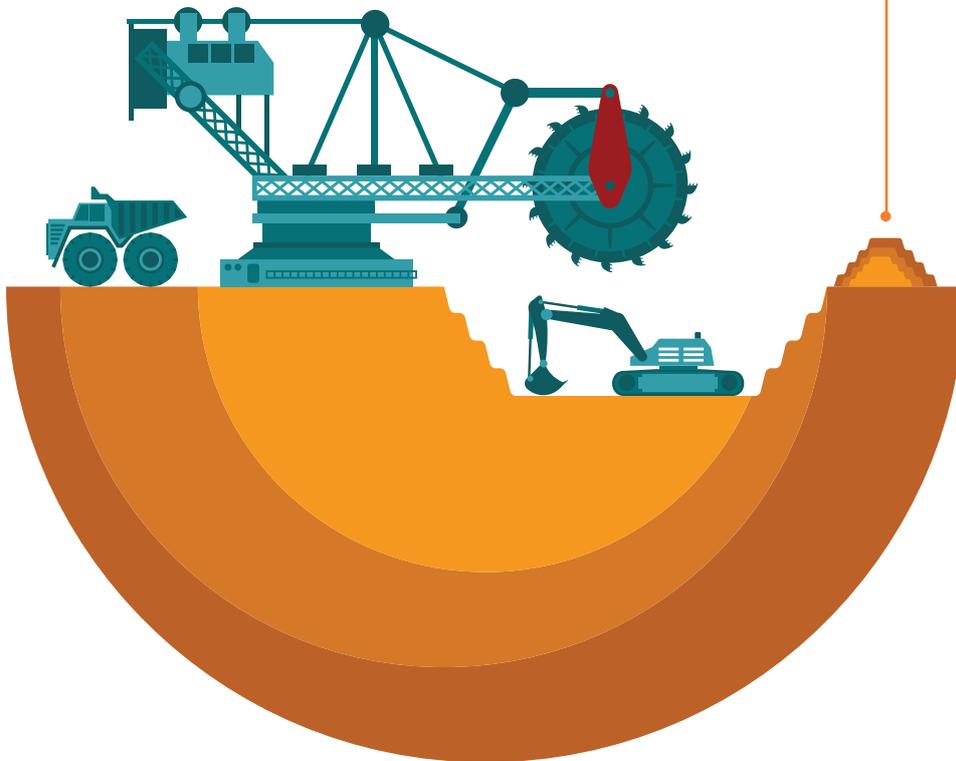


# ACHIEVING WATER BALANCE

Managing water-related risks in the mining industry



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## A WATER-DEPENDENT INDUSTRY

The mining industry is highly water-dependent. This reliance on water – particularly at a time of increasing water scarcity – carries a range of risks for mining companies. In this whitepaper, JLT Mining looks at how mining companies can minimise the risks and ensure that water-related issues do not prevent them making the most of profitable opportunities.

Water is a critical component in the mining process. All of the major mining processes require it, with the most water-intensive including separating minerals from host rocks, cooling drilling machinery, and dust suppression.

As a result, the industry is a very high consumer of water – using around 7-9 km<sup>3</sup> of water every year. This is likely to rise as the quality of exploitable ore grades is getting lower, so mining companies are having to process larger amounts of ore in order to produce the same amount of refined product.

All of this comes at a time when – because of population growth and rapid economic development – access to water is becoming increasingly constrained. Water issues are becoming so serious that the recent Global Risks 2015 report, published by the World Economic Forum, listed water crises eighth in the ‘top 10 risks in terms of likelihood’, while they came first in the ‘top 10 risks in terms of impact’.

In addition, many mines are in remote, arid locations which are considered areas of ‘water stress’, leading to a range of risks around availability of water, relationships with local communities, and the impact on the environment.

## RISING INFRASTRUCTURE INVESTMENTS

To tackle such challenges, mining companies are investing heavily in water infrastructure and management systems to transport water, reuse it, and treat it before discharge. Mining companies spent USD 11.9 billion on water infrastructure in 2013, a 270% increase from the USD 3.4 billion spent in 2009. It is estimated that expenditure reached USD 13.6 billion in 2014.

Recent major projects include Rio Tinto’s USD 310 million bore field and pipeline system for its Pilbara mine in Australia and Freeport-McMoRan’s USD 300 million desalination plant at its Minera Candelaria mine in Chile.

Approaches such as desalination are expensive, impacting the economic viability of a mining operation as they cost around 10 times more than using locally sourced water. For example, in Chile a desalination project costs around USD 100 million for small mines and up to USD 3.5 billion for larger copper projects. This puts smaller mining companies at a significant disadvantage. The large, diversified companies have the financial resources – and liquidity – to invest in the right

technology and infrastructure, as well as in-house expertise in project management and design.

Another reason why water infrastructure costs are rising is because of issues around accessibility. “Mines are often in extremely remote places, so you need to take that into account when you are calculating how much something will cost and how long it will take to install or repair,” says Hugh Sparks, Energy Consultant at Charles Taylor Adjusting. “It is a difficult logistical process; a contractor will have to mobilise men and equipment to a remote place – for example, by barging equipment, as it simply cannot get there by road.”

In addition, remote, arid regions often lack sustainable energy sources for mining companies to draw from. That puts the onus on the companies to come up with innovative ways to create sustainable energy sources – requiring substantial ongoing investments.

While the costs involved are considerable, the potential benefits to mining companies are huge because – in some cases – lack of an appropriate

water source can actually make a project unfeasible. As Jim Yates, Senior Manager, Enterprise Risk & Insurance, Newmont Mining, says: “We have potential ore body targets that are non-economic based primarily on water issues.

Jeff Beatty, who has worked in the mining industry for more than 30 years, adds: “There are two major risks at the start of any project: not enough water and not having the right people – that’s how crucial water is.”

Therefore, investing in the right water management systems can be enough to make or break a mining project. Despite that fact, it can still be hard to get buy-in for infrastructure spending. Beatty says: “We knew from our risk assessment for an underground coal mine that flooding would be an issue at some point, so we needed to purchase a pump at a cost around AUD 1 million. However, that was a big issue for the board because there had been a nine-year drought up to that point. But these major issues don’t go away and there would be a flood event at some stage, so we needed to put mitigation processes in place.”



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## THE RANGE OF WATER-RELATED RISKS

The mining industry's heavy reliance on water brings with it a range of technical, regulatory, environmental, social and reputational risks.

*Yates says:*

**“Water is a top operational risk for us – as it is for every other hard rock mining company. For each mine site, the goal is to achieve ‘water balance’– ie that we recycle / contain / have just the right amount water to run our processing systems , without drawing on additional external sources or pushing water to additional external areas.”**

### NOT ENOUGH WATER – OR TOO MUCH?

Water scarcity is perhaps the biggest – and most expensive – risk that mining companies face. Population growth, urbanisation and rising incomes are driving greater use of water around the world. The Intergovernmental Panel on Climate Change predicts that by 2025, approximately 60% of the world's population will be living in countries defined as ‘water stressed’.

Securing and managing an adequate water supply has therefore become a major challenge for mining companies, particularly as the majority of new mining developments are based in water-scarce regions such as Australia, South Africa, Chile and Peru.

The experience of the ‘Big Six’ global diversified mining companies – BHP Billiton, Rio Tinto, Anglo American, Vale SA, Xstrata plc and Glencore International AG – typifies the ongoing water-scarcity challenges. These companies have around 70% of their existing mines and 66% of new projects located in regions where water stress is considered a moderate (14%) or a high risk (56%).

Conversely, a major challenge for many mining companies is the need to manage excess water in their operations – which can be just as logistically challenging and expensive as sourcing water.

**“Many of our operations are water negative – so it’s all about capturing and containing water on site,”**

*comments Yates.*

**“Some of our sites are water positive and this creates a different risk profile to manage, focused on compliant release of excess water back into the local water system.”**

## RELATIONSHIPS WITH LOCAL COMMUNITIES

Communities close to mine sites may be concerned about the availability of water, the security of their access to it and the potential for contamination of water supplies. Conflicts with local communities over water often lead to production stoppages, protests, penalties and license withdrawals.

“When a local drought ensues, there is usually immediate pressure on the local mining industry to reduce their draw from a local water system due to a re-prioritisation of water toward agriculture or basic municipal needs,” says Yates.

Therefore, mining companies are becoming keenly aware of the need to get local communities onside and obtain a ‘social licence’ for the work they do.

Crucially, they must tread carefully as water is a highly emotive issue. “Water issues can create a contentious situation that goes straight to the heart of the community,” says Yates. Beatty agrees, saying that mining companies need to acknowledge that “water is sacred, water is life.”



When an incident does occur, it can have a very serious impact on the environment and result in significant fines or even in mining activities being suspended or shut down.

## ENVIRONMENTAL CONCERNS AND TIGHTENING REGULATIONS

Mining companies have a range of environmental issues to contend with and they must make every effort to ensure not to pollute or disrupt the ecosystem they are operating in.

To add to the challenge, all eyes are on them. “There is certainly increased scrutiny today,” says Yates. “and the mining industry needs to consistently demonstrate that we are using water responsibly.”

When an incident does occur, it can have a very serious impact on the environment and result in significant fines or even in mining activities being suspended or shut down.

Added to that, ever-tightening environmental and water usage regulations are creating a burden for companies. In some cases, the need to comply with such regulations is not only increasing costs, but also delaying the completion of major projects.

The level of regulation differs widely, however Beatty says: “In Australia, very strict legislation has been brought in for coal and coal gas seam projects around their impact on the Great Artesian Basin and the Great Barrier Reef.”

Sparks adds: “Developed countries such as Canada have very tough regulations and, when

a mine is played out, there are strict rules about reinstating what you have left behind. However, developing countries that are more dependent on revenues from mining may take a more lenient view about the impact on the environment.”

## OTHER RISKS

Other water-related risks tend to arise from issues around ground water, or natural events such as storms or flooding. Sparks says: “Climate change is another growing risk as we are seeing frequent extremes of weather conditions – absences or deluges of rainwater that typically have not occurred in the past.”

“Another contingent risk we focus on around water availability is power generation, because water scarcity will often have an impact on the availability and/or cost of power,” says Yates. “As an example, our Ghanaian operations are tied to a power supply generated from a hydroelectric source: the Volta River Akosombo Dam. The entire power grid in Ghana is exposed to the water levels in the dam and as a result, we have experienced load-sharing situations and/or availability issues in times of low water levels at the dam. Therefore, we are continuously looking at alternative power supply options in order to mitigate this exposure to our Ghanaian operations.

## WATER INCIDENTS

### THE BAIJA MARE INCIDENT, ROMANIA

In 2000, effluents containing cyanide leaked into the Tisza river from the Aurul mine in Romania. By the time the leak was detected, around 100,000 m<sup>3</sup> of wastewater had reached the Danube and killed more than 1,000 tonnes of fish, as well as contaminating drinking water supplies for more than 2.5 million people. The spill evoked strong reactions across the European Union, resulting in stringent changes to mine safety and waste disposal requirements.

### ZIJIN MINING GROUP ACIDIC COPPER SPILL, CHINA

In 2010, the Zijin Mining Group operating at Shanghang was forced to shut its copper smelter when it spilled 2.4 million gallons of acidic copper into the Ting River. The company is undergoing an extensive investigation and the financial impact is expected to be around 15% of its total production.

### MOUNT POLLEY MINE DISASTER, CANADA

In 2014, a tailing pond on the Mount Polley copper and gold mine was breached, resulting in 10 million m<sup>3</sup> of contaminated water leaking into Polley Lake. The environmental impact is being assessed and the extent of the damage may not be known for some years. The Cariboo Regional District declared an emergency due to concerns over the quality of drinking water, which affected around 300 people. The company is expected to face fines of up to USD 1 million.



## TACKLING THE CHALLENGES

The mining sector is constantly innovating to respond to water issues, finding creative ways to avoid competing with other users for water. In many cases, the industry has shown its resilience and ability to turn water-related risks into opportunities.

### INNOVATIONS IN WATER MANAGEMENT

The types of infrastructure that mining companies are investing heavily in include water treatment plants, wastewater treatment plants, reservoirs, pipelines and desalination plants. Desalination plants in particular use innovative technologies such as reverse osmosis and microfiltration that are highly effective, making more than 90% of mine water usable.

Companies are also making real efforts to minimise water losses and maximise recycling. For example, Xstrata's Lomas Bayas mine in the water-scarce Atacama Desert in Chile, which receives annual rainfall of approximately 1mm, has taken effective steps to reduce evaporative losses in the heap leaching process. In another example, BHP Billiton carried out a successful water savings project at its Olympic Dam mine in Australia to reduce the volume of water used in its processes.

Beatty says that dry washing technology for coal is another useful approach for saving water. The dry washing process involves using compressed air – instead of water – to blast coal to remove impurities. "It requires less capital and better for the environment as it creates no tailings that need to be managed," says Beatty. "However, it is new technology and further work is required to improve

yield and operational effectiveness. However, I'm very in favour of it – I think it's the future and we just need to make it work."

In mines with excess water, some companies are saving water and then putting it through a sprinkler system to help with dust suppression. Beatty says that another growing trend for dealing with wastewater is to use it for a bio plant – for example, creating a garden area instead of an open pit.

### RELATIONS WITH LOCAL COMMUNITIES

Mining companies are increasingly investing in infrastructure that can also be of benefit to communities. Dan Phebus, Director, Global Risk Management, Newmont Mining, says: "Responsible mining companies seek a partnership with their local stakeholders and water is an area where we can do something tangible and visible for these local communities. In the example of our Conga Project in Peru, we are building several reservoirs that will give the community the benefit of increased volume of water, as well as consistency of their water source."

In another example, AREVA's Trekkopje uranium mine in Namibia is the first seawater desalination plant supplying both a mine and the local region

with water. The Freeport-McMoRan Cerro Verde Mine in Peru is constructing a potable water treatment plant to ensure that the city of Arequipa will have access to clean drinking water. The eMalahleni Water Reclamation Plant in South Africa (operated by Anglo American in partnership with BHP Billiton) treats mine-affected water from its own and other mining operations and delivers the water directly into the local drinking water supply.

## COMPLYING WITH REGULATIONS

Mining companies have grown used to operating within strict rules around water usage and pollution, and often exceed what is expected of them. Phebus says: “In every situation where water is reintroduced back to the environment, it must first meet strict quality standards .”

Phebus adds: “In one instance we also cool the water as we don’t want the temperature to vary significantly from the original source as we could upset the ecology – in this case, by causing algae to grow.”

Mining companies are also getting better at assessing their potential impact on the environment. “For the last project I worked on, we spent nearly AUD 1 million on water bores and monitoring to understand our potential water impact, so we could go to the government and say hand on heart that we would not negatively impact the environment – and we could prove it,” says Beatty.



Mining companies are also getting better at assessing their potential impact on the environment.

## THE IMPORTANCE OF GETTING INSURANCE RIGHT

While mining companies are making good progress in managing their water-related risks through innovation and technology, not all risks can be eliminated, so companies also need to ensure they have appropriate cover in place.

“Incidents involving water – such as a pit flooding – can lead to very costly claims,” says Sparks. “So an important issue for mining companies to consider is the indemnity period they select for property damage and business interruption (usually the biggest part of any loss). Mining companies often choose 12 months’ cover for business interruption, which in the case of a catastrophic loss can be woefully inadequate.”

Underinsuring can be down to miscalculation – but it is often about saving money. “In the mining world, you’re always dealing with a commodity where the price goes up and down,” says Sparks. “Therefore, a company will take how much their commodity is worth at the time into account when they are choosing their indemnity period.

It is crucial to get this right – because getting it wrong could mean going out of business. “It really is that fundamental,” says Sparks. “This is partly because other factors will affect an insured’s decisions after an event. For example, if the price

of the commodity they are producing is low, it may not make economic sense to reinstate now – or ever. So they might abandon the pit, mothball it or sell it.”

Reputable mining companies understand the risks involved at all stages of the life cycle and manage them as best they can, but even with top quality risk management, things can and do go wrong. Insurance will respond to certain events but large or complex claims will take a considerable period of time to be settled. The insurance industry is taking steps to improve its response times, but for some this will be too late if cash flows are tight. Furthermore, a serious event could lead to withdrawal of licence to mine with obvious catastrophic consequences.

We have not even tackled the issue of flooding, which has led to some of the largest insurance claims in recent years; this will be the subject of a future issue of JLT Mining Whitepaper.



## LOOKING AHEAD

What will shape the mining industry's future approach to water?

### INNOVATION TO CONTINUE

Companies will continue to invest heavily in technology to create innovative solutions to challenges around sourcing water, decreasing water requirements and designing more effective methods of water management and treatment.

### WATER ACCOUNTING SYSTEM NEEDED

A consistent approach to 'water accounting' is needed across the global mining industry to help each company understand its water needs and water footprint. For example, the Water Working Group of the Minerals Council of Australia has developed a single set of water metrics for the Australian mining industry to enable consistent reporting, benchmarking and identification of opportunities to improve water management.

### VALUE OF WATER TO RISE

The value of water will always be affected by a range of factors, including pricing policies, water treatment costs and the perceived social and environmental value of water. In addition, the monetary value of water will continue to grow, becoming an even bigger consideration as part of financial planning and feasibility studies for mining operations.

### STAKEHOLDER ENGAGEMENT TO INCREASE

Finally, stakeholders in the mining industry will increasingly engage in constructive dialogue with interested parties outside the industry regarding responsible water management. Such engagement will provide a means for the sector to contribute to discussions on developing regulations and standards, as well as ensuring they are operating in ways consistent with the human right to clean water.

#### GET INVOLVED

We are going to be covering flood in our next whitepaper. If you'd like to have your say, get in touch by emailing [simon\\_delchar@jltgroup.com](mailto:simon_delchar@jltgroup.com)



## SIMON DELCHAR

Simon joined Lloyd and Partners Limited/JLT Group in June 2007 as a Partner to drive the growth of the recently formed Property Group. He is well known for his broking capabilities, innovative solutions and knowledge of the heavy industry sectors, in particular, having been invited to speak at the RIMS conferences in 2006, 2007, 2009 and 2010. He was promoted to Senior Partner in 2010 and the Board of Lloyd and Partners in 2012, assuming role of CEO Property, Casualty, Mining and Power for JLT Specialty following the merger at 1st January, 2015. He is also on the Board of the Mining Insurance Group.

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We place over £3.2 billion of premium into the global insurance markets every year, giving us leverage to secure the best deal for our clients. This is not at the expense of the relationships with our markets though, and because of this, insurers are keen to underwrite our risks, develop new products with us and push the boundaries of possibility.

We know how we work makes us different. It's quite a claim but we're driven to deliver on it every single day.

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