

# Assessment of metallophytes diversity in a metal(loid) contaminated Portuguese mine for phytotechnological purposes



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## Introduction

- Soil contamination is a worldwide problem that negatively affects both the environment and human health.
- Anthropogenic activities, such as mining, are responsible for releasing a high concentration of metal(loid)s, such as Cu, Cd, and Zn, into the soil.

- The restoration of contaminated areas is critical to recovering soil ecosystem services, such as C sequestration, nutrient cycling, and habitat provision.
- Phytotechnologies** are green technologies for soil restoration. They are environmentally less disruptive and more cost-effective than conventional technologies.

Phytotechnologies use plants and their associated microorganisms to reclaim contaminated areas and decrease pollutant linkages through different processes →

- Mining sites host plants adapted to high concentrations of metal(loid)s – metallophytes – that can be used in phytotechnologies.
- Phy2SUDOE project** aims to promote the conservation of metallophytes that have a biotechnological interest while promoting soil restoration through the implementation of phytotechnologies.

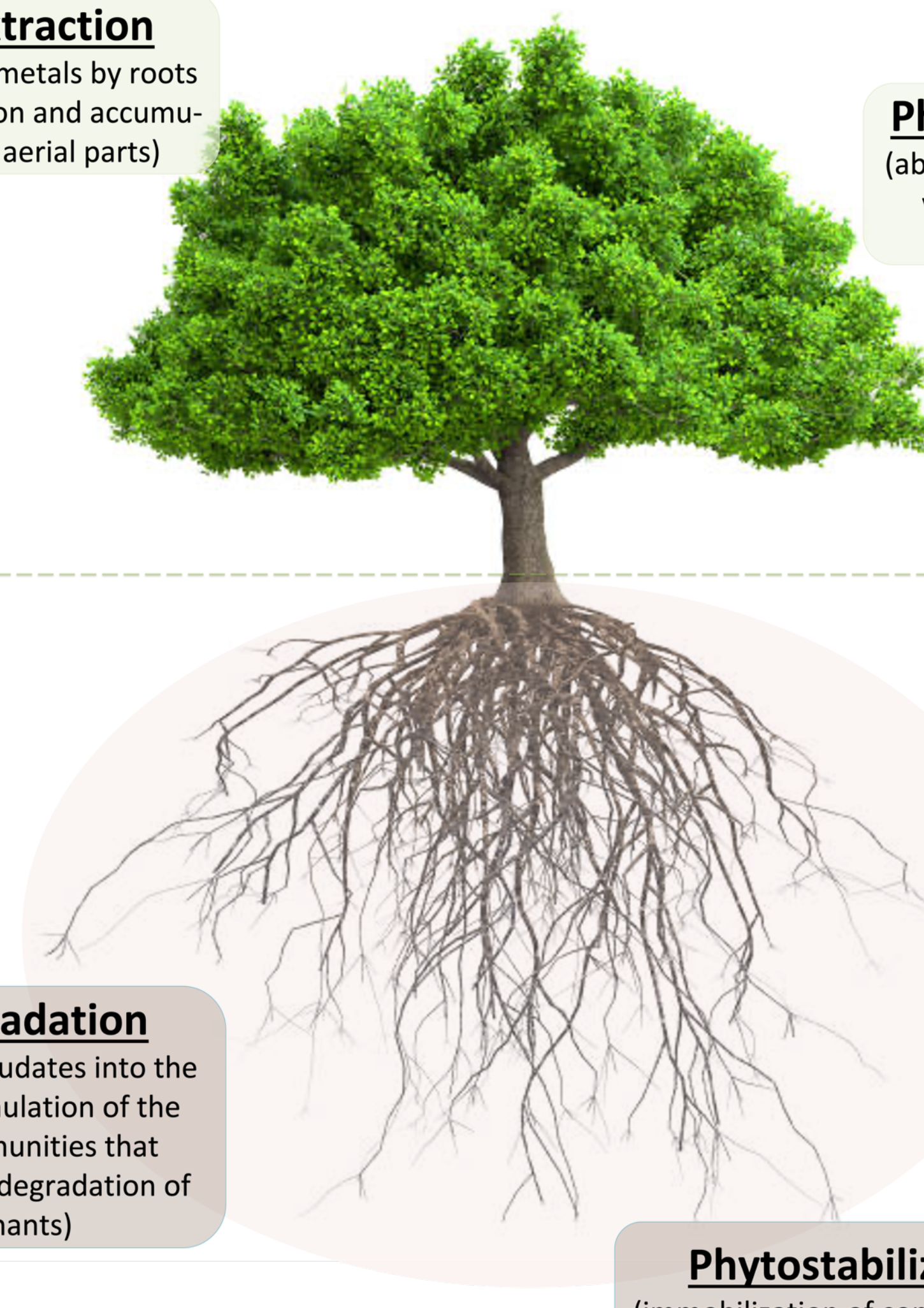
The present study aimed to identify the most abundant metallophytes in the Borralha mine, a deactivated tungsten producer located in Portugal (Montalegre, Vila Real district), for phytotechnological purposes.

### Phytoextraction

(absorption of metals by roots and translocation and accumulation in the aerial parts)

### Phytovolatilization

(absorption by the roots and volatilization of certain metals/metalloids)



### Rhizodegradation

(release of root exudates into the rhizosphere; stimulation of the microbial communities that contribute to the degradation of contaminants)

### Rhizofiltration

(absorption, concentration and/or precipitation of contaminants from an aqueous medium through root system)

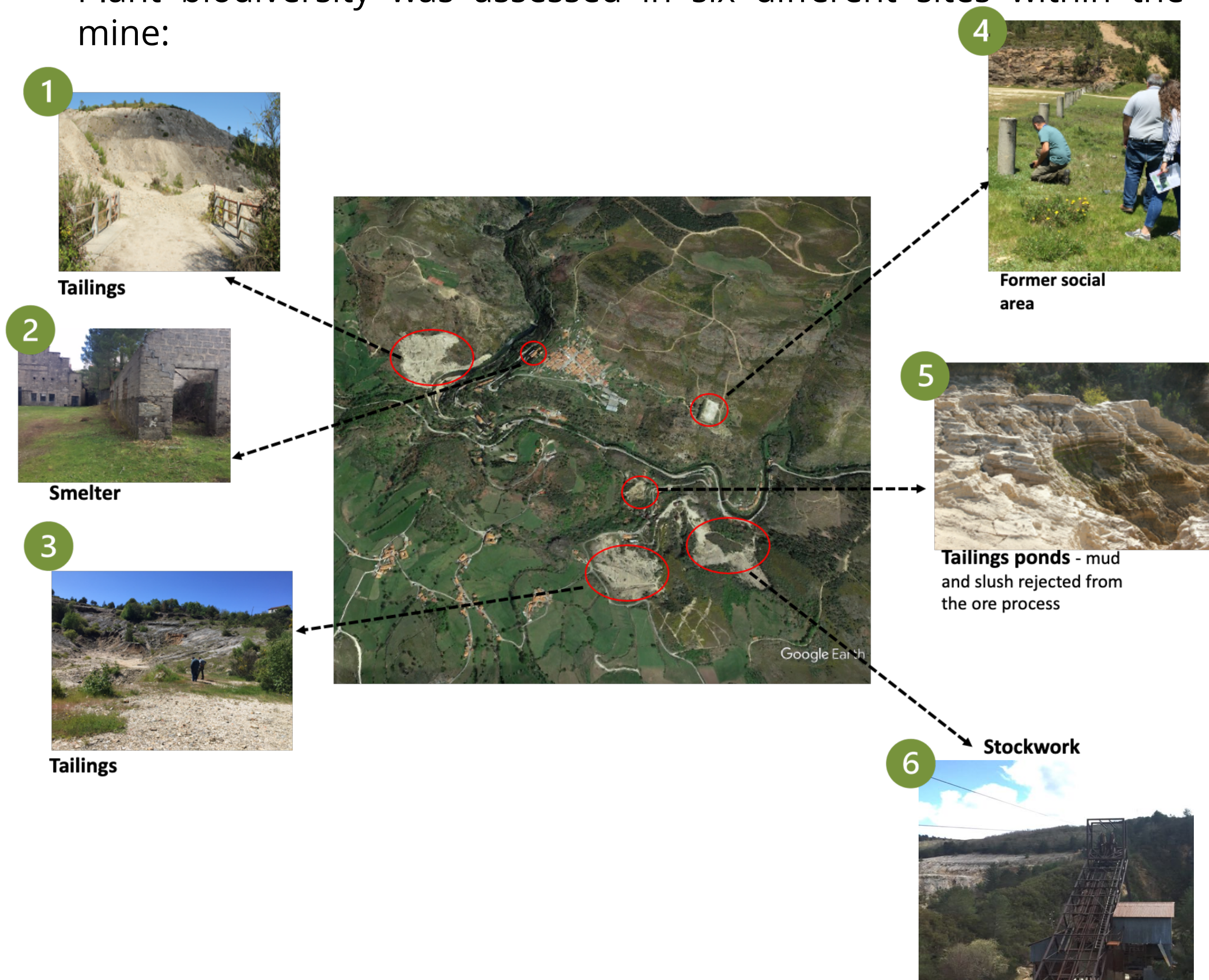
### Phytostabilization

(immobilization of contaminants in roots and/or rhizosphere)

## Methods

### BORRALHA MINE SAMPLING SITES AND DESCRIPTION

Plant biodiversity was assessed in six different sites within the mine:



- Mine operational period: 1902-1986
- Mine area: 1179 ha
- Economic exploitation: wolframite, scheelite, chalcopyrite
- Main contaminants: Cu, Fe, As, Pb, W, Cd, Zn, Mn

## Results

### PLANT BIODIVERSITY ASSESSMENT

A total of 80 plant species were identified and **49 have reported value for phytoremediation**. In the table below are some examples of the species with potential for phytoremediation:

Latin name	Phytoremediation mechanisms/Important traits	Potential uses
<i>Agrostis capillaris</i> L.	Phytostabilization/ Metal(loid) excluder	Biomass for livestock fodder or forage; green capping
<i>Cytisus striatus</i> (Hill) Rothm	Phytostabilization and phytoextraction/ Hypertolerant for As	Fibers for baskets and clothes; dye from flowers and branches
<i>Erica arborea</i> L.	Phytoextraction/-----	Wood for smoking pipes, knife handles.
<i>Rubus ulmifolius</i> Schott	Phytoextraction/ Hyperaccumulator of As and Pb	Medicinal applications
<i>Silene latifolia</i> Poir.	Phytoextraction/ Hyperaccumulator of Tl	Washing clothes soap (saponin)
<i>Urtica dioica</i> L.	Phytoextraction/ Hyperaccumulator of Pb	Fibers for textiles and composite applications



*A. capillaris* L.



*C. striatus* (Hill) Rothm



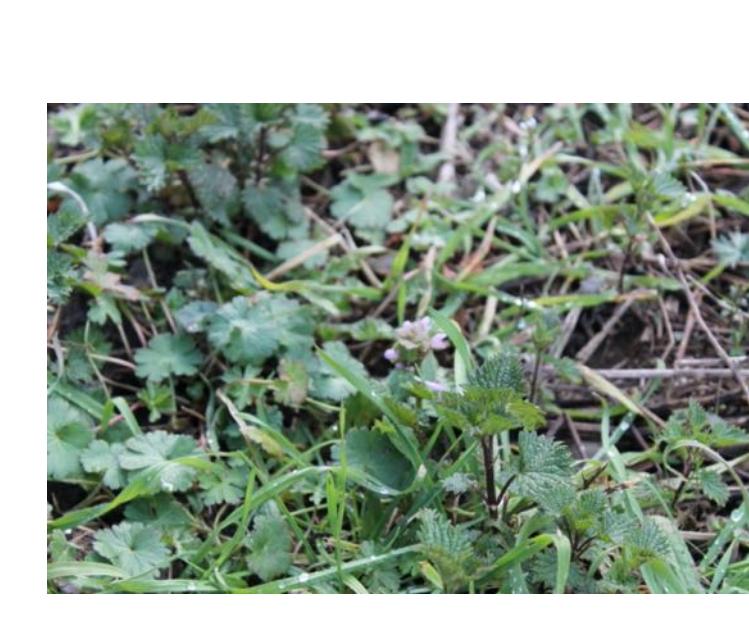
*E. arborea* L.



*R. ulmifolius* Schott



*S. latifolia* Poir.



*U. dioica* L.

## Conclusions

- Borralha mine gathers an interesting set of metallophyte species that have the potential to be used in phytotechnologies;
- Some plants could be selected for germplasm preservation based on their phytoremediation potential, i.e., biomass and metal(loid)s concentration in the tissues (under analysis).

## Acknowledgements

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