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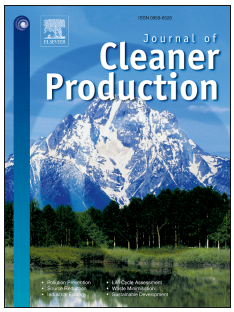

Decision-support models for Sustainable Mining Networks: fundamentals and challenges

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Decision-support models for Sustainable Mining Networks: fundamentals and challenges

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Abstract

Natural resource endowments have the potential of transforming the prospects of many developing economies. However, a nation's mineral resources can only generate prosperity if specific technology assets are employed in a way as to effectively develop its resource sector, capture value from it, and transform that value into long-term benefits. The roadmap to such an ambitious goal lies in effective management, supported by consistent, formal decision-making methods. Yet, integrating environmental and social goals into strategic, tactical and operational decisions is a complex challenge, often addressed without adequate analytical rigor. We provide a systematic analysis of the literature devoted to the development and application of quantitative decision-support methods with sustainability considerations in the mining industry. By establishing a framework based on the fundamental elements inherent to decision-making processes pertinent to mining operations, we identify several opportunities for advancing research and practice. In particular, we find important gaps in elements such as project portfolio optimization, operations and waste management, and mine closure and rehabilitation, and even more so when social targets and impacts are considered. It is our belief that powerful insights from this discussion could be of significant value to both academics and practitioners interested in promoting sustainable socio-economic development through the mining industry.

Keywords: Sustainability, mining, decision-support models, environmental & social impacts, sustainable supply chain management, economic development

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