

Investigating sustainable processing strategies for recycling granite quarry waste in Sardinia's quarrying industry: a case study of the Buddusò quarry in Northern Sardinia

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Keywords: recycling quarry waste, granite, Sardinia.

Starting from the 1970s and within less than twenty years, the Sardinia region, thanks to the different types of granite characterizing the island, became the absolute leader in Italy and second in Europe (after Spain) in the production of ornamental granite. However, since 2010, due to increased competition from other countries, financial crises, and the COVID-19 pandemic, the granite industry sector in Italy has suffered a significant decline in terms of revenue and consequently production (ISTAT, 2023). This has generated serious problems for businesses, resulting in the loss of jobs. Moreover, the extensive production of granite in Sardinia has left a considerable amount of waste associated with the extraction of granite blocks. In fact, due to the high quality standards required by the market for ornamental stones, a notable quantity of extracted material is discarded due to the presence of aesthetic defects (Rana et al., 2016). Over the years, this has led to the creation of several granite waste landfills that generate problems both from an environmental and landscape point of view. The current indications of the European Union are pushing strongly towards reuse and recycling, both to address environmental issues and to deal with the serious problem of the supply of Critical Raw Materials - CRM such as Rare Earth Elements or feldspar minerals, due to the strong dependence of the EU on China and Turkey (European Commission, 2023).

This study focuses on a granite quarry located in the municipality of Buddusò, in the extractive district of northern Sardinia, which has been active for over 40 years. Several landfills have been created in this quarry over the years, hosting over 1.5 million tons of granite waste, resulting in a strong land consumption and landscape degradation. The purpose of this work is to investigate possible solutions for the reuse and recycling of such waste (for example, in the context of the ceramic industry) through the use of processing methods based on physical processes and avoiding the use of chemical substances with resulting environmental issues.

The reuse and recycling of quarry waste would bring benefits both from an environmental and landscape point of view, as well as economic. Indeed, considering the extremely high quantity of granite quarry waste present throughout the Sardinia region, finding a processing methodology and a potential market could contribute to the revival of this economic sector.

European Commission (2023) - Proposal for a regulation of the European Parliament and of the Council establishing a framework for ensuring secure and sustainable supply of critical raw materials and amending Regulations (EU) 168/2013, (EU) 2018/858, 2018/1724 and (EU) 2019/1020.

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