

RESEARCH BRIEF · GEM MINING CONSULTING · SEPTEMBER 2026

Strikes, storms and cave-ins: how much of Chile's copper output can really be considered secure?

First assessment using the GEM Production-at-Risk Index

Executive summary

The last week of September 2026 saw a strike approved at Centinela, a complete shutdown at Escondida following a fatal accident, and a production downgrade at La Coipa due to weather and metallurgical issues. To systematically measure how much of each operation's output depends on nothing going wrong, GEM proposes the Production-at-Risk Index (PaR): the share of an operation's production that should not be taken for granted, based on its exposure to eight operational risks.

In its first assessment, covering Chile's 14 main copper operations, the index yields average production at risk of 5.2%, ranging from 2.6% to 9.0%. El Teniente is the most exposed operation (9.0%), followed by Los Pelambres (8.0%) and Escondida (7.5%). Nine of the 14 operations have at least one risk rated high.

1. Three news stories, one underlying problem

On September 28, the Trabajadores Distrito Centinela and Minera Esperanza unions, representing around 708 workers, approved strike action with 98.73% of the vote and full turnout. Their central demand is not an across-the-board pay increase, but equal conditions for workers performing similar roles who belong to different unions (Rondón Olivares, 2026). Negotiations entered a mandatory five-business-day mediation period, extendable to ten, and a stoppage could begin on October 13 if no agreement is reached (Naveas, 2026).

A few days earlier, the death of a worker during maintenance forced BHP to suspend all operations at Escondida, the world's largest copper mine (McClelland, 2026). Operations began to resume gradually on September 25, following the inspections required under Chilean regulations (Mining Weekly, 2026). At the same time, the operation's supervisors' union, representing around 1,020 workers, called for members to reject the company's final offer and vote for a strike before their collective agreement expired at the end of the month (McClelland, 2026).

On September 23, Kinross lowered its expected production for 2026 and 2027 by 2%–3%. The main cause was La Coipa, where a series of "unprecedented" winter storms affected mining and processing during the third quarter, and where some of the sulphide ore contained more copper and delivered lower recovery than anticipated. The company is considering adding a flotation circuit for this ore (Kinross Gold Corporation, 2026).

These three developments add to other warning signs during the year. In July, two storms halted Los Pelambres and Caserones: Antofagasta Minerals lowered the midpoint of its 2026 production guidance by 5% (SMM, 2026), while Lundin Mining cut its guidance for Caserones by 7% following a 12-day power outage (Jamasmie, 2026). In August, Codelco suspended the Andes Norte project at El Teniente because of the risk of deep seismic activity (Energiminas, 2026), one year after the cave-in that caused six deaths at the division (Energiminas, 2025).

The aggregate impact is already visible. Between January and July 2026, Chile's copper production fell by 9.3% compared with the same period a year earlier (Reporte Minero, 2026b), and July recorded the lowest monthly output since 2011 (Rifo, 2026). In March, a GEM study had estimated the probability of meeting the official 2026 production target at 0.6% (Diario Financiero, 2026).

2. How the index is constructed

For each operation, the index estimates the share of production at risk by combining the expected loss associated with each of eight risks:

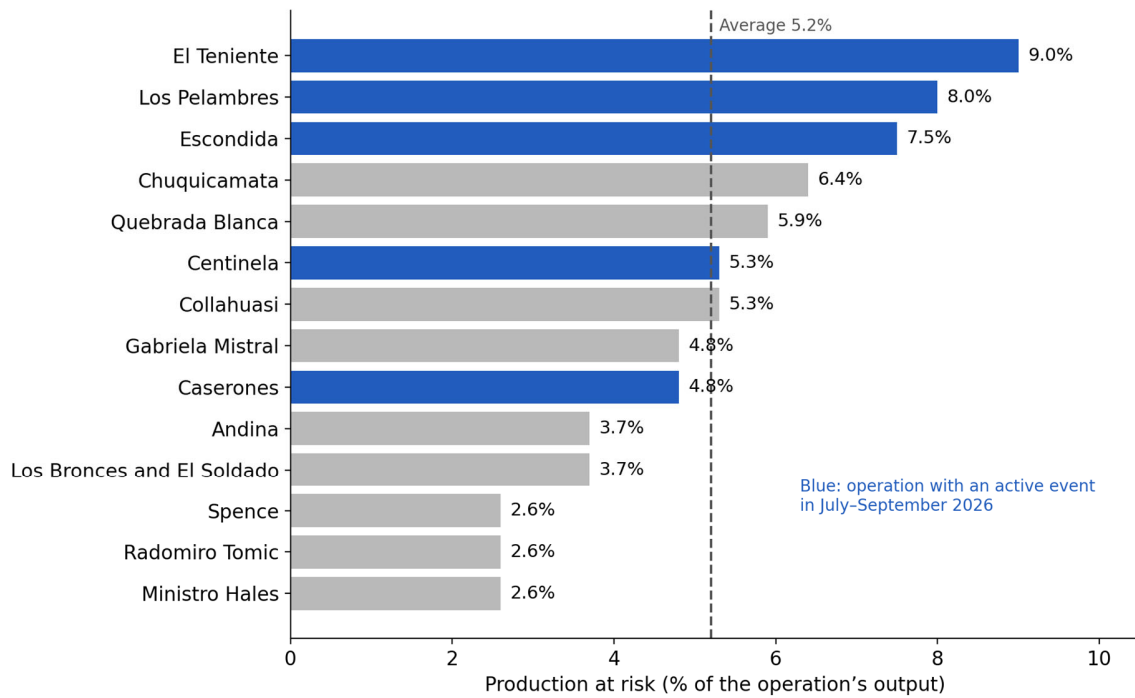
$$\text{Production at risk (\%)} = 1 - (1 - p_1) \times (1 - p_2) \times \dots \times (1 - p_8)$$

Each p is the expected loss associated with a risk, expressed as a share of the operation's annual production. The factors are multiplied because each risk acts on the production remaining after the preceding risks; for losses of this magnitude, the result is almost equal to their sum. Eight risks are considered: labour (the probability and duration of strikes), water (sources and water stress), weather (the frequency and severity of events), geotechnical (cave-ins, rockbursts and seismicity), metallurgy and grades (variability in grades and recovery relative to plan), ramp-up (deviations between planned and actual production at new projects), safety (shutdowns following accidents), and permitting (pending renewals and amendments).

In this first edition, each operation is assigned a low, medium or high rating for each risk, based on public evidence from 2025 and 2026. Each rating is associated with an expected loss: 3.0% for a high risk, equivalent to around 11 days of production per year; 0.75% for a medium risk, around 3 days; and 0.19% for a low risk, less than one day. With these values, the index average is of the same order as the 6% gap between projected and actual production recorded in Chile in 2025 (Diario Financiero, 2026). Future editions will replace these ratings with probabilities and severities estimated from each operation's history.

3. Results

Figure 1 shows the percentage of production at risk for each operation. El Teniente leads the assessment at 9.0%, combining two high risks—geotechnical and safety—with four medium risks. It is followed by Los Pelambres (8.0%), with high weather and water risks, and Escondida (7.5%), with high safety and labour risks. At the other end of the range, Radomiro Tomic, Spence and Ministro Hales have no high risks and stand at 2.6%.

Figure 1. Production at risk by operation (%)

Note: blue indicates operations with an active event between July and September 2026. Source: GEM's own analysis.

Figure 2 summarises each operation's exposure. In every case, a high risk rating is supported by a recent event. At El Teniente, these are the 2025 cave-in and the suspension of Andes Norte due to deep seismic activity (Energiminas, 2025, 2026). At Los Pelambres, it is the July shutdown due to rainfall (SMM, 2026), against a backdrop of water constraints that had already affected the industry in 2025, when its production fell by 8% (Reporte Minero, 2026a). At Collahuasi, the decline in grade from 1.15% to 0.90% reduced production by 27% in 2025 (REDIMIN, 2026). At Chuquicamata, restrictions following an accident lowered production by 13% (Codelco, 2026). At Quebrada Blanca, the pace of construction of the tailings storage facility continues to constrain ramp-up (de Vicente, 2026). At Caserones, the two storms in July and August underpin the rating (Jamasmie, 2026), while Gabriela Mistral recorded a 20% decline due to geological factors (Codelco, 2026).

Figure 2. Exposure matrix by operation (H = high, M = medium, L = low)

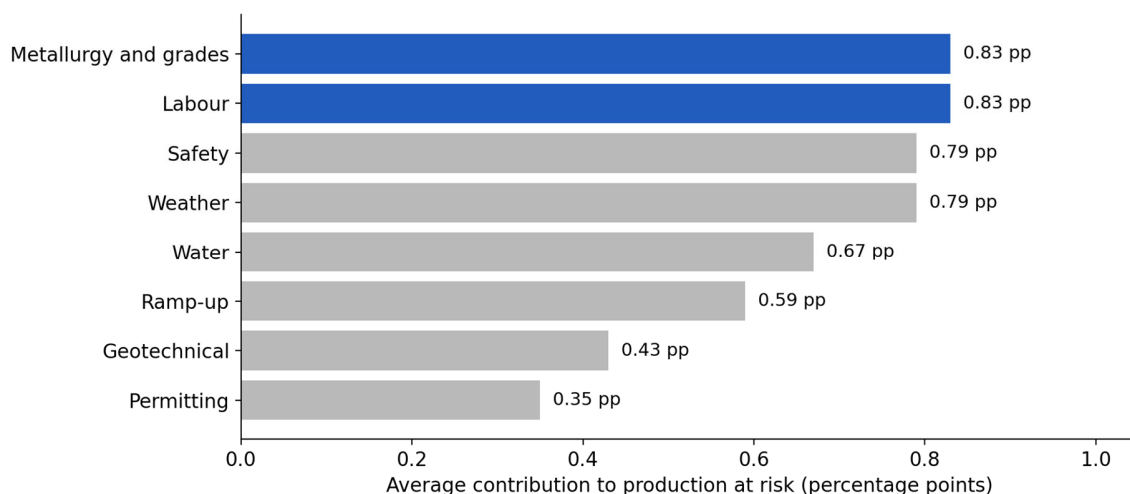
Operation	Lab	Water	Weather	Geo	Met	Ramp	Safety	Perm	At risk (%)
El Teniente	M	M	M	H	L	M	H	L	9.0%
Los Pelambres	L	H	H	L	L	M	L	M	8.0%
Escondida	H	L	L	L	M	L	H	L	7.5%
Chuquicamata	M	M	L	M	L	M	H	L	6.4%
Quebrada Blanca	L	L	M	L	M	H	L	M	5.9%
Collahuasi	L	M	M	L	H	L	L	L	5.3%
Centinela	H	L	L	L	M	M	L	L	5.3%
Caserones	L	M	H	L	L	L	L	L	4.8%
Gabriela Mistral	M	L	L	L	H	L	L	L	4.8%

Operation	Lab	Water	Weather	Geo	Met	Ramp	Safety	Perm	At risk (%)
Los Bronces and El Soldado	L	M	M	L	M	L	L	M	3.7%
Andina	M	M	M	L	L	L	L	M	3.7%
Radomiro Tomic	M	M	L	L	L	L	L	L	2.6%
Spence	L	L	L	L	M	M	L	L	2.6%
Ministro Hales	M	L	L	L	M	L	L	L	2.6%
Simple average									5.2%

Source: GEM's own analysis.

Figure 3 shows how much each risk contributes, on average, to an operation's percentage of production at risk. Labour and metallurgy and grades lead the ranking at 0.83 percentage points each: they are rated medium or high at eight operations. Weather and safety each contribute 0.79 percentage points, but in different ways. Weather exposure is spread across seven operations, whereas safety is concentrated in three high-risk cases: Escondida, El Teniente and Chuquibambilla.

Figure 3. Average contribution of each risk to production at risk (percentage points)



Source: GEM's own analysis.

The conclusion is that, on average, one in every twenty kilograms of copper expected from Chile's major operations depends on none of these risks materialising; at the most exposed operations, the figure is almost one in ten. With a strike at Centinela possible from October 13 and negotiations with Escondida's supervisors still open, the next assessment will indicate whether that share increases.

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