

# Diversity of metallophytes and metal(loid)-tolerant bacterial strains in a portuguese mine for phytotechnologies purposes

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## Introduction

Anthropogenic activities, such as mining, are responsible for soil contamination with metal(loid)s, a worldwide issue that affects ecosystem functioning and human health. To restore these soils, phytotechnologies stand out as ecological options, using plants and their associated microorganisms to reclaim contaminated areas and decrease pollutant linkages. Mining sites host organisms that are adapted to high concentrations of metal(loid)s, such as metallophytes, either excluders or (hyper)accumulators, and microorganisms, such as plant growth-promoting bacteria (PGPB), that can be used in phytoremediation strategies.

The Phy2SUDOE project aims to recover and value contaminated sites in the SUDOE region (Portugal, Spain and France), through the implementation of phytomanagement strategies, while minimizing the impact of pollutants in the surrounding areas. This project also intends to implement approaches to promote the conservation of endemic biodiversity of the contaminated sites, due to their potential for biotechnological applications.

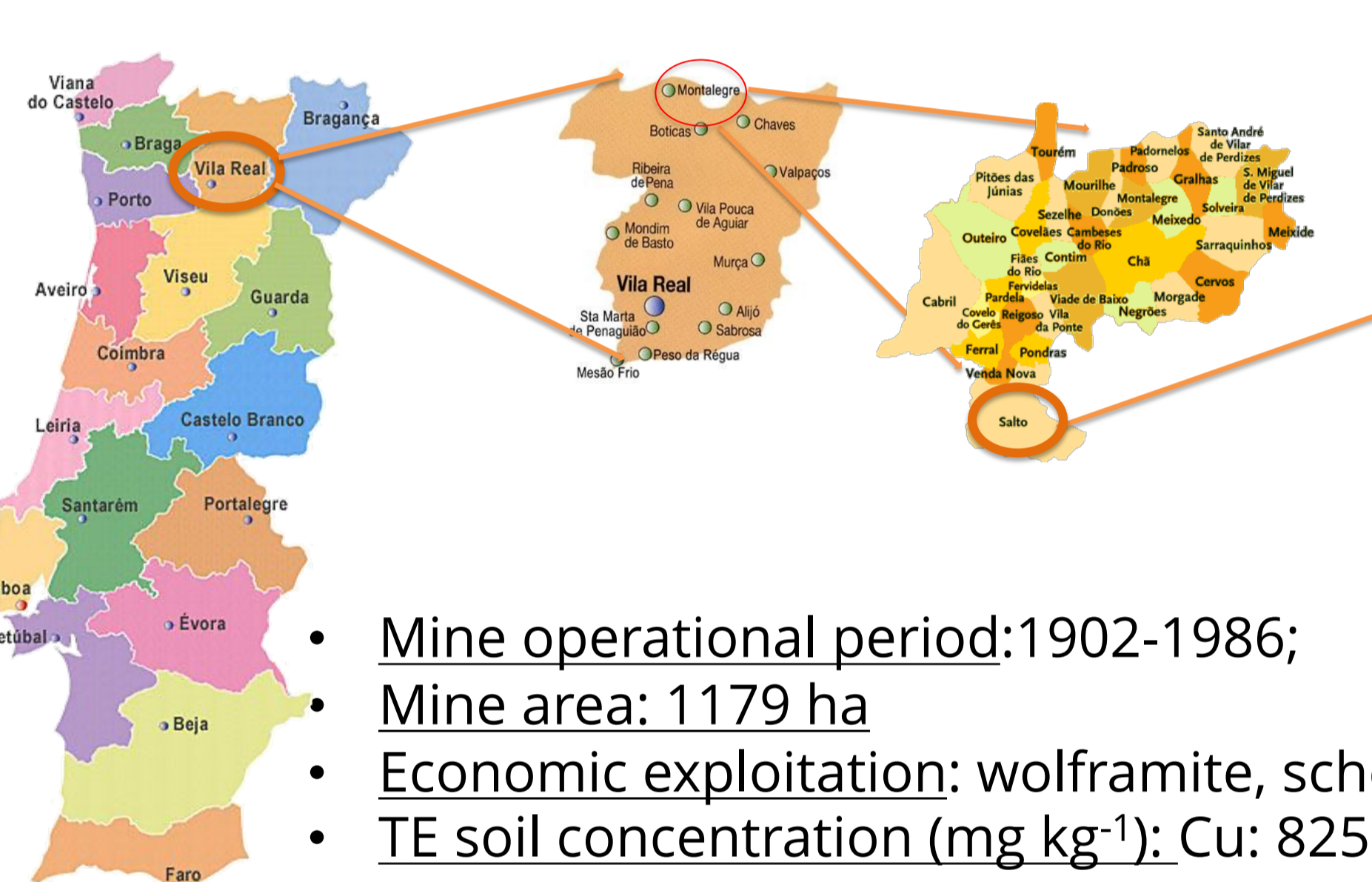
## Objectives

The Borralha mine, one of the experimental sites of Phy2SUDOE project, is a deactivated tungsten producer located in Portugal, in which the ending of mineral extraction left several open-air tailings highly contaminated with metal(loid)s, such as Cu, Zn, Cd, As, and Pb. This study aimed to:

- Identify the most abundant metallophytes in Borralha tailings;
- Isolate and characterize metal tolerant PGPB from mine tailings for biotechnological purposes.

## Methods

### BORRALHA MINE LOCATION AND DESCRIPTION









Open-air mine tailing.

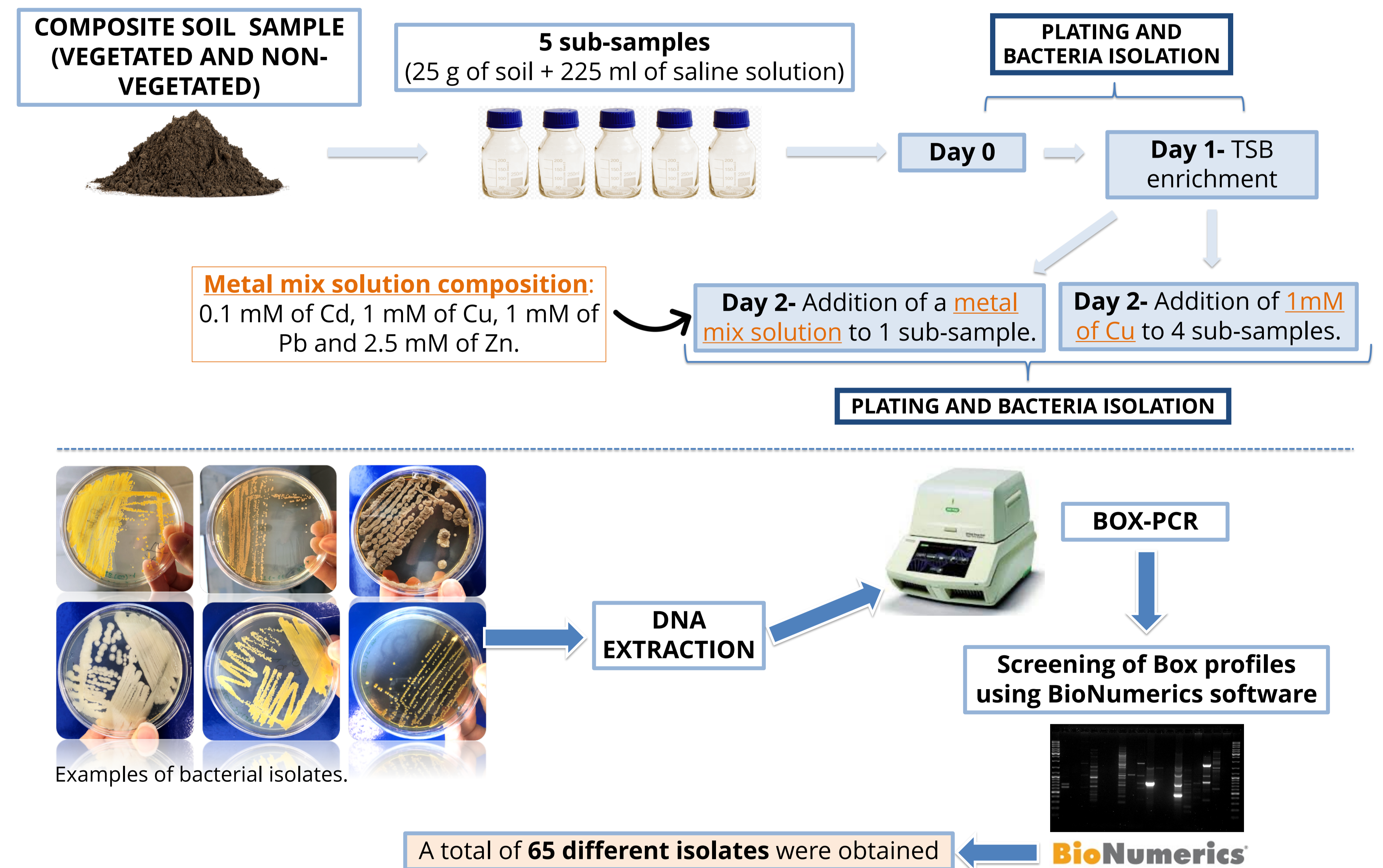
- Mine operational period: 1902-1986;
- Mine area: 1179 ha
- Economic exploitation: wolframite, scheelite, chalcopryrite;
- TE soil concentration (mg kg<sup>-1</sup>): Cu: 825.2; Cd: 3.9; Co: 14.5; Pb: 92.3; Zn: 138.6; As: 44.7; Ni: 16.9;

### PLANT BIODIVERSITY ASSESSMENT

Plant biodiversity was assessed over 1 year, covering the different seasons. A total of 6 plant species with potential to be used in phytoremediation strategies were identified.

					
<b>Agrostis capillaris</b>	<b>Cytisus striatus</b>	<b>Erica arborea</b>	<b>Pinus pinaster</b>	<b>Rubus ulmifolius</b>	<b>Salix caprea</b>
Phytostabilization (Pb, Sb, As)	Phytostabilization (As, Zn); phytoextraction (U)	Phytoextraction (Hg)	Phytoextraction (As, W, Zn);	Phytoextraction (As and Pb hyperaccumulator);	Phytoextraction (Hg, Zn);

### PGPB ISOLATION AND CHARACTERIZATION



## On-going work

The obtained bacterial isolates will be phenotypically characterized in terms of metal tolerance to Cd, Zn, Pb and Cu and in terms of plant growth promoting traits like phosphate solubilization, ACC deaminase activity and siderophores, indole acetic acid, ammonia and hydrogen cyanide production. The bacteria that show potential to be used as bioinoculants in assisted-phytoremediation approaches will be genotypically characterized and then identified.

## Acknowledgements

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