

Is data the answer to the mining industry's global sustainability challenge?



The current situation

The mining industry occupies a central position in the effort to tackle climate change. It's an incredibly important sector that provides many raw materials needed in everyday life whilst contributing greatly to the advancement of modern living, innovation, and engineering. Yet, the mining industry has some serious environmental responsibilities, as it currently contributes to [8% of the world's carbon emissions](#). As part of the 2015 [Paris Agreement](#), 195 countries agreed to limit global warming to well below 2.0°C, and ideally less than 1.5°C. Therefore, changes need to be implemented within the industry to reach the target set.

“Although it is not widely recognized, clean energy technologies such as wind, solar and batteries are actually more material intensive than current traditional fossil-fuel-based energy systems.”

[The World Bank](#), 2020.

With the demand for minerals such as Copper, Lithium and Nickel expected to rise by over 100% by 2050 to produce low carbon technologies, it is imperative that sustainable, reliable extraction and methodologies for these minerals and technologies are in place to enable carbon reduction within the industry.

This is supported by Kitty van der Hijden - Director General, International Cooperation, Netherlands' [Ministry of Foreign Affairs](#), who said:

“Without Climate-Smart Mining practices, the energy transition risks [will make] a significant contribution to global emissions.”

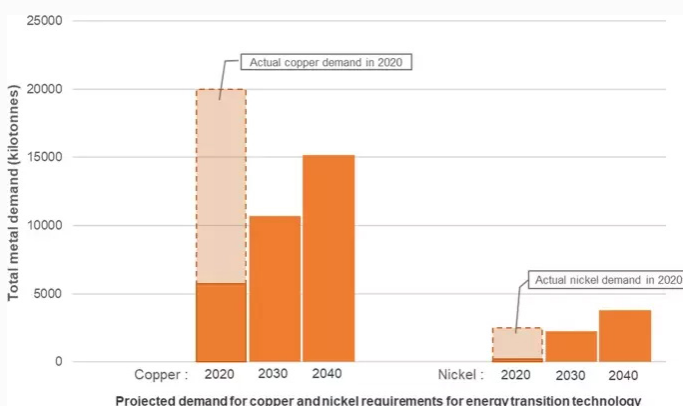


How is the mining industry contributing to climate change?

As previously mentioned, the global metals and mining industry is responsible for around 8% of the world's carbon emissions. This is largely driven by the combustion of fossil fuels to produce electricity. Fossil fuels are used to power mining and processing equipment, to manufacture mining equipment, and to transport the raw materials supplied by the mining industry. "While the mining industry contributes to global carbon dioxide emissions, the industry is also critical to lowering global carbon emissions across the broader economy." [Cox et al.](#), 2022

Through this transition of greener technologies such as electric cars, solar panels and wind farms, the higher demand for certain raw materials needed to produce them will need to be met if we are to reach the agreed carbon reduction in the Paris agreement.

Utilising information from the International Energy Agency 2020 datasets on the metal demand requirements to achieve the Paris Agreement's global warming targets, the projected demand for copper and nickel required for the production of low-carbon technology, electric vehicles, and battery storage is shown in comparison to the actual total metal demand (for all purposes) in 2020 (solid, orange bars).



There is debate over the mining industry's contribution to reducing climate change. Although it is frequently claimed that the mining sector is environmentally and socially harmful, it is really the main provider of the infrastructure required to lessen the damage caused by climate change. Therefore, if we understand that mining is needed for a greener world, we need to look at ways in which we can make the production of that greener world less destructive to the environment. In this paper, we are going to analyse the role equipment management platforms play in providing the data to the industry to help drive immediate change because:

"If you can't measure it, you can't improve it. Sustainability reporting and carbon accounting are essential tools for miners when it comes to implementing changes and tracking progress."

[Mining Technology](#)

The need for telematics in the mining industry

It can be challenging to keep track of equipment across several locations given how big and remote mining operations often are. With the variability of commodity prices and shareholder focus on performance year-on-year, mining companies are under continual pressure to accomplish more with less. Although you cannot control growing labour and fuel prices, you can increase operational effectiveness and efficiency by using operational data from telematics.

Telematics is the use of telecommunications to monitor the location and condition of equipment or goods. In the mining industry, telematics is used to monitor equipment, including fixed and mobile assets. While the basic functionality of telematics has been around for decades, new developments are making it even more powerful. Advances in artificial intelligence and machine learning have put sophisticated data analysis tools in the hands of mining professionals.

In the past, mining companies would manually track equipment and perform maintenance based hours and defects noted during paper-based visual inspections. This meant that large amounts of downtime were often unplanned, as tracking defects and meeting maintenance intervals was a time intensive process. Manual maintenance tracking also meant that only the information relevant to visual inspections was recorded. While visual inspections are still important, mining companies are now able to use telematics to track equipment performance. Automated tracking tools can monitor haul trucks, excavators, and other mining equipment to detect problems before they become major issues.

This ensures that mining companies have visibility into equipment availability, performance, and maintenance, making maintenance scheduling and repair times more accurate.

75 percent of businesses utilise telematics for fleet management and equipment tracking, which offers information on when and how much each machine across various sites is used, according to the [Teletrac Navman Construction Benchmark report](#). Utilising this data to make informed decisions about equipment quantity, maintenance, and fuel usage directly reduce costs.

MachineMax is an equipment management and data aggregation provider for off-highway fleets, that works with customers to manage key metrics such as utilisation, idling time, fuel consumption, emissions, location, and operating hours. A key mining customer, Imerys, a leading supplier of mineral-based solutions for industry, operating in 142 countries were able to reduce fuel consumption by 25% and reduce idling by 3%-10%.

Ed Buscombe – Mobile Plant Manager at Imerys:

“Benefits [of MachineMax] include a reduction in idling time which we really notice and that brings other benefits such as reduced fuel burn which helps our CSR targets as well that it brings benefits for our CO2 emissions. So really some excellent benefits from the system.”

This was achievable through the telematics platform, using engine data to calculate an estimated amount of CO2 emissions from the fleet activity.



This allowed Imerys to identify inefficiencies within their fleet and minimise idling and fuel waste.

With most companies having already adopted telematics to some degree it might be expected that this has been universally successful in delivering these outcomes. However, disconnected solutions with different platforms and logins often devalue the data and introduce significant added labour to combine and analyse the information.

By combining this data into a single platform or source of data it's possible to ensure the whole organisation is able to benefit. Adding to this a layer of automated analysis supported by artificial intelligence unlocks the possibility of turning this data into actionable intelligence.

It is this crucial element that is required to support companies in utilising their telematics investment and unlocking the efficiency and savings potential.

Environmental footprint reduction strategies

As mines seek to manage their Greenhouse Gas (GHG) emissions, there are many factors that must be addressed. They will have to balance their existing investment in machines and infrastructure against the external pressures.

While it would seem ideal to replace all machinery with new, clean alternative energy powered equipment as quickly as possible this is not yet a viable option. Although incredible amounts of time and effort have been invested into developing cleaner equipment we are still at an early stage.

Few alternative fuel machines exist, and certainly not in the sizes or quantities required to meet the needs of the mining industry.

While manufacturers strive to develop the next generation of mining machines, mining businesses themselves must consider the full scope of GHG emissions from their operations. Early replacement of equipment not only entails a financial cost, but an emissions cost which should be balanced against the savings of the machine. Additionally before the move to alternative fuels can be completed we must develop the supporting infrastructure, both on site and with suppliers, to ensure that net progress is made.

In the near future the priority will be to maximise the efficiency of existing equipment and operations. By responsibly managing existing fleets, mines will continue to extract the critical raw materials needed to develop and manufacture the next generation of mining machines. These Scope 1 and 2 emissions are already the focus of many mining businesses. As an added benefit this focus may also yield ways to reduce cost on top of the necessary emission reductions.

Scope 1 emissions include the emissions of the mining machines and any processing plants on the mine, in addition to any on-site power generation . As these items are within the control of the mines they are directly able to benefit from cost reduction. Reduction in unproductive idling, improving the efficiency of operators or haul roads and carefully considered updates to ageing equipment may all play a role in reducing Scope 1 emissions.

Additionally, with these machines likely to move to alternative energy sources in the future, it is critical to understand their energy consumption and operational patterns today. As this equipment moves from diesel to electricity or hydrogen power it will have a direct effect on the types of energy consumed, and as a result the emissions under Scope 2.

Scope 2 is derived from the power generated and supplied from off-site. As mines are often a major power consumer in a region, mines may have influence over future developments of the power network. However, with many mines working in developing nations access to green electricity may be limited, forcing miners to explore options for self-generation.

This will become even more critical as alternative fuels are utilised in equipment.

There are diminishing returns to operating an all-electric or hydrogen fuel cell fleet if the energy used to propel them originates from an ageing coal power station.

In addition to the Scope 1 & 2 emissions closer to site, mines are beginning to look at their Scope 3 emissions with “most of the world’s leading mining companies formally committing themselves to having net zero scope 3 carbon emissions by at least 2050,” ([Minerals Engineering, 2022](#)). Scope 3 encompasses the up-stream (suppliers) and down-stream (customers) elements of the mine’s carbon footprint.

Suppliers of the next generation of mining equipment not only need to develop machines that can be used efficiently, but that are manufactured in as efficient a way as possible and from responsibly sourced materials too.

Understanding the emissions from other suppliers also needs attention and while well written supply contracts may provide some assurance, holding each other mutually accountable will require new approaches to information sharing and transparency. Similarly, in the downstream direction, mines will have to increasingly understand where their products are used and account for the emissions in the value chain. While a very limited number of mines control their downstream emissions, most lose control as soon as the material reaches the nearest port, as such this represents one of the biggest challenges.

Only by looking at their full emissions profile will miners be able to minimise their GHG impact and move forward into a truly sustainable future of mining.

To provide the data needed for this sustainable transition, miners will need to expand their data capture.

By understanding the full energy picture for Scope 1 and 2 sources today mines will be better placed to make the important decisions on GHG reduction strategy.

To make an immediate difference to the carbon footprint of a fleet, must be the starting point. MachineMax offers the industry a cloud-based aggregation layer which normalises and aggregates incoming data, irrespective of the data source. Cloud computing is then used to deliver real-time data and analysis, displayed in an intuitive platform which is accessible to all, allowing miners to make decisions which result in improved revenue and capital discipline, decreased operating costs and a better reduced footprint.

“Fuel efficiency and reduction of carbon emissions in mining have become much more distinct possibilities as data collection and advanced analytics have evolved.” [McKinsey & Company, 2022](#)

Going forward miners will need this data to support key decisions on their projects. When considering the electrification of the fleet many companies today are “reluctant to make a complete shift due to performance concerns.” ([Global Mining Review, 2021](#)) With less than 0.5% of mining vehicles globally being fully electric, diesel is still mostly used throughout the industry.

However there is little doubt that the future of mining is with alternative fuel and fully connected fleets. Henrik Ager, President of Sandvik Mining and Rock Solutions voiced that electrification will be one of the biggest shifts to happen within the mining industry with diesel-powered equipment being warm, noisy, and emit particulate pollution, this change is something that needs to happen sooner rather than later. [Newscientist 2021](#)

It is key to consider that even with alternative power sources such as electric machinery telematics are key to customers understanding how hard their machines are working versus when they do not need a machine so they can choose the right equipment, choose the correct capacities, have they got the right volume of machines and are they in the right place. Therefore, having the electric machines connected is critical to ensure businesses have an overall view of their site.

In conclusion:

For the world to become more sustainable we need mining, but that does not mean mining cannot become more sustainable in the extraction of the materials needed to produce future technologies. With big environmental pressure both internally and externally throughout the industry, a shift to more sustainable energy consumption and fleet optimization will need to be made. However, to make an immediate difference, this paper concludes that data is the way to drive this change.

“Monitoring and reporting provides the information needed to validate compliance, improve system stability and minimise unplanned downtime.”

[Environment and Energy, 2022](#)

Telematics is helping mining companies improve efficiency and maximise the benefit of spent GHG emissions. What is needed now is a leap forward in the use of this data. First to maximise the operational efficiency, then to plot the course to future investment in greener solutions. All of these factors are important in reducing the mining industry's carbon footprint. When used in conjunction with other sustainability strategies, telematics can truly make the mining industry more sustainable.

About MachineMax

MachineMax is an award winning equipment management platform and universal telematics sensors for off-highway fleet, that work with customers to measure key metrics. The metrics providing the biggest initial impact include: utilisation, idling time, fuel consumption, emissions, location, and operating hours. This ensures that sites maximize their productivity, efficiency and profitability.

Our customers, across all industries, have used these metrics to identify patterns in operational inefficiencies including: too many equipment onsite resulting in under-utilisation, incorrect equipment used for the job resulting

in lower productivity, ineffective site layout resulting in idling and excessive travelling, suboptimal operator behaviour resulting in dangerous, and inefficient utilisation.

The MachineMax approach ensures data collected by heavy equipment can be communicated in real-time to technical teams and management. Focused on learning-based outcomes; we specialise in building secure and cutting-edge products that solve daily challenges and improve industry practice.

Find out how MachineMax can help you at [MachineMax.com](https://www.machinemax.com)