



Abstract

# UAS Remote Sensing Products for Supporting Extraction Management and Restoration Monitoring in Open-Pit Mines <sup>†</sup>

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**Abstract:** Accurate mapping of open-pit mine areas is a prerequisite for the efficient resource management of extractive companies, but also detailed mapping is a requirement for public administrations, especially regarding the monitoring of restored areas. In previous works, our team has contributed to a better knowledge of the use of Unmanned Aerial Systems (UAS) technologies for soil/vegetation restoration monitoring purposes, and in this work, we present a novel protocol to support combined interests of both private companies and governmental agencies. We introduce a case study in which we show the capability of multispectral sensors onboard of a low-weight multicopter to describe land cover typologies in restored areas (such as grass, scrubs, trees, topsoil and mine spoils) by applying remote sensing and GIS techniques. Moreover, we assess the capability of digital terrain models (Digital Elevation Model, Digital Surface Model, Digital Slope Model) derived from photogrammetric techniques, to provide useful and fast topographic information for the proper management of open-pit mine exploitation and restoration. By applying these techniques, we present a cost-effective workflow adequate to monitor land cover dynamics in restored areas, but also volumetric changes in stockpiles, waste dumps and extraction faces. This combined approach, supporting both environmental and industrial needs, aims to enhance the collaboration between sectors, establishing synergies, reducing costs by sharing knowledge, and adding transparency to their relation.

**Keywords:** drone; multispectral imagery; RGB imagery; morphometric; mapping; vegetation classification



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