



Critical Raw Materials and other valuable minerals recovery from mining landfill

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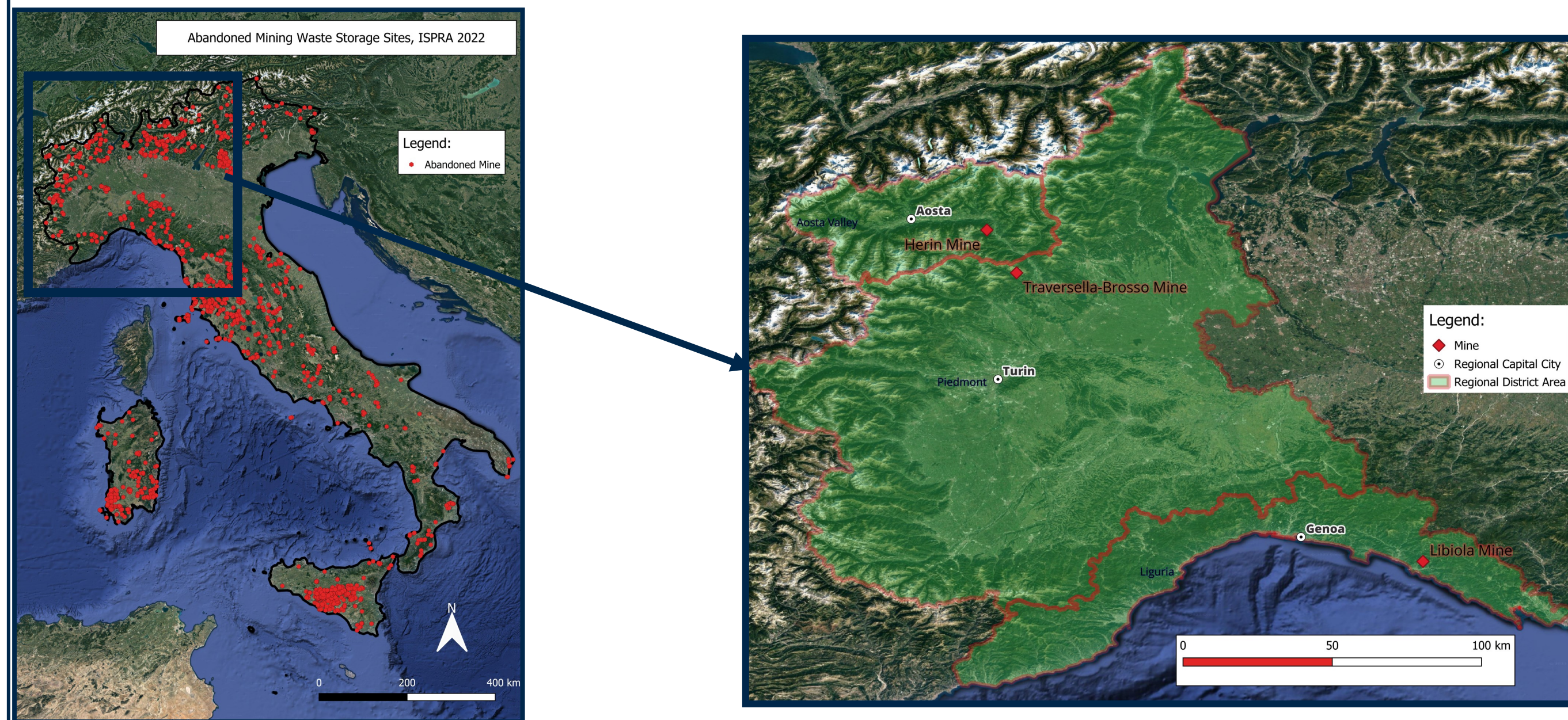
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Tutor: Prof.ssa Paola Marini Co-Tutor: Prof. Adriano Fiorucci

INTRODUCTION

European Union has recently developed policies to increase the production of Strategic (SRMs) and **Critical Raw Materials (CRMs)** within its borders. These new regulations stimulate the production of significant amounts of materials from mining operations throughout the continent while contributing towards achieving the ambitious objectives of the European Green Deal and Climate Neutrality. The ultimate goal of this action is to ensure a sustainable and secure supply of crucial raw materials for the European Industry by leveraging internal primary and secondary sources. Despite the rich tradition of the Italian mining industry over the last century, the current mining production accounts for industrial minerals, ornamental stones, and construction materials. While there are no active metal commodity operations in Italy, numerous abandoned or inactive sites can be found within the country's mining districts. In 2012, the Italian Institute for Environmental Protection and Research (ISPRA) initiated a census to identify waste storage facilities, including abandoned structures with severe negative environmental impacts or posing threats to human health. According to the 2022 update of this registry, **562 abandoned mines** are present in Italy. These sites are mainly related to ceased extractive activities in the last decades. The **objective** of this research is the assessment, identification, characterization, and preliminary mineral processing design for the **recovery** of critical and valuable minerals from existing mine waste in the Italian territory. The main objective of this project is to introduce a **circular economy approach** to the extractive industry. This strategy promotes the recycling and recovery of materials used in the final stages of production to achieve a zero-waste supply chain and foster the rehabilitation of polluted mining waste regions.

PERFORMED ACTIVITIES

► **Bibliographical research for available data on mine wastes in Italy, especially North-Western Regions, for identification of potential case studies** (*Presented @ RawMat23—Athens, Greece—28-30 Aug 2023*)



Geographical location of mining waste facilities in Italy and selected sites from North-Western Regions

Site	Commodity	Reported mining dumps
Traversella-Brosso Mine (Piedmont)	Fe ¹ , W, Mo, U, REE ²	ISPRA (2022) Minor works (2004)
Libiola Mine (Liguria)	Fe ³ , Cu	ISPRA (2022) Marescotti et al. (2010) Buccheri et al. (2018)
Herin Mine (Aosta Valley)	Fe ³ , Cu, Ni, Co	ISPRA (2022)

¹ Magnetite Ore. ² Not exploited during historical operations. ³ Pyrite Ore.

► **Site inspections and preliminary sampling for 3 abandoned mines: Traversella (Piedmont), Herin (Aosta Valley) and Libiola (Liguria).**

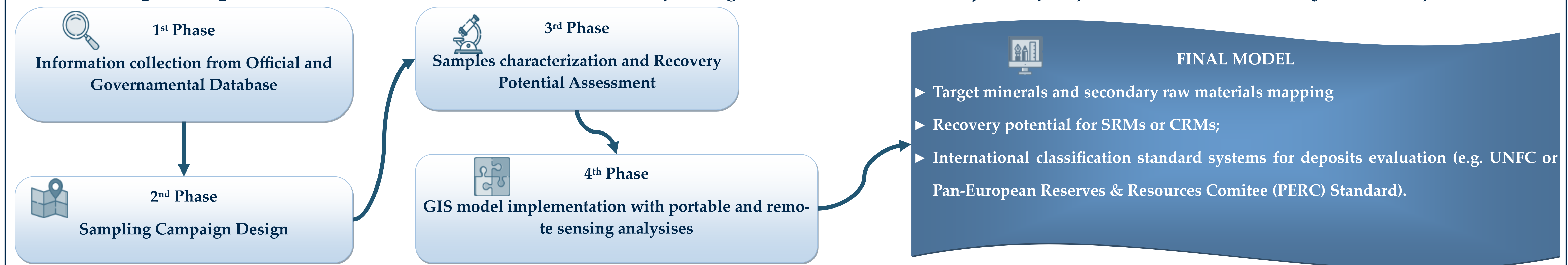


Libiola Mine, Liguria—Mining dumps surrounding the abandoned mining site



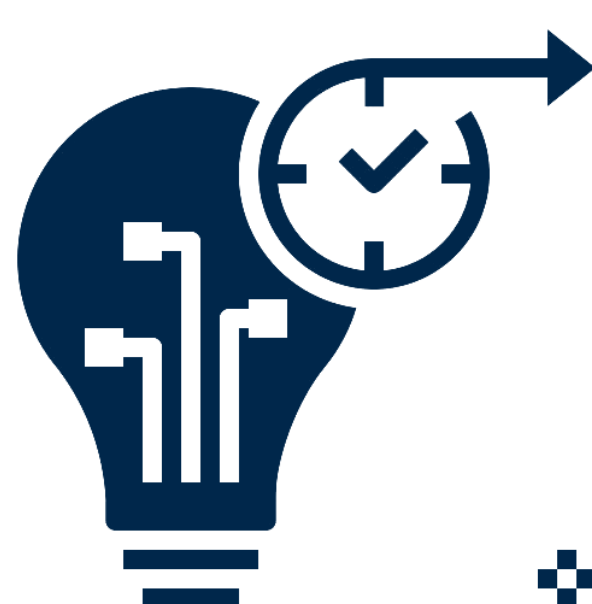
Herin Mine, Aosta Valley—Mining dumps

► **Development of a multi-step approach model for background definition, sampling, characterization, mapping, treatment and recovery of valuable minerals from existing mining waste facilities** (*Presented @ The Geoscience paradigm: Resources, Risks and future perspectives—Potenza, Italy—19-21 Sep 2023*).



FUTURE DEVELOPMENTS

- **Extend** the range of **potential case studies** by involving institutional partners or mining companies with specific industrial interest ;
- Design and realization of **sampling campaigns** for the selected case studies;
- On-site **portable-XRF mapping** and characterization of samples (SEM, XRD, Raman, ICP-MS);
- Development of **lab-scale mineral processing** solutions for each case study aiming at recovering CRMs and other primary/secondary raw materials.



TRAINING, DISSEMINATION & COLLABORATIONS

Hard Skills : 114/100 h, Soft Skills: 38/40 h:

- 10 Internal and 2 External Training Activities.

Conference participations:

- RawMat23—Athens, Greece—28-30 Aug 2023: “Recovery of Critical Raw Materials from abandoned mine wastes, some potential case studies in North-Western Italy”;
- The Geoscience paradigm: Resources, Risks and future perspectives—Potenza, Italy—19-21 Sep 2023 : “Screening Tests On Potential Recovery Of Strategic And Critical Raw Materials From Mining Waste Facilities In Italy”.

On-Going Collaborations:

- Geological Survey of Finland (GTK) - FutuRaM EU Project “Recovery of Secondary Raw Materials from Mining Waste: the most potential sites in Finland”.

