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Reuse of extractive waste from an abandoned mine site: Case study of Campello Monti, Italy

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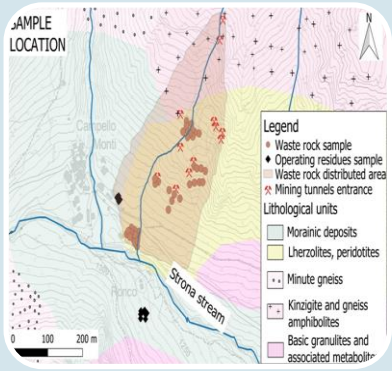
Study site: Campello Monti



Geographical location

Campello Monti is in Italian region of Piedmont.

Geological Setting

Mafic formation intruded by mantle peridotites.

Minerals: Chalcopyrite, pentlandite, pyrrhotite

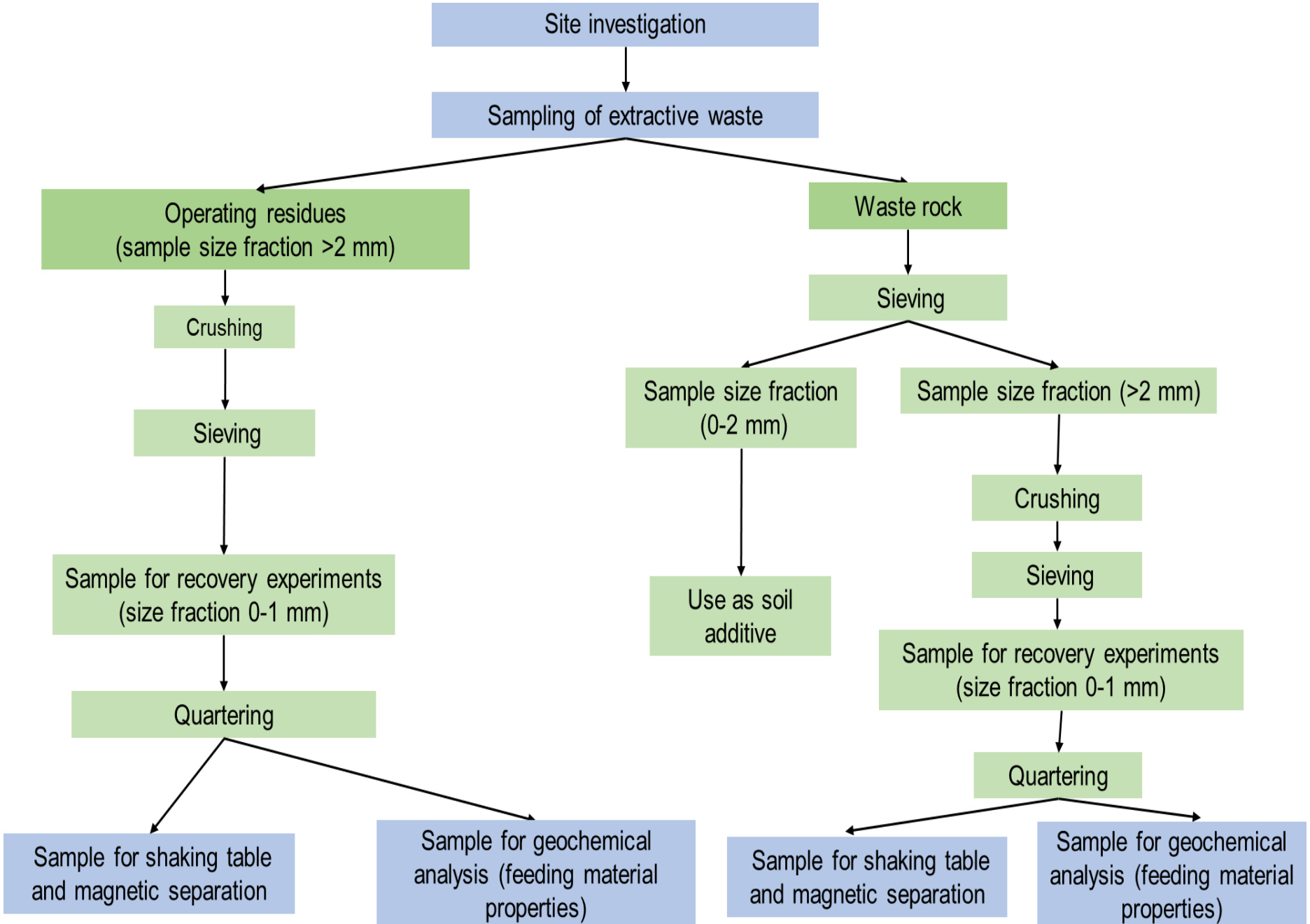
Exploitation activity

About fifteen small Fe-Ni-Cu-(Co) sulphide deposits occur. Nickel exploitation occurred from 1865 to 1943.

Sampling

In total 50 samples of **waste rock** and 31 samples of **operating residues** were collected

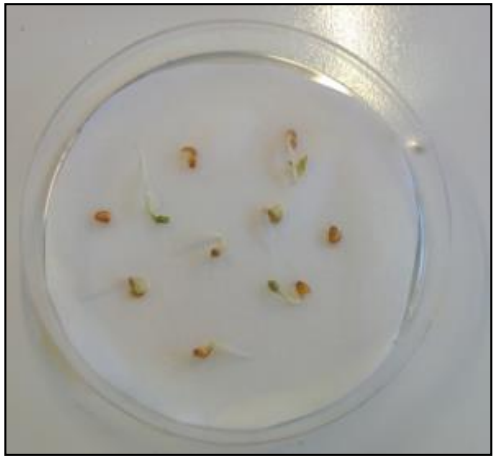
Sample preparation for reuse

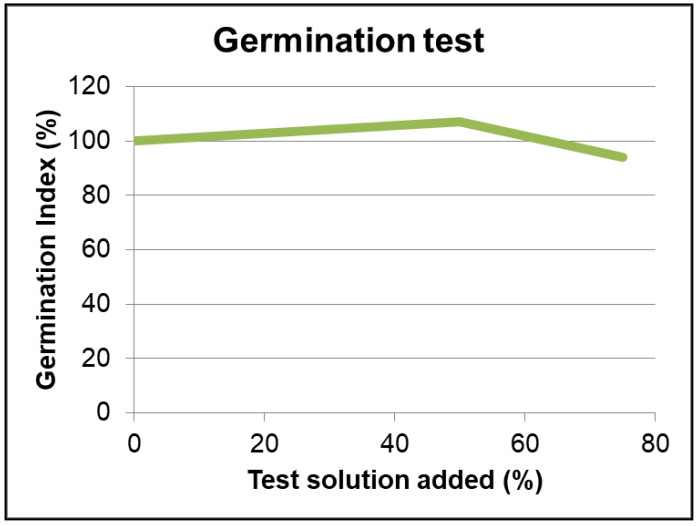


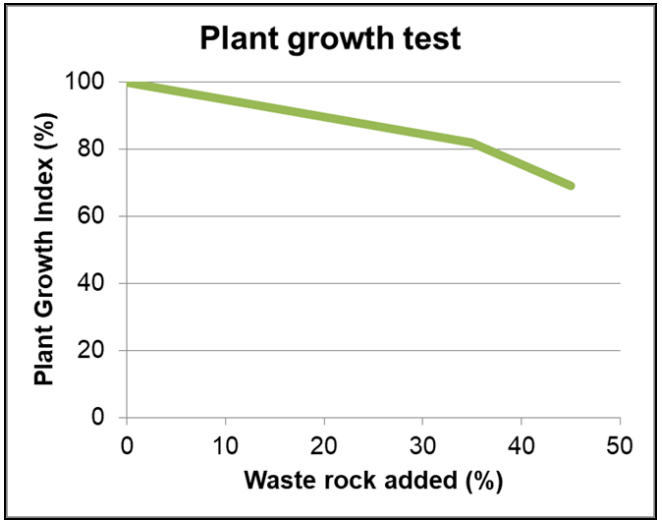
Reuse of fine fraction as soil additive

- Extractive waste was sieved to obtain the **fine fraction** (< 2 mm, sieve size). Fine fraction was analyzed for its use as **additive to soil**.

- Experiments were conducted on ***Lepidium sativum*** seeds.







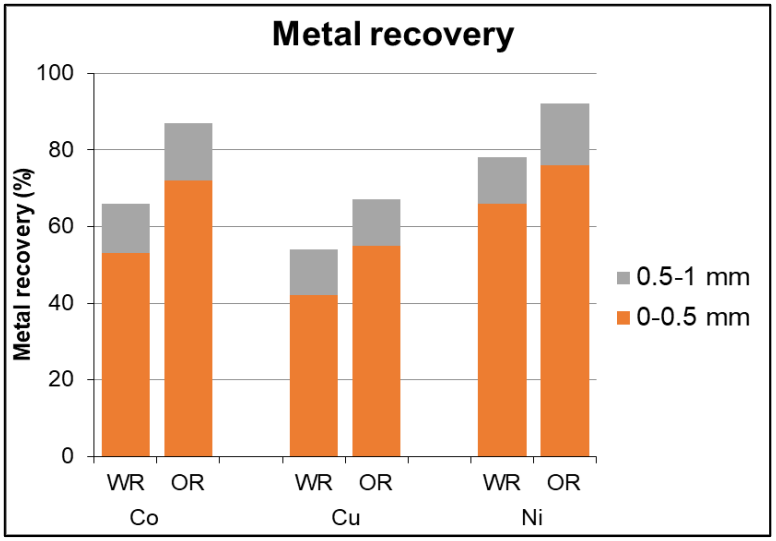
Dressing activities for coarse fraction

Metal recovery (in %)

$$\frac{Concentrate\ x \cdot Concentrate\ weight}{Feed\ x \cdot Feed\ weight} \cdot 100$$

Shaking table:

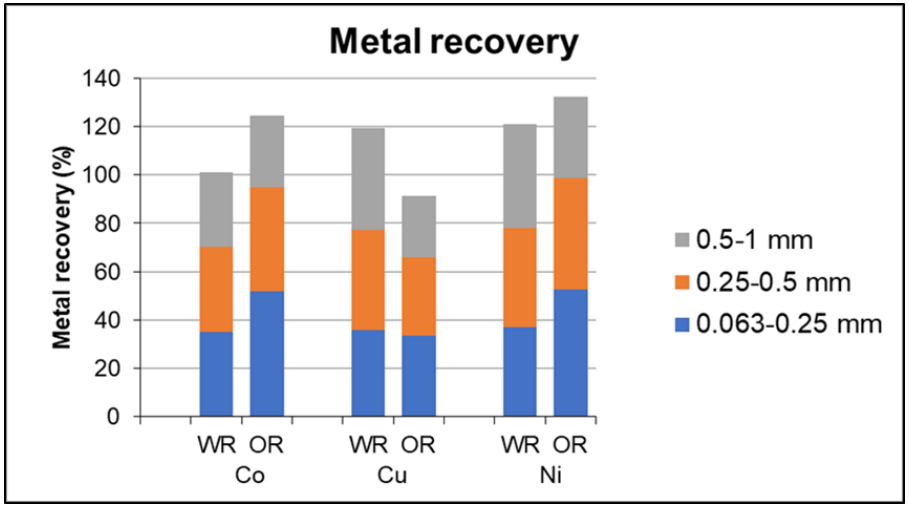
- Recovery of Co, Cu and Ni was higher for size fractions (0-0.5 mm) than 0.5-1 mm
- Recovery of Ni reached upto 76% for operating residues



Shaking table

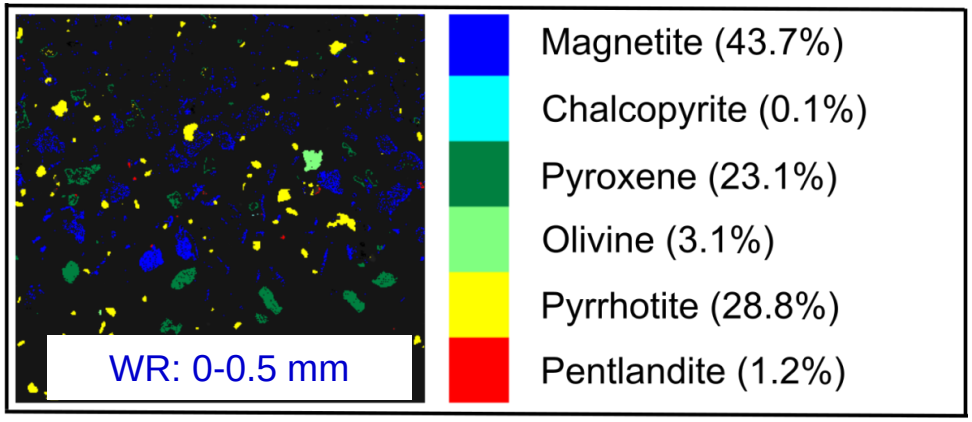
Magnetic separation:

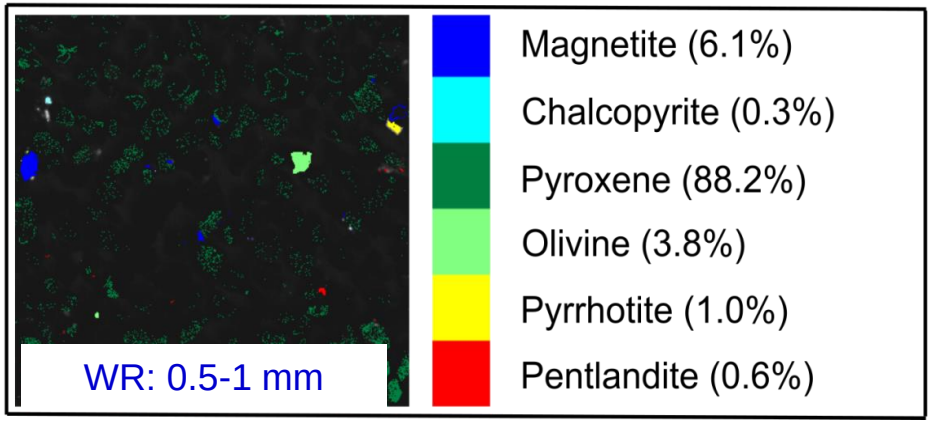
- Highest recovery reached upto 52% for nickel
- In general, showed lesser recovery than shaking table



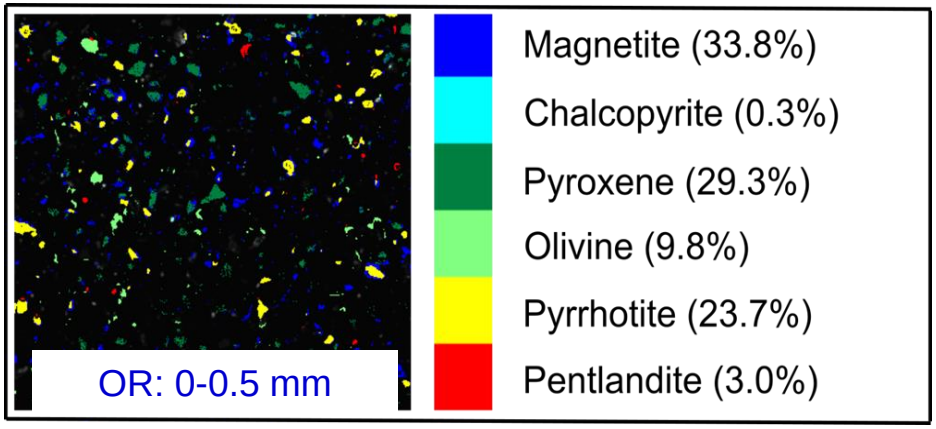
Magnetic separation

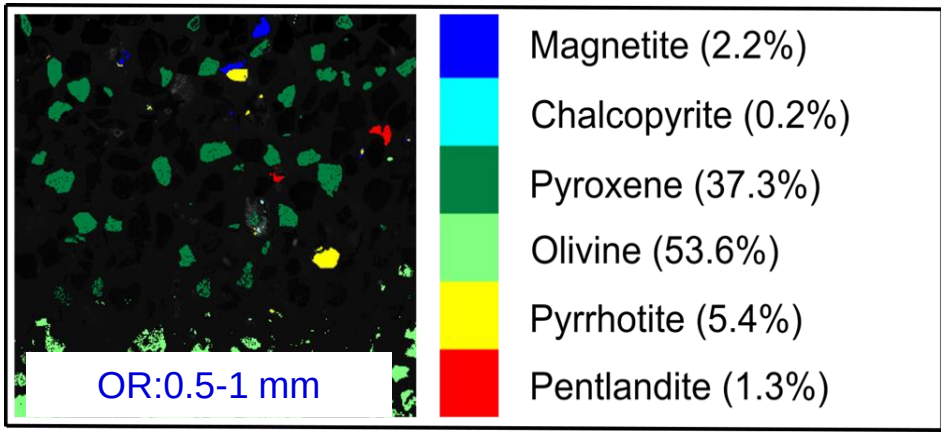
Mineral analysis (micro-XRF) after shaking table





Heavy fraction obtained from waste rock



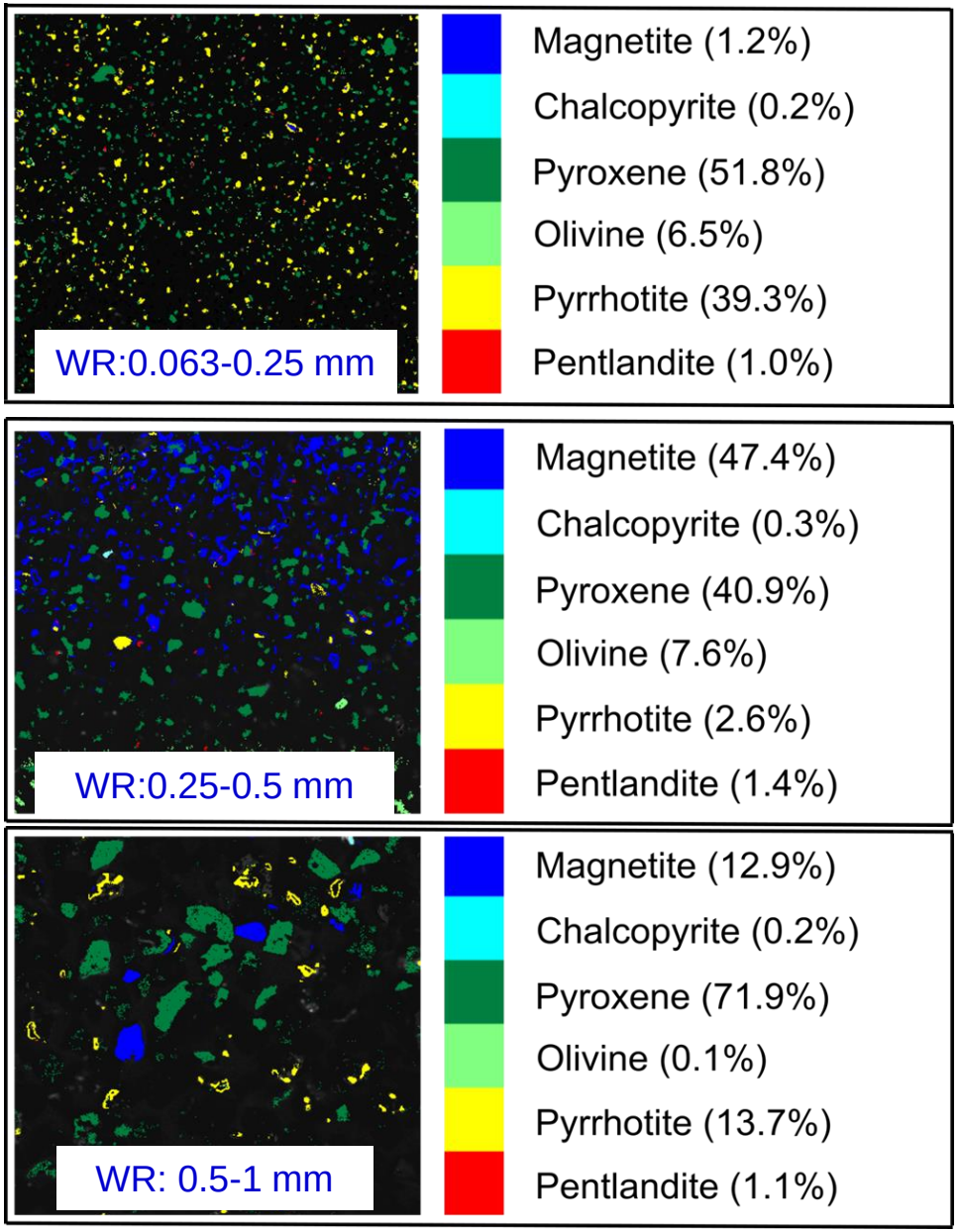


Heavy fraction obtained from operating residues

Mineral analysis after magnetic separation

Mineral maps of the magnetic fraction obtained after dressing activity:

- The waste rock (0.063-0.25 mm) and (0.5-1 mm) indicate prsence of pentlandite as *c.* 1%.
- The waste rock (0.25-0.5 mm) recorded highest presence of pentlandite as 1.4%.

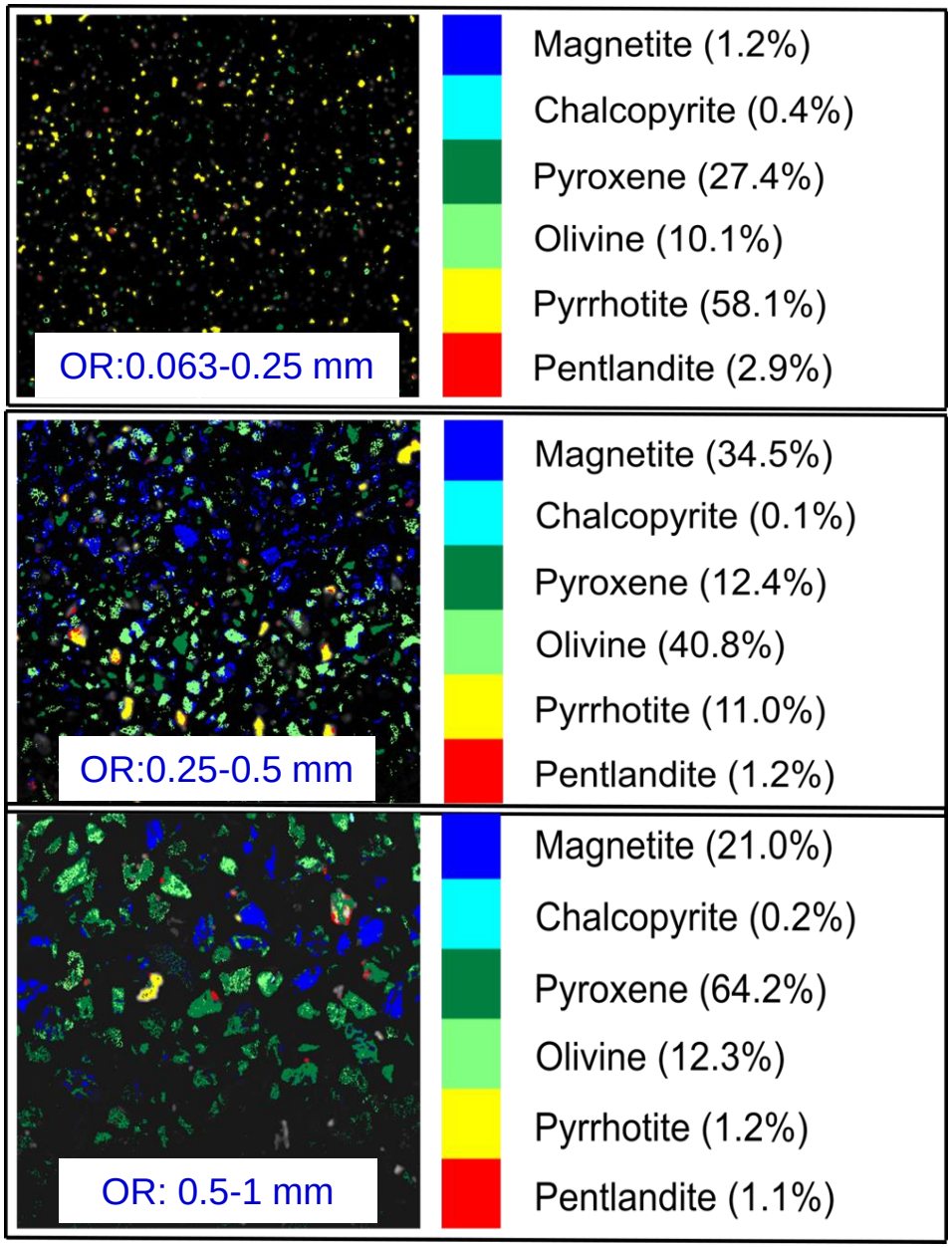


Mineral analysis after magnetic separation

Mineral maps of the magnetic fraction obtained from operating residues:

- The OR (0.063-0.25 mm) recorded presence of pentlandite as 3%.

- The results indicated that both magnetic fraction and shaking table treatment almost led to same pentlandite% in the concentrate fractions.



Conclusions

- Fine fraction from waste rocks had major impacts on plant growth but not on seed germination. Thus with further amendment it is possible to use fine fraction for soil additive purposes.

- Pentlandite was 1% and Chalcopyrite as 3% in the **concentrate fractions** from the dressing activities.

- Changes in the geo-political and economic scenario are pushing nations towards procuring long lasting **raw material sources**.

- The present interdiscplinary research shows that etxtractive waste at abandoned mine sites can be use as raw material source in order to and generate **economic benefits and** reduce **environmental impacts**.