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Sustainable approach towards extractive waste management and potential exploitation. Two Italian case studies

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Extractive wastes (EW), present in old waste facilities and coming from waste streams from extractive industries, represent, on the one hand, a problem, due to environmental impacts and health safety associated to their management, and, on the other hand, a potential source to recover raw materials (RM), secondary raw materials (SRM) and critical raw materials (CRM). EW represent the second most important sector in terms of waste quantities produced in the EU-27 (28.1% or 703 million tons), and the total amount of mining waste, stored in whole EU, exceeds 5.9 billion tones. Furthermore, at a wider scale, about 25 billion of EW (both coarse and fine fractions) are produced world wide each year. EW facilities can be intended as “new ore bodies”, which could be exploited to integrate the RM exploitation from mining activity (Natural Resources preservation). Furthermore, if we treat and recover fluent waste, we preserve different areas from the presence of new dumping with the contemporary recovery of SRM and CRM (implementation of the End of The Waste criteria and of Circular Economy approach).

A sustainable and efficient waste management and recovery, is based on the reduction of the environmental impacts (on soil, water and air), and on the improvement of their market and environmental acceptability. To reach the effective recovery of such materials, operators, public bodies and SME associations have to encourage the use of waste as integrative sources of RM.

In the recent years several EU and national projects, as Smart Ground and Remediate, have been founded, with the aim of improving awareness and knowledge about RM sustainable supply, including issues as resource efficiency, risk assessment and site remediation.

This work focuses on the issues connected to EW management and the chance to recover RM/SRM/CRM from EW, contemporary remediating polluted areas. The investigation methodologies have been tested and validated on two EW facilities (Campello Monti Ni mining site and Gorno Zn-Pb mining district).

The first results can be briefly resumed in following:

- Campello Monti: enrichment in Ni, Cu, Co in the EW, with a potential exploitation from the inferred resources of about 280 t of Ni, 70 t of Cu and 15 t of Co. As, Cr and Cu were also significantly present in the EW. The risk analysis for the current situation Monti showed a carcinogenic risk due to the presence of As. The same waste poses risks to groundwater due to Ni, As, Sb, and Pb.

- Gorno: enrichment in Zn and Cd (\pm Ga) in the EW, with a potential exploitation from the inferred resources of about 25.000 t of Zn, 73 t of Cd and 4.5 t of Ga. The environmental analysis shows a low risk for the environment, to be confirmed by detailed risk analysis (in progress).

In conclusion, on the basis of the first investigations on the two sites, a deeper investigation is suggested for Gorno, due to its potential higher chance to profitable exploit RM and CRM from EW with lower environmental impacts.