Advanced connectivity transforming **Europe´s mining**

5G and Europe's mining
Access to strategic raw materials will be crucial to the competitiveness and resilience of Europe's renewable energy, digital, space, and defence technology sectors. The region's green and digital transformation will drive demand for the critical raw materials needed to support renewable energy, expanded electrical grids and electric vehicles. In addition, the green and digital transformation will be crucial in enabling decarbonization of other sectors.

More productive and sustainable mining operations, underpinned by advanced connectivity, will be key to meeting the EU´s critical raw material target of 10 percent of EU annual consumption from EU extraction, set out in the Critical Raw Materials Act.[1]

To realize 5G's full potential to support safe and sustainable mining operations, Europe must prioritize advanced and trusted connectivity and promote policies that incentivize investment, drive adoption and enable innovation.[2]

"The EU has untapped potential in terms of domestic resources and excellence in domestic mining and recycling. Accelerating the opening of domestic mines could enable the EU to meet its entire demand for some critical minerals [...] Currently, however, the EU remains heavily reliant on raw material imports, rather than exploiting domestic resources."
Mario Draghi, The future of European competitiveness[3]

5G use cases in mining

Autonomous operations
Advanced connectivity elevate the performance of autonomous vehicles, such as Pit Viper drilling rigs, enabling improved safety and efficiency through the use of autonomous vehicles and remote operations using robotics.

Real-time monitoring
Advanced connectivity support extensive sensor networks throughout mines, providing real-time data on everything from air quality to rock stability. The high-bandwidth capabilities of cellular networks also allow for the creation of digital twins for remote monitoring and predictive maintenance, as well as supporting high-resolution cameras and unmanned aerial vehicles to improve surveillance.

Efficient resource management
Advanced connectivity enables precise control of smart ventilation systems, optimizing energy consumption while ensuring a safe working environment. 5G-enabled sensors can provide real-time data on air and water quality, noise levels and energy consumption, helping mines monitor and reduce their environmental impact and work towards sustainability goals.

[1] European Commission, Critical Raw Materials Act (2024).
[2] Ericsson – "Drive innovation, growth and competitiveness in Europe with 5G".
[3] Mario Draghi – "The future of European competitiveness: Part B" (September 2024).

30% reduction in underground staff
The Panzhihua Iron Ore Mine in China used remote electric shovels and autonomous mining trucks, reducing underground staff requirements by 30 percent, and the number of underground workers per shift by 75 percent.[4]

13% reduction in maintenance costs
RioTinto increased productivity by 34 percent with Komatsu's FrontRunner Autonomous Haulage System, and maintenance costs were cut by 13 percent per operating hour.[5]

Leveraging automation and mobile connectivity in mining **Boliden Aitik mine, Sweden**

About the program
Boliden's Aitik mine, the largest open-pit mine in Europe, is leveraging automation and mobile connectivity to enhance efficiency, reduce costs and improve sustainability. The project integrates 5G technologies to enable the remote operation and automation of drilling rigs, increasing their utilization by 40 percent and reducing requirements for additional machinery and personnel. Current connectivity relies on Wi-Fi, but 5G offers a more stable, scalable, and high-performance solution. The mine aims to expand automation to trucks and excavators, further optimizing materials transportation and reducing environmental impact.

Benefits of 5G
- **Autonomous drilling:** 5G increases both the operational hours and the efficiency of remote-controlled and self-operating drilling rigs.
- **Remote-controlled machinery:** 5G enables real-time control of mining equipment from a safe, off-site location.
- **Fleet management and tracking:** 5G provides real-time monitoring of mining vehicles and equipment, improving logistics.
- **High-quality video streaming:** 5G supports remote inspection and control of operations through multiple 3D video streams.
- **IoT and sensor networks:** 5G enhances predictive maintenance, air quality monitoring, and worker safety through IoT and sensor networks.
- **Low-latency connectivity:** 5G ensures uninterrupted communication for mission-critical operations.
- **Automated trucks and excavators:** 5G enables future expansion into autonomous transport, to optimize material flow.

Impact of 5G
- **Increased efficiency:** Automation boosts drilling rig utilization by 40 percent, reducing reliance on additional equipment.
- **Cost savings:** Eliminates the need for two extra drilling rigs, saving EUR 2.5 million annually.
- **Improved safety:** Reduces worker exposure to hazardous conditions through remote-controlled operations.
- **Environmental benefits:** Automated trucks improve fuel efficiency, reducing CO2 emissions by 9,400 metric tons annually.
- **Scalability and future proofing:** 5G enables seamless expansion of automation in mining operations.
- **Reduced equipment wear and tear:** Smarter operations lower maintenance costs and extend machinery lifespan.
- **Optimized resource management:** Real-time tracking ensures better allocation of vehicles and personnel.

5G´s capabilities

5G's transformational impact
Advanced and trusted mobile connectivity is critical infrastructure that will underpin electrification, automation and digitalization. It is pivotal to scaling cloud and AI innovation, driving industrial competitiveness, enabling decarbonization and supporting digital inclusion.

High-performing networks
The foundation for advanced mobile connectivity is the deployment of transformative 5G, with mid-band spectrum to boost capacity and 5G standalone (SA) for new functionality. This delivers high-performing, programmable networks with a step change in capabilities and performance.

Differentiated connectivity
"One-size-fits-all, best-effort" mobile broadband powered the consumer app economy, but full digital transformation requires differentiated connectivity. Transformative 5G provides an innovation platform that unlocks network capabilities, tailoring connectivity to different users and use cases.

5G automation has boosted drilling rig utilization by 40 percent.

40%

[4] ABI research: Review of The 5G Ecosystem, Adoption, and Industrial Use Cases in Asia (2023).
[5] Ericsson, Komatsu, Epiroc and Arthur D. Little, 'Connected Mining' (2020).