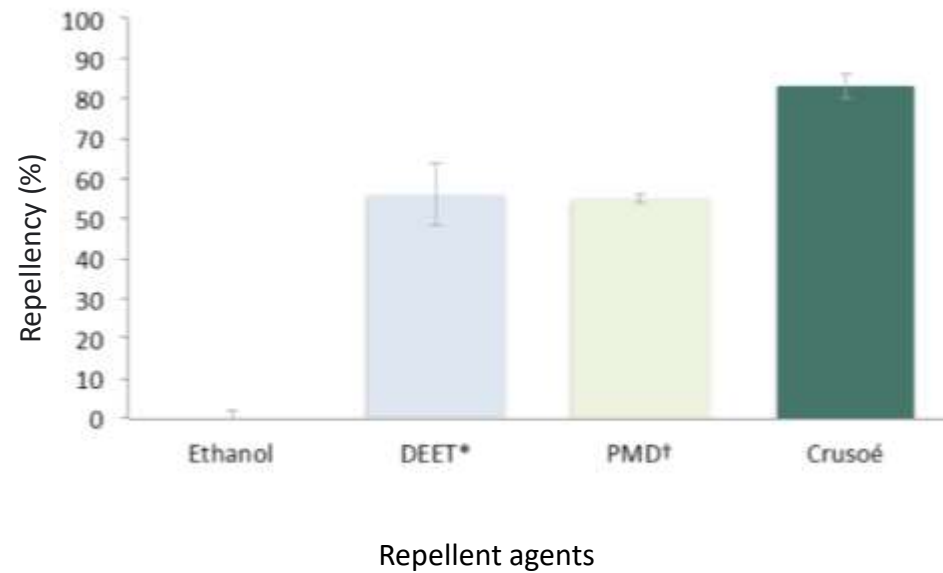


- 1/ Target multiple receptors to maximize repellent power
- 2/ Identify combinatorial interactions between natural odorant molecules and their receptors

5.2. Invasive alien insects

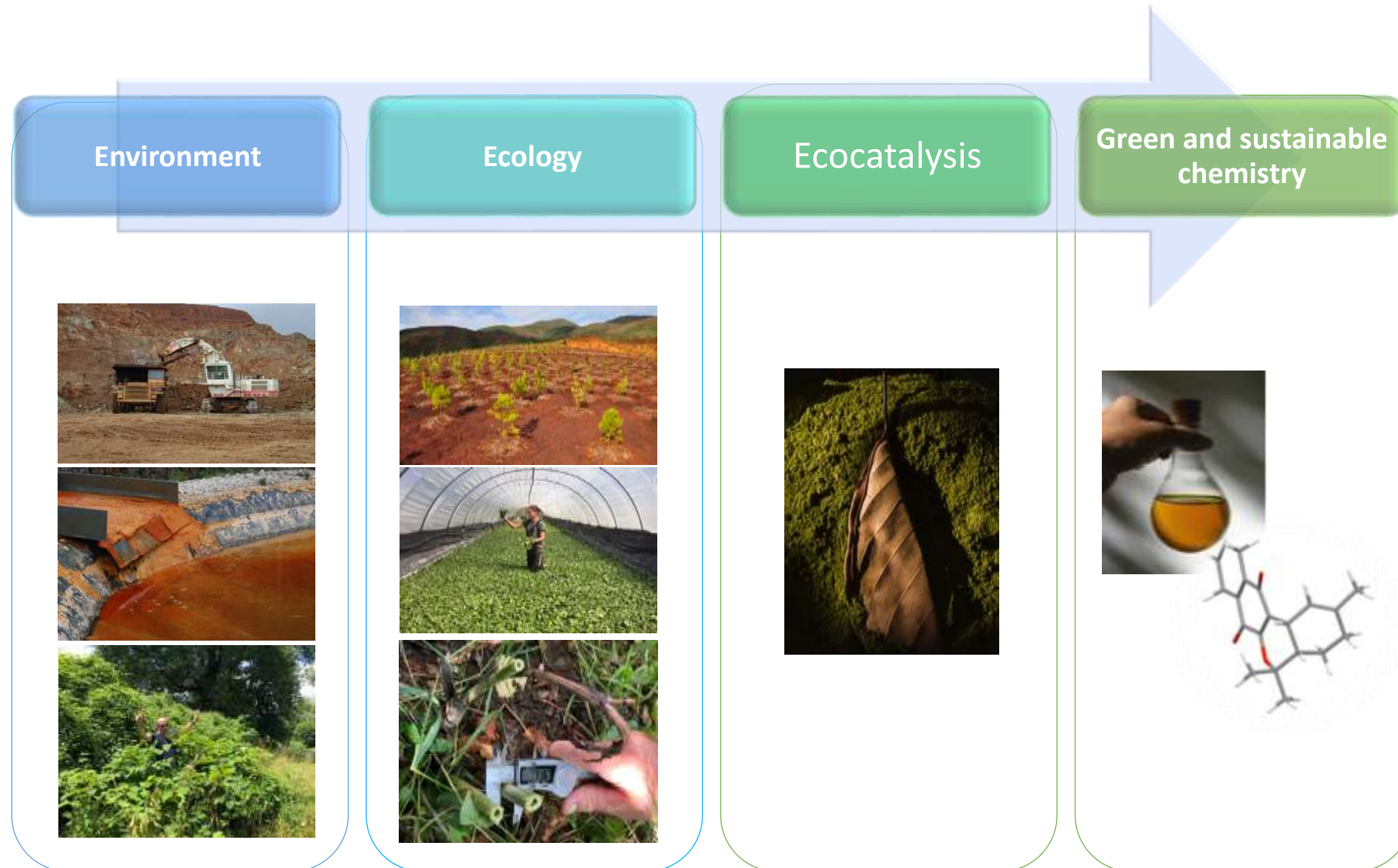
What is the use of this research?

From research to market

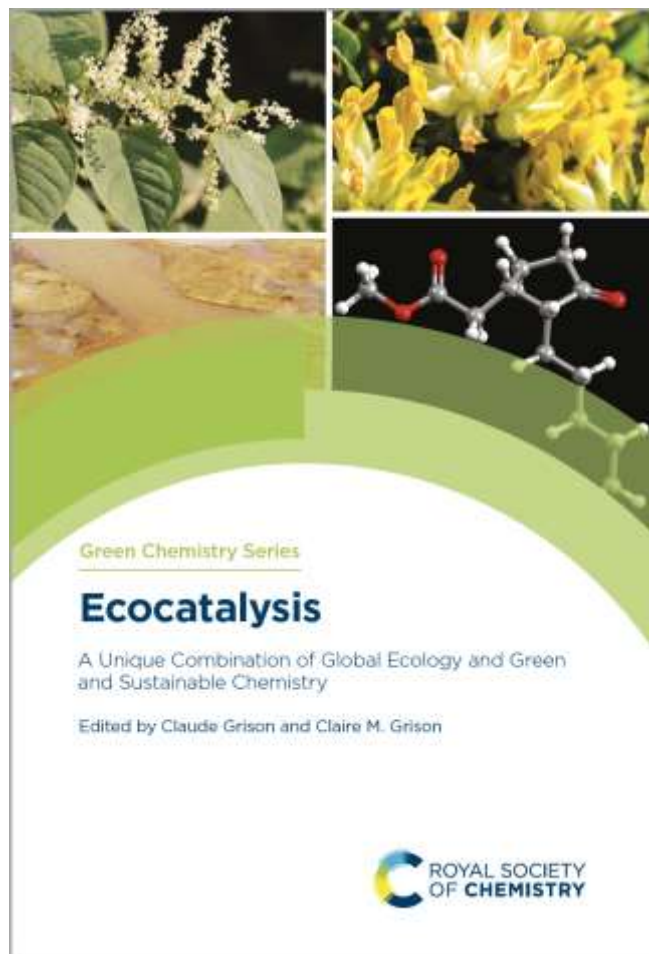


Behavioral tests of Asian tiger mosquitoes against pure and mixed repellent molecules
(Vectopôle Sud de Montpellier, centre collaborateur de l'OMS / * ED50 : 110mg / m² † ED50 : 200mg / m²)

Nature-based Solutions represent an economically viable and sustainable alternative thanks to green and sustainable chemistry!



Nature-based Solutions represent an economically viable and sustainable alternative thanks to sustainable chemistry!



TEAM : Together Everyone Achieves More