

The Future of Mining

Drivers of change

The mining sector is facing industry specific and global challenges as well as rapid technological changes that are forcing it to adapt.

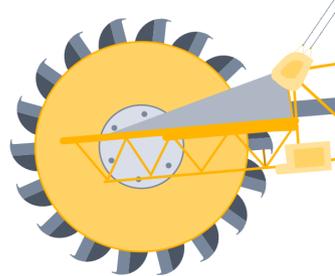
The impact of industry trends on the mining industry

Trends	Drivers	Impact/Challenge
Global Demand	Continued slow global economic growth, increased urbanization and developing-world growth, geopolitical instability, end-market consumption trends, circular economy lowering consumption, increase in competing materials	Slower, more volatile medium-term growth for ores and metals, peaking in the long term
Industry	Green Business, sustainability, Resource scarcity and remoteness, heavy competition	Increased costs, fewer projects, fewer viable players
Workforce	Ageing workforce, millennials, developing world skill gaps	Global skill gaps
Government & Society	Climate Change, CO ₂ mitigation, Resource nationalism, heightened community connection and engagement, increased media attention	Increased costs and need for transparency

Productivity

Rising productivity, alongside exploration, is the principal means by which mining can combat resource depletion. From 2004 to 2010 productivity in mining has declined by more than 40%. Automation and digitization offer companies great potential to increase productivity.

MineLens Productivity Index (MPI)



Technologies and their value addition

New technologies can raise productivity, make mining safer, **increase efficiency** and **improve cost-effectiveness**: By 2025, they **could** generate up to **189 bn USD** in additional value for the sector.

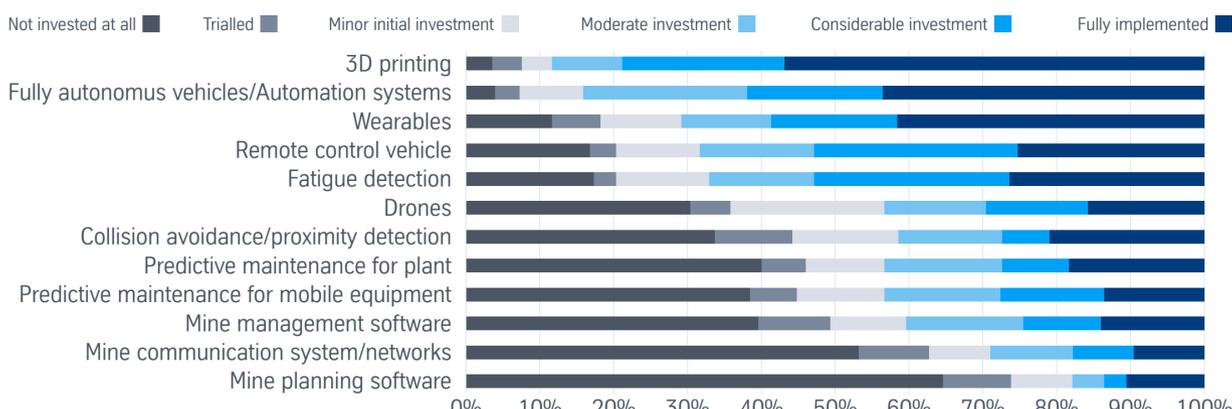
Digital themes and initiatives in mining and metals and projected value addition 2016–2025

Themes	Automation, Robotics and Operational Hardware	Digitally Enabled Workforce	Integrated Enterprise, Platforms and Ecosystems	Next-Generation Analytics and Decision Support
Value addition in bn USD	<ul style="list-style-type: none"> Autonomous operations and robotics: 47 3D printing: 0 Smart sensors: 9 	<ul style="list-style-type: none"> Connected worker: 59 Remote operation centers & Remote services: 65 	<ul style="list-style-type: none"> Asset cybersecurity: 5 Integrated sourcing, data exchange and commerce: 2 	<ul style="list-style-type: none"> Advanced analytics and simulation modeling: 2

The arms race has begun

The World Economic Forum expects a digital “first mover” mining company would have average EBITDA differences that were **at least 70%** higher than digital “laggards”. In 2019 mine planning software, communication systems and management software had the highest rate of adoption.

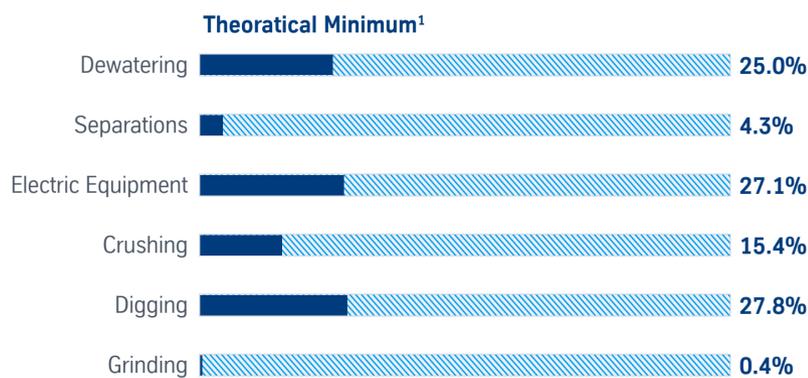
Technologies mining companies have invested in (%), 2019



Clean(er) mining

Mining is currently responsible for **4 to 7%** of global greenhouse-gas (GHG) emissions. The majority of emissions originate from fugitive coal-bed methane that is released during coal mining. To stay on track for a global 2°C scenario, the sector needs to reduce CO₂ emissions from 2010 levels by **at least 50%** by 2050.

Energy Consumption and Saving Potential by Equipment Type US Mining Industry



* Note: Values assume that production rates remain constant and are based on coal, metals and mineral mining data.

¹ Theoretical Minimum Energy = Energy Consumption * Efficiency

thyssenkrupp — digitalized expertise

Digitalization offers great potential for improving process efficiency and competitiveness in mining. Keep up with your competitors: **take advantage of our digitalized expertise.**

Contact us: automation.mining@thyssenkrupp.com



thyssenkrupp