

Editorial

Editorial for Special Issue “Exploring Mining Landscapes: Reconciling Past and Present of Mining Activity”

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The first mining compendium, edited by Georg Bauer, also known as G. Agricola, was published in 1556, providing the basis of mining and metallurgical processing methods for almost two centuries [1]. Today, nearly five centuries later, mining engineering has undergone an enormous technological, scientific, and environmental change, enhanced with the onset of the Industrial Revolution. In 1937, the Nobel Prize winner in Physics, Sir George Thomson, proposed coining the term of a new materials age, thanks to the use of new raw materials and resources that developed the socio-economic growth at that time, thereby contributing to improving people’s quality of life. The importance of mining can be observed in our daily lives and in fields as diverse as the chemical, technological, metallurgical, energy and health industries.

This volume explores the recent scientific and technological advances that have been made in recent years to improve the field of mining. The articles published in the Special Issue are divided into three categories of interest to the industry. Several articles are aimed at guaranteeing the safety of mining sites, which are particularly sensitive to the triggering of landslides, falling blocks, and other earth movements, due to the enormous volume of material that must be moved. More than 50% of these instability processes are the result of mining activity and are not directly related to seismic activity or persistent rainfall events [2]. Several articles focus on the progress made in the field of spatial remote sensing, which facilitates not only the discovery of ore deposits, but also the study of difficult to access or remote areas. The recent integration of new geomatic technologies in mining research, such as unmanned aerial vehicles (also known as UAVs), provide versatile and fast results, together with resolutions that facilitate the monitoring of mining areas and guarantee the safety and control of restoration sectors.

Krzysztof-Tajduś et al. [3] analyze the problem of subsidence and surface deformation in seven abandoned coal mining sectors in Germany. Subsidence is a slow process that can occur over tens or hundreds of years, so monitoring this process temporally and spatially can help to mitigate the potential risks and establish the necessary period of measurement for the correct control of deformation. This control is also of interest in the study of mineral recovery, since dilution in underground mines is often determined by the stability of the rock mass. Bazaluk et al. [4] provide an assessment of the underground sectors prone to failure in areas close to fractures, thus improving mineral recovery. Their physical models also provide insight into the most efficient method for mining while preserving mineralized zones in fault sectors until stoping is carried out. By optimizing parameters such as height, width, and degree of the slope in the hanging wall, the ore recovery can be improved.

The paper by Witkowski et al. [5] provides an example of the advances that are being made in the field of stability and deformation in mining areas by the use of remote sensing techniques. The application of InSAR (Interferometric Synthetic Aperture Radar) technology makes it possible to estimate changes in the position of points on the earth’s surface from multi-temporal radar images (Sentinel-1 images) and to monitor the observed deformation over time. Their study contributes to improving safety in areas where subsidence can occur due to natural causes and due to present and past mining activity. They



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demonstrate the accuracy of the method to obtain the strain tensor using a geometric integral model for the assessment of copper mines of Poland.

Carabassa et al. [6] focus on the combination of UAVs and Geographic Information System (GIS) techniques for the study and monitoring of mining restoration. They provide interesting information on the advantages and resolution of this type of geomatic tool. High-resolution digital elevation models allow for accurate volumetric reconstructions that are useful for detailed mapping related to erosive processes from large and inaccessible slopes, providing better results than those obtained with traditional field techniques.

The study carried out by Rebbah et al. [7] analyzes the advantages and limitations that the opening of a structure, such as a tunnel, can have on mining developments. They show that the implementation of an in-pit conveyor during the early stages of mine development is a low-cost option, reduces carbon emissions, and improves mining performance. Their model was tested in the Bled El Hadba phosphate deposit. The test results showed that the location of the tunnel in the non-mineralized bottom of the mine can provide advantages for environmental recovery simultaneously with mineral exploitation. Innovative solutions can successfully contribute to reducing energy consumption and emissions, thereby promoting green and efficient mining.

DeWitt et al. [8] provides an inventory of Afghanistan's brick kiln and clay quarrying using remote sensing tools. They used field work and geospatial analysis in combination with existing geologic information and hyperspectral image analysis from high-resolution satellite imagery to show the location of these resources.

This Special Issue demonstrates the importance of the use of new technological tools and the capacity of traditional remote sensing techniques and methodologies to solve everyday problems in mining that can cause significant human and economic loss. It is thought that the papers in this Special Issue will be of great interest to a wide audience and hopefully, it represents the foundation for future research in the field of mining.

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