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

Soizig Le Stradic, Sylvain Boisson, Maxime Séleck, Guylain Handjila, Grégory Mahy

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

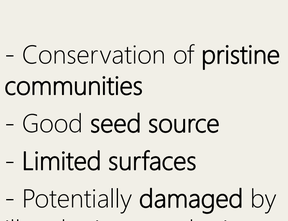
- **Problem** to translocate structuring species with **Xylopodium** (e.g. *Cryptosepalum maraviense*)

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**

Visit our website !
copperflora.org