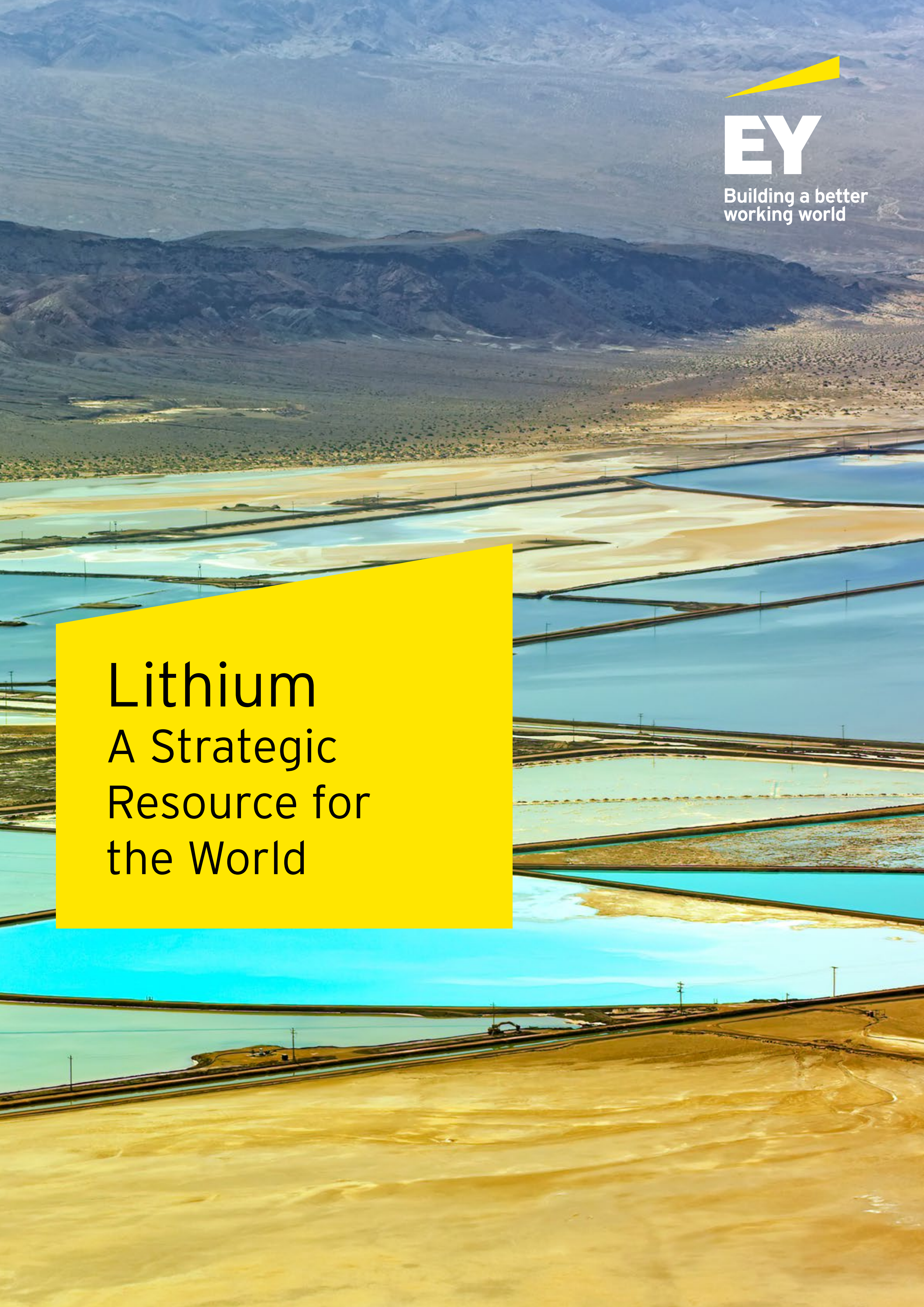

Lithium
A Strategic Resource for the World

EY
Building a better working world

Foreword

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Leader Centre of Excellence Mining & Metals Chile

Dear Investor:

In this document we aim to explore specific issues that, in our experience, miners and investors around the world need to consider before making critical decisions on the development of new lithium operations. Thus, we include an overview of the resources, updating some figures and highlighting the potential of Latin America; we give our views on processing methods, complemented by a summary of the key indicators to consider when discussing lithium investments that have been evolving over the last few years. This document complements perfectly with our 2024-2025 lithium investment guide in Latin America, which provides access to essential information to help foreign investors understand the regulations governing investment and, in particular, the legal, fiscal and regulatory requirements for operating in the lithium sector taking into account the different state/provincial regulations specific to lithium in Latam.

This report also outlines the different views to be considered in this industry in the context of energy transition and recent ESG requirements. It represents a further step in our commitment to build a better working world and provide knowledge and insights and understanding of the business challenges for lithium companies in Latin America.

The objective, as always, is to provide international mining and exploration companies with a critical data and information to facilitate and support their discussions and investment decisions in the region.

We sincerely hope that this is the beginning of fruitful conversations with our teams who are at your disposal to address your primary concerns and to delve into the specifics required to materialise your investments in the lithium industry in Latam.

Should you have any inquiries or wish to engage in a more detailed discussion with our teams, please do not hesitate to contact us. ■ ■ ■

Introduction

The two main drivers explaining the high demand for lithium are the electromobility revolution and the stationary storage of electricity (ESS). The electromobility uses lithium batteries produced from lithium carbonate (LC) or lithium hydroxide. A second life for lithium batteries is the ESS application.

Lithium carbonate is classified into technical grade and battery grade based on its purity level. Technical grade (TG) typically consists of a minimum of 99% assay, while battery grade (BG) contains a minimum of 99.2% - 99.5% assay. BG has lower impurities, such as magnesium, sodium, iron, potassium, magnetic impurities. To achieve BG quality, LC requires additional processing, resulting in higher production costs.

BG lithium hydroxide (minimum 56.5% assay) is mainly used to produce cathodes with a high nickel content, which enables the production of batteries with higher energy density, allowing electric vehicles to achieve a longer driving range. BG contains fewer impurities such as carbon dioxide, chlorine, and sulfate. Lithium hydroxide has gained strong share in the battery market in the last decade.

Traditionally, TG LC has been used primarily in the production of specialty glasses and ceramics, special rubbers, air conditioning, aluminum production, enamel and fluxes, etc. It is also used as a raw material in the production of lithium hydroxide and other derivatives.

On the other hand, traditional TG lithium hydroxide applications are greases for automobiles, airplanes, train wagons, agricultural and military equipment. Lithium greases are non-corrosive, versatile, and perform well under different temperatures and weather conditions.

Another lithium bearing material are minerals, such as pegmatites (spodumene, lepidolite, petalite, etc.) and sedimentary materials (tuff, clays, etc.). The main commercial compound is spodumene concentrate, which is a high-purity lithium mineral processed from spodumene, a lithium and aluminum inosilicate mineral. The term "concentrate" refers to the processed form of the mineral, which has been crushed and heated to change its crystalline structure and make it more suitable for further processing. This concentrate typically contains a significant percentage of lithium, often around 6% as Li2O, hence the term "Spodumene Concentrate 6" or "SC6".

Lithium minerals can be found in pegmatite rocks (formed from magma crystallization in the Earth's crust), sedimentary rocks (formed from the deposition and solidification of sediments), brines in salt flats (resulting from a natural leaching and evaporation process), and oil and geothermal fields.

In Table No. 1, we provide a brief classification of these three categories according to deposit type, the percentage they represent globally, and the natural state in which they are found.

Table 1: classification of Lithium resources

Type	Deposit type	Global percentage	Natural state	Location of largest deposits
Pegmatite	Spodumene, petalites, lepidolites, amblygonite and eucryptite	26%	Hard rock (from crystallized magma beneath the Earth's surface)	Australia, U.S.A., DRC, Canada
Brine	Inland (salt flats), geothermal and petroleum	66%	Brine (sand, water, and mineral salts)	Lithium Triangle (Chile, Argentina, Bolivia)
Sedimentary Rocks	Clays, volcanic tuff, lacustrine evaporative rocks	8%	Mineral rocks of smectite (clay), jadarite (lacustrine evaporite)	USA, Mexico, Serbia (Jadar), Peru (Falchani)

Source: Cochilco based on various market sources

Lithium Resources

Due to ongoing exploration, the identified lithium resources have substantially increased worldwide, totaling approximately 103 million metric tons. The distribution of identified lithium resources is presented in the following chart (Million of Metric Tons).

	Mill Metrics Tons		
Country	Li Metal	LCE	
Bolivia	23	122,4	22%
Argentina	22	117,1	21%
US	12	63,9	12%
Chile	11	58,6	11%
Other Select (*)	11	58,5	11%
Australia	8,7	46,3	8%
China	6,8	36,2	7%
Others	3,6	19,2	3%
Canada	3	16	3%
Peru	1	5,3	1%
Russia	1	5,3	1%
TOTAL	103,1	548,8	

Source: USGS Mineral commodity summaries 2024

Lithium Reserves

Lithium reserves are those resources that are economically exploitable, determined by an intensive study of resources with high level geophysics, hydraulic modeling, drilling and testing of production wells, and metallurgical processing.

Country	Mill Metrics Tons	
Chile	9,3	33%
Aus	6,2	22%
Arg	3,6	13%
China	3	11%
Other Select (*)	2,8	10%
US	1,1	4%
Other	1,07	4%
Canada	0,93	3%
TOTAL	28	

(*) Other Select : Consolidated basis from Germany, DRC, Mexico, Czechia and Serbia.

Brine Characterization

From a processing standpoint, one important aspect for investors and lithium projects developers, when evaluating a new asset, is brine characterization, since this may have an enormous impact in the project Capex and Opex. Brine characterization is not just about lithium concentration, which is obviously important to make a preliminary assessment about the processing feasibility, but to know and understand the impact of other ions in the brine need to be considered.

In general, salt flats may contain predominantly calcium rich brines or sulfate rich brines. According to our observations, within the so called "Lithium Triangle" calcium rich brines are present in "southern" salars, such as Antofalla, Tres Quebradas in Argentina, and Maricunga in Chile. To the north, and in more abundancy, salars contain predominantly sulfate rich brines, such as Diablillos, Hombre Muerto, Pastos Grandes, Rincón, Cauchari-Olaroz in Argentina, and Atacama in Chile. However, in this last case, the south-west zone of the Atacama contains high calcium brines as well, coming from the natural occurring leaching process of the Chepica peninsula.

Magnesium (Mg) is another important challenge in lithium processing. Whether it is precipitated in ponds or chemically treated, the more magnesium content in the brine means higher operational costs, associated to the usage of chemical reagents, filtration equipment and laborious separation efforts. The lowest Mg/Li ratio in the raw brine is always desired. As magnesium content is typically high in the brine, huge amounts of its precipitates are collected as by-product or waste ($MgCl_2.6H_2O$, $Mg(OH)_2$). For this reason, entrained brine in these solids should be observed carefully when determining lithium yield, specially at higher brine concentrations.

Boron (B), as lithium, is highly soluble in brines and both follow a similar concentration pattern. However, when it reaches saturation, it forms borates, a very fine and sticky compound that traps lithium, affecting the process yield. Handling of these borates is also a difficult operational task given its physical characteristics. Where B:Li ratio is higher, such as in many Argentinian lithium deposits, special considerations need to be taken to avoid lithium losses in borates during evaporation.

Sulfate (SO_4) may become a cost issue if it is not removed before reaching the chemical plant. Ideally, it is depleted by precipitation with calcium during the evaporation process. If it is not, it will require additional treatment in the chemical plant.

Sodium (Na) is significantly reduced by precipitation of sodium chloride (NaCl) in the evaporating ponds; generally, being the first to precipitate in the salts sequence, when raw brine is saturated. However, for lithium carbonate production, the additional sodium incorporated downstream with soda ash (Na_2CO_3) is so big that makes it an irrelevant effort to reduce sodium during evaporation. In spite of this, the final product must comply with challenging sodium limits for the battery grade market, so special efforts are given for sodium reduction in the lithium carbonate precipitation stage.

Calcium is used to precipitate sulfate in the ponds, so in sulfate rich brine deposits it is incorporated as lime (CaO) or calcium chloride ($CaCl_2$). In calcium rich brines a sulfate source (e.g. Na_2SO_4) is used for the same purpose. An unbalanced ratio between calcium and sulfate may result in an excess of calcium that could be managed in the process, within certain reasonable limits. Calcium excess, rather than sulfate excess, is easier to handle in the carbonate plant.

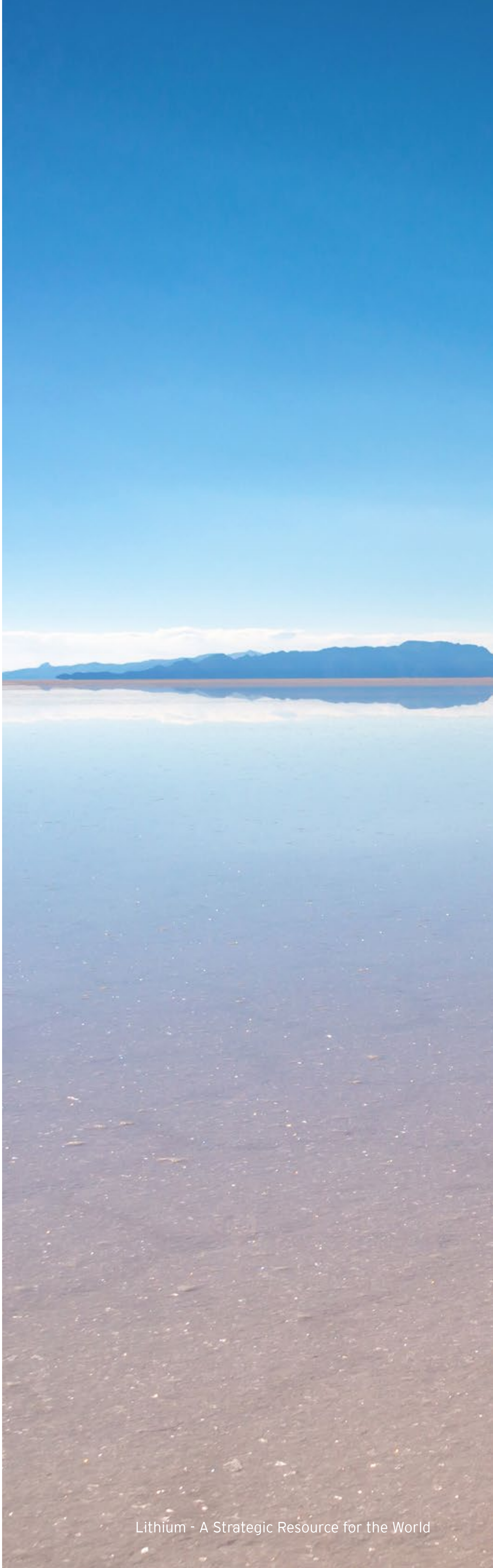
Minerals Characterization (Pegmatites and Clays)

There are several minerals containing lithium in the Earth crust, but only a few of them are found in enough abundancy and with a sufficient Li_2O% concentration to make its extraction profitable at industrial scale. One important source are pegmatites, igneous rocks formed by magma solidification, where during its ancient formation, lithium and other valuable elements were concentrated. These are the lithium aluminum silicates (spodumene and petalite), mica materials (lepidolite), and lithium aluminum phosphates (amblygonite). Within these minerals there are also other elements of interest that are obtained as by-products in lithium production processes (cesium, rubidium, fluorine, potassium, tantalum) and contribute as credit to the lithium processing cost.

Clays are lower grade lithium bearing materials compared to pegmatites and represent just around 7% of the world lithium resources.

The following chart shows the main pegmatite's lithium contents.

Mineral	Formula	Li_2O range, %
Spodumene	$LiAl(Si_2O_6)$	1,5 - 7,0
Petalite	$LiAl(Si_4O_{10})$	3,0 - 4,5
Amblygonite	$(Li, Na)Al(PO_4)(F, OH)$	8,0 - 9,0
Lepidolite	$K(Li, Al)_3(AlSi_4O_{10})(F, OH)_2$	4,0 - 5,0
Zinnwaldite	$KLiFeAl(AlSi_3)O_{10}(F, OH)_2$	2,0 - 5,0



Lithium Triangle

Brine deposits are the most abundant in the world, and their largest reserve (14.3 million tons, nearly 65% of the world's total) is concentrated in what is known as the "Lithium Triangle." This triangle encompasses the northeastern region of Chile (concentrated in the Salar de Atacama), the northwestern region of Argentina (concentrated in the Salar de Olaroz and Hombre Muerto), and the southern region of Bolivia (concentrated in the Salar de Uyuni).

For this reason, countries such as China, the United States and Korea, who are pioneers in the energy transition and renewable sources, have invested here.

Throughout the first two decades of the 21st century, China emerged as a significant trade partner for all three countries and a major lender of development funds through its state-owned development banks. In fact, China loaned $17.1 billion to Argentina and $3.4 billion to Bolivia between 2005 and 2020 (Scott B. MacDonald).

The following chart shows the concentration of some of the main lithium resources in the lithium triangle, as well as potassium and the magnesium to lithium ratio. The latter, plus the evaporation rate, are important parameters to ascertain if the conventional processing approach is adequate for such resource to be exploited. Besides this information, the type of brine chemistry (not shown in this chart), whether the resource is a sulfate brine or calcium brine, and boron content, are also important for processing decisions.

	Salt flat	Country	Li (ppm)	K (ppm)	Mg/Li	Evaporation (mm/a)	Surface (km2)	Height (masl)
1	**Atacama**	**Chile**	**1,500**	**18,500**	**6.4**	**3,700**	**3,000**	**2,300**
2	Pastos Grandes	Argentina	1,033	7,766	2.2	1,500	100	4,200
3	La Isla	Chile	860	3,170	5.1	1,000	152	3,950
4	Maricunga	Chile	800	7,480	6.6	1,200	145	3,760
5	Salinas Grandes	Argentina	795	9,547	2.7	2,600	212	3,450
6	**Olaroz**	**Argentina**	**690**	**5,730**	**2.4**	**2,600**	**120**	**3,900**
7	**Hombre Muerto**	**Argentina**	**690**	**6,100**	**1.4**	**2,775**	**600**	**4,300**
8	**Zhabuye**	**China**	**680**	**N/A**	**0.001**	**2,300**	**243**	**4,420**
9	Hombre Muerto (Salar de Vida project)	Argentina	660	7,370	2.2	N/A	N/A	4,025
10	Diablillos	Argentina	556	6,206	3.7	N/A	40	3,760
11	Pedernales	Chile	400	4,200	8.7	1,200	335	3,370
12	Dianxiongcuo	China	400	N/A	0.2	2,300	56	4,475
13	Cauchari	Argentina	380	3,700	2.8	2,600	350	3,950
14	Uyuni	Bolivia	350	7,200	19.0	1,500	12,000	3,650
15	Rincón	Argentina	330	6,200	8.5	2,600	260	3,700
16	Coipasa	Bolivia	319	10,600	45.7	1,500	2,218	3,650
17	**Xitai**	**China**	**310**	**N/A**	**65.0**	**3,560**	**N/A**	**2,790**
18	**Dongtai**	**China**	**300**	**N/A**	**40-60**	**3,560**	**N/A**	**2,790**
19	**SilverPeak**	**USA**	**230**	**5,300**	**1.5**	**900**	**80**	**1,300**

Note: Operating salt flats are shown in darker grey and bold font.
Source: COCHILCO based on Garrett (2004), Gruber et al. (2011), Mohr et al. (2012), Riesacher et al. (1999), Roskill (2013), Yaksic & Tilton (2009) and mining companies' information.

From Brine

In a conventional evaporating process, where the purpose of the lithium producer is to achieve a highly concentrated brine (e.g. 6% wt Li) and with the least impurities, whether the raw brine is a calcium rich or sulfate rich type, a stoichiometrically equivalent amount of sulfate (SO_4) or calcium (Ca) ion is needed respectively, to precipitate calcium sulfate (gypsum) and get rid of both simultaneously. With a proper process control, brines treated this way will contain a negligible sulfate amount which won't require further treatment. Cations such as sodium, potassium, magnesium, will get concentrated along the evaporating process until their saturation and precipitation as chlorides (NaCl, KCl, $MgCl_2.6H_2O$), in sequential stages. In this conventional approach, lithium and boron never precipitate until concentration of these elements reach values close to 6% wt and 1% wt respectively. In spite of the remaining magnesium, calcium, and boron in a brine product (6% wt Li) obtained this way, this is suitable as raw material for lithium carbonate battery grade, without the need of complex purification stages (e.g. bicarbonate process).

A different conventional method used to treat sulfate rich brines is the "liming process", where calcium hydroxide ($Ca(OH)_2$) reacts with magnesium to precipitate magnesium hydroxide ($Mg(OH)_2$). This is very effective for magnesium depletion; however, just part of the sulfate in the brine reacts with calcium to precipitate gypsum. The resulting brine will still contain a significant amount of sulfate ion, calcium hydroxide and hence will have a high pH. Given the fine particle nature of the precipitating solids, these are not easy solids to handle during pond harvesting.

Some advantages and disadvantages of both "conventional" processes are identified as follows:

	Chlorides Process		Liming
✔	Final Li up to 6% wt, used as feed for battery grade plant	✘	Final Li normally 1% wt. Intensive purification required downstream
✔	Coarser crystals harvested from the ponds to disposal	✘	Fine solids require sizeable filtration equipment
✘	Mg prevails along the evaporation process affecting lithium yield, and remains as high as 2% wt in the final 6% Li wt brine	✔	Removes almost all the Mg present in the brine at the beginning of the evaporation process
✔	K and SO_4 are reduced not requiring further treatment	✘	K and SO_4 remain high in the brine, requiring further treatment
✘	Strong dependency on weather conditions to achieve 6% wt Li brine	✔	Less dependency on weather
✔	Commercial grade $CaCl_2$ and/or high calcium brine is required	✘	Requires high quality quick lime
✘	First pass global lithium yield (considers evaporation and chemical plant) is around 50%	✘	First pass global lithium yield affected by extensive purification steps, but slightly higher than the "chloride" process

From Minerals (Pegmatites)

Spodumene is the most used lithium mineral coming from pegmatitic deposits. The processing approach to obtain final products such as lithium carbonate and lithium hydroxide, is commonly the acid or alkali roasting methods. Occurring at high temperatures, the α-spodumene is converted to β-spodumene to allow lithium leaching. As compared to brines, high processing costs are explained by the necessary energy and material handling associated to the mining, crushing and beneficiation steps prior to chemical treatment. This results in a 6%wt Li_2O spodumene concentrate (SC6), which can be sold directly to other processing companies, or continue its treatment in the plant. In addition, the intensive usage of energy, water and reagents required to achieve the chemical conversion of the ore, at temperatures as high as 1000 °C, leaching processes of the solids and purification of the final lithium solution, also contribute to a higher operating cost.

An advantage of these processes though is the possibility to obtain not only lithium carbonate but also lithium hydroxide directly from the leached lithium sulfate solution, without the need of lithium carbonate as an intermediate product.

Cash Cost

In general, LC cash cost from brines is lower than from mineral, however there is a wide range of values as a consequence of the lithium grade of the brine, the evaporation rate at the site, and the level of impurities, and the energy cost of pumping.

At the Atacama salt flat, brines are pumped from wells that are less than 100 meters deep, while in Argentina, brines are pumped from depths in the range of about 300 to 400 meters, having an impact in energy cost and CO_2 footprint. Equipment maintenance in Atacama is lower given the mature condition of the salar and lower pumping depth (brine is hosted within a sodium chloride mass).

In addition, lithium concentration is 2 to 3 times more than any other salar requiring less evaporation area.

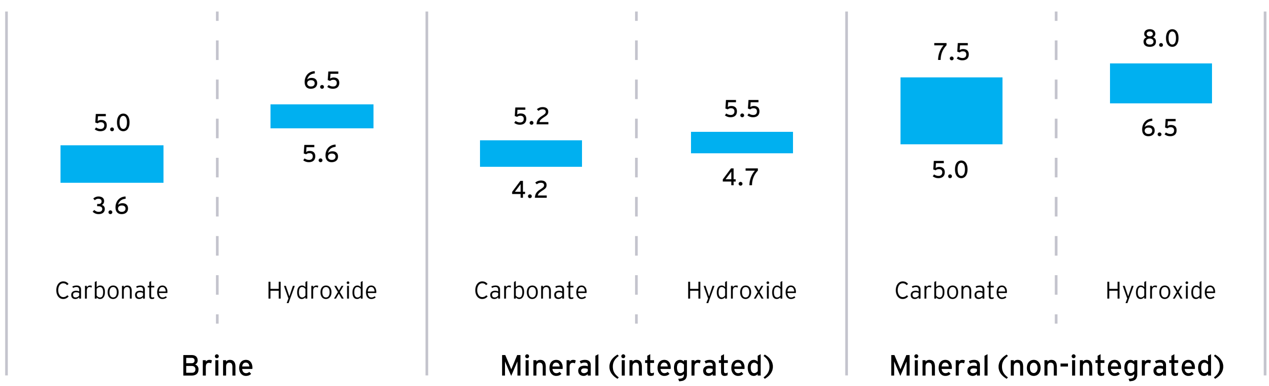
Salts harvesting and disposal is an important item in the cash cost composition, but no filtration processes are needed as in the liming process.

Another factor to consider is the location of the solar plant. In a given project, such as in Atacama, to have the solar ponds and the salts disposal areas built on the surface of the salar provides an advantage of cash cost (salts hauling; brines pumping distances) compared to facilities outside the salt flat.

Mineral processing cash costs includes mining costs (blasting, ore hauling, crushing, grinding, separation, acid roasting) prior to obtain a lithium sulfate solution suitable for feeding to a lithium hydroxide plant.

The table below includes the integrated cash cost for mineral processing, which uses the value contribution of the sub-products as credit.

Estimated normal range of operating costs (kUSD/ton), 2020



Source: Cochilco based on Roskill 2020
Note: Royalties and income taxes are not included.

Direct Lithium Extraction (DLE)

As opposed to conventional methods, where the processing scope is to remove "contaminants" present in the brine by crystallization or chemical treatment, DLE considers the isolation of the lithium element from the raw brine, leaving impurities behind. From a product quality perspective, and being battery materials the focus market, this approach should be better, since no external agents are required for chemical treatment; processing infrastructure should be simpler as no huge evaporating areas are required; process performance is independent of environmental and weather conditions, plus DLE methods work well for lower grade brines, where conventional methods are economically restricted.

In spite of such process attractiveness, there are important challenges to consider with DLE, which have made its implementation difficult at industrial scale.

Li Selectivity. Capability to extract lithium, but not other contaminants such as Mg, Ca or Na.

First Pass Yield. To extract a high amount of lithium from the feed brine in the first pass, avoiding reprocessing or recirculation.

Chemical Stability / Life Cycle. The materials used for Li extraction (adsorbents or extractants) need to keep their performance after an important number of cycles, to avoid extensive changeover of extractant materials.

Fresh Water Usage. The use of high-quality water is used in significant amounts to regenerate the extractants.

Energy consumption. Energy used for brine concentration is another consideration for this type of process.

Extractant Materials Disposal. One concern is the volume to dispose, and the other one is the weathering exposure.

Foreign chemicals incorporated to the process. Determine if the extractant to be used is compatible with the final product.

Evaporation Area Requirements. DLE is not exempt of brine concentrating needs, requiring evaporation area or enclosed heating steps.

Extractants Costs, may significantly impact in the project operating cost.

Processing Methods

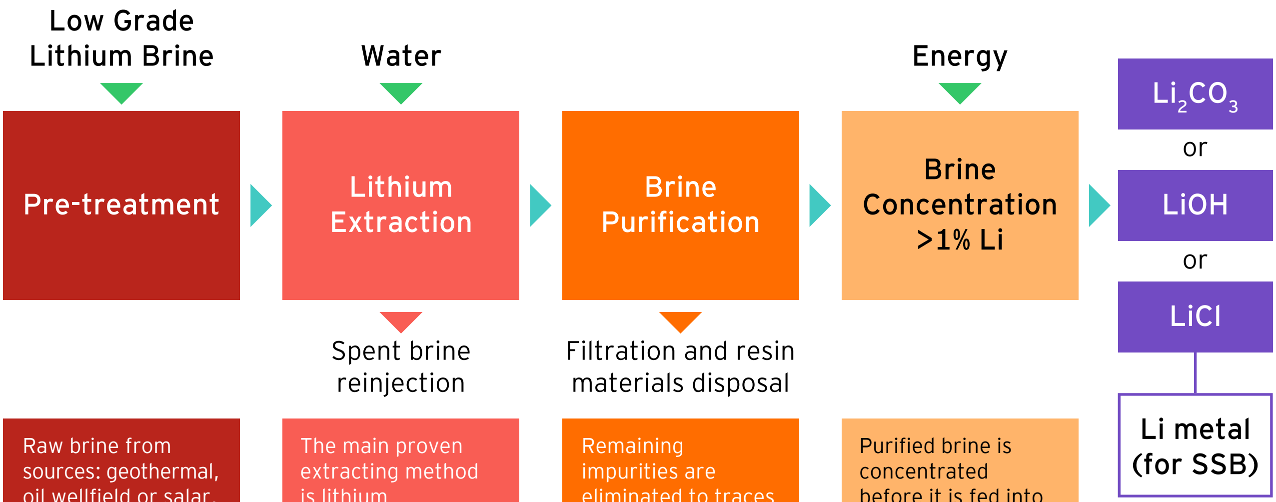
Many different extraction methods have been studied.

Adsorption is the most advanced and proven at pilot scale, including one industrial facility by Livent, in Argentina, being in operation for more than 20 years. Aluminum hydroxide and manganese oxide are the adsorption materials commonly used. However, this type of plants may not be easy to operate. Adjustment in brine concentration and temperature prior to the adsorption columns are required, with the associated consequences in energy consumption, equipment and materials. Use of desorption reagents (HCl) and important amounts of water for lithium desorption are other cost and environmental aspects. A description of the process can be seen in the graph on the next page.

Solvent extraction is another DLE method under development, however, it has yet to be implemented in an operational industrial plant. The continuous operation concept of solvent extraction is very interesting, if it proves to be effective for lithium extraction. Different organic compounds have been studied but poor selectivity is an important challenge. In other words, there is no benefit if lithium and magnesium or calcium are extracted from the brines at the same time.

Other complex compounds have been investigated looking for their capability of extracting lithium from brines. Crown ethers and ionic liquids are part of this. Unfortunately, the above-mentioned challenges and the complexity of these chemicals' synthesis, haven't been solved at the point of making these compounds usable at industrial scale.

Diagram of adsorption process



Pre-treatment: Raw brine from sources: geothermal, oil wellfield or salar, is pretreated to remove part of the impurities and to adapt the brine prior to the "extraction" step, in order to enhance the extracting performance. Chemical precipitation, membrane filtration, and pH adjustment may be used.

Lithium Extraction: The main proven extracting method is lithium adsorption, which is carried out in a set of columns filled with a solid adsorption element that traps lithium in its surface and lets all the other elements present in the brine to pass through. Afterwards, water is used to elute and recover the adsorbed lithium.

Brine Purification: Remaining impurities are eliminated to traces levels by means of a sequence of filtration steps (nanofiltration, reverse osmosis) and specific ion exchange resins. Resins and filtration media lifespan will require exchange of these materials on a periodic basis.

Brine Concentration: Purified brine is concentrated before it is fed into the chemical plant. DLE developments consider enclosed evaporation equipment for water recovery and reduce brine contamination risks.

Source: EY Centre of Excellence Mining & Metals Chile.

Battery Grade Lithium Carbonate

Historically, lithium carbonate chemical and physical specifications have evolved to meet the requirements of the final users.

In the 80's the most common specification was:

TG Lithium Carbonate (Cristallized)	
Chemical	%
Li2CO3 min.	99,0
Cl max.	0,02
Na max.	0,1
Ca max.	0,04
Mg max.	0,01
SO4 max.	0,05
Fe2O3 max.	0,003
K max.	0,05
B max.	0,05
LOI max.	0,7

Physical	
Tyler Sieve	+20=1.5% +200=70% min

This specification used to meet the requirements of applications such as glass and aluminum production, ceramics, glazes and enamels, organic compounds.

With the advent of the lithium-ion batteries in the 90's the quality requirements asked for lower content of sodium, magnesium, calcium, boron, heavy metals, metallic magnetic inclusion (MMI) and particle size distribution (PSD). A typical specification of this time is shown on the next table.

BG Lithium Carbonate	
Chemical	%
Li2CO3 min.	99,5
Cl max.	0,01
Na max.	0,055
Ca max.	0,011
Mg max.	0,008
SO4 max.	0,035
Fe2O3 max.	10 ppm
K max.	10 ppm
B max.	30 ppm
LOI max.	0,6
Water	0.2
Insolubles	0.009
Magnetic impurity max.	0.0003

Physical	
	d10 ≥ 1 μm d50 ≥ 8 μm d90 ≤ 15 μm d100 ≤ 40 μm

Nowadays, the two applications driving the growth of lithium demand are electromobility and stationary electricity storage (ESS).

As electromobility progresses to satisfy customer battery requirements such as range, safety, cost, two families of batteries dominate the market today: lithium iron phosphate (LFP) and lithium manganese- nickel and cobalt (LNMC).

Which one to use for a given application is primarily defined by range and cost.

The LFP batteries require a lithium carbonate with some level of impurities. These batteries find application mostly in what is known as "city cars", where range is not a strong requirement.

When high range and energy densities are required, LNMC batteries enter the picture with applications in high end automobiles, buses and trucks.

ESG considerations

Environmental

As with any productive operation, the exploitation of lithium resources produces a certain impact on the environment, which has to be understood in its real dimension. These impacts are mainly associated with brine extraction from underground sources and their effects on the surrounding hydraulic systems (rivers and lagoons), flora, fauna and communities. Hence the importance of a correct characterization and evaluation of the salt flats in terms of their impact on wetlands, protected areas, climatic conditions, accessibility, as well as their geological, hydrogeological, geochemical and environmental characteristics.

Conventional processes do not use fresh water. They use brine that, after the evaporation process, does not return to the source. This is especially important in salt flats with slow recovery or readaptation, but not in large ones, such as Atacama, where the geographical natural conditions allow it to recover naturally by permanent contributions from the slopes that surround it, which is not the general norm.

However, The impact on a salt flat must be evaluated considering the set of actors involved, not only for the extraction of brine but also for the extraction of fresh water from the recharge sources.

On the other hand, DLE has a minimal impact on the hydraulic of the system because most of the brine is reinjected to the source, but it requires an important amount of high-quality water and energy. Reinjection in itself is a delicate issue to address, since a bad design can lower the brine concentration of the operating salar. Again, it will depend on the particular salt flat and its correct characterization.

As can be deduced, environmental considerations must be carefully analyzed and weighed since the technology or process will depend on an accurate characterization of all the variables that make each salt flat a particular ecosystem.

Social

A well formulated strategy for any lithium exploration and exploitation project must take into account a number of social considerations to ensure that the development is sustainable and responsible.

Impact on local communities: Lithium projects can have a significant impact on nearby communities, both positive and negative. It is important to assess how the project will affect people's daily lives, including access to resources, employment, and social and cultural dynamics.

Community consultation and participation: Affected communities should be consulted and have the opportunity to participate in the decision-making process. This includes adequately informing the community about the potential impacts of the project and listening to their concerns and suggestions.

Indigenous peoples' rights: If the lithium project is located in areas inhabited by indigenous peoples, it is crucial to respect their rights. These rights include their land rights, their right to free, prior and informed consultation, and their right to preserve their culture and way of life.

Employment and economic development: Lithium projects can create employment and foster economic development. However, it is important to ensure that economic benefits are not concentrated in the hands of a few and that there are opportunities for local people to benefit equitably.

Training and education: Investing in the training and education of the local workforce can help maximize the social benefits of the project, allowing local communities to develop along with the project.

Health and safety impact: Lithium extraction projects must assess and mitigate health and safety risks to workers and nearby communities, including chemical exposure and waste management.

Displacement of populations: If the project requires the displacement of people, it is critical to ensure that this is done fairly, and that adequate housing and compensation is provided to those affected.

Infrastructure and services: Lithium projects often require improvements to local infrastructure, such as roads and utilities. It is important that these improvements also benefit local communities and not just the project.

Transparency and accountability: Maintaining a high level of transparency in all phases of the project and ensuring that accountability mechanisms are in place can help build trust and avoid conflict.

Long-term sustainability: Projects should consider their legacy and ensure that, once lithium extraction is complete, local communities are not left with unresolved environmental or social issues.

Governance

Following the global trend, projects must apply a clear management business ethic. Governance in the evaluation of lithium projects is a complex process that requires a balanced and multifaceted approach to address technical, social and environmental challenges. Implementing sound governance practices can help ensure that lithium extraction and production contribute positively to sustainable development and the global energy transition.

Aspects to consider include:

Legal and Regulatory Compliance: Lithium projects must comply with all applicable local, national, and international laws and regulations. This includes environmental, mining, occupational health and safety, and international trade regulations.

Transparency and Disclosure of Information: Lithium projects must operate with a high degree of transparency. This includes disclosure of information on environmental and social impacts, governance practices, and financial results.

Risk Management: Identifying, assessing and managing the risks associated with the lithium project is essential. This includes financial, environmental, social and political risks.

Responsible Supply Chain: As lithium is a key component in electric vehicle batteries and electronic devices, companies must ensure that their supply chains are responsible and sustainable.

Circular Economy: Promoting a circular economy in which battery materials can be recycled and reused can help reduce demand for lithium extraction and mitigate environmental impacts.

Stakeholder Engagement: The active and continuous involvement of all stakeholders, including investors, local communities, governments and NGOs, is critical to the long-term success of the project.

Innovation and Technology: Investing in technology and innovation can improve the efficiency of lithium extraction and processing, reduce environmental impacts and improve the competitiveness of the project.

Long-Term Planning and Adaptability: Lithium projects should be designed with a long-term vision, taking into account the volatility of lithium prices and the evolution of battery technologies.

Conclusions

The key aspects for making investment decisions in lithium projects can be summarized as follows:

1. **Weather Conditions.** For conventional methods, this is an important aspect to consider; evaporation rate, rainfall, humidity, wind, ambient temperature, among others..

2. **Brine Quality.** For lithium concentration in the range of (*) 450 mg/l to 500 mg/l and higher, the conventional method is applicable. For lower concentrations, a DLE approach is required. In addition to lithium, other elements in the brine must be considered when applying the conventional method, such as magnesium, sulfate, boron, as they can significantly impact costs.

3. **Resource Size.** Flat area for evaporation ponds, and enough area for the well field to feed brine to the system. In a range of +1,000 ha, can sustain a 20,000 tpa LCE for 20 years (*).

4. **ESG.** Establishing clear rules for lithium extraction and reducing bureaucracy in permitting processes are positive to enhance investment and business development. Other aspects to be examined by the investor are local taxes application, royalties, and operation contract conditions.

5. **Process Design.** Since the processing method has to be adapted to the project site conditions and brine quality, and given the development of new technologies (DLE), an experienced technical team should be considered from the beginning, to avoid time and money wastes. Experience in plant floor is scarce and valuable.

6. **Project Neighborhood.** Given the liquid nature of the resource, the neighborhood around a salt flat will face some challenges associated to brine extraction interferences and the accumulated impact of all the operations on the environment.

(*) As a manner of an example, some sound figures are used based on experience in different projects.

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