Plant-based Nature-based Solutions for the restoration of degraded mining ecosystems

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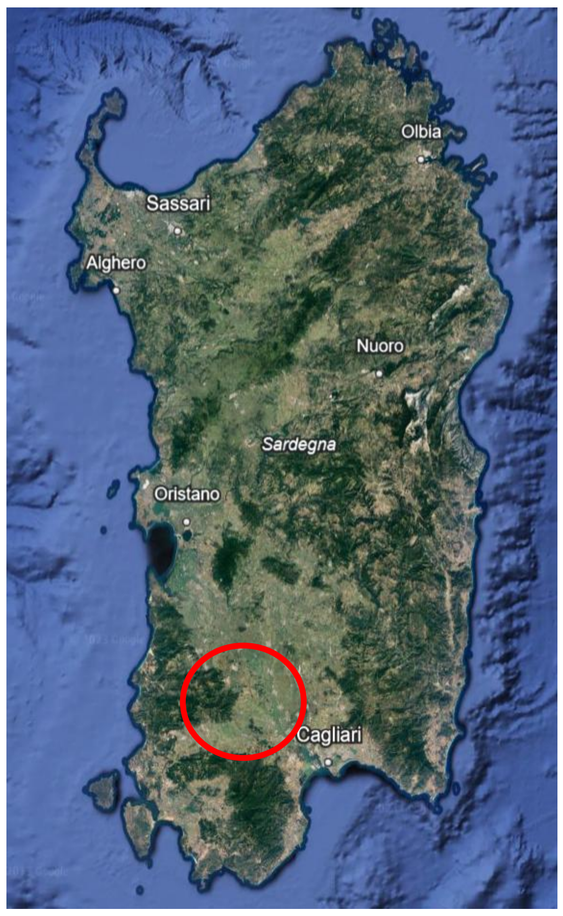
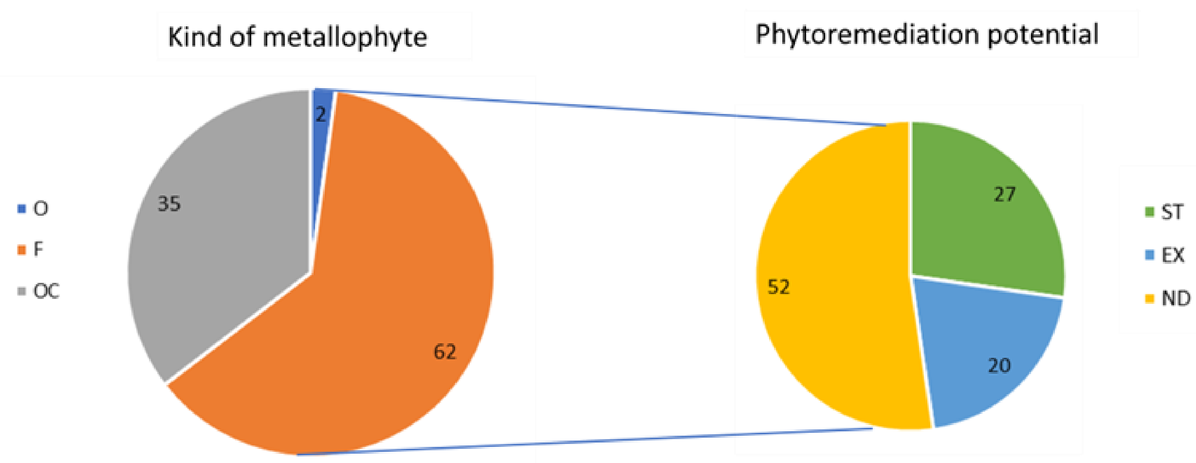
Mining has long been a major source of environmental degradation, causing severe contamination of soil, water, air, and posing significant risks to ecosystems and human health. When mining operations cease, they often leave behind barren, metal(loid)-rich, and nutrient-poor soils that prevent natural vegetation from re-establishing. Therefore, identifying sustainable ecological restoration methods is crucial to mitigate these impacts and promote environmental recovery.

Sardinia (Italy) represents a particularly relevant case, as it is one of Europe's most historically significant mining regions, with extraction activities dating back to the Bronze Age. After mine closures, vast areas-especially within the **Sulcitano-Iglesiente sector**-remain affected by abandoned mines and waste deposits that continue to release pollutants, impacting terrestrial and aquatic ecosystems and endangering nearby communities.



A comprehensive floristic inventory was compiled through literature review, fieldwork, and herbarium analyses, identifying **655 taxa**. About 49% of these were classified as metallophytes, predominantly facultative species.

Among them, **27%** were found suitable for phytostabilization while **20%** showed potential for phytoextraction.



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The study recorded numerous endemic and threatened species (70 % are Cyrno-Sardinian endemism) highlighting the necessity of combining biodiversity conservation with ecological restoration.

Cistus salvifolius L.

Euphorbia pithyusa L. subsp. *cupanii* (Guss. Ex Bertol.) Radcl.-Sm.

Helichrysum microphyllum Cambess subsp. *tyrrhenicum* Bacch., Brullo & Giusso

Scrophularia canina L.

Pinus halepensis L.

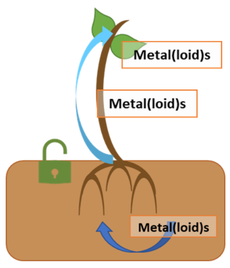
Pistacia lentiscus L.

Iberis integerrima Moris

Santolina corsica Jord. & Fourr.

The use of native species ensures ecological balance and long-term sustainability while preserving Sardinia's unique plant diversity.

NRPP e.INS. WP2
Restoration and remediation of polluted mine sites

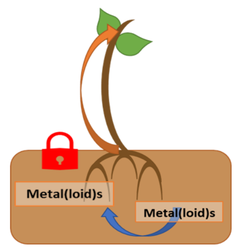


Phytoextraction

Accumulator species

task 2.2
Selection of native plants for revegetation and remediation of abandoned mine sites.

task 2.3
Development of innovative and sustainable technologies for secondary raw materials production



Phytostabilization

Excluder species

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