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AI—a Game-Changer for the Mining Industry

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Artificial intelligence (AI), the capability of computational systems to perform tasks typically associated with human intelligence, is without question one of the most far-reaching and impactful technological developments of the 21st century. From chatbots, online shopping recommendations and financial risk assessment to analysis of customer data, artificial intelligence is a game-changer for industries large and small.

One industry rarely associated with artificial intelligence is *mining*; yet the nexus between AI and this industry—especially for Latin America—deserves increased attention, given its profound impact in both developed and emerging markets. For example, AI is capable of analyzing large amounts of data and providing digital solutions for businesses, with the technology helping to increase speed and safety in mining operations

Mining is the backbone of the natural resources sector in Latin America with Chile, Peru, Brazil and Mexico the dominant players. The mining sector produces revenue exceeding $110 billion, accounting for 21% of the global base metal mining market, with copper, iron ore, and gold leading the way.

The positive impacts of AI on the mining sector are threefold. First there is *increased efficiency and cost reductio*n. AI-driven systems can predict when mining equipment will fail, reducing downtime and maintenance costs. For example, Rio Tinto, the British-Australian multinational, uses AI to monitor its fleet of autonomous haul trucks, reducing maintenance costs by up to 15%. Second is the factor of *improved safety*. AI can analyze environmental conditions to detect risks such as gas leaks, rockfalls, and structural failures. Take Newmont Goldcorp. The firm uses AI in underground mines to monitor for hazardous conditions. Finally, there is the impact of *enhanced sustainability and compliance.* AI improves ore detection and sorting, reducing waste and

environmental impact. A good example is TOMRA's AI-based ore sorting technology reduces water and energy usage in mines by 30%.

Recognizably, AI also produces negative impacts in mining. High costs and barriers to adoption immediately come to mind. AI systems require significant upfront investment in hardware, software, and training. For example, the estimated cost of AI-powered autonomous truck fleets is $5 million–$10 million per vehicle. Another downside is workforce displacement. AI-driven automation reduces the need for human labor, particularly in routine mining jobs. In the case of Fortescue Metals Group's transition to autonomous trucks, the company eliminated over 1,000 jobs in Australia. Many of the remaining workers needed to be reskilled. In general, workers must be retrained to manage AI-based systems, but many companies lack training programs. Also, of increasing concern surrounding AI are data privacy and cybersecurity risks. AI systems in mining operations are potential targets for cyberattacks, which could disrupt production. Three years ago a cyberattack on a mining company in Canada temporarily shut down operations. Not to be overlooked are ethical concerns enveloping AI. AI-driven decision-making in resource allocation and environmental compliance can raise ethical issues if not properly regulated.

At a country level, Colombia provides an excellent case of AI applications. For example, wearable devices integrated with AI can monitor the health and safety of miners; and AI can be employed for the early prediction of potential methane explosions in underground coal mines. The 2021 explosion of the Tópaga mine, where 12 miners lost their lives, was reconstructed using AI with evidence revealing that the use of individual methane detectors could have displayed data alerting miners to potential risks.

An increasing number of mining companies in Colombia are embracing AI. Drummond, one of Colombia's largest coal producers, is using AI to enhance operational efficiency and safety. The company has been incorporating AI in predictive maintenance for mining equipment and optimizing the coal extraction process. Cerrejón, a major coal mining company in Colombia, has been experimenting with AI technologies to improve resource extraction efficiency and sustainability. And EPM (Empresas Públicas de Medellín), a Colombian energy and mining company, has implemented AI solutions in their mining operations, particularly in their hydroelectric and mineral extraction projects. The widest use of AI is for predictive maintenance, equipment monitoring, and operational optimization.

What does the future hold for AI in the mining industry—for Latin America and beyond? As infrastructure improves, more mines in Africa, Latin America, and Asia will adopt AI to enhance efficiency and safety. Companies will use AI to discover new mineral deposits, reducing exploration costs by up to 50%. For example, GoldSpot Discoveries uses AI to identify gold deposits with high accuracy. We can also expect government to push AI-driven sustainability solutions to reduce mining's environmental footprint; and more sophisticated AI-driven robots will handle complex mining tasks in hazardous environments.

In essence, AI will continue to revolutionize the mining industry, enhancing efficiency, safety, and sustainability by automating tasks, optimizing operations, and improving decision-making through data analysis and predictive analytics. By 2035, AI is expected to generate over $100 billion in efficiency gains for the mining sector, with developed markets leading in automation and emerging

markets catching up through AI-driven exploration and ore processing innovations. In resource-rich regions like Latin America, mining firms like Glencore, Zijin Mining Group, BHP, and AngloGold Ashanti are well-positioned to harness AI to the benefit of their shareholders and the public at large.

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