Native plants for the remediation of abandoned sulfide mines in Cyprus

Marinos Stylianou[1,3,4*], Ifigenia Gavriel[2,4], Antonis Zorpas[2], Agapios Agapiou[3]

[1]NIREAS-International Research Center, University of Cyprus, Department of Civil and Environmental Engineering, P.O.Box 20537, 1678, Nicosia Cyprus

[2]Cyprus Open University, Faculty of Pure and Applied Sciences, Environmental Conservation and Management, Laboratory of Chemical Engineering and Engineering Sustainability, P.O. Box 12794, 2252, Latsia, Nicosia, Cyprus

[3]Department of Chemistry, University of Cyprus, P.O. Box 20537, 1678 Nicosia, Cyprus

[4]Almyras Cultural and Environmental Workshop, Non-Governmental Organization, Agia Varvara, Nicosia, Cyprus

*Corresponding author email: stylianou.a.marinos@ucy.ac.cy

Abstract

Mining in Cyprus reached its peak between 1950 and 1970 (Bear, 1963) resulting in a significant number of abandoned mines on the island. The consequences of mining are still evident at the abandoned mine land since, due to lack of legislation no rehabilitation measures have been taken. In the majority of the abandoned mines a lake of dark brown acidic water is formed at the bottom of the opencast with high heavy metals concentration whereas, acid rain is reported (Charalambides *et al.* 2003) in the areas where these mines exist. Additionally, mining activities resulted in the removal of the topsoil and its nutrients bringing bedrock on surface instead. A number of chemical (pH, metal content, nutrients), physical (rock content, soil texture, slope, topography and stability) and biological (microbe population, bacteria) properties determine the fertility of the soil. Waste dumps include adverse factors such as elevated bioavailability of metals; low pH; elevated sand content; lack of moisture; increased compaction; and relatively low organic matter content (Sheoran et al., 2010). Climate change with long periods of droughts is making the situation even more difficult for the vegetation to grow in this already polluted environment. Despite the downgrading of the soil in the mine areas some native plants appear to grow by their own. This study aims to report the plants that naturally grow on the waste dumps and make a comparison to the geochemistry of the waste dumps, slope and topography of the abandoned mine land. Revegatation and phytoremediation are

techniques that are cost effective for the rehabilitation of abandoned mines, they reduce erosion, protect soil against degradation, have aesthetic advantages and long term applicability (Sheoran et al., 2010, Chhotu and Fulekar, 2009). In order to proceed in these techniques a complete study of the current situation at the abandoned mines should be conducted taking in to consideration the native species that naturally grow in these areas and thus are tolerant to the existing environment (*e.g.* climate, soil). Three mines are examined in the current study Kokkinopezoula mine, North and South Mathiatis mines.

Keywords: metals; mine; plants; phytoremediation