

WATER WASTE TO WATER WISE

Exploring the pathway
to a waterless mine.



About DRA's Future of Mining Series.

The mining industry is one laden with contradictions. On the one hand, we must produce faster, smarter and more lucratively than before. On the other, we must consider the environment, sustainability and even the end consumer. Is there a common ground to achieve mutually beneficial outcomes on this uncharted and often unstable terrain?

We've seen accelerated strategies in ESG, digitisation and automation since the outbreak of the COVID-19 pandemic. Change has become business as usual, and compared to a long history of using the past as our compass, the industry is now looking to the future as a driver of fundamental and sustainable change.

Disruptive technologies continue to shape and reshape our picture of the future. There's no clear or definitive image of what that will be, but we unpack some fundamental elements of what success might look like on our next horizon. Share our journey, as we imagine the workforce of tomorrow, explore socially conscious mines of the future, weigh up the risks, investigate new business models and get real with artificial intelligence.

In DRA's Future of Mining Series, we look at the challenges the industry is facing. We leverage the knowledge from our expert team of advisors to highlight some considerations for mining companies and their value chain to navigate the future with confidence. Join us as we step into tomorrow.

THE WATERLESS MINE: FACT OR FICTION?

The World Economic Forum¹ is predicting a shortage of clean, fresh water as the greatest global, societal, and economic risk over the next decade. Mining as an industry is renowned for its heavy reliance on water, but on the other side of that gold coin – the industry is also a vital entity of the global supply chain.

Ultimately, we're all reliant on the industry, in one form or another. Outside of agriculture, a vast majority of products are dependent on mining. You may have heard the quote, "If it can't be grown, it has to be mined", an appropriate acknowledgment of mining's enabling force in our daily lives. As we move to a cleaner, greener tomorrow, high expectations have been placed on the industry and how it goes about its operations. As consumers and regulators demand products be manufactured sustainably, and as organisations start to focus on Scope 3 emissions, more focus will be placed on greening the supply chain. The mining industry needs to get ahead of this curve. What if mining companies took the initiative to green their operations, decarbonise their segment of the supply chain, and acknowledge the business resilience stemming from water security?

The mining industry is a key component of the global low-carbon transition. Facing up to the role that mining plays in a green supply chain is a major challenge to mining organisations.

As a major consumer of water through activities like mineral processing (e.g., flotation, tailings management, hydrometallurgy), dust suppression, slurry transport and storage, extraction processes and site usage, is it possible for the industry to reduce its water footprint? Considering that in most mining operations, operators extract water from groundwater, streams, rivers, lakes or through commercial water service suppliers, their impact on the environment can be significant. Where does the opportunity for change lie, if any?

Perhaps the greatest pressure on mining is the current business model which maximises profit, without parity to other outcomes. The priorities of sustainability and profit are not mutually exclusive. We want minerals and commodities to be extracted sustainably, but we want our products to be affordable. This distorts the four areas of sustainable development, namely the environment, social equity, economic development and human. The perceived need to enhance shareholders' return on their investment distorts these equal pillars, with profitability traditionally viewed as the "bottom line" goal. The perception of miners, like many other organisations in the vast majority of commercial enterprises, suffer as a result. So, does the concept of "creating shared value" hold water?

Growing populations increase pollution, climate volatility and the reliance on water and ultimately, the scarcity of the resource enters the equation until behaviours change. With two-thirds of the world's population predicted to face water shortages by 2025, only three short years from now, the mining and metals sector can play its part to drive collective solutions that deliver water security and sanitation across the industry.

The necessity for behaviour change is what the water shortage forecast demands, and we are rapidly finding ways to turn this need for behaviour change into an opportunity for better outcomes.

STAKEHOLDER CAPITALISM

Although water security is an agenda item for any responsible player, talk is cheap. Fortunately, the rise of stakeholder capitalism is empowering the mining industry to act on some meaningful partnerships, those that have improved infrastructure, improved water management systems and increased collaboration between water users.

To create shared value, the industry will need to share insights and look beyond its clients through a holistic lens. With each company typically facing a unique set of challenges, such as location, political factors, local operating conditions, social and environmental risks – all factors far beyond the mine itself – there is no one size fits all approach. Through collaboration, leadership and innovative problem solving, pioneering solutions to water challenges can be born, transforming the industry into a valued partner in sustainable development.



The concept of a Net Positive or Net Negative water balance is rarely so cut and dry. Water management decisions are also unique to each mining operation. The trade-off factors include the obvious availability of water, the quality of that water, the process requirements for water, discharge and environmental requirements, host community needs, cost, and more and more the carbon emission impacts of each additional litre of water consumed, treated, or discharged. An interesting way to look at design in mining is to consider the mine as a microcosm and water as an asset of the broader ecosystem. Water entering or leaving the mine impacts the larger ecosystem on a circular basis.

The processes of design and design planning of circular water mines is available now and should be part of every design evaluation and every mine design conversation. These mines are being built today, and existing mines are actively improving their watershed stewardship on an ongoing basis. Global Feasibility Study standards³ require that a potential mine include the impact on many factors now included in the ESG umbrella (specifically including water).

Local environmental regulations have always dictated requirements for mine water discharge that miners have had to consider, however, the range of issues are now becoming more complicated, more entwined and more critical in response to climate change.

In many instances the perspectives of climate change and climate transition are running ahead of updates to environmental regulations and so, whilst many miners might only have to comply with host country environmental and licensing regulations, miners now need to think beyond those regulations into the realm of circularity and the requirements of their shareholders and parent company stock exchange listings. Many investment houses and debt financiers are now making decisions about where they will put their money. This is adding a further perspective on mining companies to rethink their operations and assets. This will often mean that before a financial decision can be made to proceed with investment in a new mine, the engineering consultant must incorporate water stewardship into the design and communicate that stewardship to both investors, government agencies, and host communities alike, all while considering the end-consumer.

It's predicted that socially conscious and tech-enabled consumers will demand greater transparency about what they buy. Whether it's diamonds from Sierra Leone, power generated by thermal coal or the source and sustainability of the metals in the bike or car, bus, train, ship or plane they use to go about their day or take vacations. These highly engaged and motivated stakeholders, share their opinions with others on peer-to-peer social networks, often mobilising others to their cause.

In 2011, a well-known water brand, synonymous with high-end luxury, cost consumers nearly three times more than other options on the shelf. But, in a misguided attempt to eco-consciousness, the brand launched a new campaign, outlining how buying a bottle of their water had a positive environmental impact. The marketing campaign used a green water droplet, far too similar to environmental seals of approval used by independent third parties.

In actuality, one bottle of this water was said to release 81g of fossil fuels and use 720g of water,



1 bottle water =

81g Fossil fuels

+

720g water



far from 'carbon negative' claims made by the company. Packaging came out of a diesel-powered factory and were made from polyethylene terephthalate (PET), low recycling rates and decomposition estimated to take thousands of years.

The outcome was a class action lawsuit for "forward crediting": essentially, giving yourself credit for carbon reductions that haven't happened yet. Albeit the lawsuit was eventually dismissed, the greenwashing of audiences led to irreparable damage to the brand.

What is the lesson here for mining companies and companies in general? Could the loop in this new, extended value chain be closed if we get into the mindset that all water is valuable? Yes, fresh water is very valuable for drinking, but water treated to a different specification can hold value too. If water can be looked at as "fit for purpose", depending on what that purpose is – then it too can hold value – and its production can be at an optimal cost.

When treating mine affected water, the requirement is not always to achieve fresh or potable water standards. Where a decision is made to treat to a lower specification, a value-added product can still be created in the permeate (product water) which should not be wasted. Identifying internal mine process users, or external users outside of a mine's fence, is key in ensuring this valuable water resource is never labelled as a 'waste,' but rather a secondary by-product of the mine.

AN INDUSTRY IN TRANSITION

Demand for most minerals is projected to be high in order to achieve the energy transition and so the opportunity for impact is enormous. Given that low-emission energy and transportation systems are more mineral-intensive than their fossil fuel-based counterparts, the transition provides a great opportunity for the mining sector and unconventional partnerships. If major users of mining products partnered with miners, what would these results be? Could the mine be the epicentre of a community generating water and power that fuel growth and support life?

The principles of circularity and sustainable operations can be enhanced when we think about grouping together processes and operations that are complementary and symbiotic.

Manufacturing has done this for many years with the evolution of the "industrial estate" or industrial park where manufacturers are co-located in near proximity to each other and the output of one manufacturer becomes the input to another.

A mine's location is (obviously) dictated by the geology of the commodity that is being extracted. Those locations are fixed. In most instances they are remote, necessitating the transportation of the commodity to another location for refining or further processing.

However, as we begin to look at a mine as not only producing its primary commodity and start to look at it as a source of a range of valuable "products" such as water, low-cost energy, and/or jobs, and as we model and communicate these opportunities from the onset, the picture starts to change.

Looking creatively at waste as a valued commodity is a core principle of circular thinking. In a world where sustainable mining and net zero becomes a base requirement, it is not far-fetched for mines to be viewed not as standalone entities but rather welcomed as enabling participants in our communities.



SOURCES

- 1 https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2022.pdf
- 2 <https://www.un.org/press/en/2016/sgsm17610.doc.htm>
- 3 <https://www.oecd.org/finance/ESG-Investing-Practices-Progress-Challenges.pdf>
- 4 <https://www.forbes.com/sites/forbesbusinesscouncil/2021/05/04/transparency-is-no-longer-an-option-its-a-must/?sh=2636173a75fe>