How UAV improve past metallurgical deposits characterization for landfill regeneration

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Ancient metallurgical industries produced large amounts of residues, which were typically deposited in heaps or tailing ponds. The presence of such wastes could represent a potential source of pollution that may prevent the reuse of the sites. The NWE-REGENERATIS project aims to characterize different types of metallurgical deposits in order to improve their management and rehabilitation. The understanding of these sites is made difficult by their heterogeneous composition, complex morphology and dense vegetation.

Here, we explore the interest of integrating UAV surveys in geophysical characterization of NWE-REGENERATIS sites. First, our approach uses photogrammetry to build the digital surface model. Such models can be used to approach deposit volume and improve modelling of the sites. Those are crucial to carry accurate inversion of land-based geophysical data. Secondly, the multi-spectral measurements allow characterizing surface geochemical composition in order to define surface waste characteristics. These data could be used to explain surface electrical resistivity variation. Finally, areas with high metallurgical contents are highlighted with magnetic mapping. There, the ability of UAV to cover areas previously unattainable by land (dense vegetation and/or steep inclines) is key for a better understanding of the site.

This methodology is applied to multiple sites, including old iron and zinc factories or uncharacterized industrial landfill. We thus present strengths and weaknesses of each UAV mapping used to characterize metallurgical landfills.