Asset-Level Benchmarking of Water Use and Production Risk in the Mining Industry

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Abstract

In response to a growing requirement for comparable transparent water use in the mining industry for its potential impact on production and cost, at asset, company and country level, Skarn Associates have developed a novel methodology by normalising key water indicators, while applying a mining analyst's approach: using technical, operational, and commercial data to contextualise water management at each site, with transparent benchmarking and estimating where necessary.

This bottom-up approach enables the review and evaluation of water management data at mine, corporate and country level. This converts into a powerful tool to ascertain the complexity of the water management by a particular operation and serves as an indication of the level of resilience the operation has when facing a drought period. When overlaying climatic precipitation trends, it is even possible to estimate the volume of metal that is produced in regions that are facing a negative trend in annual rainfall.

While there exists a multitude of ESG benchmarking tools on the marketplace, the Skarn Mine Water Benchmarking Tool is mining-specific water bottom-up quantitative analysis tool, which combines disclosed water asset-level and external public data with contextual mine water management knowledge. This allows for a valid comparison of water impacts on ESG metrics, economical and risk quantification, at asset, company and regional level.

Introduction

Over the last decade, several organisations have intensified their warnings on water-related risks for the mining industry. In 2019, CDP, a non-profit group that runs a global disclosure system, reported

exposure to water-related risks in the mining sector totalling US$ 24.9 billion, with just under half of the CDP respondents having already been impacted by water-related financial losses amounting to US$11.8 billion during the previous 5 years. These losses only relate to water as a revenue risk factor. To illustrate the importance of water availability in mining, BHP, one of the major diversified mining companies indicates: "Without water, our business simply could not operate. And without water, the communities we operate in wouldn't survive".

Water is also a major reputational and transition risk factor, where important investments are made to mitigate environmental issues through remediation systems, or through billion-dollar seawater desalination installations. Simultaneously, population growth and climate change conditions are applying even greater stresses on the mining industry, being an important local competitor for available water. This has already resulted in numerous examples where legal and community conflicts have reduced or even completely cut off access to water for mining operations, resulting in disruptions to production and a direct loss of revenue, increased operational costs and even leading to stranding of valuable mineral deposits. As Climate Disclosure Standards Boards (CDSB) confirms "Water is arguably the medium through which we feel the effects of climate change most". For many mining companies over the last few years, water has converted from an operational back-end "nuisance" that was managed at operational level (only-cost, no-benefit), to a front-end corporate strategic, operational and transition risk factor.

The complex and localised nature of water, climate change, and the mix of qualitative and quantitative information available makes it difficult for investors and other mining industry stakeholders to incorporate water risk data into their company analyses. Until now, little information or suitable methodologies exist to help quantify operational water data into relevant information for corporate and external stakeholder decision-making.

In response to this growing requirement for simple, transparent and comparable water-use in the mining industry, Skarn Associates have developed a proprietary methodology, normalising key water indicators, while applying a mining analyst's approach: using technical, operational, and commercial data to contextualise water management at each site and the resulting impact on production and costs at an asset level. Skarn utilises a combination of actual reported data (where available) and benchmarking of water use parameters where necessary that allows for mining operations and/or companies to be compared on a like-for-like basis.

The Challenge

As mentioned, water is a direct revenue risk factor for the mining industry. It is also a complex parameter to evaluate as it requires combining local climate context together with an understanding of the operation's water use and resilience to external water-related factors. Skarn has identified three main reasons why most of the currently available water-risk tools do not fully satisfy the requirement to identify water-related business risk for mining companies and their stakeholders:

Firstly, there are several different types of reporting standards and guidelines which makes it difficult for companies to report to a common framework. This can be seen in the following figure which represents a selection of mining related reporting standards and guidelines on water, environment, sustainability, climate change, accounting, etc that contain definitions on water parameters.

Figure 1: Mining related reporting standards, guidelines and organisations

The complexity around these different standards is that they are not all aligned when it comes to parameter definitions, resulting in indicators that can be interpreted differently depending on the standard that is used. This is especially complex for companies that are committed to report following multiple guidelines, resulting in inconsistent or conflicting reported data. Furthermore, qualitative reporting standards provide little use for quantitative and benchmarking analysis.

A second issue, as noted in several publications, is that one of the main complications for water-risk analysis in the mining industry is the lack of consistency in water data reporting by mining companies. Not all companies disclose their full asset level water performance data in a consistent way, year-on-year, using the guideline definitions as claimed. Examples include: mining companies reporting water data only at corporate aggregated level, limited parameters, or even reporting negative water consumptions. The latter example typically results from under-reporting water withdrawals, due in part to not accurately recording all captured rainwater, run-off or dewatering volumes.

However, one of the most crucial problems is the complexity of contextualisation and translation of available water use data into useful financial risk quantification. This requires asset-level evaluation and cannot be executed through top-down analysis. Water risk impact is not uniform among the mining industry globally or within a company portfolio. Negative effects related to drought or flooding depend on a combination of external, local as well as site-level operational conditions and factors. These external and internal parameters are often very localised and as such have direct impact on water management for each mine. This limits the validity of a top-down analysis approach in evaluating water impact for the mining industry, as it does not allow for differentiation at mine or even company level.

Several of the existing water reporting guidelines used by the mining industry, such as GRI and ICMM, recognise the importance of the external climate context and recommend the use of tools such as WRI Aqueduct or WWF Water Risk Filter to identify a mine's Baseline Water Stress level as a trigger for more detailed water disclosure requirements. Unfortunately, these water stress indicators tell only part of the story, as they do not evaluate water use or operational resilience to water variability factors, nor do they flag the direct external water exposure of a mine. Furthermore, the major use of these tools relates only to potential drought conditions and does not provide information relating to production risk from excess water, such as flooding events.

As a result, Skarn Associates has developed a simple tool that enables external stakeholders to evaluate and compare relevant water-related information and impacts at both a mine and company level; taking into consideration the lack of reporting consistency, variety of standards in use, incomplete or erroneous asset level reporting and the lack contextual impact evaluation and comparison.

The Solution

In response to the above, Skarn recently launched two separate tools: Skarn Water - Gold and Copper, which provide a detailed bottom-up evaluation of water management at a mine, company and country level for the gold mining industry. The tool helps to simplify the complexity of water management at a particular mine and highlights the resilience an operation has to potential drought conditions. By combining climatic precipitation trends and drought data, the tool allows to estimate the metal production at risk and the overall financial impact to a mine or company.

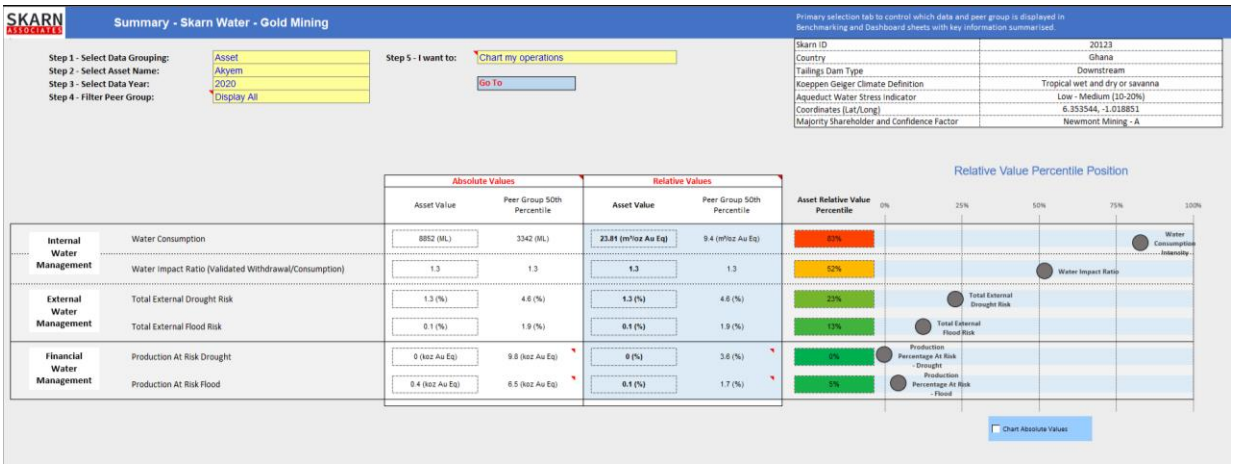

Figure 2: Skarn Water Gold Mining – Main Menu

The Skarn Water tool main menu screen allows users to group data by asset, company or country for a selected year and view a summary of six key indicators. Users can also select a comparison peer group such as mine, process, tailings dam or climate zone type, or default to a global comparison.

The summary view shows the three key indicator classes:

- **Internal Water Management**: The physical water context of the mining operation, represented by its water consumption (total and intensity), and Water Impact Ratio (a Skarn defined indicator, representing both water efficiency and environmental impact).
- **External Water Management**: Flood and Drought Risks based exclusively on external climatic parameters and historic climate data.
- **Financial Water Management**: Production at risk due to flood and drought factors, evaluating current water use on site to determine resilience and operational exposure.

Global coverage: Skarn currently covers detailed water use for the majority of listed gold mining companies globally, representing around 50 million ounces of gold production. The forthcoming Skarn Water Copper Mining tool will cover over 18 million tonnes of global copper production, equivalent to over 85% of mine supply.

Results

Gold mining is a water intensive industry: in 2020 over 2 billion cubic meters of water was withdrawn from the environment to produce 50 million ounces of gold. However, only half of that volume was consumed (following GRI and ICMM definitions) with the remainder discharged to the environment as (treated) effluent.

Skarn estimates that in 2020 the copper mining industry withdrew greater volumes of water than gold at around 3.6 billion cubic metres. The higher volume largely reflects larger scale operations in copper mining; however, surprisingly, the industry discharges a similar volume of water back to the environment as gold, or around 28% of the water withdrawn.

Several general conclusions can be taken from this. First, and this can be verified at an individual mine operation level, copper mines operate in drier climate locations than gold mines, forcing them to be more water efficient. The direct implication is that copper mining, in general, is more exposed to drought risk, whereas gold mines are more likely to be impacted by flood risk events.

Skarn has identified that well over 4% of annual gold production is at risk due to flood or drought related events, associated to trends in recent climatic precipitation – taking into account asset-level exposure and resilience of mining operations to external climatic factors. Although 4% might sound manageable, it does represent over US$ 3 billion of annual revenue losses based on current gold prices. However, the main issue is that this risk is not evenly spread among the mining companies: 80% of the total water-related production revenue risk is represented by just 51 mining operations.

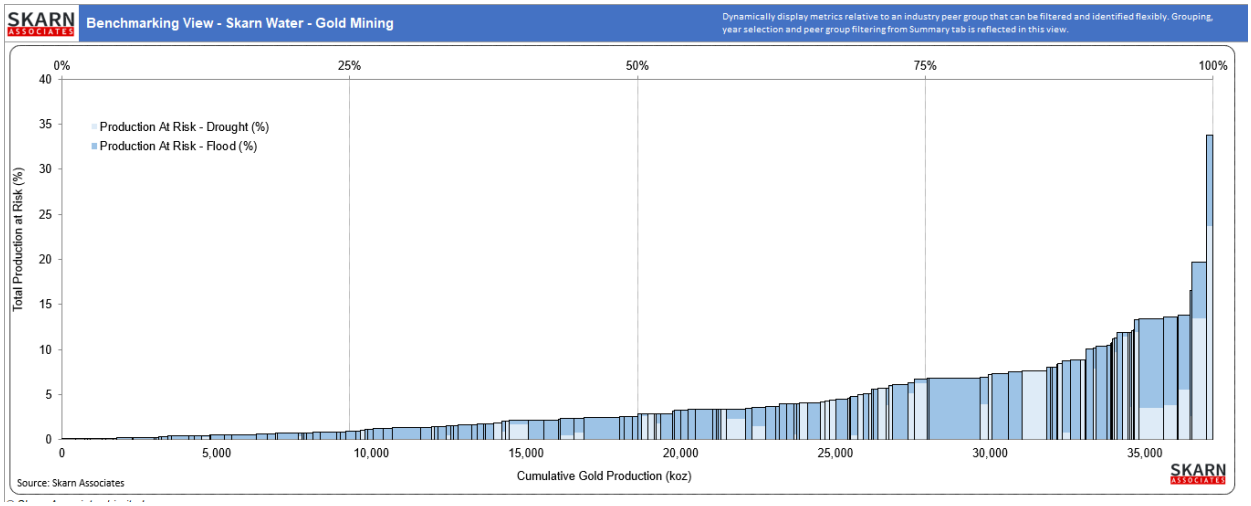

Figure 3: Skarn Water Gold Mining – % Gold Production at Risk – Asset Level

Figure 3 shows asset level production at risk, based on 2020 production data that is overlain with contextual information on internal water management, resilience and exposure to water availability based on the matrix of water sources used at the mine site, and external climatic data.

In the case of copper mining, total production at risk due to flood and drought conditions, based on reported data and current production conditions, exceeds US$ 5 billion, 25 only operations accounting for well over 70% of that risk.

From an investor's perspective, water risk analysis and differentiation at the asset level not only drives environmental and sustainability aspects, it also influences economic value and returns evaluation.

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