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Responsible Mining in the Lithium Triangle

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Today's Topics

Executive summary

The mining industry throughout Latin America is facing increasing pressure to act responsibly and to develop more sustainable practices, and nowhere is this more important than in the Lithium Triangle comprising Argentina, Bolivia, and Chile. There are signs of a growing realisation within the mining industry that sustainability measures can help improve efficiency, cut costs, and reduce business risks.

- The Lithium Triangle covers around 400,000 sq km in northwestern Argentina, western Bolivia, and northern Chile. It is home to the majority of the world's reserves of lithium at a time when demand for lithium is set to increase from 327 kilotons in 2020 to 2,114 kilotons in 2030.
- Skyrocketing demand is exerting huge pressure for more rapid development, but there are particular environmental difficulties with lithium mining that have to be overcome. The process uses a huge amount of water, around 500,000 gallons per ton of lithium extracted, yet the Lithium Triangle is one of the driest places on earth.
- In Argentina, successive presidents have backed lithium mining, cutting taxes to attract investment, with powerful provincial governments also keen to develop extraction. However, miners have run into difficulty with local indigenous communities over payments, and some have filed lawsuits over insufficient consultation.
- Bolivia's President Luis Arce has moved to push lithium extraction forward, but community relations will be the key to developing lithium mining in Bolivia. For instance, a region-wide blockade and strike that began in July in Potosi, led by key local organisation Comcipo, indicates that the people of Potosi are far from happy with progress to date.
- Chile's lithium reserves are found in the arid Atacama Desert which makes extraction and evaporation easier compared to salt flats in Argentina and Bolivia. Nevertheless, the National Lithium Commission established in 2015 by then-president Michelle Bachelet emphasised the fragility of the ecosystem. There is growing concern over water use in what is the driest area of the country, and this has led to calls for lithium brine to be regulated as water rather than a mineral as currently, thereby affording stronger protections.
- Now that the three Lithium Triangle countries all have left-leaning governments, discussions on forming an association of lithium-producing countries have been reignited and this may add momentum to the move towards more responsible mining. However, it is hard to argue that, as yet, sustainable and responsible mining is currently being practiced anywhere in the region. Latin America is the region with the most mining-related socioeconomic conflicts in the world, and the number of conflicts has been increasing. This is the great challenge that needs overcoming as the demand for lithium continues to skyrocket.

Latin America's mining industry is facing increasing pressure to develop more sustainable practices

Introduction

Latin America is rich in natural resources and mining is a hugely important part of the regional economy, but the industry is facing increasing pressure to develop more sustainable practices. Here we examine responsible mining with a particular focus on the Lithium Triangle, an area of increasing geopolitical importance which includes parts of Argentina, Bolivia, and Chile.

Defining responsible mining

Mining operations can displace communities, degrade the environment, and increase inequality if not managed correctly, and responsible mining practices aim to reduce these negative environmental, social, and economic impacts. The challenge is that "responsible" can mean different things to different people in different contexts, although there has been some progress in developing standardised frameworks.

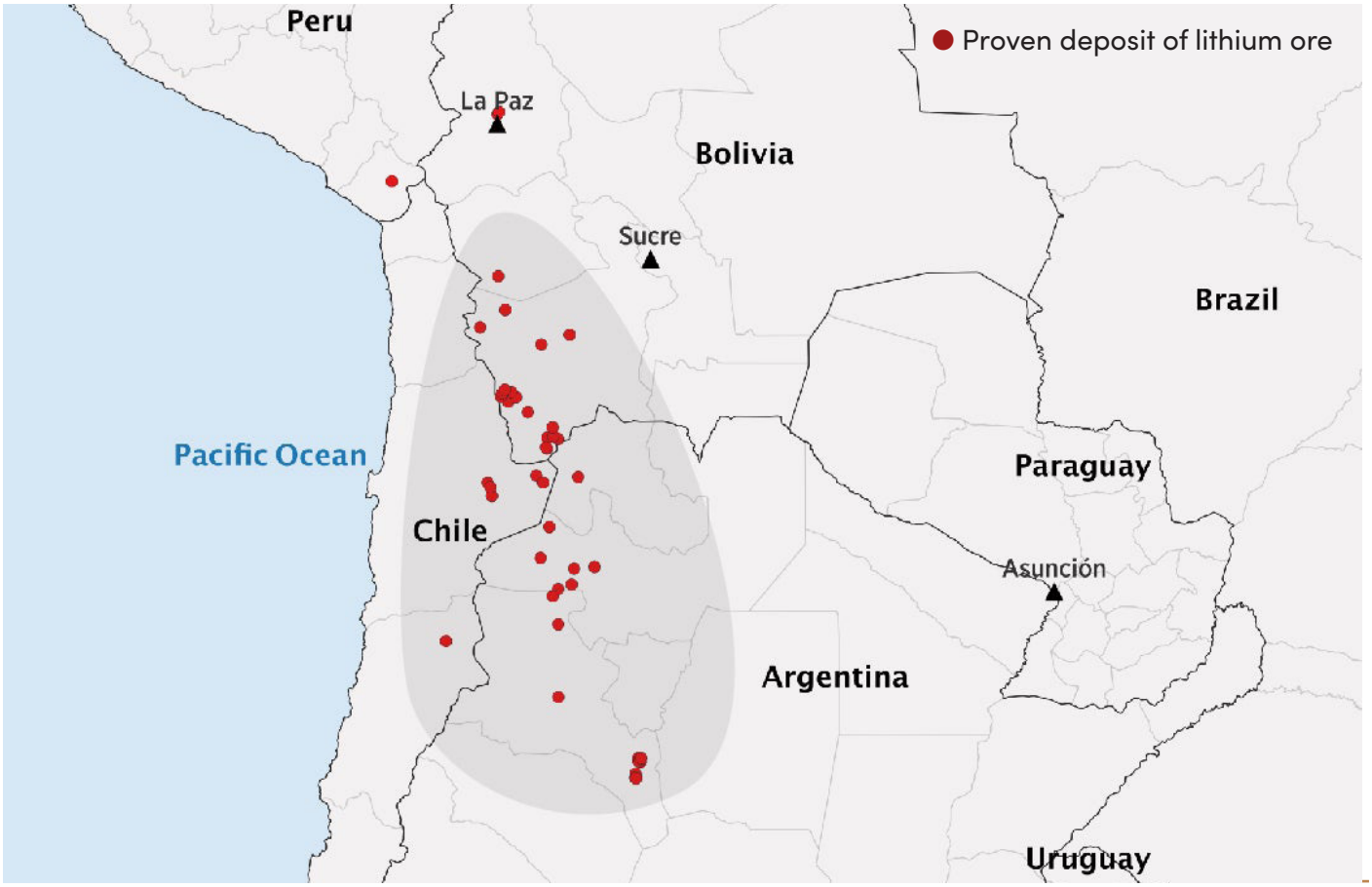
A key moment in the development of responsible models was the 1992 Rio Earth Summit, which produced various legally binding agreements and led to the creation of the United Nations (UN) Commission on Sustainable Development. The commission later developed the 17 Sustainable Development Goals (SDGs) which have since been adopted by UN member states. In terms of concrete steps towards achieving these goals, "mining companies will be called on to extract with responsibility, produce with less waste, use safer processes, incorporate new sustainable technologies, promote the improved wellbeing of local communities, curb emissions, and improve environmental stewardship," according to the UN.

Mining companies are trying to be more sustainable

Pressure to move towards responsible mining comes from external actors, such as governments and local communities, but also from the industry itself. Mining companies used to regard sustainability as a business cost, a requirement to obtain an operating licence or keep complaints from local communities at a minimum. However, there is a growing realisation that sustainability measures can help to improve efficiency, cut costs, and reduce business risk. This could help miners make more money from declining mines, and ensure the long-term survival of the industry as both the public and investors become increasingly concerned about the environment. This is evidenced by the increasing voluntary adoption of environmental, social, and governance (ESG) guidelines by mining companies.

In addition, governments and local communities have stepped up opposition to mining projects as the long-term impacts of the industry have become more apparent. Latin America is the region with the most mining-related socioeconomic conflicts in the world, and the number of conflicts has been increasing. The main concerns are environmental impacts, lack of consultation with local communities, and inequitable distribution of the benefits of mining operations. For example, many mines require huge amounts of water, and countries throughout Latin America are already under significant water stress. Some mines also contravene international agreements such as the Indigenous and Tribal Peoples Convention 169 (ILO 169), which obliges states to consult Indigenous peoples on projects that affect their land and communities. Many Latin American states, including Argentina, Bolivia, and Chile, have ratified ILO 169, but there is a wide variation in how its requirement for free, prior, and informed consent (FPIC) has been put into practice, which can cause conflict. Other operations are accused of failing to deliver tangible benefits for local communities, which have remained underdeveloped despite the huge value of resources extracted on their doorstep.

Figure 1: Map of proven lithium deposits



The Lithium Triangle and why we are talking about it

The Lithium Triangle covers around 400,000 square kilometres in northwestern Argentina, western Bolivia, and northern Chile. It is home to the majority of the world's reserves of lithium, the lightest metal in the world, which is used to make batteries for smartphones, laptops, and electric cars. Lithium-ion batteries were created in 1991, and demand has skyrocketed in recent decades as rechargeable devices have become more and more common. This explosive growth is expected to continue thanks to the importance of lithium in the green energy transition, which under current plans will involve building huge numbers of electric vehicles and domestic battery storage systems. Demand for lithium will increase from 327 kilotons in 2020 to 2,114 kilotons in 2030, a compound annual growth rate of 21%, according to the Comision Chilena del Cobre (Cochilco), part of Chile's mining ministry. Electric vehicles represented 41% of lithium consumption in 2020, and this share will increase to 73% by 2030, said Cochilco. This means that securing lithium supplies has become a priority for governments and companies such as automakers, turning the resource into a geopolitical battleground.

China leads the world in electric vehicle production, thanks in part to its investments in lithium mines in Australia, the world's largest producer of the metal, and Beijing has been expanding its interests in the Lithium Triangle in recent years in order to secure more supplies.

The US is also moving to secure supplies, and the signing of the Inflation Reduction Act on 16 August will only accelerate that need. "Government sway is now in play," said Simon Moores, chief executive of Benchmark Mineral Intelligence, in an interview published 25 August. "The lithium-ion battery is now geopolitical. And if EVs mean lithium-ion batteries, then EVs mean mining." This could also be one reason for continued high lithium prices, despite Goldman Sachs predicting a price crash at the end of May. Instead, prices have remained near the record highs recorded in April this year, and that could remain the case, according to Benchmark. Lithium production capacity will not increase significantly until late 2023 or early 2024, and the company predicts that the market will remain tight until around 2026.

Figure 2: Global lithium resources

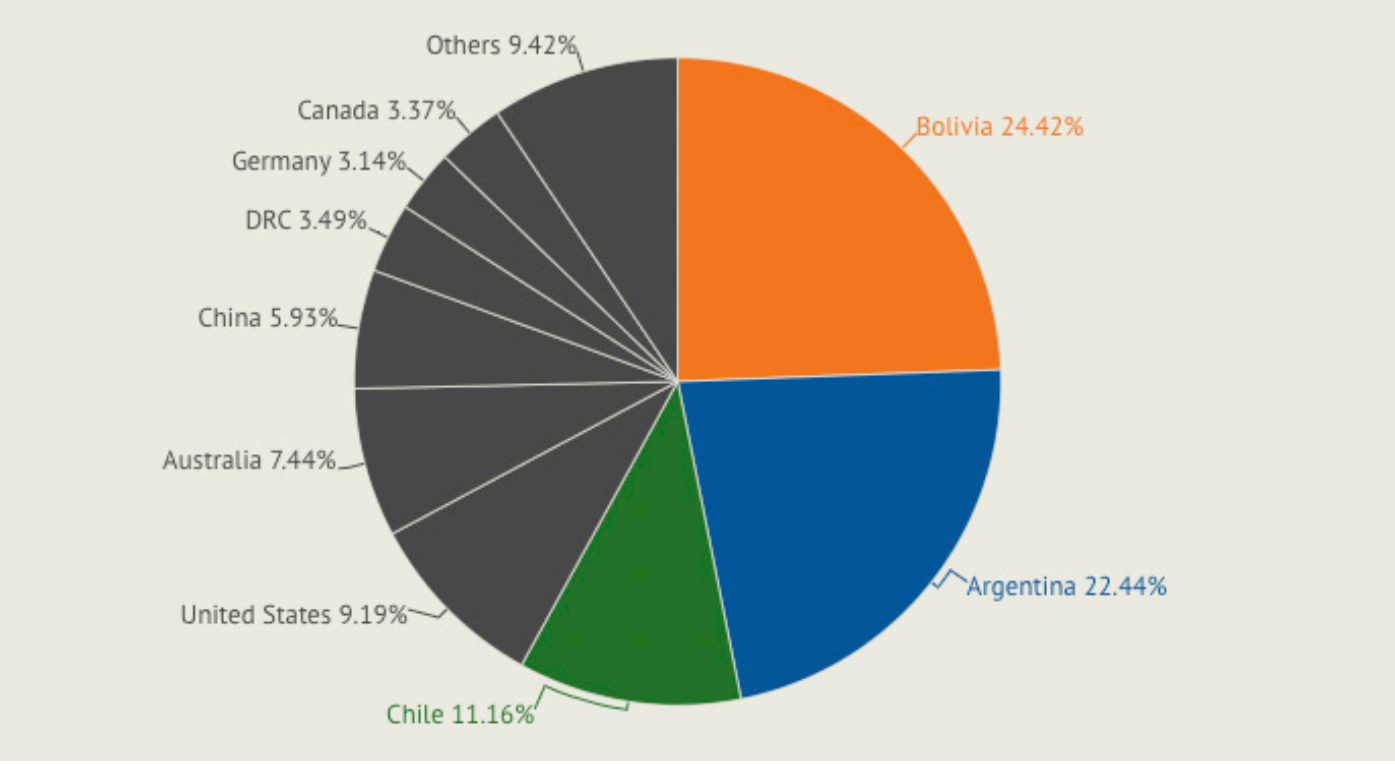
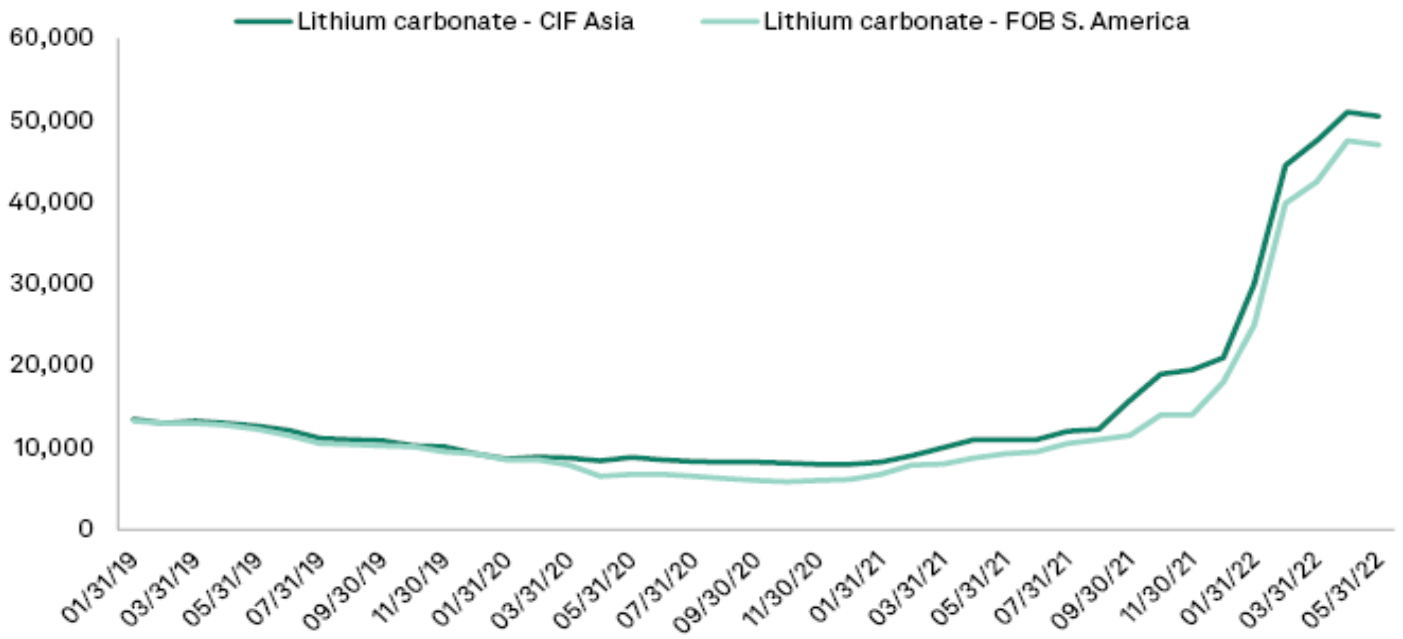


Figure 3: Lithium price in South America and Asia since 2019 ($/tonne)



While continued high prices and skyrocketing demand could bring huge benefits for the countries of the Lithium Triangle, there are many complications. First of all, the lithium deposits are found in salt flats, and it is extracted by pumping brine to the surface and leaving it to evaporate for months at a time. The process uses a huge amount of water, around 500,000 gallons per ton of lithium extracted according to some estimates, but the Lithium Triangle is one of the driest places on earth. Although new technology has been developed which can extract lithium using far less water, the area could still become uninhabitable as there isn't enough water to extract as much lithium as the energy transition will demand. Adding to environmental concerns, remaining water supplies can be contaminated by chemicals used in the evaporation process. This means agricultural activities can be affected by both water shortages and potential contamination. In addition, there has been little research into whether lithium and other chemicals are carried in the air, and what their effects could be.

Here we look at the situation in Argentina, Bolivia, and Chile to examine the story of lithium mining so far.

Argentina

Argentina boasts 19m tons in identified lithium resources, with 2.2m in proven reserves, according to the latest figures from the US Geological Survey. In 2021 it produced 6,200 tons, up from 5,900 tons in 2020, making it the fourth largest producer in the world. Argentina is forecast to account for 7% of global production this year, according to CRU Consulting, and this share could increase to 17% by 2026, equivalent to 384,000 tons.

Most of the lithium deposits in Argentina are found in the salt flats of the northwest of the country, in the provinces of Catamarca, Jujuy, and Salta, and in 1997 the Hombre Muerto salt flat in Catamarca became the first to start producing lithium. There are only two mines producing lithium commercially – Fenix and Sales de Jujuy – with a third, the Cauchari Olaroz project operated by Minera Exar, scheduled to start production at the end of the year. However the mining provinces made significant efforts to benefit from the lithium price boom in 2016-17, and the fruits of that labour can be seen in around 50 lithium projects at different stages of development, even if experts say that it is very unlikely that all of them reach the production stage.

While it started producing lithium far later than Chile, Argentina experts say the country has greater potential than its neighbour, and the industry has developed rapidly in recent years. Automakers such as BMW, Toyota, Ford, and General Motors have all agreed investments in the country, and agreements for a raft of projects have been announced in recent months. State-owned energy company YPF signed an association agreement with Catamarca Minera y Energética Sociedad del Estado (Camyen) for a 20,000 hectare project in Fiambalá at the end of

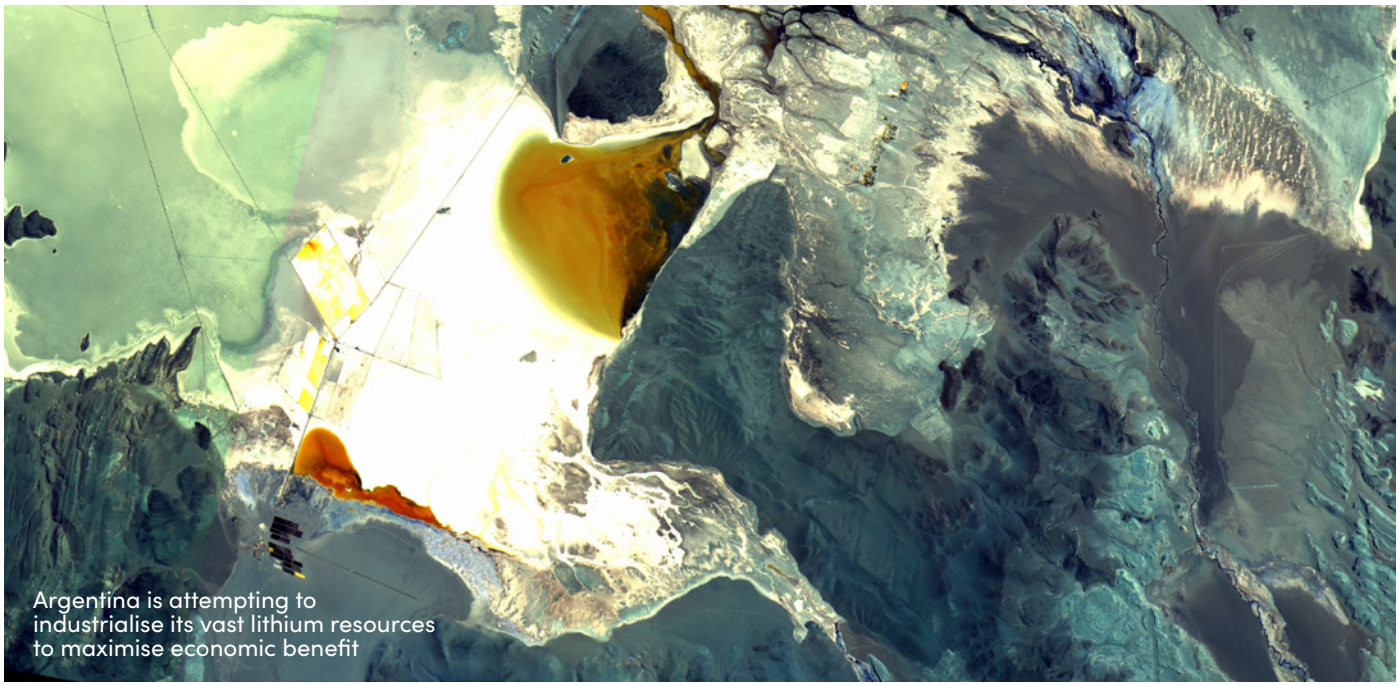
August, the company's first lithium project, and Canadian firm Portofino Resources announced it had received permission for exploratory work at the Yergo project around the same time.

Argentina has also been making efforts towards industrialising its vast lithium resources, which will allow the country to maximise the economic benefits. Chinese companies have been very active in Argentina, with Tianqi Lithium signing a deal with YPF to invest in the lithium value chain. Gotion High Tech has signed a deal to make lithium batteries in Jujuy, and Chery will build electric cars in the country. Discussions with Beijing also raised the idea of technology transfers from China to Argentina. Already, YPF subsidiary Y-TEC says it has the expertise to start producing lithium batteries at a facility in La Plata by December this year.

Argentina is generally seen as a difficult country in which to do business, with a lack of clear rules on investment and obstacles to exports and currency flows. It also suffers from long-running economic instability, and the failure to successfully develop its vast shale deposit at Vaca Muerta is a warning sign. That said, former President Mauricio Macri (2015-19) slashed taxes to attract foreign investment, and the government of his successor President Alberto Fernández has continued to back lithium mining, cutting taxes on mineral exports from 12% to 8% in October 2020.

However, in Argentina's federal system, each province has the power to exploit mineral resources according to its own constitution. Provincial governments have proven keen to develop lithium extraction, and in August 2022 the formation of the "Lithium Mining Region" was announced to develop shared regulations in Catamarca, Jujuy, and Salta. Officials are also looking outside Argentina for opportunities, and a delegation from the mining regions travelled to the US for a series of meetings with politicians, businesspeople, and lenders such as the World Bank and the Inter-American Development Bank (IDB) at the end of August. Interestingly, the IDB said Argentina has the greatest potential of the Lithium Triangle countries as it is the most open to investment.

However miners have run into difficulty with local indigenous communities including the Salinas Grandes, Guayatayoc, and Kolla, which have filed lawsuits over insufficient consultation. They are currently being considered by the Inter-American Court of Human Rights (IACHR). In addition, there have been protests against Minera Exar for reportedly failing to uphold an agreement to pay local communities an annual payment, as well as hiring local staff and building an aqueduct in a region known for water shortages. On the other hand, Sales de Jujuy has worked hard to maintain good relations with communities around its Olaroz salt flat, with salaries above the average for the region among a workforce of which 65% are members of local indigenous communities. Sales de Jujuy has also provided medical and dental services, as well as providing microloans.



Argentina is attempting to industrialise its vast lithium resources to maximise economic benefit

Lithium extraction in Bolivia's Salar de Uyuni is complicated by a huge tourism industry

Bolivia

Bolivia boasts 21m tons in identified lithium resources, according to the latest figures from the US Geological Survey, but there is no data on proven reserves due to a lack of research capability.

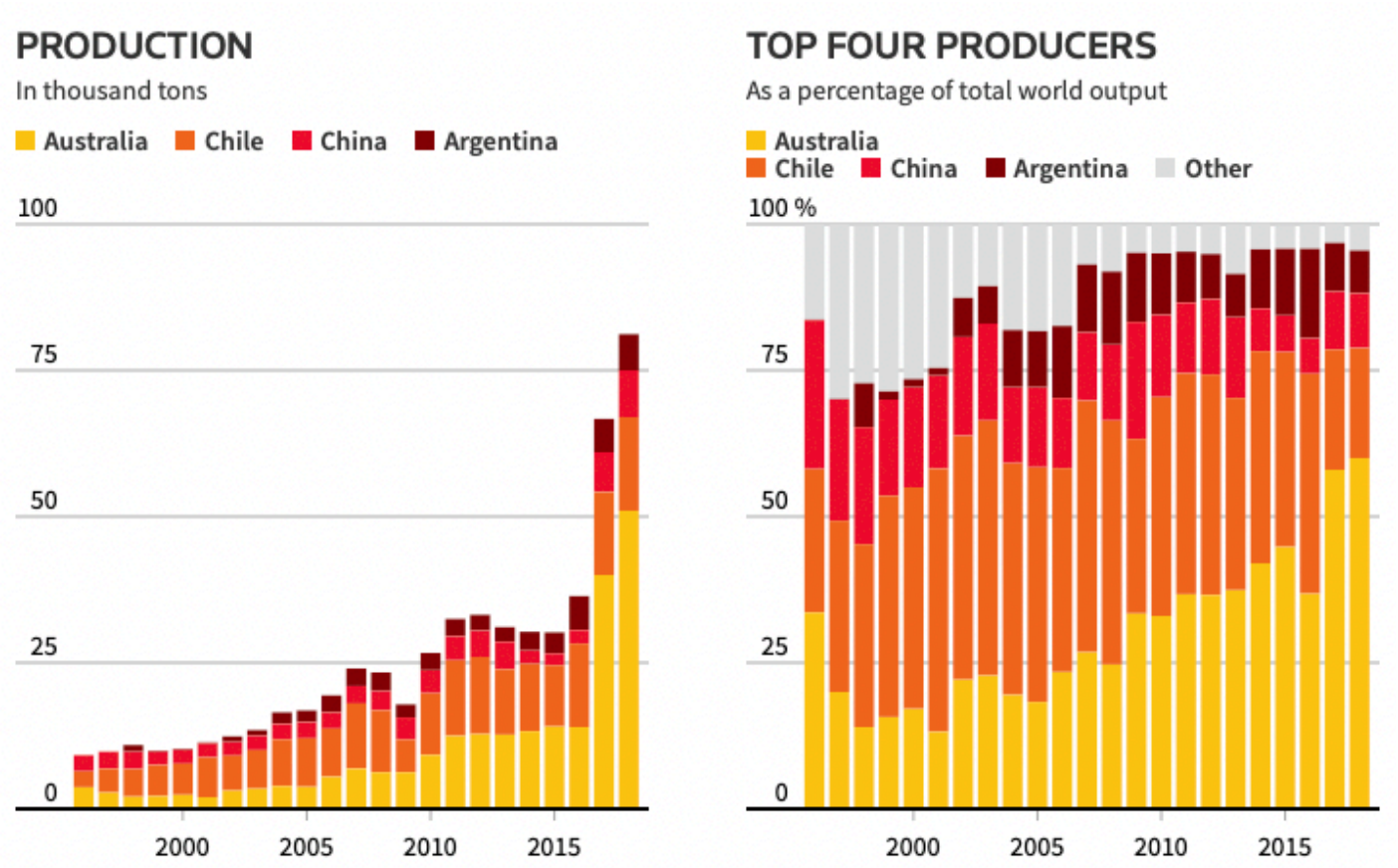
The country is something of a sleeping giant in the industry, with the largest amount of identified lithium resources in the world. Its deposits are found in the Salar de Uyuni, the largest salt flat in the world and home to the largest single identified lithium resource on the planet, which is located in the Potosi department in southwest Bolivia. However it is not clear how much of these resources are exploitable, with a December-March rainy season making evaporation more challenging and the salt flats suffering from a low concentration of lithium with high levels of impurities. Another complication is the fact that the Salar de Uyuni supports a huge tourism industry and widespread lithium mining could alter the landscape. Bolivia also suffers an infrastructure deficit that would make transporting the metal more difficult and expensive.

The history of lithium mining in Bolivia is informed by the Potosi region's history and the idea of resource nationalism. Potosi is home to Cerro Rico, the world's largest silver deposit, which was exploited by Spanish colonists. To this day the area remains underdeveloped despite its vast mineral wealth, and local populations are determined to ensure that they should see some benefits from the so-called 'white gold' that has become today's hot commodity.

These communities have a long history of protest, including bringing about the cancellation of a 1992 deal between the government and US firm FMC Lithium Division (Lithco). Interestingly, the company instead set up in Argentina, where it runs the Fenix project. President Evo Morales (2006-19) nationalised lithium in 2008, designating it a strategic resource, and promised to industrialise it through the lens of 'resource nationalism', processing it through state-controlled entities such as Yacimientos de Litio Bolivianos (YLB). During his time in office the state spent around US$900m developing a lithium project, but it failed to produce any significant quantity of lithium. Juan Carlos Zuleta, who ran YLB for a brief period, said that the mine was not commercially viable as it only recovered 9% of the lithium extracted from brines, compared to around 50% at Chilean mines. In recent years the government has acknowledged the need for foreign investment and expertise, and in 2018 a deal was signed between YLB and German firm ACI systems. However, in 2019 that deal was also annulled after more protests from local communities. The current president, Luis Arce, has moved to push lithium extraction forward, inviting firms to submit proposals to commercialise lithium and selecting six candidates to compete in trials to test their technology. However analysts don't expect any deliveries in the short term.

As demonstrated by the failure of previous deals due to protests, community relations will be key in developing lithium mining in Bolivia. A bill on lithium exploration is currently under discussion, and on 5 August key local organisation Comite Civico Potosinista (Comcipo) submitted a proposal which includes an 11% tax on lithium sales, to be paid to the Potosi department in its entirety, as well as a 30% tax on net profits, half of which would be paid to the Potosi department. Comcipo believes that private companies should be allowed to be involved, a change that would involve changing the law that created YLB. The company is working to convince local communities of the benefits of lithium extraction, and in June the company signed an agreement with the Universidad Técnica de Oruro (UTO) to develop research and training projects for the lithium industry. However a Comcipo-led region wide blockade and strike on 5 July calling for action on the lithium law, as well as greater transparency in the selection process for a company to exploit the deposits, goes to show that people in Potosi are far from happy with progress up to this point.

Figure 4: Lithium production and top four global producers

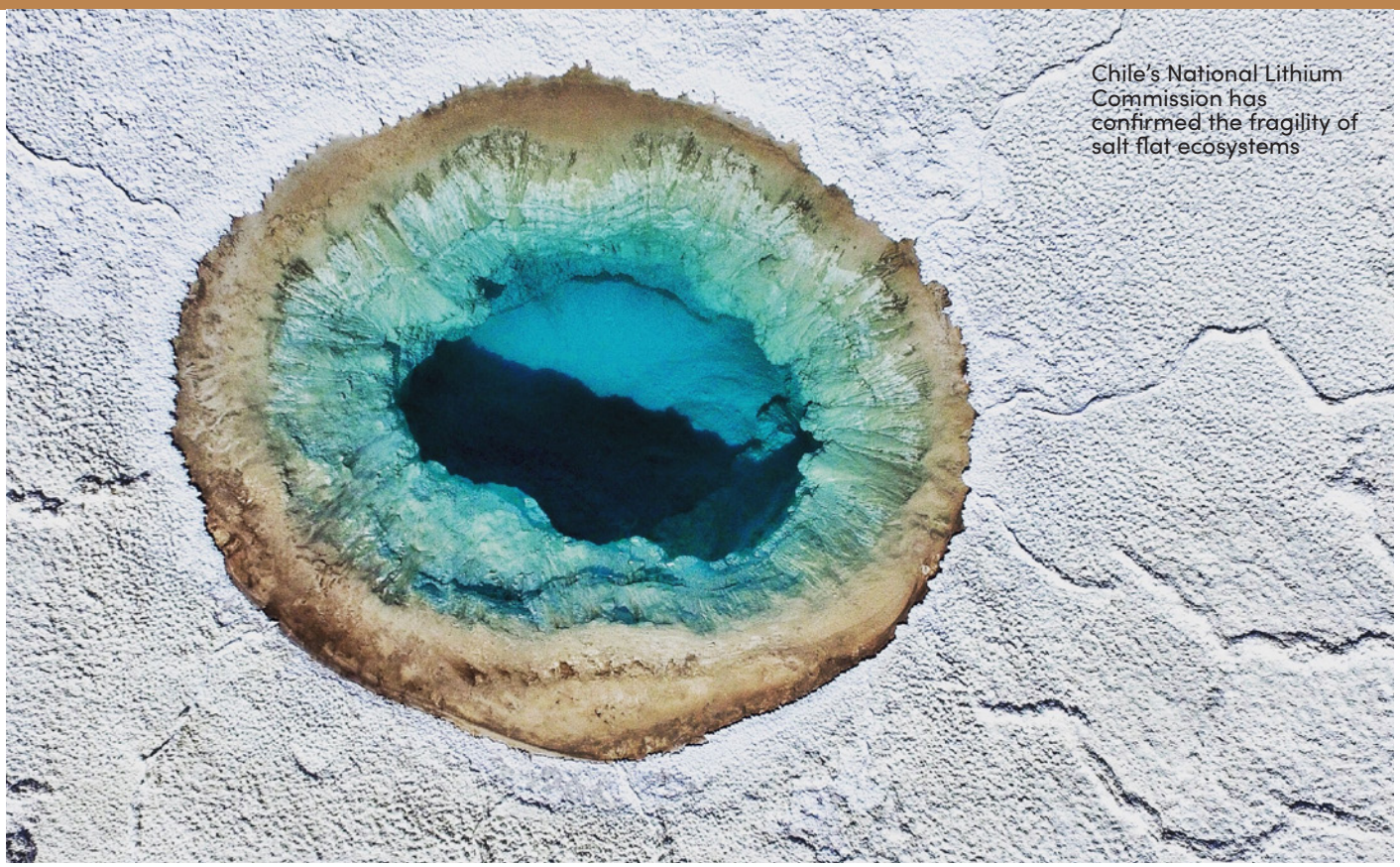


Chile

Chile boasts 9.8m tons in identified lithium resources, with 9.2m in proven reserves, according to the latest figures from the US Geological Survey, the largest reserves in the world. In 2021 it produced 26,000 tons, up from 21,500 tons in 2020, making it the second largest producer in the world. Chile is forecast to account for 26% of global production this year, according to CRU Consulting, but this share could decrease to 20% by 2026, equivalent to 330,000 tons, as other countries expand production.

Chile's lithium reserves are found in the Atacama Desert in the north of the country, which boasts an arid climate that makes extraction and evaporation easier compared to salt flats in Argentina and Bolivia. It also benefits from good access to the Pacific Ocean and comparatively well-developed infrastructure, keeping production costs down. Lithium was first discovered in the Atacama in 1962, and in 1979 the metal was designated a strategic resource of national interest. This means that lithium mines are public-private partnerships, rather than concessions. Chile had the first large-scale lithium-brine mine in the world, and two firms - US-based Albemarle and Sociedad Química y Minera de Chile (SQM) - have operated in the Atacama since 1993 under rental contracts with the Corporación de Fomento de la Producción (CORFO). Due to the regulatory environment, they remain the only two companies operating in Chile. In the year 2000, Chile supplied around 65% of the world's lithium, when the market was still limited to industrial applications, and the country was the largest producer of lithium in the world until 2017, when it was overtaken by Australia, as shown in Figure 4.

In 2015, centre-left President Michelle Bachelet (2014-18) created a National Lithium Commission, which was asked to create a sustainable strategy for lithium exploitation. Its findings confirmed the fragility of the ecosystem in the salt flats and recommended that the local communities be adequately compensated. The commission's findings also led to the renegotiation of contracts with Albemarle and SQM, with new agreements signed in 2019 obliging the miners to sell 25% of their production to Chilean companies at a preferential rate.



Chile's National Lithium Commission has confirmed the fragility of salt flat ecosystems

Chile has struggled to improve its output for a number of reasons. One issue is lithium's designation as a strategic resource, which limits new projects as there is no clarity as to how a private company can exploit lithium. Another issue is growing concern over water use in the driest area of a country that has suffered a 13-year megadrought. This has led to widespread awareness of the impacts of mining on the water table and led to calls for lithium brines to be regulated as water in the proposed new constitution, rather than a mineral as it is currently, which would afford it stronger protections.

The proposed constitution was rejected by voters in a referendum on 4 September, but another rewriting process could be undertaken. Even if there is no constitutional change, President Gabriel Boric has spoken about imposing increased royalties on mining companies, which would increase the tax burden and discourage new investment, reiterating his plans on 30 August, as well as strengthening environmental protections. Boric has also proposed forming a state-owned lithium company, a move that would increase competition for private companies, sparking concern from private mining association Sonami and the Chilean mining chamber (CMC).

Boric is in part responding to conflict between mining companies and local communities, which have protested the effects of water shortages on agriculture as well as inequality. The Chilean state has also stepped in to enforce environmental regulations, with the Superintendence of the Environment starting a sanctioning process against SQM in 2016 as the company had damaged ecosystems by extracting more brine than it was allowed to.

There have also been further losses for lithium miners in the courts. In June, the supreme court accepted appeals filed by indigenous groups against two contracts granted last year under President Sebastián Piñera (2018-2022), who had made it easier for foreign companies to enter the industry. Commenting on the decision, mining minister Marcela Hernando said that Chile was not closed to private partners. "We are going to do everything in our power to build an institutionality around lithium that allows us to recover the trust," she said, but the ruling further muddies the regulatory environment in the country. In addition, the contracts sparked street protests and criticism from opposition lawmakers. Despite its head start, Chile could lose more ground as other countries start to boost lithium production given this combination of factors.

International cooperation

Officials from the three Lithium Triangle countries have been making increasing efforts to work together in order to maximise the economic benefits received from their natural resources. Governments have recognised that their scientific and technical capacity doesn't match that of the private sector, and one potential way of catching up is to share knowledge and expertise.

Lithium Triangle countries have agreed to collaborative efforts in science and technology

For example, on 4 July Argentina's minister of science, technology and innovation Daniel Filmus met with President Arce of Bolivia to discuss scientific and technological cooperation. Then, on 28 July, YLB and Y-TEC signed an agreement to cooperate on the development of lithium ion batteries, before Arce and Argentina's President Fernández discussed further cooperation on 7 August. Arce also met with Boric on the same day, with the Chilean president hailing "significant advances in our bilateral relations".

Chile and Argentina are also deepening ties. Gonzalo Gutiérrez, advisor to President Boric of Chile, said that the two countries were working to develop public sector knowledge and close the gap to private firms. Boric visited the Y-TEC facility in April, and the two countries agreed to form a bilateral working group, the Grupo de Trabajo Binacional sobre Litio y Salares, which met for the first time in June. In addition, Bárbara Figueroa, Chile's ambassador to Argentina, has discussed the possibility of the two nations working together along with Bolivia. In an interview published 28 July, Figueroa told Argentinian media outlet Telam that lithium extraction should be undertaken with sovereignty, environmental concerns, and working conditions paramount. Figueroa was also part of a Chilean delegation that visited the Y-TEC facility on 11 August, when the bilateral working group met for the second time.

The idea of forming an association of lithium-producing countries, which could function like the Organization of the Petroleum Exporting Countries (OPEC), has also been floated. Argentine and Bolivian officials reportedly discussed the idea in March 2021, but the election victory of President Gabriel Boric in Chile in December 2021, which means that the three nations are more politically aligned under left-leaning leaders than before, has reignited discussions. Certain advances were made at the Summit of the Americas in June, but some fear that such an institution would face opposition from lithium miners. Another issue is the fact that the Argentine constitution gives each province control over its resources, which means that Chile and Bolivia would have to negotiate with the governors of Jujuy, Salta, and Catamarca rather than the federal government. Gerardo Morales (Jujuy) is part of the opposition Juntos por el Cambio (JxC) party, which could complicate negotiations. Argentinian regulations would also make it difficult for the state to intervene in the market.

Lithium mining can offer substantial business opportunities, if approached responsibly

Conclusion

In conclusion, there are many positive business opportunities in the Lithium Triangle, and mining companies, governments and local communities could all benefit hugely if the region's resources can be exploited in a sustainable manner. But while governments increasingly recognise the benefits of working with mining companies with the aim of developing their societies, conflicts with local communities are common, due to the environmental impacts of lithium mining in a sensitive ecosystem and demands that more money be invested in the affected areas.

For their part, mining companies are voluntarily updating their practices to improve sustainability, thanks to a growing realisation that such measures can help to improve efficiency, cut costs, and reduce business risk, improving their prospects. However miners cannot solve all of the issues of the Lithium Triangle's complex business environment by themselves. Argentina may have proven the most open of the three countries to private investment, but economic instability remains a risk. Bolivia has a huge amount of lithium resources, but technical difficulties and entrenched social conflicts leave the country in danger of missing out on the lithium boom. And restrictive regulations in Chile, coupled with political uncertainty and concern over environmental impacts, threaten to strangle growth in what was once a world leader in the field.

These challenges are common throughout Latin America, and it is hard to argue that sustainable mining is currently being practised anywhere in the region. The issue is that an operation considered sustainable by a mining company is often far from it in the eyes of local communities, and governments find themselves stuck between the interests of the two. What is clear is that the pressure to solve the puzzle is only set to increase as lithium and other minerals found in the region are coveted around the world.

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