

ESG Risks in the Upstream Electric Vehicle Battery Supply Chain: Lithium

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Comprehensive report on the ESG risks in the lithium mining sectors of Australia, China, and Chile

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Executive Summary

James Murphy

Demand for electric vehicles (EVs) has increased dramatically in the past decade in response to concerns about climate change. To avoid the disastrous effects of a 1.5°C increase in global temperatures, EV production will need to continue to increase. Many battery-powered cars and trucks depend on lithium, a mineral produced primarily in Australia, Chile and China which together account for over [90%](#) of global lithium production. Governments, policymakers, and public and private sectors around the world will need to strengthen their upstream EV supply chains in an environmentally responsible way to rapidly scale the production of EV batteries.

The “upstream” portion of the EV battery supply chain refers to the extraction of the minerals needed to build EV batteries. In this part of the supply chain, there are rising concerns that there could be lithium supply shortages. More importantly, however, is the increasing focus on the ESG (environmental, social and governance) credentials of lithium mining operations as they are routinely associated with human rights abuses and environmental degradation. To conduct business in a socially and ecologically responsible way, stakeholders in the EV battery supply chain must consider and address the ESG risks outlined in this report. There are considerable benefits in doing so as, in recent years, mining companies demonstrating superior ESG performance have generated [significantly higher returns](#) for their shareholders compared to the broader market. Lithium mining companies also face a growing demand to exhibit a firm dedication to addressing ESG risks and complying with ESG standards to secure funding.

This report provides insights to shareholders in the lithium mining sector about the ESG risks in the three main lithium-producing countries. The report is structured into three sections comprising a (1) commodity overview, (2) a mining company overview and (3) an analysis of the ESG risks for the mining companies in the three largest mining locations: Australia, China and Chile. The operations of the five largest publicly listed lithium mining companies will be explored as well as the environmental, social and governance risks posed to these companies in each region. By providing this analysis of the lithium mining industry, the ESG challenges it faces, and opportunities to improve it, we hope to assist governments, policymakers, and the private and public sector in exploring vital issues related to upscaling EV battery production. The main findings are as follows:

ESG risks in Australia

E: droughts, carbon intensity, waste & biodiversity loss

S: labour safety & shortages

G: lobbying & transparency

ESG risks in China

E: droughts, soil erosion & water pollution

S: DEI policies

G: company autonomy & corruption

ESG risks in Chile

E: droughts & biodiversity

S: indigenous rights & labour regulations

G: company autonomy & regulations



1. Lithium: Commodity Overview

David Neef

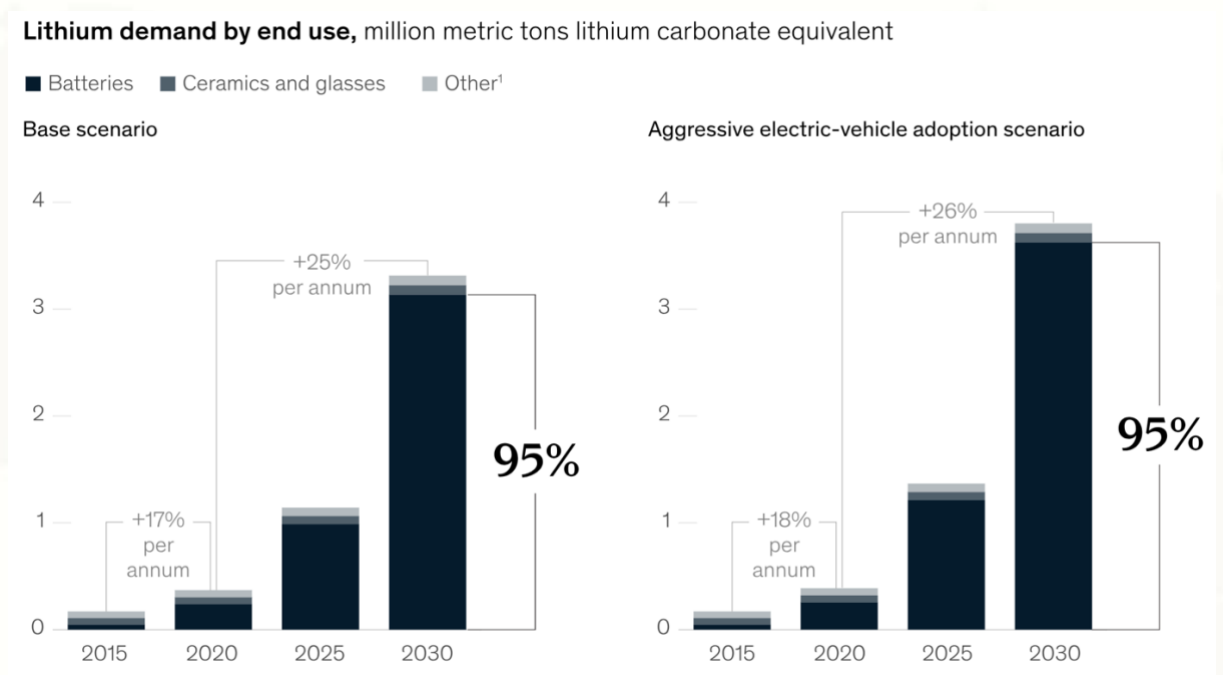
Lithium is crucial to the energy transition, and specifically the energy transition in transport. The metal is commonly used in rechargeable batteries for electric vehicles (EVs), laptops, cellular phones, as well as in ceramics and glass. Future demand will mainly be driven by EVs, mainly due to lower prices and transport decarbonisation policies.

The ESG impacts of the lithium supplies needed to fulfil EV demand differ across different countries, regions, and mineral sources. This section aims to give an overview of the production and demand patterns, while also giving specific insight into the different mining processes involved with different mineral sources.

Lithium Production, Reserves, and Demand

In 2022, total global demand, which stood at [814,000 tonnes](#) of lithium carbonate equivalent (LCE), was bigger than total global production, which stood at [737,000 tonnes](#) of LCE. Demand is forecast to grow to [1,000,000 tonnes](#) of LCE in 2023, and reach over [2,000,000 tonnes](#) of LCE in 2028, whereas total production is forecast to reach [964,000 tonnes](#) of LCE in 2023 and [1,167,000 tonnes](#) of LCE in 2024.

Global demand for lithium is mainly driven by an increasing demand for batteries, and in specific lithium-ion batteries. This demand from energy technologies is expected to reach [2.2 million tonnes](#) of LCE by 2050. [McKinsey](#) forecasts steady demand for lithium batteries in the next decades, at a compounded annual rate of almost 30%.

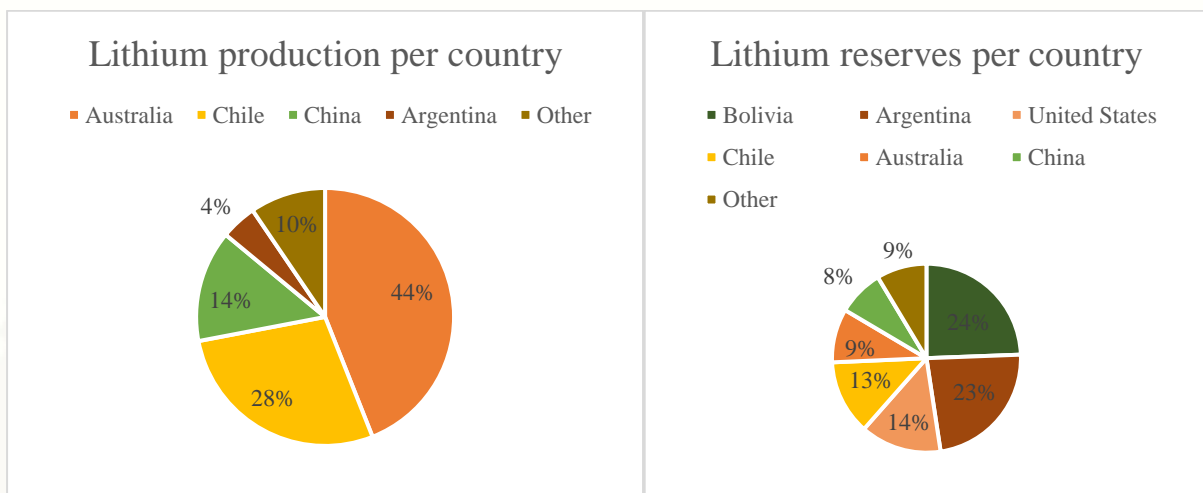




A driver of demand in batteries is the increased interest in EVs. Because of lower prices and government plans to phase out fossil fuel vehicles, consumer interest in EVs is [increasing](#). The [EU](#) and [UK](#), for example, plan to halt the sale of gasoline and diesel vehicles by 2035. In that same year, [China](#) plans to make all new vehicles sold “eco-friendly”, meaning that 50% are to be “new-energy” vehicles (electric, plug-in hybrid or fuel cell-powered), and the other 50% are to be hybrids. Many states in the US have also come up with regulations on zero emissions, requiring car manufacturers to sell a specific number of EVs annually. These government initiatives will increase demand for lithium in the coming years.

Australia, with roughly [325,000 tonnes](#) of LCE in 2022, was the world’s top producer of lithium, accounting for 44% of global production. Chile was the second largest producer, with [208,000 tonnes](#) of LCE or more than 28% of global production, and China was the third largest producer with [101,000 tonnes](#) of LCE or almost 14% of global production.

Global reserves currently are identified at [457.8 million tonnes](#) of LCE, with the majority being placed in South America. Bolivia with [111.8 million tonnes](#) of LCE or 24.4% of global lithium resources, has the world’s most reserves, followed by Argentina with [106.5 million tonnes](#) of LCE or 23.2%, the US with [63.9 million tonnes](#) or 13.9%, and Chile with [58.6 million tonnes](#) of LCE or 12.8%. Australia has [42 million tonnes](#) of LCE or 9.2% of global supplies, and China has [36.2 million tonnes](#) of LCE or 7.9% of global supplies.



Source: [U.S. Geological Survey](#)

Hard rock vs. Brine

Lithium is mainly produced from either lithium-enriched brines or lithium pegmatites, also known as “[hard rock](#)”. Brines are usually found in South America, while pegmatites are found in Australia, Canada, Zimbabwe, and other places across the world. According to [Benchmark's Lithium Forecast](#), hard rock sources of lithium currently account for and will continue to account for roughly 60% of the world's mined lithium supply until 2030. Just under 40% of the lithium that is currently produced globally comes from brine sources.

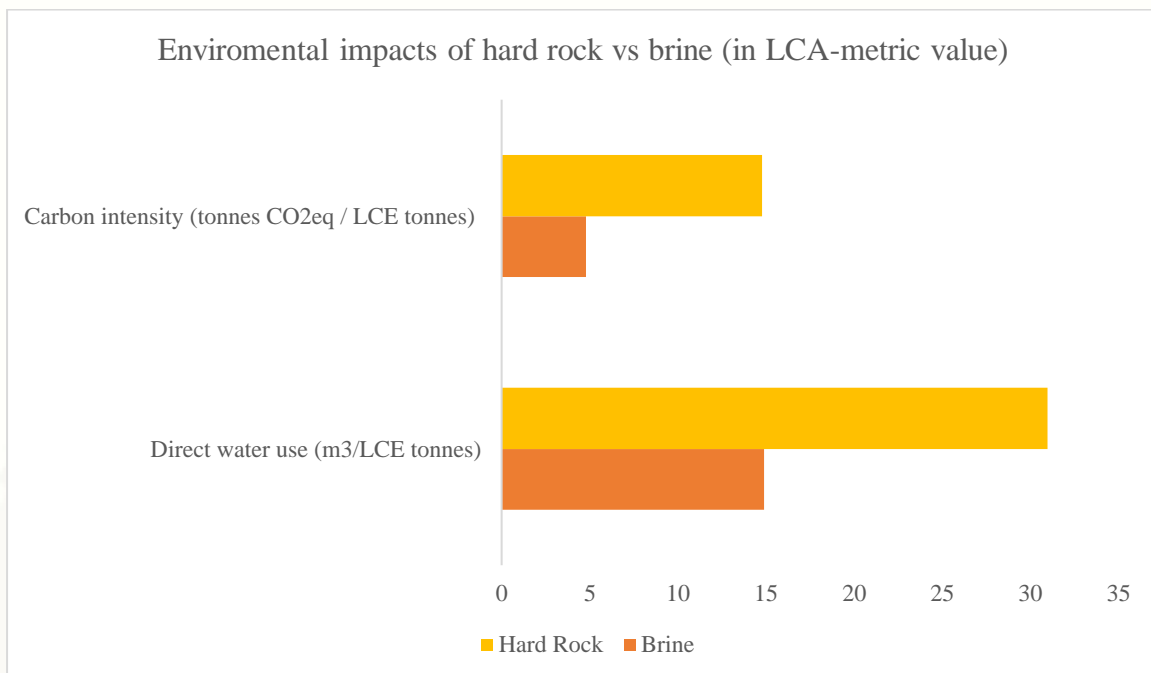
Lithium-enriched brines are [found](#) underground, in mineral ores and clays. During the [lithium recovery process](#), pumps are used to bring salt water to the surface and into several evaporation



ponds. The water evaporates over several months and several salts precipitate out, leaving a brine with increasing lithium quantities. When the lithium concentration reaches a specific level, the metal is extracted from the brine, and the brine is then pumped to a recovery plant.

Lithium from hard-rock resources can be found in more than [100 different minerals](#). However, only 5 minerals are actively mined for lithium production, including spodumene, lepidolite, and petalite. Although mining operations differ per mineral, usually it involves removing the mineral material, heating it and then pulverising it. The powder then is combined with chemicals, heated, filtered and concentrated to form lithium carbonate.

Though a small amount of the world's lithium production comes from [hard rock](#) mineral deposits, lithium contents in mineral ore deposits are frequently higher than that of brines. However, they are often more expensive to extract due to the high use of energy, chemicals, and other materials. Lithium derived from hard rock sources can be three times as [carbon-intensive](#) and is more water-intensive compared to brine sources.



Source: [Benchmark Global Lithium LCA](#)

Deep-sea mining

In the future, lithium may also be mined from the deep sea. Lithium can also be found on the deep seabed floor when extracted from polymetallic nodules. These nodules contain high quantities of critical minerals including cobalt, nickel, copper and [lithium](#). The Clarion-Clipperton Zone (CCZ) located in the Pacific is the world's largest nodule region, containing the equivalent of 2.8 million tonnes of lithium, according to the [World Ocean Review](#).

Proponents of deep-sea mining (DSM), such as [The Metals Company](#), a deep-sea minerals developer, argue that it is both more environmentally friendly than land-based mining and can



minimise human rights abuses that occur in some land-based mines. However, [marine and climate scientists](#) counter that there's a lack of understanding of the impact of DSM on oceanic biodiversity and carbon sequestration. Due to these uncertainties, some battery-reliant manufacturers, such as BMW and AB Volvo Group, have called for a [moratorium](#) on deep-sea mining. These moves highlight the possible limited market for lithium extracted from the deep sea due to environmental concerns should commercial DSM activities begin.

Lithium Recycling

Recycled lithium may also become more important. Current mining operations throughout the world are unable to extract enough lithium to satisfy the rapidly increasing demand for EV batteries. [Furthermore](#), not only does creating new mines require a costly and protracted process, but mining contributes to several environmental issues, such as the depletion of adjacent water supplies and the contamination of the area with runoff debris. [Recycled](#) lithium batteries could therefore assist in satisfying the growing demand. [McKinsey](#) estimates that by 2030, the supply of lithium from recycling could reach roughly 6% of total lithium production, where currently it is estimated that 0.7% of the supply of lithium comes from recycling.

2. Overview of mining companies

Duniya Al-Nabhani & Ojus Sharma

This report focuses on the five largest publicly listed lithium mining companies to provide insight into the specific ESG issues relevant to each company as well as to reveal a broader understanding of the ESG characteristics of the lithium mining industry. In this section, we provide an overview of those companies and their lithium operations and investments. Additionally, we utilise [Sustainalytics' ESG Risk Ratings](#) across all five mining companies. These ratings consider each company's exposure to industry-specific material ESG risks and assess their management of those risks. This multifaceted methodology, reviewing both exposure and management, provides an absolute assessment of ESG risk. These ESG risks are categorised into five degrees of ESG risk severity ranging from negligible to severe.



Albermarle Corporation



Headquartered in Charlotte, North Carolina, United States, Albermarle Corporation is a chemicals manufacturing company. The company is publicly listed on the New York Stock Exchange (NYSE) under the ticker symbol ALB. Albermarle has a market capitalization of approximately US\$23.29 billion as of August 2023. In the year 2022, Albermarle had a capacity of around [200,000 tonnes](#) of LCE, securing a notable 17.6% market share globally, making it the world's largest lithium producer.



Albemarle operates [two brine-based lithium resources](#). One is located in the Salar de Atacama (Chile, 85,000 MTA LCE), and the other one is in Clayton Valley near Silver Peak, Nevada (USA, 5,000 MTA LCE). The company also holds a 49% share in the spodumene mine of Talison Lithium in Greenbushes, Australia (88,000 MTA LCE). With these resources, Albemarle has a superior position in terms of backward integration as well as supply security.

ESG Policy

Environmental: Albemarle has set [targets](#) to reduce greenhouse gas emissions, energy use, and water consumption in its operations. The company aims to grow its energy storage business in a carbon-intensity neutral manner through 2030. It is also working to reduce its freshwater intensity by 25% by 2030 in high-risk regions like Chile. The company monitors and manages its environmental impacts across areas like energy, emissions, water, waste, and biodiversity. It aims to optimise resource efficiency and apply greener technologies and processes. Passive solar energy, the most sustainable way to concentrate brine, contributes to roughly [80%](#) of Albemarle's total energy consumption and plans to reach net-zero energy use by 2050. Albemarle emphasises the importance of transparency in its operations and ensures that it has transparent ESG reporting.

Social: Safety is also a top priority for Albemarle, with a goal of zero incidents. Diversity, equity and inclusion (DEI) targets are in place to boost the representation of women and racial minorities, especially in technical roles. In 2022, [24%](#) of employees were women and [30%](#) of the leadership and board were black or Hispanic. Talent development programs are expanding through leadership training, mentoring, and upskilling initiatives. US\$7,500 per year is offered in educational reimbursement and there is a strong focus on community engagement in operations, including with indigenous populations.

Governance: Albemarle boasts an accomplished and diverse board of directors that plays a crucial role in providing oversight on sustainability matters. In addition to this, the company has established committees dedicated to monitoring and addressing key Environmental, Social, and Governance (ESG) topics. Furthermore, Albemarle's comprehensive risk management process takes into account various ESG factors, thereby ensuring a well-rounded approach to risk assessment. To underline the company's commitment to addressing climate-related risks, Albemarle has prominently featured these concerns in its inaugural report following the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). Moreover, Albemarle places a strong emphasis on ethical business conduct, enforcing these principles through rigorous Code of Conduct training and ongoing monitoring. In fostering a culture of transparency and accountability, Albemarle encourages a "speak up" culture within its organisation, providing employees with a platform to voice concerns or report issues. The company also places great importance on its supply chain management policies, which are designed to address responsible sourcing, human rights considerations, and other ESG priorities, further solidifying its commitment to sustainable and responsible business practices.

ESG Performance





Albemarle received a [Medium](#) ESG Risk Rating from Sustainalytics. The company has a high exposure to material ESG issues (governance, sustainability or societal factors likely to affect the financial condition or operating performance of businesses). However, Albemarle's management of those ESG issues is considered strong and it has relatively robust ESG programs, policies and practices in place. Albemarle became the first lithium producer to have [completed an audit](#) of one of its operations in accordance with the Initiative for Responsible Mining Assurance (IRMA) in June 2023. Its lithium brine extraction and concentration site in Salar de Atacama achieved a [50 IRMA](#) level of performance out of a possible 100 on its scale. [Albermarle](#) received low marks for community health and safety but scored highly for its greenhouse gas emissions abatement.

The main ESG material issues for Albemarle are its carbon-intensive operational energy use, human capital, and occupational health and safety. However, based on its actions, such as volunteering to complete an independent audit and incorporating recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), Albemarle demonstrates a genuine commitment to sustainability for stakeholders. The assessments show Albemarle manages ESG risks reasonably well despite high exposure. The ESG Risk Rating also confirms Albemarle's strength in sustainability, notwithstanding some areas for improvement.



SQM (Sociedad Química y Minera)

Headquartered in Northern Chile, SQM is listed on the Santiago Stock Exchange (Bolsa de Comercio de Santiago) under the ticker symbol SQM-A. the company holds a substantial market cap of US\$19.18 billion. In 2022, their Salar de Atacama operation yielded [180,000 Mt LCE](#), contributing to a market share of approximately 13.43% in the LCE market. Operating across [110](#) countries, SQM maintains commercial offices in over 20 countries while managing production operations in Chile and Mexico. The heart of their production facilities lies within the Atacama Desert across the Tarapacá and Antofagasta regions. In Chile, SQM holds mining rights encompassing both non-metallic and metallic purposes, primarily through Mining Exploitation Concessions, which constitute about 56% of their interests. Beyond Chile, the company is engaged in the Mt. Holland Lithium project in Australia, collaborating with Wesfarmers Limited in a 50% joint venture focused on lithium production.

ESG Policy

Environmental: SQM focuses on responsible water management, reduction of greenhouse gas emissions, proper handling of emissions and waste, and a thorough identification and assessment of environmental aspects. SQM has committed to becoming a [carbon-neutral](#) lithium producer and reducing its continental waste consumption by [40%](#) before 2030.

Social: SQM upholds labour and human rights, actively opposes child labour, forced labour, and modern slavery, champions equal opportunities, diversity, and inclusion, engages in community involvement for shared social value and respects indigenous rights and autonomy.



Governance: The company is characterised by ethical and transparent business practices, adherence to a strong code of ethics, prioritisation of transparency, risk management, and control mechanisms, implementation of anti-corruption and anti-money laundering measures, and the establishment of a [robust governance framework](#) focused on responsible practices.

ESG performance



According to Sustainalytics, SQM has a [Medium](#) ESG Risk rating which suggests that the company has some ESG-related risks to consider such as corporate governance, emissions, effluents, waste, management of risks related to its operational energy use and GHG emissions, and how efficiently and effectively it uses its raw material inputs (excluding energy and petroleum-based products). But, its overall risk profile is not excessively high. In September 2023, SQM's operations in the Salar de Atacama achieved a [75 IRMA](#) certification, which measured the environmental and social performance of the mine sites under the rigorous standards set by the Initiative for Responsible Mining Assurance. Whilst [SQM](#) scored highly for its respect for biodiversity, fair labour standards and noise mitigation, it was penalised for its security arrangements and emergency preparedness.

Ganfeng Lithium



Ganfeng Lithium has its headquarters situated in Xinyu, Jiangxi, China. The company's listing is on the Shenzhen Stock Exchange, identified by the ticker symbol 002460. SZ. Ganfeng Lithium commands a substantial market capitalization of approximately [US\\$11.18](#). As of 2021, their lithium salt production capacity stood at [120,000](#) tonnes of LCE per year, a figure set to surge with the incorporation of two new factories, potentially elevating their production capabilities to approximately 100 GWh annually. With a notable [12.6%](#) share of global production, Ganfeng Lithium secures a significant presence in the market. Ganfeng Lithium's operations span globally, including China, Australia, Argentina, Ireland, Mali, and Mexico. Lithium extraction from salt lakes occurs in Qinghai, China, and spodumene mining takes place in Jiangxi, China, as well as in Mount Marion, Pilgangoora, Finniss, Avalonia, and Goulamina.

ESG Policy

Environmental: Ganfeng Lithium's stated ESG policy reflects its environmental dedication by aligning with China's "emission peak and carbon neutrality" strategy, emphasising green and low-carbon development while integrating climate risk indicators into risk management.

Social: In the social sphere, the company prioritises talent development through incentive and training systems, with a focus on enhancing skills among employees. Safety is emphasised through safety management systems, while a positive work environment is fostered through employee rights, development, and community investment.

Governance: Ganfeng maintains an ongoing focus on operational compliance and governance alignment. The company's proactive risk management includes risk identification, anti-



corruption measures, and integrity promotion. Research and Development (R&D) and innovation drive sustainable growth, with university collaborations to address industry challenges and promote innovation. Ganfeng Lithium's commitment to innovation leadership is evident in its R&D investments and technology platforms.

ESG performance



Ganfeng Lithium has a [Medium](#) ESG risk rating which indicates that the company's ESG risk profile is moderate, and it is relatively positioned well within its industry in terms of ESG risk management. Associated risks include corporate governance, the environmental and social impact of products and services, the company's management of risks related to its operational energy use and GHG emissions, and the management of workplace hazards affecting a company's employees and on-site contractors.



Tianqi Lithium

Tianqi Lithium, headquartered in Chengdu, Sichuan, China, maintains a significant presence in the industry. The company is listed on the Shenzhen Stock Exchange under the ticker symbol 002466.SZ and on the Hong Kong Exchange (HKEX) with the stock code 9696. HK. With a market capitalization of approximately [US\\$11.14 billion](#), Tianqi Lithium showcases its substantial standing. Notably, the company planned to achieve an output of 34,200 tonnes of LCE (7%) in 2021, reflecting an estimated global market share of 7%. Tianqi Lithium's operations span several countries, including Australia, China, and Hong Kong. The company is actively engaged in lithium production with facilities across various locations, most notably in China and Australia. A significant aspect of their asset portfolio includes a 20% equity stake in Shigatse Zhabuye, a company holding exploration rights for Zhabuye Salt Lake situated in China's Tibet Autonomous Region. This strategic investment marks their foray into salt lake brine resources, specifically the Zhabuye Salt Lake, which is estimated to harbour approximately [1.84 million tonnes](#) of LCE. Furthermore, the company has ventured into the Greenbushes lithium mine in Western Australia, showcasing a diversified approach to asset acquisition. However, the distribution of their asset portfolio across regions lacks clarity due to a lack of transparent reporting, leading to an absence of explicit information regarding the company's consolidated assets despite efforts to glean insight from financial reports.

ESG Policy

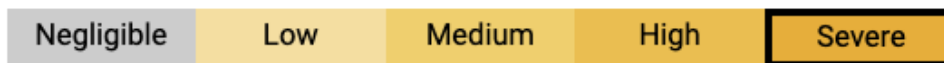
Environmental: Tianqi asserts its recognition of climate change's significance and active engagement in global initiatives, aligning with China's "dual carbon" policy for green and low-carbon development as well as China's national development goals of "Carbon Peak" in 2030. Underlining environmental health and safety, an established EHS management structure and policy contribute to safety management and workplace security.



Social: On the social front, Tianqi adheres to labour laws and employee rights, emphasising protection against child and forced labour, harassment, and discrimination. Human resources policies prioritise standardised practices, equal treatment, diversity, and female employee rights. Instances of adverse labour practices are reportedly absent. The company expresses community involvement through support for volunteer service programs, fostering sustainable community growth.

Governance: Tianqi has asserted a comprehensive Anti-Bribery and Anti-Corruption Policy at its Australian facility, focusing on compliance with integrity obligations. Vigilance towards whistleblowers' protection and anonymous fraud reporting channels is maintained. A standardised approach for disciplinary violations and malpractice management is noted. Stakeholder engagement relies on diverse methods, guiding the identification of material ESG issues and shaping the company's ESG responses.

ESG performance



Tianqi has a [Severe](#) ESG risk rating from Sustainalytics, indicating that the company's ESG risk profile is considered relatively high, both within its industry and within the global context. There are many risks linked to corporate governance, emissions, effluence, and waste, and how it engages with local communities (including indigenous people) through community involvement, as well as its management of human resources. Nevertheless, Tianqi [states](#) that it is committed to reducing its Scope 1 and 2 emissions of its core operations, striving to achieve a 50% decline in Scope 1, 2 and 3 emissions compared to the base year 2022 by 2030 and achieve carbon neutrality by 2050. Despite this, according to the [2019](#) Business & Human Rights Resource Centre report, Tianqi has previously faced allegations of corruption, tax avoidance or violating environmental regulations and is therefore placed with a severe ESG risk rating.



Pilbara Minerals

Headquartered in West Perth, Western Australia, Pilbara Minerals is a prominent player in the global mineral industry. The company is publicly listed on the Australian Securities Exchange (ASX) under the ticker symbol PLS. Pilbara Minerals commands a market capitalization of approximately [US\\$9.12 billion](#) as of August 2023. In the year 2022, Pilbara Minerals demonstrated its prowess by producing a remarkable [620,000 tonnes](#) of spodumene concentrate. This output [translates](#) to around 37,200 tonnes of lithium carbonate equivalent (LCE), securing a notable 3.2% market share on a global scale.

Pilbara Minerals' operations extend across two key nations: Australia and Papua New Guinea. In Australia, the company's flagship asset is the Pilgangoora Project, which boasts one of the world's largest hard rock lithium deposits. This significant resource is situated in the Pilbara region of Western Australia, a region known for its rich mineral reserves. The Pilgangoora Project operates two primary facilities, the Pilgan Plant and the Ngungaju Plant. Beyond Australia, Pilbara Minerals has a strategic presence in Papua New Guinea through the acquisition of Sturt Resources.

[Australia](#): At the **Pilgan Plant**, Pilbara Minerals operates a substantial mining and processing operation with an annual capacity of 2 million tonnes. This operation yields between 360,000 to 380,000 tonnes per annum of spodumene concentrate. The processing facility employs heavy/dense media separation (DMS) technology to create coarse concentrate, while a flotation and gravity circuit produces fine concentrate. These two concentrate streams are blended to deliver a high-quality spodumene concentrate product to clients. The **Ngungaju Plant**, acquired by Pilbara Minerals in 2021, underwent enhancement works to improve throughput and recoveries. By the third quarter of 2023, the plant achieved its nameplate production capacity of 180,000 to 200,000 tonnes per annum of spodumene concentrate.

ESG Policy

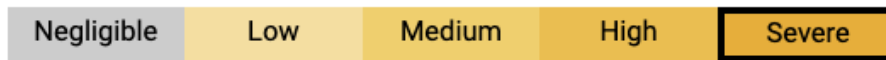
Environmental: Pilbara focuses on improving its [sustainable operations and environmental responsibility](#), focusing on efficient resource management, reduced impact, and adherence to laws. The company also addresses [climate change mitigation](#), encompassing greenhouse gas tracking, emissions reduction, risk management, and energy efficiency.

Social: Pilbara is committed to [eradicating modern slavery practices](#) and aligning ethical procurement with regulatory requirements. They also aim to foster a [diverse and inclusive workplace](#), characterised by fair employment practices and employee engagement. [Community investment](#), extending to education, mental health programs, and community resilience, is also a major aim for Pilbara driven by partnerships and sustainable practices. Pilbara also strives to support indigenous relations and heritage preservation by collaborating with traditional owners, fostering understanding through agreements and cultural awareness training.



Governance: Pilbara adopts a strong stance against [disrespectful behaviour](#), with initiatives like the "Stand Up – Unmute Yourself" campaign promoting diversity and inclusion. The company also aims to improve its sustainable mining development, through mining lithium while adhering to [regulatory standards](#) and stakeholder engagement.

ESG Performance



Pilbara Minerals received a [Severe](#) ESG Risk Rating from Sustainalytics. The company has high exposure to material ESG issues based on its business model and industry. This indicates it faces major sustainability-related risks. Pilbara Minerals' management of those risks is considered satisfactory. Pilbara Minerals is among the first of the four companies to publicly share a [detailed modern slavery policy statement](#), outlining their procedures for extending the supply chain to involve service providers who adhere to procurement pre-qualification criteria aligned with their Modern Slavery Policy. However, the key ESG topics that are material for Pilbara are emissions, effluents and waste, human capital, and occupational health and safety. Mining waste in [some operations](#) can often reach well over double the amount of extracted ore, e.g. for each ton of iron ore extracted, between 2 to 12 tonnes of overburden material might be removed. Additionally, a [skills shortage](#) continues unabated as demand rises for metals to feed the demand. Miners in Western Australia are ramping up efforts to train and employ Indigenous people and engage Aboriginal-owned businesses. Its exposure to these issues is elevated. Areas for improvement include strengthening its emissions reduction efforts, waste and wastewater management, labour practices, and community relations. Its ESG programs could be more robust. The rating shows that Pilbara Minerals has sub-par sustainability performance compared to industry peers. It faces major ESG risks related to its business and supply chain, but its management of these risks is currently moderate. Improving across key ESG areas would lower its severe ESG risk exposure.



3. ESG country risks to mining companies



Country Analysis: Australia

Ashley Bloedorn

[Australia](#) has the second-largest lithium ore reserves in the world and is the top producer of “spodumene”, the raw ingredient for lithium hydroxide and lithium carbonate. The Australian lithium mining sector is crucial for the global green energy revolution but faces significant ESG challenges that can impact both operations and individual companies. This section explores the ESG effects on Australian lithium mining companies: Albemarle, SQM, Gangfeng Lithium, and Tianqi Lithium.

Environmental Risks: Droughts, Carbon Emissions, Waste & Biodiversity loss

Australia's mining industry faces challenges due to the country's harsh environment. The continent's geographical location within the [subtropical high-pressure belt](#) results in low and irregular rainfall across most of the country, leading to droughts. Western Australia, where major mining companies like SQM, Albemarle, Gangfeng Lithium, Tianqi Lithium, and Pilbara Minerals operate, is also prone to these droughts which can impact operations. Most mines employ detailed water balance models to monitor and assess their water usage. For instance, SQM lithium utilises [hydrogeological modelling](#) which is crucial for groundwater management and can deploy early warning systems through continuous monitoring for effective drought mitigation. Smaller mines, however, face a larger risk of closure as they often lack the resources to implement mitigation plans. The mining industry, in general, faces environmental challenges because it requires long-term planning, such as installing a desalination plant, which [takes at least 18 months and necessitates](#) a decision two to three years in advance. However, the industry at large tends to prioritise short-term market and commodity price-driven decisions over long-term planning.

Lithium mining has a uniquely harmful impact on the environment. Australian lithium extraction carries a [heavier carbon footprint](#) compared to other regions. This is due to the higher carbon-intensive spodumene mining operations and related power sources, where diesel is primarily used in the extraction process, and electricity usage which relies heavily on coal, accounting for [75%](#) of the country's electricity generation. Moreover, a significant portion of Australian lithium is [shipped to China](#) for further processing, where carbon-intensive fuels are also prevalent. Additionally, the mining generates waste materials, such as spent brines, posing challenges for safe disposal. Furthermore, mining operations often [disrupt local ecosystems](#), leading to habitat loss and jeopardising biodiversity.

Despite the environmental impacts of lithium mining, Australia maintains stringent environmental standards and regulations that mining companies must adhere to, bolstered by its membership in the [Sustainable Critical Minerals Alliance](#). This Alliance is dedicated to promoting long-term sustainability and aims to restore ecosystems, hold companies accountable for environmental harm, and work towards reducing greenhouse gas emissions while striving for [net-zero emissions by 2050](#). Before joining, Australia already had robust ESG legislation in place, including the Environmental Protection Act 1986 (WA). Under this



Act, lithium mining companies operating in Australia were required to adhere to strict guidelines, making their transition to the organisation's standards relatively seamless. Since joining the organisation, companies have intensified their commitment to ESG interests and sustainability. For example, Albemarle, [joint owner](#) of the world's highest grade hard rock lithium mine in Western Australia, aims to reduce the carbon intensity of their Catalysts and Bromine businesses [by 35% by 2030](#), aligning with science-based targets. Additionally, Albemarle has set a new air quality goal to cut sulphur oxide emissions by 90% by 2027 since Australia joined the Sustainable Critical Minerals Alliance in [December 2022](#).

Moreover, with the potential implementation of [the guarantee of origin system](#) in the Australian power sector, a significant opportunity arises for mining companies to reduce the carbon intensity of their operations. That is because the certificates guarantee that the energy consumed is 100% renewable, which allows companies to account for zero emissions, rather than the average emissions of the whole electricity net. At the same, it means that the carbon intensity for mining companies that don't buy certificates will increase, thereby posing as an environmental risk. Therefore, the implementation of this system acts as a double-edged sword, presenting both opportunities as well as risks for the sustainability of the lithium mining sector.

Social Risks: Labour safety & Labour shortages

Australia maintains strict standards against human rights abuses and enforces labour laws in its mining sector. However, challenges persist in the industry, as it still holds the [third-highest](#) fatality rate, averaging [nine worker deaths](#) annually. Some of these fatalities are linked to the industry's inherent risks, but others result from [inadequate safety regulations](#). It is worth noting that work health and safety (WHS) in mining are [not directly regulated](#) by the Australian government but are under the jurisdiction of states and territories. While this decentralised approach allows tailored solutions, it can lead to inconsistent safety standards and enforcement. However, since [2022](#) Western Australia has implemented updated labour laws to enhance safety standards. Companies like SQM, Albemarle, Gangfeng Lithium, Tianqi Lithium, and Pilbara Minerals are now required to revise their practices to ensure full compliance with these safety measures.

Australia is currently grappling with a labour shortage in its mining sector, influenced by factors such as COVID-19's impact on labour markets and an [ageing workforce](#). The challenge is compounded by the need to attract younger generations, who are entering the workforce but may be [deterred](#) by environmental concerns associated with mining. The Australian Resources and [Energy Employer Association \(AREEA\)](#) recently reported a requirement for 24,000 new workers over the next five years to support various projects across the country. While this labour gap is more pronounced in the coal sector, the lithium mining industry has also been affected, prompting companies to implement measures to address this issue. Pilbara Minerals had to revise its export volume targets from an initial range of [440,000 to 490,000 tonnes of spodumene concentrate down to a target range of 380,000 and 440,000 tonnes](#) mainly due to labour shortages. These shortages caused delays in the ramp-up of certain plants like Pilgan and Ngungaju. A similar situation occurred with Albemarle, which had to [postpone](#) the second stage of its Kemerton Lithium processing plant by three months, citing labour shortages as a primary reason. To address these workforce challenges, we may see the mining industry following other sectors in embracing digital transformation, incorporating automation, machine learning, and remote work solutions. Additionally, government support is crucial to



bridge this labour gap, and the [Priority Migration Skilled Occupation List \(PMSOL\)](#) shows promise in addressing skill shortages in the sector.

Governance Risks: Lobbying & Transparency

Australia's political landscape has raised concerns about its relationship with mining operations. Unlike many other democracies, [Australia lacks restrictions on political donations](#) and campaign expenditures by federal-level political parties. This absence of limits allows mining companies to wield significant lobbying influence, potentially leading to the approval of projects that might have otherwise been denied. Critics, including organisations like the think tank Australia Institute, have raised concerns that political contributions and influential lobbying efforts between the government and the mining sector can wield [unwarranted sway](#) over the formulation of laws and regulations related to mining operation approvals. For instance, a report revealed that the former LNP government received nearly [\\$1.2 million in donations](#) from the mining industry between 2011 and 2015, while the Queensland ALP received over \$91,000. Information regarding the negotiation and administration of State Agreements (contracts between the state of Western Australia and developers) remained [undisclosed to the public](#) before their formation. This lack of public accountability increases the potential for agreements to contain terms that benefit the company but may not align with the public interest. Efforts have been made to address these concerns, as demonstrated by Anastacia Palaszczuk's pledge to enhance the transparency of political donations in [Queensland](#) to address concerns about the mining industry's influence. Additionally, the Australia Institute, a public policy think tank, has advocated for a ban on mining industry donations, while some members of parliament have called for a public inquiry to thoroughly investigate the sector's influence on the government.

Australia has a comprehensive [regulatory framework](#) at federal and state/territory levels, encompassing environmental, safety, Indigenous land access, resource, water management, and financial assurance regulations. Businesses must ensure comprehensive compliance to meet these diverse requirements transparently. However, transparency within the mining industry in Australia remains limited; within the mid-tier 50 mining companies (MT50), which includes major Australian-listed mining firms, including Pilbara Minerals, fewer than [50%](#) have released sustainability transparency reports. These reports encompass areas like business ethics, tailings storage facilities management, and air quality. In terms of water and hazardous materials management, biodiversity impacts, security, human rights, and indigenous rights, only [50-85%](#) of these companies have issued transparency reports. Among the top four lithium mining companies in Australia, [Albemarle](#), [SQM](#), and [Pilbara Minerals](#) have issued transparency reports. Of these, Albemarle and Pilbara Minerals have included indigenous engagement in their reports. Albemarle's report is the most comprehensive, covering 26 areas including water management, human rights, greenhouse gas emissions, and fair labour practices. However, Gangfeng Lithium and Tianqi Lithium have not produced similar reports. Not aligning with ESG principles and failing to provide transparent reports could hinder these companies in hiring talent and result in increased capital costs or restricted access due to non-compliance with Australia's regulatory framework.



Country Analysis: China

Toribio Iriarte

China holds [7% of the world's identified lithium reserves](#), a fraction of Chile and Australia's supply, yet it exported [30,206 metric tonnes](#) in the first quarter of 2023 and is [projected](#) to export around 14 million kilograms by 2026. Over the last two decades, China has become the most prominent lithium stakeholder, [purchasing](#) 70% of the world's lithium compounds and supplying 70% of refined lithium. The expansion of lithium-related activities, namely EV battery production and exports, created a global multilateral dependence that generated upstream supply chain concerns, prompting the Chinese government to adhere to ESG initiatives.



Environmental Risks: Droughts, Soil erosion & Water Pollution

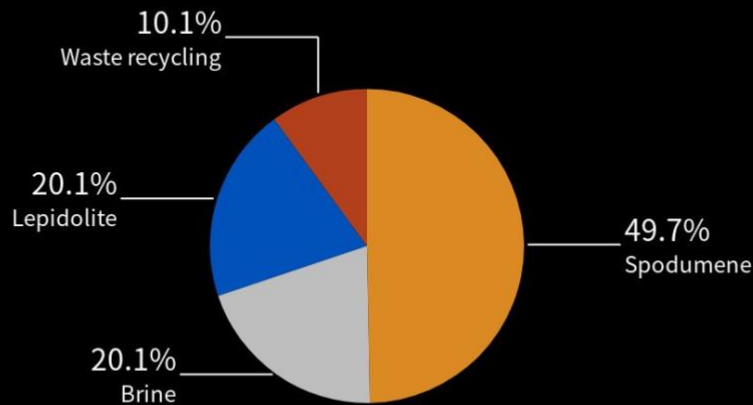
China has a drought [every two years](#), with the most recent one [shrinking the Yangtze](#) and shutting down lithium production in Sichuan. The overreliance on water has negative environmental implications, as improper management and disposal of residues result in heavy air pollution and water contamination. These contaminants directly affect nearby communities as pollution spreads to water sources, impacting drinking water and agriculture. The chemicals and heavy metals released by these activities erode soil, ail crop growth, and disrupt wildlife habitats, further impacting the livelihood of the communities.

A major detriment to the environment is China's reliance on lepidolite. Considered one of the poorest-quality lithium sources, this mineral is responsible for [one-fifth](#) of China's lithium extraction. The mining and processing of lepidolite lead to [soil erosion and water pollution](#) in vast quantities, leading to permanent, long-term environmental damage. The city of Yichun is especially involved in lepidolite extraction and is planning a [four-fold](#) increase in output by 2025. This initiative will likely increase environmental detriments unless ESG is strictly enforced and could serve as a 'test' of the CCP's [commitment](#) to sustainability.



Where China's Lithium Comes From

As the price of lithium carbonate has risen, lepidolite has become an important resource



Source: China Geology

Bloomberg

Source: [Bloomberg](#)

Social Risks: DEI policies

China's [approach](#) to diversity and inclusion differs from that commonly accepted by Western nations. In *Made in China 2025*, a [plan](#) to reduce the country's international dependence, there lies a clear resolve to unite rural and urban sectors to create economic inclusion, reduce income inequality, promote innovation, and regulate carbon emissions. The CCP has sought to achieve social and regional inclusion by promoting internal migration, gender equality, and the empowerment of women. China has recently [\(2006\)](#) ratified the Discrimination (Employment and Occupation) C111 convention, meaning a workforce expansion and income stabilisation effort will likely see women entering the mining sector, eventually diversifying all sectors in China, including lithium. The difference with the West lies in the lack of LGBTQ+ inclusion and the commonplace prejudice towards sexual and gender minorities. The recent [LGBT centre force majeure shutdown](#) in Beijing showcases the lack of interest in including certain minorities in long-term social integration plans (as a part of either China 2025 or 2035). This creates a large disconnect with the West and a lag behind Western socially responsible shareholder expectations, although an incentive to provide equity seems present.



Governance: Company Autonomy & Corruption

When equitable and fair governance are concerned, China is subject to controversy. The CCP leaves companies with little to no autonomy and self-governance. All mining and extractive activities are governed by the [Mineral Resources Law](#) (MRL), set forth by the Standing Committee of the National People's Congress. The mining industry is administered and regulated by the Ministry of Natural Resources and its respective bureaus, in collaboration with other ministries that regulate certain aspects of extractive activities (e.g., environmental protection and worker rights). The most relevant [authorities](#) in the mining sector are the National Development and Reform Commission, the Ministry of Ecology and Environment, the Ministry of Commerce, the Ministry of Emergency Management, and the National Health Commission. The regulatory system affects corporate governance to a large extent, as most laws and regulations allocate mineral resource ownership and management to the state, especially the MRL. Nonetheless, in its infringement of mining companies' autonomy, the Chinese government has implemented a wide range of ESG initiatives. For example, in [February 2023](#), government officials halted mines in the main lithium-producing hubs due to their pollution of nearby rivers, demonstrating a firm commitment to environmental sustainability that exemplified positive governance and trustworthiness.

Corruption is an ongoing risk for Chinese lithium mining companies despite the [significant decreases](#) witnessed in recent years, following President Xi Jinping's 2013 anti-corruption campaign. A [study](#) evaluating the impact of the campaign suggests that the legal framework implemented under the campaign saw fewer safety violations and worker deaths in coal mines. Nonetheless, some Chinese companies continue to utilise bribery and other covert practices to compete with US and European companies in the lithium industry. This has been particularly evident in [Latin America](#), where Chinese companies attempt to monopolise the sector in countries such as [Argentina](#), [Bolivia](#), and Chile using bribery, nepotism, and the subversion of bidding processes.

China's involvement in environmentally and socially detrimental overseas projects decreases trust in their supposed commitments to ESG, and the lack of autonomy perceived by most companies exhibits a worrying lack of corporate sovereignty. This creates a contrasting outlook, as the CCP's control of domestic companies has developed ESG to an extent, yet these advances were obtained in an authoritarian manner and excluded territories that should be in their purview.



Country Analysis: Chile



Julia Pollo

[Chile is the second largest producer of lithium in the world](#), which has brought the country into the spotlight for companies and governments regarding its public policies related to mining. In the wake of the 2022 elections, the nation faces a dual landscape of challenges and opportunities concerning ESG factors. The policies developed must tread a fine line, striking a balance between state control and regulations. Given Chile's significance on the global stage, mismanagement of these resources could have an international impact, potentially disrupting the worldwide electricity grid revolution.

Environmental risks: Droughts & Biodiversity Loss

In [South America's Atacama Plateau](#), the primary method for lithium extraction involves the evaporation of brines located beneath salt flats. This process is exceptionally water-intensive, as it requires the pumping of the water into ponds, where lithium gradually separates through evaporation. This process depletes already limited water resources in the desertic region, also posing a threat to the ecosystem.

This scenario is not new for the actors involved. As early as 2018, a [Reuters](#) article highlighted that “local indigenous groups, SQM and Albemarle, regional copper miners and newcomers to the region are all competing for water”. This statement illustrates the ongoing challenge in the region: high demand for a crucial resource in the face of a limited supply. While local communities rely on water for their daily activities and needs, companies also view it as a vital asset for advancing the energy transition and promoting green energy. Furthermore, since the era of Pinochet's government, water has been subject to [privatisation](#), intensifying disputes over this resource.

The impacts are not restricted to water resources, as mining presents a significant threat to the local fauna and flora. Out of the 53 animal species inhabiting the region, 17 are currently categorised as [endangered](#). This becomes even more worrying when considering that 80% of the region's species are native and exclusively live in the wetlands, heightening the risk of extinction for these species.

Social risks: Indigenous Rights & Labour Regulations

In Chile's mining framework, environmental and social risks are intrinsically linked, and centre around the current mining technique, which has depleted water resources in the region. Atacama is one of the driest deserts in the world. Copiapó, its capital, has a population of more than 200,000 people, who currently struggle to find [potable water](#) and rely on tankers to deliver it. [Indigenous communities](#) that live near the sea flats, where the extraction happens, are disproportionately affected. Despite playing a substantial role in the region's culture and history, these native communities often find themselves marginalised, with limited access to public policies and support.

Besides droughts severely impacting communities and causing human distress, the lack of communication between the operating companies and local communities is likely to jeopardise business operations, posing a risk to their continuity. In 2021, activists delayed the start of a



project at Minera Salar Blanco that was approved by the government as the companies involved did not comply with community rights by failing to secure [“free, prior and informed consent”](#). The principle is in line with the United Nations Declaration on the Rights of Indigenous People, also signed by Chile.

As for labour regulations, Chile has a history of strong union practices, including in the mining sector. As of [2021](#), union members were involved in strikes, primarily due to concerns related to inadequate working conditions and wage disparities. However, the absence of more recent articles on this matter suggests that it may not have persisted as a prevailing trend in the last few years.

Governance risks: Company Autonomy & Regulations

Currently, lithium mining operations are subject to more strict regulations compared to other minerals. SQM and Albemarle, the two companies that operate in Chile, are required to have [defined contracts and strict output quotas](#) established by governmental agencies. While these stringent regulations aim at trying to protect more vulnerable sectors, such as the environment, they have inherent risks. Obtaining the required [environmental approvals](#) can be complex and time-consuming, potentially resulting in delays and increased costs. Furthermore, the current scenario is easily influenced by changes in [government sectors](#) or policymakers' decisions, which can impact the regulatory framework over resource exploitation, affecting the companies' operations. Lithium mining in Chile has consistently faced stringent regulation, often intertwined with government intervention, and many of the governance risks have been associated with slow bureaucratic processes and abrupt shifts in decision-making patterns.

Chile's president, [Gabriel Boric](#), who took office in March 2022, campaigned on the promise of strengthening the country's welfare state. In April 2023, Boric [announced](#) preliminary plans for increasing the government's stake in the lithium sector, which is expected to capture rents formerly being extracted by international mining companies. The initiatives that are expected to be implemented are detailed in a report titled "Estrategia Nacional del Litio, Por Chile y su gente" (National Lithium Strategy, For Chile and its People). This report proposes the creation of a state-owned mining company that would have a significant stake and presence in domestic operations. However, the report anticipates that activities will begin in the first half of 2024.

Boric does not plan for a complete nationalisation but rather for the national company to have a [significant stake in the industry](#), functioning as a joint venture between the private and public sectors. While the legal and political foundations for the creation of the industry are under discussion, the president has delegated Codelco, the state-owned copper company, and ENAMI, the state mining company, to represent the government in the sector. [As one of the initial actions](#), Codelco is negotiating leases with SQM and Albemarle, which expire in 2030 and 2043, respectively. A division of [Codelco](#) will also be studying how to minimise environmental impacts in the exploited regions. [The negotiations](#) revolve around granting foreign companies the right to mine the lithium-rich salt flat in exchange for the government owning a stake in their projects.

Although the national strategy envisioned the involvement of the private sector, the market reacted negatively to the news, leading to a [significant drop](#) in the stock prices of Sociedad Química y Minera de Chile (SQM) and Albemarle Corporation (ALB). While SQM fell by 5%



to 74.01 points, the North Carolina-based Albemarle Corporation dropped by 2.7% to 187.80 points in April 2023. Nonetheless, the announcement was in line with the companies' expectations. ["No material impact on our business"](#) was the response of the Albemarle.

On the other hand, the national company may face more economic challenges with the mentioned new policies. In 2022, [SQM's revenue](#) was \$10.7 billion, of which \$8.15 billion came from lithium mining. Additionally, the company mentioned that \$3.27 billion had already been paid to the government in lease payments, and \$1.79 billion in income taxes. With the pressure for energy transition and the increase in lithium prices, SQM's revenue has indeed seen a remarkable 770% increase. However, a significant supply shortage is still likely in the medium to long term, affecting the company's profitability.

When considering the future prospects, the new plan raises several uncertainties that require close attention. Much of its success hinges on its fate in Congress, and the degree of intervention it entails may have profound implications for businesses operating in the sector. Additionally, there are significant uncertainties surrounding the renewal of contracts.



4. Conclusion

Frank Stengs & James Murphy

As EV adoption increases, there are growing ESG risks associated with lithium mining projects. Failure to consider these risks may lead to backlash and limit the supply required for the switch from internal combustion engine (ICE) vehicles to EVs. Without a reliable lithium supply chain, it will not be possible to scale up EV production quickly enough to meet global climate goals.

This report has identified several ESG risks to mining companies that can impact the EV supply chain in the three largest lithium-producing countries:

In Australia, **environmental risks** mainly exist in water scarcity and the high carbon intensity of energy. The potential implementation of the guarantee of origin system in the power sector offers companies the option to lower the carbon intensity of their operations, but will also pose risks, as the average carbon intensity of energy (purchased without guarantees) will go up. **Social risks** mainly pertain to labour safety and labour shortages. Australia's health and safety regulations are decentralised and differ across states and territories, which leads to inconsistent standards and enforcement. Labour shortages, on the other hand, negatively impact the efficiency and profitability of operations. **Governance risks** are identified in the power of the mining sector and their disproportionate influence through lobbying. A lack of transparency has also been identified as a governance risk in the lithium mining sector.

In China, **environmental risks** are related to water shortages and have led to production shutdowns. They have also been related to soil erosion and water pollution, due to the mining of lepidolite minerals. **Social risks** are present in the Chinese DEI policies, which differ from approaches commonly accepted in the West, and create a lag behind socially responsible shareholder expectations. **Governance risks** pertain to state involvement in the mining sector. While the CCP's control of domestic companies has developed ESG to an extent, the advances were obtained in an authorisation manner and excluded territories that should be in their purview.

In Chile, **environmental risks** are present in water shortages, and the environmental damage and fauna impact as a result of the mining operations. **Social risks** mostly affect local and indigenous communities and have been related to environmental risks - particularly the risks of water shortages. The lack of communication between operating companies and local communities also poses a threat to the continuity of business operations. **Governance risks** have been notified in the country's stringent regulations and the lithium strategy of the newly elected government.

Addressing the ESG risks in the lithium mining sector also presents numerous **opportunities** for mining companies. These opportunities encompass reducing energy and water consumption to improving operational efficiency, strengthening community and regulatory relationships, and meeting stakeholder expectations. Additionally, there may also be benefits related to enhancing the ability to attract and retain skilled labour, securing access to capital, and



attracting investors who value integrated sustainable development practices as indicators of long-term company viability. Thus, mitigating the ESG risks outlined in this report paves the way for a more sustainable and resilient future for lithium mining companies operating in the EV supply chain whilst offering multiple benefits.