

Acute	Chronic	Legal and policy	Market	Technology	Reputational
Physical risk		Transition risk			

Freeport’s Share Price and Divestment Deal Spoiled by Tighter Tailings Rules

The case of mining company Freeport-McMoRan demonstrates how abruptly transition risk can materialize. Following allegations that the firm’s vast mining and mineral operations – and specifically waste from copper and gold processing – had resulted in water pollution and forest degradation in Papua, the Indonesian environment ministry tightened regulations on tailings disposal.

The company’s initial failure to comply with these standards delayed a divestment deal with a state-owned metals producer, hitting Freeport’s share price and reputation.

100% Share of gross value added in the direct operations of the mining sector that is moderately dependent on nature

18% Decline in Freeport’s share price immediately following the announcement of new mining waste regulations

\$12.95 billion Estimated cost of environmental damage caused by Freeport in Indonesia

Materiality of nature impacts and dependencies

Materiality refers to the influence some factor, event, or information has on a company’s valuation, the omission of which in a financial statement could mislead investors or other stakeholders.

‘**Single materiality**’ is conventionally used in accounting. For nature, it captures only how firm valuation can be affected by changes in the ecosystem services that production depends on.

‘**Double materiality**’ also considers the impacts of the firm on nature, capturing how production processes change the state of nature.

Manifestation of nature risk

Freeport-McMoRan Inc. (NYSE: FCX) is a major producer of copper, gold and molybdenum, a trace mineral used in steel alloys. The Phoenix-based firm operates Grasberg Mine in Papua, Indonesia, through PT Freeport Indonesia (PT-FI), a joint venture between Freeport and the Indonesian government. With some of the world’s largest reserves of gold and copper, the 11,100-hectare mine yielded 711,000 tons of copper and 55.9 tons of gold in 2022. Freeport has run operations at the rainforest-flanked complex since 1988, including a one-mile-wide open pit mine, an underground mine and four concentrators. Grasberg accounted for 47% of Freeport’s operating income in 2017.

Extraction at Grasberg is followed by primary crushing on site before delivery to a nearby mill complex for further processing. The milling and concentrating facility is the world’s largest, generating enormous volumes of tailings – the materials left over in the process of separating the valuable fraction of an ore from the gangue, or uneconomic fraction.

Freeport-McMoRan’s Grasberg copper and gold mining complex in Papua province, Indonesia



Source: Free West Papua.org

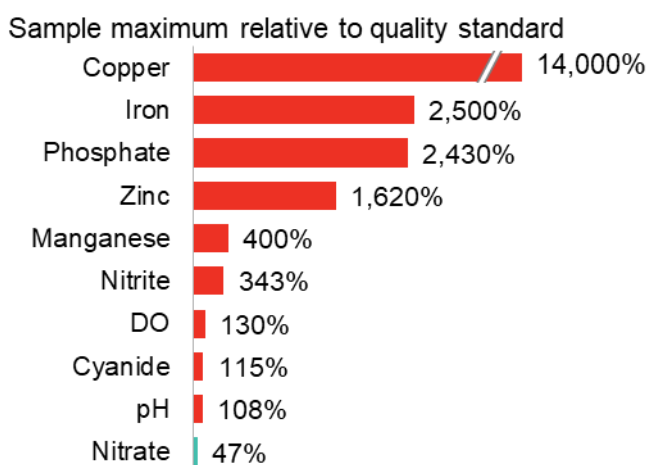
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In line with a 1990s [agreement](#) with the Indonesian government, PT-FI has dumped up to 300,000 tons of tailings per day [directly](#) into the nearby river system, where it flows downstream to the Ajkwa deposition area (ADA). A 2018 Bloomberg News [article](#) cited data from mining watchdog-group Earthworks, which suggested Freeport sent over 76 million tons of tailings into Indonesian rivers annually, though the company puts the 2017 figure at 50 million tons.

According to scientific journal Nature, as discharge levels into the river [increased](#), so did heavy metal-rich tailing deposition, dramatically raising the riverbed and reducing channel capacity. Sediment buildup restricted the movement of fish, and chemical particles covered their gills, leading to the [suffocation](#) of over 200,000 fish in April 2016. Tailings not deposited in the ADA flow [onward](#) to the Arafura Sea, increasing suspended particulate matter and heavy metal concentrations.

A 2018 water quality survey [conducted](#) by Indonesian environmental group Walhi indicated that the rivers into which PT-FI dumped tailings contained harmful levels of toxic chemicals. In all three samples across two rivers, concentrations of copper, iron, phosphate, zinc and cyanide were far in excess of those permitted. Two samples showed elevated levels of nitrate and chlorine solids, while high concentrations of manganese were found in another.

Water quality survey in the Papua Province in 2018



Source: Walhi Papua. Note: Three samples taken from the Yamaima and Okorpa Rivers. Red denotes concentration beyond permitted level. DO is dissolved oxygen.

Satellite images [reveal](#) vegetation disturbance in the region directly correlated with the rate of Grasberg tailings production. Between 1987 and 2014, some 138 square kilometers of rainforest, mangroves, and agricultural land experienced substantial vegetation loss, a result of flooding from the aggraded riverbed.

In 2017, the Indonesian Financial Audit Agency, BPK RI, [published](#) an assessment report on the extent of the ecological damage caused by PT-FI, putting the figure at 185 trillion Indonesian rupiah (\$12.95 billion in 2017 real terms). Though it does not represent a penalty payable by Freeport, future liability could arise, and the firm [asked](#) the government to recalculate its estimate.

With growing awareness of the mine's environmental impact, on April 5, 2018, the Indonesian environment ministry [released](#) new standards requiring that over 90% of tailings deposits must be stored on land, a significant step up from the previous 50%. The percentage represents the proportion of tailings recovered from water downstream after dumping into rivers to move them to the ADA.

Freeport Chief Executive Officer Richard Adkerson [described](#) the ministry's demands as "shocking and disappointing", telling analysts in [earnings call](#) several weeks later in April 2018 that "nobody could mine this ore body in consistency with these decrees" and that it "is so far out of bounds it cannot be done". Bloomberg News [reported](#) in June of that year that "[a]lmost every other miner in the world has been forced or has elected to stop discarding tailings in rivers".

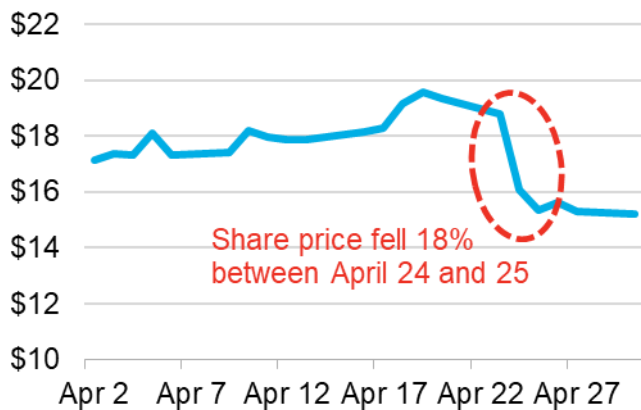
Financial and reputational impacts on Freeport-McMoRan

In the two days following Adkerson's response to the tighter regulations, Freeport's shares dropped by 18.2%, to below \$16. It was the company's largest share price decline since January 2016, and rendered Freeport the day's worst performer in the S&P500 index. Investors were concerned that the company's inability to meet the new standards would further stall plans to increase government ownership in PT-FI.

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As part of a 2009 law, all foreign mining companies in Indonesia were required to divest at least 51% of their shares to government entities. After years of disagreement, in December 2018, Inalum, a national mining holding company and aluminum producer, was selected as the new majority stakeholder as part of a \$3.85 billion equity transfer. Disagreement between Freeport and the government over who should bear responsibility for ecological damage at Grasberg held up completion of the deal.

Freeport-McMoRan's share price fell 18% in 2018 on the CEO's response to the tailings regulation



Source: BloombergNEF, Bloomberg Terminal.

Reuters reported in June 2018 that Indonesia's mining minister said that his office would need approval from the environment ministry before permits could be issued to extend PT-FI's operations until 2031. Inalum's CEO informed parliament in July that, "regarding the environment, we told Freeport 'the past problems are your sins,'" and "the [\$13 billion] from tailings damage still needs to be cleared up". In December 2018, the two sides reached a compromise after Freeport agreed to a roadmap to manage tailings disposal at Grasberg through 2030. No agreement has been made public on how the \$13 billion historical damage is to be redressed.

Institutional investors had earlier taken note of the ecological concerns. Norway's sovereign wealth fund, GPF, which controls over \$1 trillion in assets, excluded Freeport from its investment universe in 2006, citing Grasberg's use of rivers for tailings

disposal. The fund also sold \$850 million of Rio Tinto shares in 2008, due to an agreement that gave the company the rights to 40% of the mine's output above specific levels.

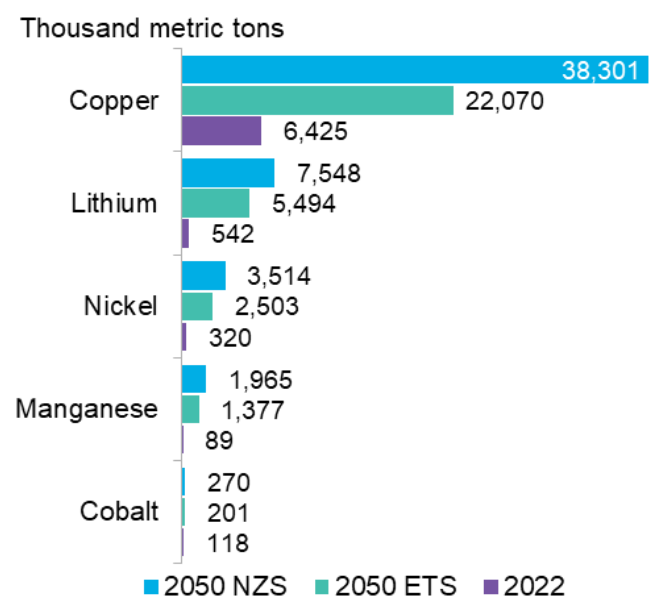
To compensate for the impacts of ecological damage on local economies and community health, Freeport created the Partnership Fund for Community Development, committing \$55 million in 2018.

Nature risk across the mining value chain

The mining sector operates at the intersection of different facets of nature risk – particularly geological degradation, water and air pollution, and biodiversity loss. According to CDP, an environmental non-profit organization, mining operations and mineral extraction account for around 7% of tropical deforestation.

The acceleration of the energy transition will spur the buildout of more physical assets to supply the required joules, increasing the extraction of metals and critical minerals globally. The energy transition includes power generation, battery storage, power grids and transport sectors.

Demand for energy transition metals in 2022 and outlook for 2050, covering power generation, battery storage, power grids and transport sectors



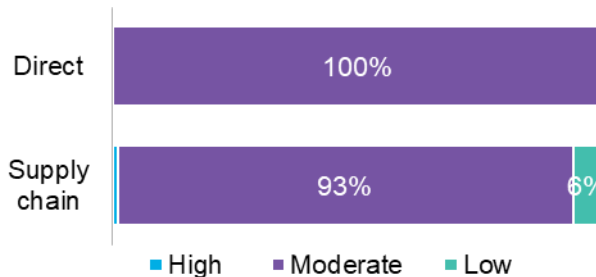
Source: BloombergNEF. Note: 2050 NZS and ETS refer to the Net Zero Scenario and Energy Transition Scenario in BNEF's New Energy Outlook report.

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Metals required for the transition (and their demand drivers) include copper (wind, solar, EVs), aluminum (solar, EVs), cobalt (energy storage, EVs), nickel (EV batteries, stationary storage, wind) and lithium (EV batteries). This presents a significant future source of physical and transition risk as approximately 350 mines used for energy transition metals are located within key biodiversity areas – sites contributing significantly to the global persistence of biodiversity. For more BNEF analysis on energy transition metals, see: *Transition Metals Outlook 2023* ([web](#) | [terminal](#)).

The metals and mining sector is moderately dependent on nature. According to the World Economic Forum, 100% of gross value added in its direct operations is classified moderately reliant on nature, while 93% of its supply chain value generation is moderately or highly dependent.

Nature dependency of gross value added across mining and metal companies' direct operations and supply chain



Source: World Economic Forum, BloombergNEF.

Global Canopy and UNEP's ENCORE nature tool provides further detail on these nature interactions. The precious metals and minerals subsector is dependent on five ecosystem services: groundwater, surface water, water flow maintenance, climate regulation and erosion control. Four of the five are deemed to be of at least high materiality. The nature impacts of the subsector are more significant than its dependencies. The ENCORE materiality matrix identifies nine impact drivers of nature loss, which assess the impacts of production processes on ecosystem services and natural capital that result from the operations of the sector. Of these, water use and

terrestrial ecosystem use are rated very highly material to nature loss, while the rest are deemed highly material.

There are a myriad of cases of nature risk translating to financial impacts in mining. The table below highlights the examples of BHP, Anglo American and Vale.

Similar risks faced by other large mining companies

Company	Risk type	Description
BHP	Legal and reputational	Fined \$8.2 million in 2022 by Chile's environmental regulator for damage from water extraction in the Sakar de Atacama salt flat.
Anglo American	Legal and reputational	The British miner was fined \$37.7 million in 2018 for a burst pipeline in Brazil that spilled 313 metric tons of iron ore slurry into a nearby river.
Vale	Legal and reputational	Fined \$16.8 million in 2022 after failing to present adequate information on tailings disposal at its Brumadinho dam, following the 2019 collapse of nearby Corrego do Feijao iron mine.

Source: BloombergNEF

Managing nature risks in the mining sector

Several technologies that could help mitigate the industry's nature impact have been developed. These include deployment of reclamation, water and oil treatment, and digital tools in both mining and smelting operations to reduce emissions and minimize production errors. Lower-impact mining techniques and exploring circularity for mining waste can boost sustainability and reduce nature-related risks for the sector. Over the short term, identifying and disclosing sources of risk remains the most effective approach.

More from BNEF:

Sector page: *Metals and Mining* ([web](#))

Transition Metals Outlook 2023 ([web](#) | [terminal](#))

Series: *Industrial Metals Monthly* ([web](#))

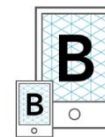
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