GEOVIA

THREE WAYS TO ADOPT MORE SUSTAINABLE MINING PRACTICES

Future proof your operation to satisfy increased ESG requirements

DASSAULT SYSTEMES

INTRODUCTION

Meeting the Environmental, Social, and Governance (ESG) Challenge.

Shifts in climate, geopolitics, capital, workforce, and society are transforming the mining and metals industry. In particular, the transition to low-carbon energy sources like wind turbines and solar panels will require a significant increase in the production of certain metals and minerals. The World Bank predicts that by 2050, the production of minerals, such as graphite, lithium and cobalt, could increase by nearly 500%, to meet the growing demand for clean energy technologies.

These global factors are rapidly changing societal needs and values, which are affecting the expectations of investors, regulators, and communities in their dealings with mining companies.
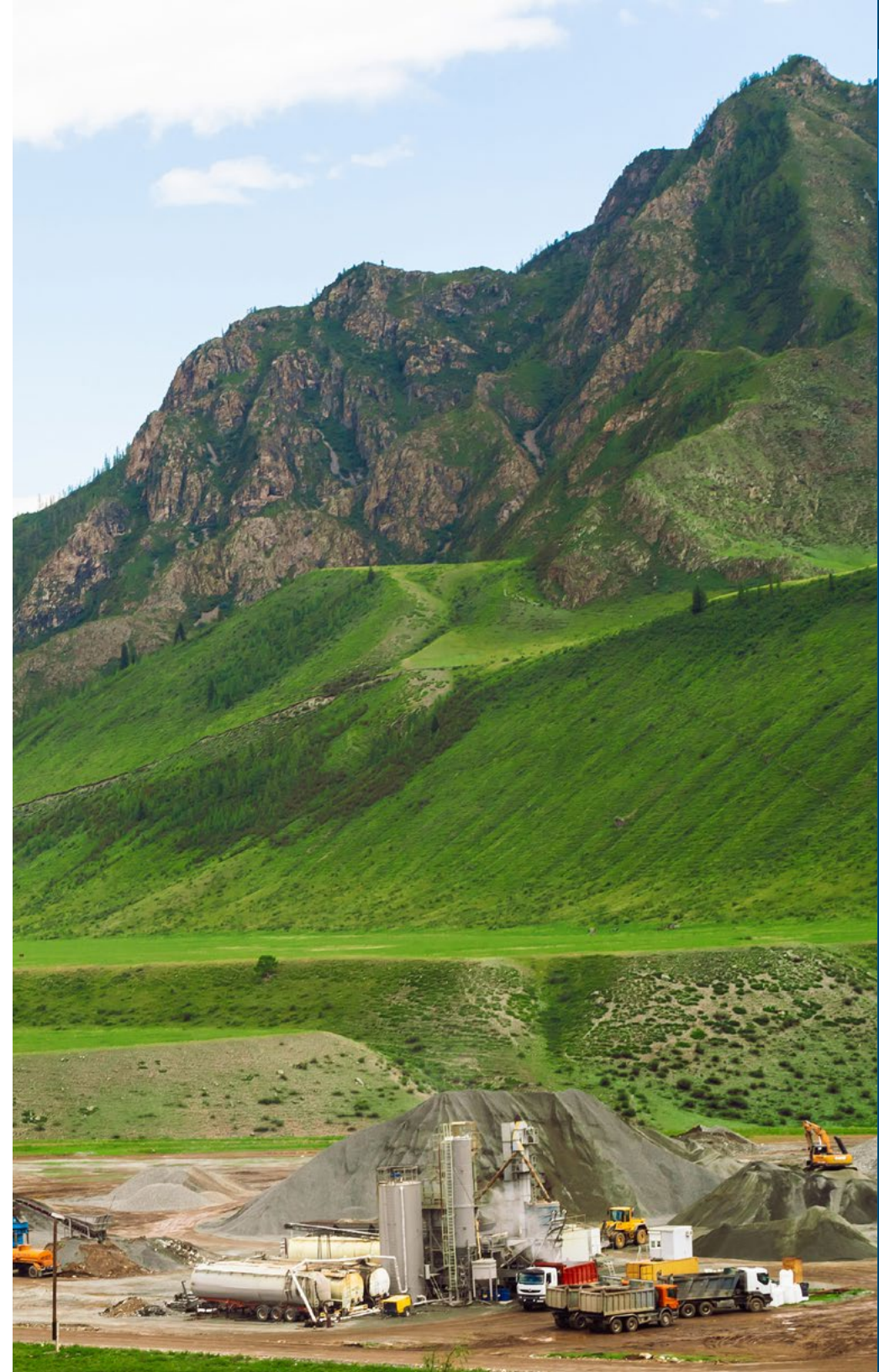
PRESSURE FROM INVESTORS

Investors are increasingly sensitive to ESG risks and are putting a lot of pressure on mining companies to set and meet sustainability targets. They are intent on seeing operations include these targets in their Competent Person's Reports as well as embedded in procedures for operational activities.

Shareholders are also holding leadership accountable for their company's sustainability performance, sometimes voting down bonuses for missed targets and low sustainability rankings. What's more, a low rating today may even reduce access to reasonably priced capital

REGULATORS REQUIRE MORE

When it comes to regulators, mining companies are being required to include sustainability policies and goals in operating procedures as well as mineral resources and reserves reports. Local jurisdictions are also enacting laws that require companies to go above and beyond traditional issues like environmental concerns and tax regulations. They now include requirements for transfer of knowledge and know-how, sustainable local wealth generation, and more.

HIGHER EXPECTATIONS FROM COMMUNITIES

However, regulatory compliance alone is not enough to guarantee a license to operate today. Communities throughout the world are holding mining companies accountable to local best practice guidelines and regulations. They are becoming increasingly vocal when companies are not compliant and are putting a significant amount of pressure on mining companies to be more sustainable and environmentally friendly. These communities have the power to stall project development at great cost to the operator.

MAKING PROGRESS

Due to all these factors, the mining industry is under increasing scrutiny to step up efforts to improve, track, and communicate sustainability metrics to be more effective and competitive.

Most companies have recognized this and responded by setting KPIs that align with the United Nations (UN) Sustainable Development Goals (SDGs) and others as well as adopting more transparent reporting systems that provide visibility into their progress.

However, a gap remains between high-level corporate targets and on-the-ground business practices. The Responsible Mining Foundation's RMI Report 2020, which analyzes 38 major mining companies' policies and practices around sustainability issues, concluded that while more companies have made and disclosed commitments, "many companies show little sign of movement and much needs to be done to translate corporate commitments and standards into successful business practices."
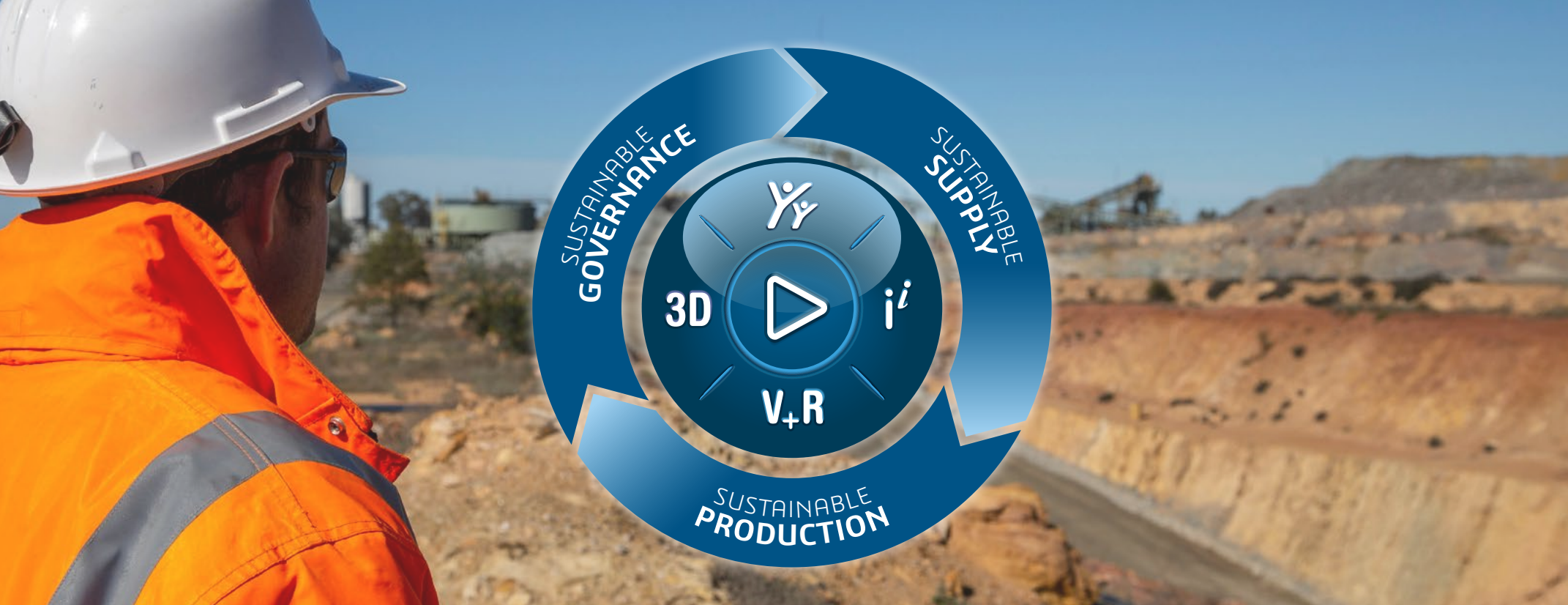
HOW TO BRIDGE THE GAP

In its Tracking the Trends 2022 report, Deloitte highlighted "Embedding ESG into organizations" as one of the key components to keep mining companies competitive in the decade to come. According to the report, "To move from pledge to action, mining and metals companies must be functionally set up to respond to and deal with ESG-related opportunities, challenges, and risks. At a practical level, this requires an operating model that facilitates visibility, accountability, and collaboration between departments, along with a clear governance structure."

The same structure is aimed at getting the best out of the production and supply systems the company operates. In other words, sustainable production, sustainable supply, and sustainable governance are all intrinsically linked through a digital platform.

The platform effectively creates a virtual world in which diverse teams can interact digitally in the same way they would interact in the real world to access sustainability targets, operational procedures, and relevant data. Not only does this promote visibility, accountability, and collaboration, but it also helps employees better understand their role as it pertains to sustainability and empowers them to make daily choices that align with higher-level targets. The consequences of any planned actions are therefore already known with certainty before their execution.

DECARBONIZE MINING OPERATIONS

CLIMATE CHANGE ADAPTION WITH INNOVATION

PROCESS PLANT CONDITIONING

STRATEGIC MINERAL SUPPLY CHAIN MANAGEMENT

FOUR KEY DRIVERS FOR SUSTAINABILITY IN MINING

1. Decarbonization (transition to green energy will be key);

2. Innovation to adapt to climate change (for example, better managing water supplies);

3. Process plant conditioning; and

4. Management of strategic mineral supply chains.

Digital technology is designed to enable mining operators to do more with less – less carbon, less waste, less water, less harm, and more transparency with improved production.

Whilst we have already seen that the road to sustainability covers every facet of a mining operation, in practical terms, companies can start by focusing their efforts on three key areas of the mining process within the scope of sustainable production:

1. **Maximizing recovery and yield of geological assets;**

2. **Deploying intelligent mine planning and design systems to define low-waste and low-carbon extraction methods; and**

3. **Optimizing operations management and execution to target sustainability.**

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STEP 1:

MAXIMIZING RECOVERY AND YIELD OF GEOLOGICAL ASSETS

The first place to start on the path to sustainable extraction is with the evaluation and modeling of geological resources in order to optimize the lifecycle of an orebody by extracting the best part of it at the right time with minimal waste to generate and protect value for future generations.

A DESIGN IS ONLY AS GOOD AS ITS DATA

This begins with data. Geoscience data is the foundation of all decision-making that happens during this phase of a mine's lifecycle.

Due to the large amount of data geologists are required to work with, it is important that information is collected and stored digitally within one single platform for all key stakeholders to access. This improves data quality, reliability, and visibility while allowing for a more accurate use of the data. At the same time, it reduces the amount of data lost and increases data utilization, which in turn reduces the need to collect additional data.

Not only does this cut unnecessary time and costs, but it also helps plan future explorations by allowing for focused exploration targets due to better data confidence.

GAINING A NEW PERSPECTIVE

Once the data has been collected, it's critical to manage, manipulate, and interpret that geospatial data into 3D models. By being able to visualize and analyze the data in this way on a collaborative platform, an organization can enhance cross-departmental cooperation. The results are better still if Machine Learning and Artificial Intelligence are brought into the mix. This facilitates an improved understanding of the geology and increases the confidence of the geological interpretation.

By improving transparency as well as the understanding and accuracy of a geological interpretation or model, an organization can plan the extraction of the orebody in a more sustainable way.

GOOD REPORTING LEADS TO GOOD PLANNING

Once this data is collected and modeled, it's paramount to generate accurate resource reports. For one, investors and other stakeholders insist on resource reports that are robust, consistent, and accurate. More importantly though, planning based on inaccurate or outdated resource models can lead to mining and plant production losses or inefficiencies.

Having an accurate and updated resource estimate will allow for better mine planning and extraction of the resource, which will increase the sustainability of the operation.

SOLUTIONS

Our dedicated industry solution experience for resource and geology modeling is delivered through the following workflows:
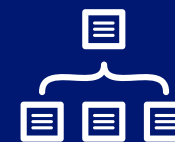
Geodata Discovery

helps mining clients import, organize, analyze, and store all geological data in one place.

Strategic Geology Modeling

provides geologists with the applications and processes to automate data importation and streamline data management.

Strategic Resource Modeling

uses industry best practices along with geology intelligence analytics to generate accurate resource reports.

STEP 2:

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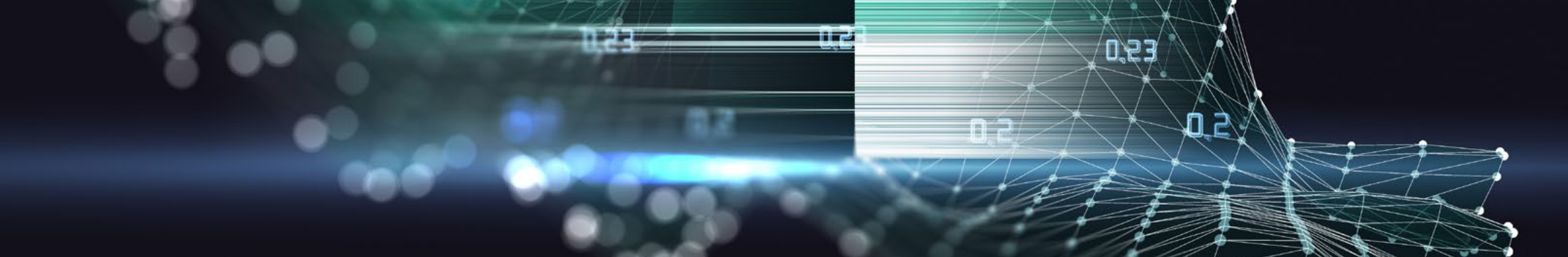## DEPLOYING INTELLIGENT MINE PLANNING AND DESIGN SYSTEMS TO DEFINE LOW–WASTE AND LOW-CARBON EXTRACTION METHODS

The next step to achieving a more sustainable operation is through strategic mine planning and design to extract the orebody in the best way possible to minimize the land footprint and disruption to the ecosystem as well as minimizing carbon emissions in the process.

THE POWER OF PARAMETRIC MODELS

A successful mine design allows companies to maximize the value from a mineral resource. However, a traditional CAD-based mine design is cumbersome due to the manual work involved in developing it.

A parametric model, on the other hand, is an algorithmic design approach that uses various parameters as inputs to the design model. This means that if the designer updates the parameters to reflect a different scenario or new data, the model immediately updates as well. This offers engineers and designers a high degree of flexibility to create, consider, and evaluate different designs and scenarios quickly and efficiently. They can create an unlimited number of potential designs along with an equally unlimited number of refinements, all without losing previous work. This saves precious time that can be used to ensure all aspects of the design meet the desired ESG targets.

It also creates a higher level of visibility within an organization as key stakeholders can view and comment on the design as well as track the history of design decisions. This can help refine the final design to meet key sustainability KPIs, reduce costs, and improve production management of the operation.

FUTURE PROOFING THE MINE PLAN

A solid long-term mine plan is also critical when considering the sustainability of an operation. Mines are designed to operate for decades, but metal prices and operating expenses can fluctuate over time. This can make it challenging to determine the proper mine plan to maintain value throughout the life of the mine.

It's important to analyze all possible decisions and scenarios to determine their impact on long-term value. Using a virtual twin, an operation can generate numerous combinations of factors to test alignment, fit, robustness, practicality, and financial delivery. A "Green NPV" would benefit the environment, society, and the mining company itself.

SOLUTIONS

Our dedicated industry solution experience for strategic mine planning & design is delivered through the following workflows:

Strategic Mine Design

provides engineers with the tools to parametrically design the mine and simulate numerous iterations of the mine design.

Strategic Mine Planning

enables mining companies to create a long term strategic plan while considering ESG, operational, and financial parameters and rules.
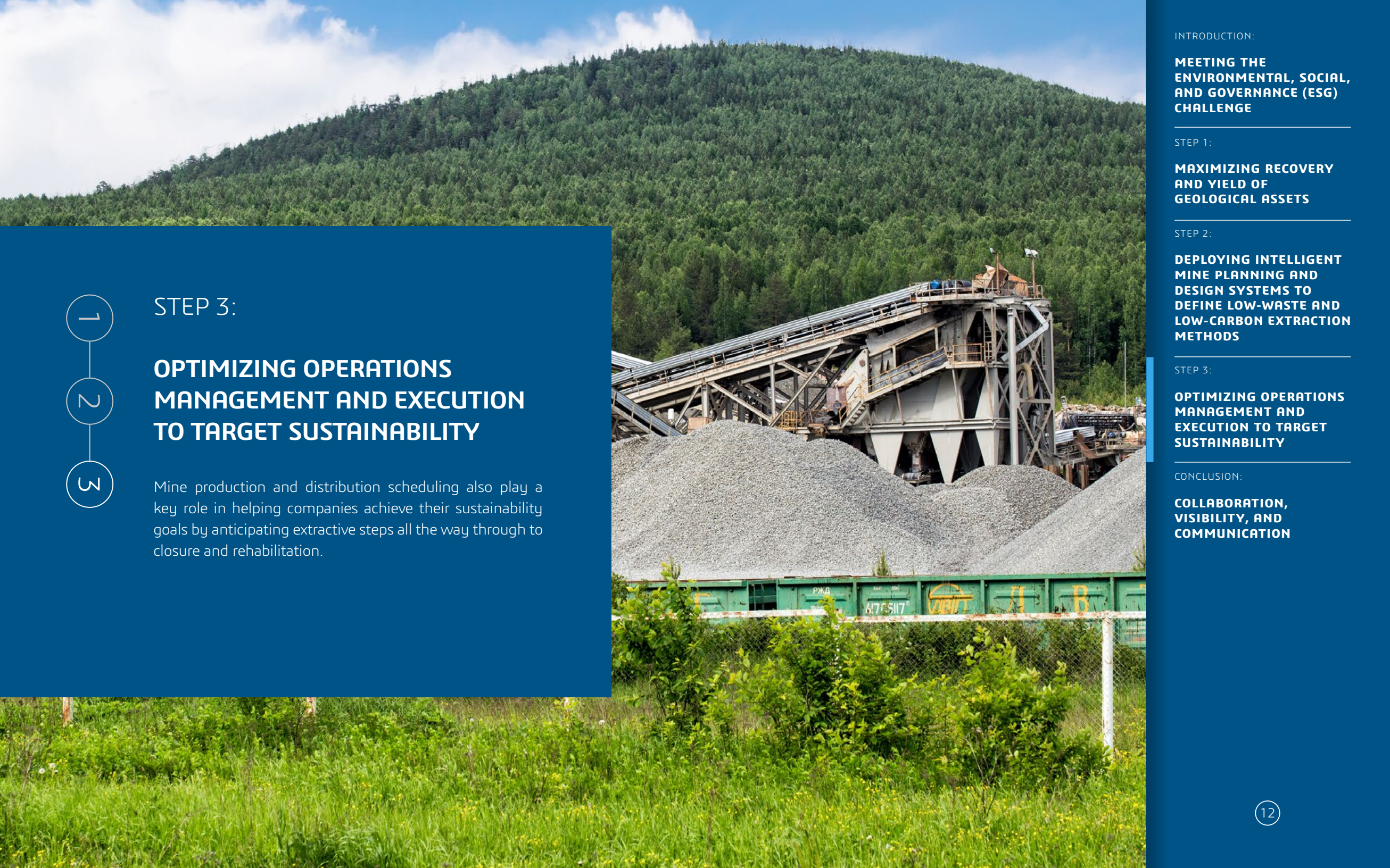
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STEP 3:

OPTIMIZING OPERATIONS MANAGEMENT AND EXECUTION TO TARGET SUSTAINABILITY

Mine production and distribution scheduling also play a key role in helping companies achieve their sustainability goals by anticipating extractive steps all the way through to closure and rehabilitation.

PLANNING MAKES PERFECT

To do this, a mining operation must create robust schedules that are practical to mine, meeting operational constraints while maximizing profits and reducing waste, greenhouse gas emissions, and cost.

A virtual twin can test sustainability metrics for different mining equipment fleets, haul distances, waste dump location and size, and more. It can also evaluate the impact on local communities and the environment, providing input to engagement and governance processes, all of which support a sustainable business model.

SCHEDULING FOR SMOOTH OPERATIONS

Delivering products from the mine at the correct blend on time while minimizing operational delays and cost is critical. However, scheduling development activities is very challenging due to the number of moving parts in a typical mining operation. Schedulers need to ensure that development work is sufficiently advanced to meet the requirements of production operations.

A virtual twin allows a scheduler to follow the correct order of mine development activities, assigning required resources while maximizing resource utilization.

UNDERSTANDING THE REALITY ON THE GROUND

Once the mine is operating, it's critical to have a digital tool that monitors all mining activities in a single location. This improves visibility, control, and synchronization of mine production, which in turn reduces waste and delivers a more sustainable operation.

It also helps reconcile grade measurements across the value network, tracks material movements, and provides deviation feedback to upstream processes for quick alignment. Again, this reduces waste and environmental impact, allowing mining companies to deliver against ESG KPIs.

SOLUTIONS

Our dedicated industry solution experience for mine production & distribution scheduling is delivered through the following workflows:

Tactical Mine Planning

enables a mine to produce short-term mine plans based on well-defined KPIs and supports integration with the long-term strategic mine plan while permitting multi-scenario plans analysis over several mining methods, including surface, underground, and caving mines.

Mine Operations Management

provides real-time monitoring for all mine operations, material reconciliation and asset performance programs and reliably link all sources of data, from fleet management to weighbridge, laboratory to stockpiles and everything in-between, into one single source of truth.

Mine Scheduling

produce long and short-term schedules that meet capacity and material quality targets. Schedule from pre-created block, grid, and polygon models that originate from many different mine planning systems.

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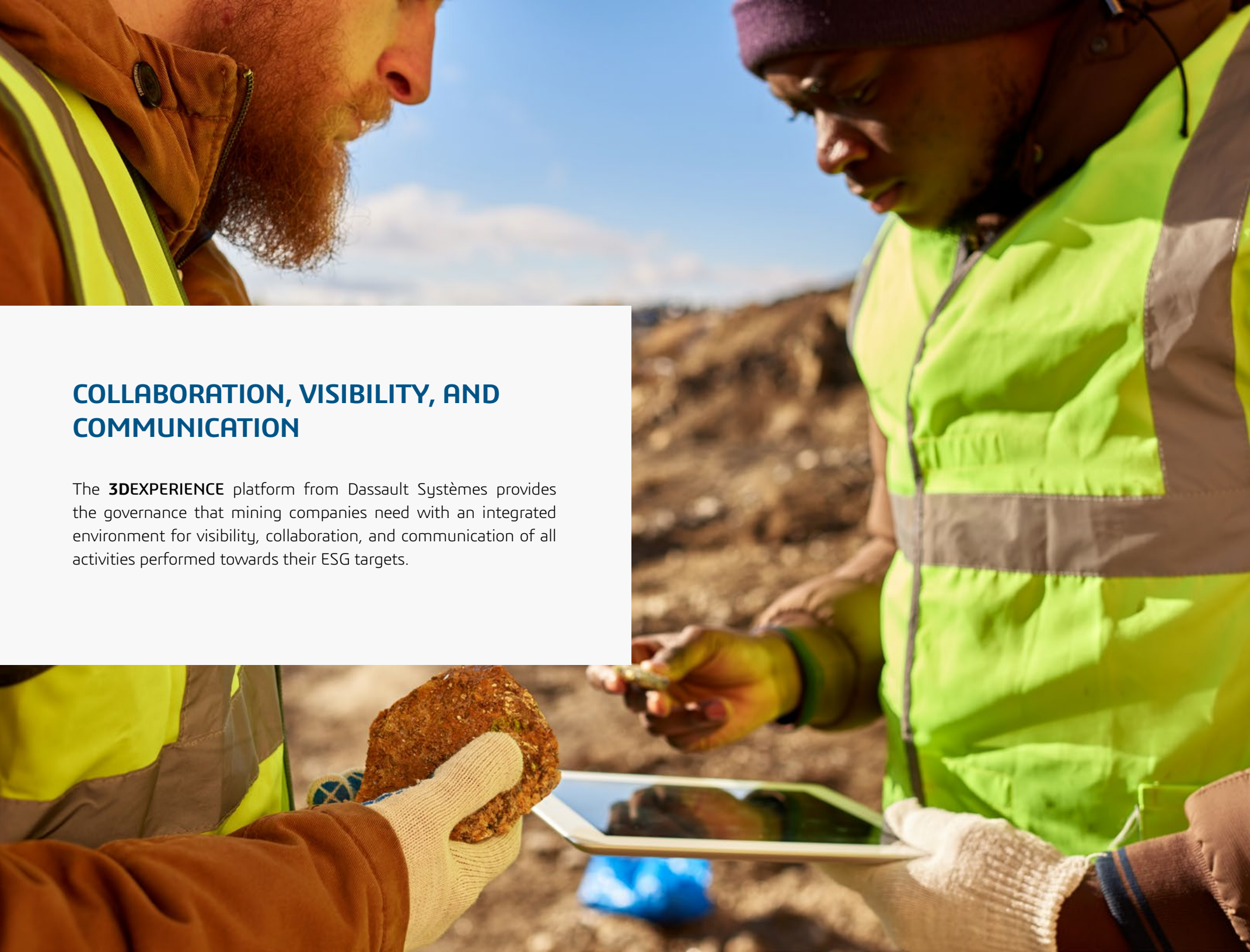
COLLABORATION, VISIBILITY, AND COMMUNICATION

The **3DEXPERIENCE** platform from Dassault Systèmes provides the governance that mining companies need with an integrated environment for visibility, collaboration, and communication of all activities performed towards their ESG targets.

COLLABORATION, VISIBILITY, AND COMMUNICATION

The **3DEXPERIENCE** platform hosts an extensive array of applications for data analytics, advanced modeling, and faithful simulation. These components combine to address the mining processes outlined in the previous chapters in the form of dedicated industry solutions available from Dassault Systèmes for sustainable production.

The platform provides a single source of truth for data where all the tasks, KPIs, and activities relating to ESG can be transparently visualized, tracked, and audited. Operations can attach standard operating procedures to tasks to ensure they are performed in compliance with sustainability targets. They can also visualize all activities and sensors that monitor compliance with regulations and display the compliance figures on customizable dashboards.

All the ESG activities that are tracked can pass through a review process and incorporate a clear governance model that help companies ensure compliance with all regulations.

This single source of truth is also designed to break down silos and improve collaboration by sharing the latest operational data, ensuring all departments are working from the same up-to-date information. This improves cross-departmental interaction, idea sharing, and social collaboration that can assist in creating a seamless environment to facilitate processes, such as strategic planning, budgeting, and forecasting.

The customizable dashboards, reports, data intelligence, and fully integrated project management applications provides teams with all the tools they need to improve visibility, transparency, and auditability in all sustainability goals, activities, and outcomes.

CONCLUSION

We have outlined three ways to leverage technology to adopt more sustainable mining practices. There are many more, including technologies for advanced material formulations and laboratory science, optimized supply chain analytics and planning, as well as systems engineering and quality assurance aimed at operational excellence for the infrastructure and capital facilities that support the mining operation. When all these features are combined, the result is a virtual twin capable of harmonizing product, nature, and life.

To learn more about how to adopt sustainable mining practices at your operation, contact GEOVIA.info@3ds.com.

If you want to learn, interact and share ideas about the sustainable future of mining with like-minded professionals and Dassault Systèmes experts, please join the GEOVIA User Community

Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3D**EXPERIENCE platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit **www.3ds.com**.

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