# Which strategies to conserve and restore metallophytes threatened by intensive mining activities in southeastern D.R. Congo?

Soizig Le Stradic [1], Sylvain Boisson [1], Maxime Séleck [1], Guylain Handjila [2] & Grégory Mahy [1]

soizig.lestradic@ulg.ac.be

[1] BIOSE - Biosystem Engineering Department, Biodiversity and Landscape Unit, Gembloux Agro-Bio Tech, University of Liege, Belgium
[2] Tenke Fungurume Mining SARL, Route de l'aéroport, Lubumbashi, Haut Katanga, Democratic Republic of Congo

## ▶ Context

Integration of economic activities with environmental integrity: case of mining activities in southeastern Democratic Republic of Congo (Fig. 1).

While pristine habitats are threatened by mining activities, plant communities include numerous endemic species (Fig. 2).

*[Cu]* 10,000 mg $kg^{-1}$
*[Co]* 1,000 mg $kg^{-1}$

*Unique plant communities on copper outcrops in South Katanga (D.R.C.)*

*56 endemic species*

**Fig 2.** Due to high available copper and cobalt concentrations in soils, Cu-Co hills present original plant communities with over 600 metallophytes including 56 endemics,


**Fig. 1.** The copperbelt, located in the southeastern D.R. Congo (**a**), represents one of the largest ore bodies of copper (Cu) and cobalt (Co) in the world. Most Cu-Co outcrops have now been allocated to mining companies and expected to be impacted in the coming years and decades (**b**).


## ▶How do we conserve and restore Cu-Co communities ?

**A** gain **information on ecology** of plant communities & **experience on the restoration** of copper vegetation

**B** **temporarily store** and **conserve** native copper plant diversity for future re-establishment on post-mining sites

**Complementarity of implemented actions :**

**Copper outcrop**

[Cu], [Co] +++

Cu-Co gradient

Mining

[Cu], [Co] +

**Copper mine**

2. Rehabilitation / restoration
- Seeding
- Transplantation

Steppe
on shallow soils & higher [Cu], [Co]

Main plant communities



Steppic savanna
on deeper soils & lower [Cu], [Co]

**1. Conservation actions**
- ❖ *In-situ* **conservation** ①
- ❖ *Ex-situ* **conservation**
  - ▪ **Communities translocation** ②
  - ▪ **Species translocation / Botanical garden** ③
  - ▪ **Direct seeding** ④
  - ▪ **Plant nursery** ⑤
  - ▪ **Seed bank** ⑥
  - ▪ **Phytostabilization** ⑦

### ① *In-situ* conservation

*Protected areas*

*Plant Micro Reserve*

- Conservation of **pristine communities**
- Good **seed source**
- **Limited surfaces**
- Potentially **damaged** by illegal miners and mine prospection

### ② Communities translocation

- **Whole-turf** translocation is more effective than **topsoil** translocation
- Success depends on community-type: better results for **steppe** than **steppic savanna**
- Higher **weed invasion in topsoil**

*Topsoil translocation*

*Whole-turf translocation*

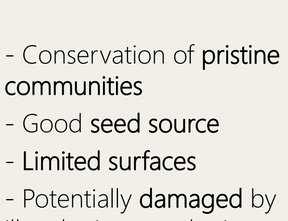
- **Problem** to translocate structuring species with **Xylopodium** (e.g. *Cryptosepalum maraviense*)

*Cryptosepalum maraviense*

### ③ Species translocation

→ In pristine copper outcrops
→ In translocated communities
→ In botanical garden

*Basananthe kisimbae*



*Cheilanthes perlanata var, nov*

*Dissotis derriksiana*

- Success depends on **species**
- Can be a valuable solution for **deep rooted** species



Botanical garden:
Where most threatened species of concern are translocated

### ④ Direct seeding

- Encouraging first results on **topsoil**
- Few germination in **whole-turf communities**
- Success is species dependent

*Vegetation cover with direct seeding*

### ⑤ Seedling production in nursery

- Production of **seedlings of native species** for translocation
- Usefull for the **production of xylopodia** species and **structuring** species
- Importance of **adequate material** availability

### ⑥ Seed bank

- 3 conservation sites
→ Botanic Garden Meise
→ University of Lubumbashi
→ Mine site

*Ultra drying in silicagel*

- Most species with **orthodox seeds**
- Regular **seed viability tests**

*Cold storage (-18°C).*

### ⑦ Phytostabilization

- On **anthropogenic polluted sites**
- **Seeding or seedling** transplantation
- With **native grass** species
- Enrichment with **endemic** species

*Example of phytostabilized site in Lubumbashi*

- **Developing of partnership between universities and mining companies**
- **Improving restoration programs using native plant material**
- **Delivering appropriate know-how to mining companies**

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