GLOBAL MINING GUIDELINES GROUP

GMG

# BUILDING A BETTER FUTURE OF MINING: STRATEGIES FOR TODAY'S BURNING ISSUES

Outcomes of key discussions and input at the 2019 GMG Leadership Summit

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# DRIVING THE FUTURE OF MINING THROUGH COLLABORATION

The 2019 GMG Leadership Summit was an interactive event aimed at developing collaboration strategies on three key topics for the mining industry:

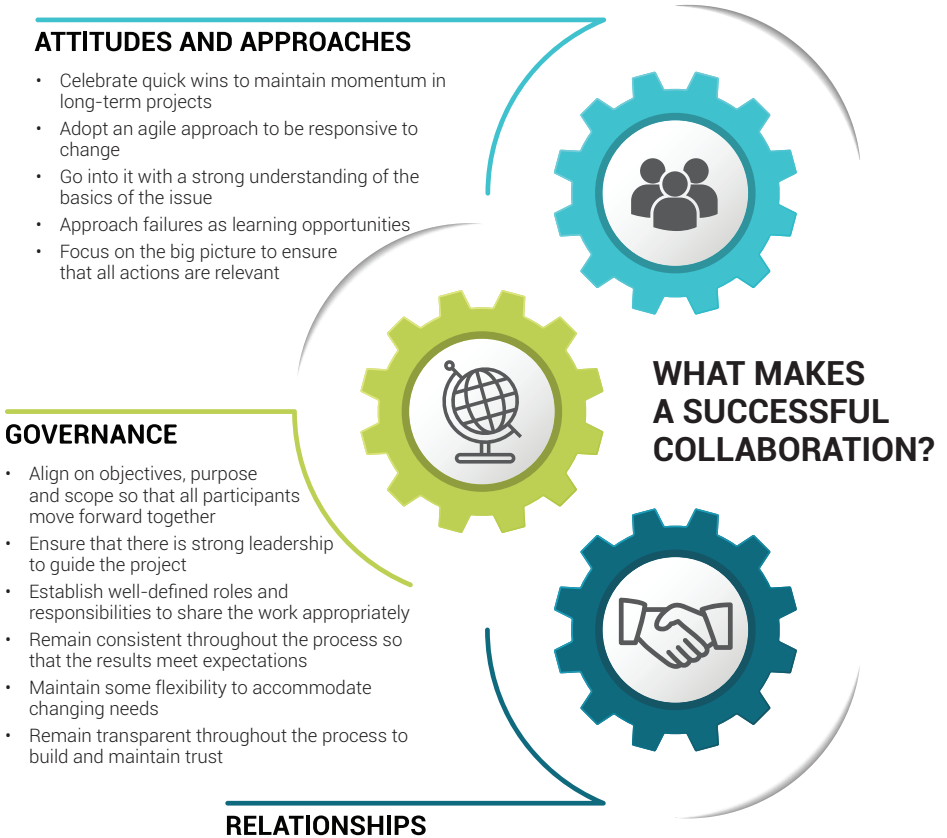
- Interoperability (see p. 3)
- The workforce of the future (see p. 5)
- Climate change (see p. 7)

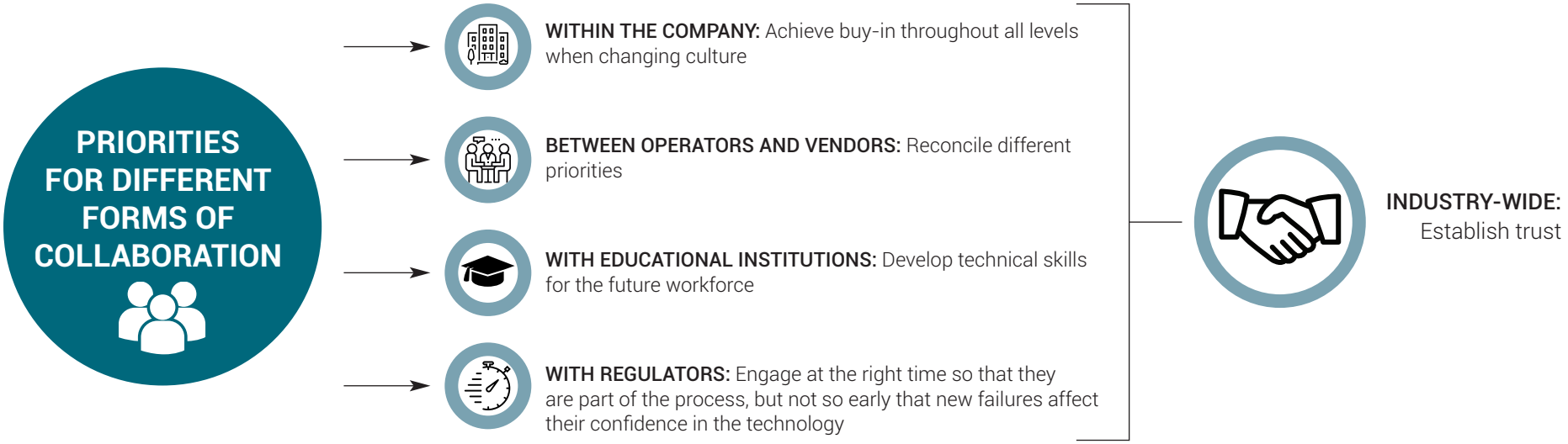
All three areas have wide-reaching implications with regards to safety, cost and social license to operate and therefore the industry is looking for ways to drive progress in 2020. Blockchain and automation – especially issues of safety and responsibility associated with automation – were identified as key industry priorities along with these three core topics.

Throughout 2019, there has been increased collaboration among industry stakeholders on interoperability, the workforce of the future and climate change in order to accelerate the rate of innovation, adaptation and adoption. More now needs to happen on a global scale. To successfully carry out an industry-wide strategy, there needs to be alignment:

- between companies to set directions
- between industry organizations
- on priorities

GMG brings all key stakeholders together to achieve alignment and coordinate how we will successfully realize industry-wide strategies. The following pages outline the key steps – based on your feedback and discussion – that we will take in order to support the industry in laying the groundwork for a better future.






## EXAMPLES: COLLABORATION SUCCESS STORIES

- **Involve the right people and establish clear objectives and constraints**

  The Earth Moving Equipment Safety Round Table (EMESRT) is a global initiative to improve safety. Collaboration on their collision avoidance protocol was successful because the right people who could make it happen were involved and they were working towards one common agenda: safety. Clear objectives and constraints were also key.

- **Open dialogue and engaging the end user allows the company's people to take ownership of a project and its successes**

  Freeport-McMoRan has seen success in their Americas Concentrator Project, largely based on successful collaboration within their company. They implemented an agile methodology with an advanced analytics model in order to improve productivity. The project has been largely successful due to the many feedback points for operators and how they captured and trialled ideas that came from the feedback. Through this kind of open dialogue, people throughout the company had ownership over the model and the process.

## EXAMPLES: LESSONS LEARNED

- **Misaligned and unclear expectations lead to unsuccessful or mediocre results**

  Many unsuccessful collaborations are the result of unclear or misaligned expectations among stakeholders. This can be from misalignment between a supplier and operation on the intent of a solution they are working on, misalignment within levels of an organization, or the lack of a defined vision of success.

- **Collaboration does not always equal consensus**

  Each party involved in a collaborative project will have a different point of view. When those involved in collaborative projects avoid difficult conversations, they risk delivering a mediocre result.

- **Consistency and carefully managing change are essential to maintaining trust**

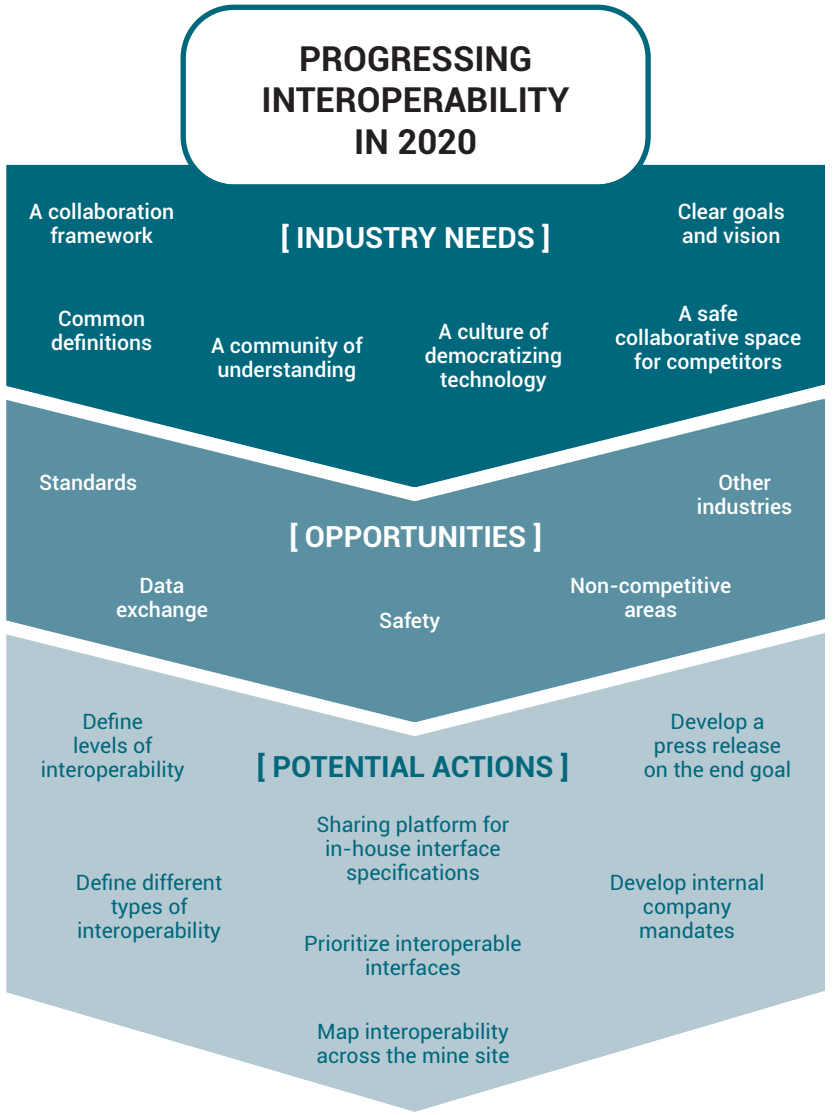
  The GMG Mobile Equipment Open Data project aims to facilitate consensus between operators and OEMs to enable open access to onboard data for mobile equipment across the mine cycle. The second edition was stalled late in the development process because the scope shifted away from what was initially agreed. The guideline no longer represented the consensus that it was meant to represent. The breakdown in communication identified a missing step in the engagement process.

# INTEROPERABILITY

Interoperability is the ability of two or more systems, components or processes to exchange contextualized information so that they can act on it to achieve business and operational outcomes. Industry evolution depends on digitalization, automation and integration, but poor interoperability remains the number one roadblock to achieving the productivity, safety and efficiency gains associated with them.

The challenge in mining is slightly greater than in some other industries because it must deal with interoperability at the hardware level as well as the software level. Companies are feeling a sense of urgency, but interoperability cannot be solved in a vacuum. Our industry needs a robust and structured framework for collaboration among all stakeholders – mining companies, OEMs, OTMs, integrators and others – in order to make progress. Over the past few years, there have been many efforts to advance interoperability, but they have not gained traction on a global scale.

Because interoperability is such a massive topic, creating a community of understanding, establishing clear goals, finding common ground, and identifying realistically achievable goals are key for making progress in 2020. Through these quick wins, the industry can develop a capability and framework for collaboration in order to progress interoperability on a larger scale.



# INTEROPERABILITY STRATEGIES

## CLARITY

**All stakeholders need a common understanding before moving forward.**

**Examples:**
Common definitions • Maturity levels
Aligned priorities • Industry roadmap

**Industry example:** Sandvik Mining and Rock Technology announced in May 2018 it had released its data interoperability policy, which specifies how Sandvik systems share data. The policy outlines the principles that Sandvik uses to communicate with external technology, touching on data accessibility, fleet data compatibility, data rights, and control and data privacy. This policy also references work that GMG has done.

### What is GMG already doing?

**Interoperability Definitions and Roadmap Guideline**
Common definition, principles, high-level roadmap
**Learn more**

**Interoperability Organizations Network**
Landscape of work on interoperability
**Learn more**

**Partnership with IIC Mining IoT Reference Architecture**
**Learn more**

### GMG Next Steps

**Distinguish between and define different types of interoperability**
For example, a white paper that peels back the layers of data interoperability so that it is clear how progress can be made in that area.

**Develop an interoperability maturity model**
For example, a capability model like the models that have been outlined for automation could help companies understand where they are and what they need to prioritize.

## COMMITMENT

**It is impossible to move forward without committing to the path.**

**Examples:**
Internal mandates • Commitment to sharing
Commitment to principles • Transparency
between suppliers and operators

**Industry example:** In 2017, GMG launched the first version of the Open Mining Format (OMF), an open-source file specification for 3D data interoperability. Seequent, Dassault Systèmes, Deswik and Micromine have publicly committed to supporting OMF. Work is currently underway on the second version of the framework, which will support block models.

### What is GMG already doing?

**Interoperability Alignment Report and ongoing feedback and engagement**
- Shared vision
- Aligned principles
- Industry roadmap
- Aligned priorities
- Vision for commitment

**Learn more**

### GMG Next Steps

**Develop a toolkit to enable commitment**
For example, templates for RFPs and contracts between mining companies and suppliers.

**Develop a strong governance structure**
For example, provide a framework that will determine the effectiveness and sustainability of interoperability initiatives.

## DEMONSTRATION

**The industry needs proven solutions in order to adopt them.**

**Examples:**
Case studies • Lessons learned
Testbeds and test sites

**Industry example:** The University of Western Australia, working with Enterprise Transformation Partners, AMIRA International and South Metropolitan TAFE, established the Industry 4.0 TestLab for Energy and Resources Digital Interoperability in early 2019 to accelerate the adoption of new technologies into the mining industry. The goal is to develop and demonstrate standards-based interoperable process control and automation. It plans to engage in research and development, technological trials and education on the subject.

### What is GMG already doing?

**Open Mining Format (OMF)**
**Learn more**

**Testbed Network**
- Connecting test facilities
- In development

**Case study and use case library**
- In development

### GMG Next Steps

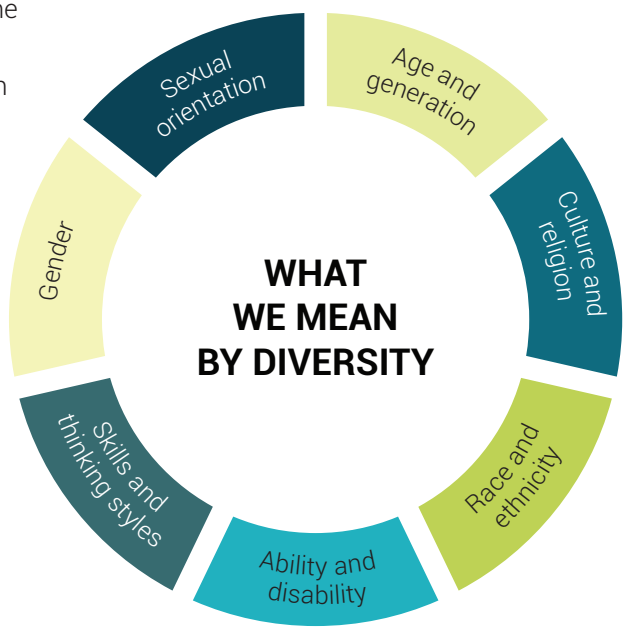
**Coordinate a dedicated platform for safe information sharing**
For example, many companies have developed in-house solutions. If there was a safe space for them to make information such as custom APIs available, the industry could have a base on which to build standardized interfaces.

# WORKFORCE OF THE FUTURE

Developing an industry approach to training, recruitment and diversity for enabling the workforce of the future is a high priority for the industry. Ensuring that employees are trained to thrive in the future, attracting experts, educating the emerging workforce and promoting agility, innovation and adaptation are keys to success. Today's connected mines require a workforce with a systems thinking approach, strong digital and technical skills, a solid understanding of human–machine interaction and the ability to synthesize vast quantities of information.

A diverse and inclusive workforce is also critical to success in fostering innovation and enabling the future. In mining, diverse perspectives and being inclusive of local communities also plays an important role in the social license to operate. Our industry still has a long way to go in terms of diversity. Gender diversity gaps – especially in leadership positions – are the most often cited challenge, but they are by no means the only one. For example, generational diversity has also emerged as a key priority.

Most initiatives on the workforce of the future are currently done on a national basis; however, this is a global issue. Like safety, it is also a non-competitive issue that the industry can work on together. Now is a crucial time to define a global strategy for the industry before there are major roadblocks.




### AN ESSENTIAL PART OF THE CONVERSATION

Evolving workforce requirements have been central to GMG projects that focus on implementing and benefiting from new technologies, such as the **Implementation of Autonomous Systems** and **Foundations for AI in Mining** projects.

The workforce of the future was also a key topic at GMG forums throughout 2019. It has become clear that there is a great industry need for collaboration in this area, especially in relation to autonomous mining.

# WORKFORCE OF THE FUTURE STRATEGIES

### Leverage the existing workforce and their skills

**Example:** Freeport-McMoRan distributed an entry-level data science test to everyone in the company who wanted to try it. It identified that many of their current employees already have these skills, even if they weren't using them in their current roles. As a result, they are developing a training program to help their employees grow these skills.

### Provide internal training pathways

**Example:** Teck's innovation strategy, RACE21, includes a strong focus on empowering employees. Part of this is their Digital Academy, which offers opportunities for employees to grow their skills and develop new ones.

### Develop closer relationships with educational institutions

**Example:** The University of Arizona Lowell Institute of Mineral Resources reached out to several mining companies, technology companies, OEMs and other stakeholders to help design their programs to better reflect the skills requirements of the future.

### Move away from a hierarchy-based way of working

**Example:** Many tech companies such as IBM are adopting reverse mentoring programs. These programs provide opportunities for junior employees to mentor senior employees on technological skills that they are more likely to have gained through their education.

### Build strong relationships with local communities

**Example:** As part of their expansions at their Voisey's Bay mine in Labrador, Canada, Vale is working with the Labrador Aboriginal Training Partnership, local and federal governments and the College of the North Atlantic to run programs to train the local indigenous communities and provide hands-on experience and skills development.

## INDUSTRY NEEDS

A platform for sharing successes, challenges, case studies and best practices

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An international strategy

## GMG RESPONSE

GMG's broad network can help to address this as a global topic and a new **GMG Workforce of the Future Working Group** can help to meet these needs through collaboration:

1. **Develop an industry landscape of what is already being done**
2. **Provide a safe, global platform for information sharing**
3. **Develop best practices for relationships with educational institutions**
4. **Develop best practices for creating internal training pathways**
5. **Develop best practices for relationships with local communities**

# CLIMATE CHANGE

Mining is an energy-intensive industry that produces significant waste. Climate change and environmental impact are therefore pressing concerns. With the rise in socially responsible investing, mining companies are at a risk of missing out on valuable capital if they do not reduce their effects on the environment. As regulators and governments also become more aware of environmental issues, minimizing our impact will become an important factor in our social license to operate. Customers, too, are standing up and demanding change, and markets are changing in response. As an industry, we need to come out in front of it by developing a comprehensive strategy.

**We only have 580 Gt of $CO_2$ emissions for a 50% probability of limiting warming to 1.5°C**

Source: IPCC, 2018: Global Warming of 1.5°C

In order to reduce the industry's impact on climate change in 2020, creating opportunities for quick wins is key. This can be done, for example, by looking at existing processes through the lens of reduction and identifying areas that can be improved in order to be as efficient as possible. Electric vehicles have also been identified as an economically and technically valid strategy – especially for underground mines – and accelerating their adoption can make a huge difference. Another key strategy is to look to what the industry is already doing and to provide education and visibility in order to make these strategies more accessible.

**"Whether you believe in climate change or not, it's going to impact your industry, it's going to impact your company, and it will impact your career because other people are taking this really seriously."**

- Ned Harvey, Rocky Mountain Institute, speaking at the 2019 GMG Leadership Summit

While targeting quick wins is important, the global industry strategy on an issue as urgent as climate change must also drive **transformational** – not incremental – change.

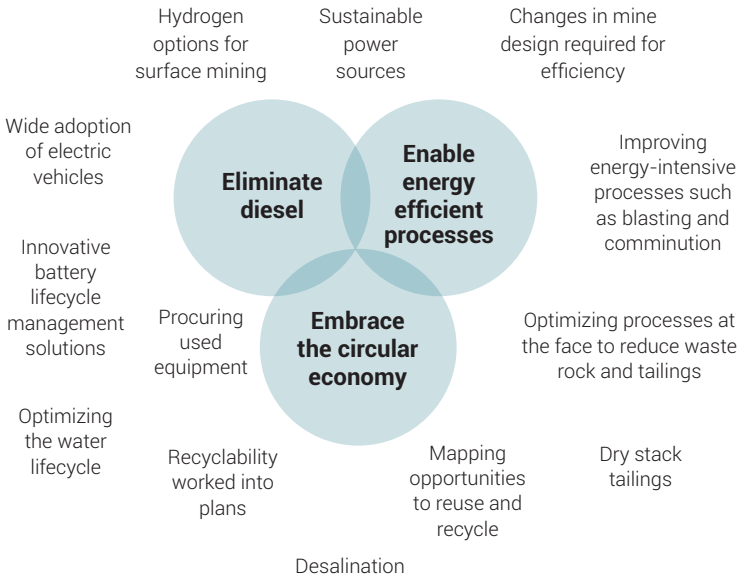
## INDUSTRY EXAMPLES

In May, Antofagasta Minerals subsidiary Minera Antucoya announced it would use 100% renewable energy at its copper operation. The company signed an agreement with power producer ENGIE Energía Chile S.A. for about 300 GWh/year, which will come into effect in January 2022. As per the agreement, ENGIE will certify that the energy used at Antucoya comes entirely from renewable sources. The company expects to save annual greenhouse gas emissions equivalent to 134,000 tonnes of $CO_2$.

Newmont Goldcorp is developing its Borden Lake project in Ontario, Canada, as an all-electric mine. The major miner has said that its whole mobile fleet – including scoops, trucks, jumbos and bolters – will be either battery-powered or tethered electric equipment. In April 2018, MEDATECH and MacLean Engineering delivered the first ever 100% battery electric retrofit motor grader to the project.

# CLIMATE CHANGE STRATEGIES

## Key Strategies and Examples




## Current and Ongoing GMG Activities

### The Electric Mine

**Published Guideline:** Recommended Best Practices for Battery Electric Vehicles in Underground Mining

**Learn more**

**The Electric Mine Working Group**
**Launched 2019**
**Learn more**

#### Next Steps

Benchmarking and key learnings
Operational best practices
Collect case studies and use cases
Address surface mining challenges
Offer a platform for sharing
Support ICMM Innovation for Cleaner Safer Vehicles (ICSV)

### Comminution Efficiency

Industrial Comminution Efficiency Working Group
Three published guidelines
**Learn more**

#### Next Steps

Identify new areas for collaboration
Update older guidelines

### Tailings Management

Tailings Landscape
**Learn more**

#### Next Steps

Identify gaps and potential projects
Connect the industry

## INDUSTRY NEEDS

Transformational – not incremental – change

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Education and visibility

## GMG RESPONSE

In addition to advancing the ongoing work on the electric mine, comminution efficiency and tailings management GMG will launch a **Climate Change Working Group** in order to broaden our work on climate change:

1. **Develop an industry landscape and identify gaps**
2. **Provide education and visibility**
3. **Develop guidelines and best practices on the circular economy**
4. **Develop guidelines and best practices for waste and water management**
5. **Collect case studies and use cases**

# BUILDING A BETTER FUTURE

In 2020 we will accelerate progress in many key areas including interoperability, workforce of the future and climate change – and your participation is essential. As key drivers of innovation in the mining industry, we are asking you to commit knowledge, resources and time to help break down the silos that hinder progress.

For example:

- Share information such as case studies, use cases, success stories and lessons learned
- Get involved and get others from your company involved in GMG Working Groups and Projects
- Attend or present at GMG events
- Spread the word about industry initiatives being tackled within the GMG community
- Be a line of communication to ease the sharing of information between industry organizations
- If you are involved in other organizations, look for collaboration opportunities

**Let's build a better future by collaborating towards a sustainable, safer and healthier industry.**