Lithium-rich brines in the Central Andean salars of Argentina, Bolivia, and Chile

José Cabello

Mineralium CG

jcabellolechuga@gmail.com

Abstract

The Central Andes of South America are characterized by a succession of ~N-S trending ranges and closed basins occupied by numerous 'saline lakes', 'salt crusts', and 'salars'. The term 'salar' describes a continental saline deposit composed mainly of a salt crust, brine with dissolved elements of potential economic interest, and a clastic fraction of sedimentary and/or volcanic origin, formed by the evaporation of groundwater in hydrographically closed arid basins. The discovery of lithium-rich brines in the Salar de Atacama (northern Chile) in 1969 initiated the identification of one of the world's major lithium-rich brine regions. Today, the Central Andes account for a significant portion of the world's lithium production; for example, in 2025, Chile and Argentina produced 27% of the estimated world's total of 290,000 tons of lithium. The region became a major producer due to the large size of its deposits and the high quality of its lithium-rich brines. In addition to lithium, the brines contain potassium, boron, and magnesium. Out of the 130 salars known in the Central Andes, this contribution focuses on 43 evaluated deposits with lithium-rich brines reported to date. Reports, evaluations, and exploration surveys provide an updated perspective on the state of knowledge regarding lithium-rich brines in the Central Andes. Recent developments are promising: the identified lithium reserves and resources, together with favorable exploration prospects, position this region as a significant contributor to the global lithium industry.

Keywords: Andes, Central Andes, Salar, Lithium, Brine

Salmueras ricas en litio en los salares de los Andes Centrales de Argentina, Bolivia y Chile. Los Andes Centrales de Sudamérica se caracterizan por una sucesión de cadenas cordilleranas de orientación aproximada norte-sur, con cuencas cerradas ocupadas por numerosos lagos salinos, costras salinas y salares. El término salar describe un depósito salino continental compuesto principalmente por una costra de sal, una salmuera con elementos disueltos de potencial interés económico, y una fracción clástica de origen sedimentario y/o volcánico, formado por la evaporación de agua subterránea en cuencas áridas hidrográficamente cerradas. El descubrimiento de salmueras ricas en litio en el Salar de Atacama (norte de Chile) en 1969 inició la identificación de una de las mayores regiones continentales del mundo con salmueras ricas en litio. Actualmente, los Andes Centrales aportan una porción significativa de la producción mundial de litio; por ejemplo, en 2025, Chile y Argentina produjeron un 27% del total mundial que alcanzó las 290.000 toneladas de litio. La región destaca a nivel mundial gracias al gran tamaño de sus depósitos y a la alta calidad de sus salmueras ricas en litio. Además de litio, estas salmueras contienen potasio, boro y magnesio. De los 130 salares conocidos en los Andes Centrales, este estudio se centra en 43 depósitos evaluados por su contenido de litio en salmueras. Informes, evaluaciones y trabajos de exploración ofrecen una perspectiva actualizada acerca del estado del conocimiento de las salmueras ricas en litio en los Andes Centrales. Los desarrollos recientes son promisorios: la cantidad identificada de reservas y recursos de litio, en conjunto con varios prospectos favorables de exploración, sitúa a la región como un contribuidor significativo para la industria global del litio.

Palabras clave: Andes, Andes Centrales, Salar, Litio, Salmuera

Introduction

Critical minerals are essential to achieve the green energy transition. Lithium, for example, an element of growing interest in modern technologies, is a key metal for electromobility and energy storage from renewable sources (Lusty et al., 2021; European Commission, 2023; U.S. Geological Survey, 2025). Although lithium is widely distributed on Earth, it does not occur in elemental form because of its high reactivity; instead, it is present in a variety of forms, including lithium carbonate (Li_2CO_3), lithium oxide (Li_2O), and lithium hydroxide (LiOH). Lithium (and its compounds) enable clean energy through rechargeable batteries for electronics, electric vehicles, and grid storage, uses that account for ~80% of the global demand (Tankou and Hall, 2026). In addition, due to its natural properties, lithium improves productivity and energy savings in glassmaking processes, and its use in glass products increases their durability, corrosion resistance, and thermal endurance. Lithium and Li-containing compounds are critical to lightweight structural alloys used in the aircraft industry (Wanhill, 2014).

Over the past decade, lithium has gained considerable attention as a critical mineral resource (Gardiner et al., 2024). In 2024, the demand solidified lithium's position as the third most explored commodity, maintaining this ranking for a second consecutive year (S&P Global, 2024). The development of low-CO_2 technologies is driving increased lithium demand, with net-zero emissions requiring greater reliance on both new and recycled sources of lithium for batteries. The use of electric vehicles will continue to rise as countries implement bans on petrol and diesel vehicles to meet emission targets. The UK, for example, will ban the sale of new petrol and diesel vehicles from 2030 onwards, and a similar ban will come into force in 2035 across the European Union. This extensive and sustained use of lithium in technological applications has therefore steadily increased its demand and will likely continue to do so. In addition, two mineral commodities important to the manufacture of lithium-ion batteries, cobalt and lithium itself, are expected to have large capacity growth in the next few years, and in anticipation of rising demand for lithium-ion batteries, mining companies have started investing in the expansion of lithium production (U.S. Geological Survey, 2025).

The global lithium distribution is highly heterogeneous and controlled by geological settings, with pegmatites, brines from saline deposits, and sedimentary rock formations as the best-known deposit examples (Kesler et al., 2012; Balaram et al., 2024; Putzolu et al., 2025). Most of the world's lithium brine resources are located in the semi-arid highlands of South America and in dry areas of the western United States and western China, whereas the lithium hard rock resources are mainly located in Australia, China, Zimbabwe, Portugal, Brazil, Canada, and Russia (Balaram et al., 2024). In addition to lithium, mineral-rich brines also contain potassium, boron, and magnesium.

More than 70% of the world's lithium deposits occur in Argentina, Chile, and Bolivia (Kaya, 2022), with the first two countries accounting for ~37% of the world's reserves (U.S. Geological Survey, 2026). Of the current global lithium supply, a significant portion (27%), comes from salars (large basins of internal drainage) in Argentina and Chile. While these salars are an important source of lithium, they occur in arid environments and support complex and valuable ecosystems. Lithium extraction thus presents significant challenges, requiring extensive resources to fully understand their complexities (Idoine *et al*., 2024). Additionally, the extraction process raises significant social, environmental, and governance concerns, making sustainable management and responsible production a key issue for the future of lithium production.

Although hard-rock deposits dominate current global lithium production, lithium-rich brines remain the second source of lithium for global markets. In comparison with pegmatites and sedimentary deposits, lithium-rich brines are cheaper to extract and contain more reserves. In salar-type deposits, the saline brines form in continental closed basins associated with leached volcanic rocks, where high evaporation rates contribute to concentrating lithium (Munk et al., 2016, 2025). These brines are waters that have leached surrounding volcanic rocks and have their lithium content greatly enhanced through evaporation. Brine, in fact, contains about 200 times more soluble solid substances than drinking water and ~70 times more than water that can hardly be used for agriculture.

Salars are unique among mineral deposits because valuable elements are found in a mobile environment (Hains, 2012). These characteristics create specific challenges for lithium exploration and sampling of brine deposits. Lithium-rich brine processing requires freshwater: mining operations have a choice of a variety of traditional evaporation ponds and direct lithium extraction (DLE) mining technologies (Corkran et al., 2022; Halkes et al., 2024). These technologies involve a trade-off between net brine withdrawal and freshwater consumption: some withdraw more brine but use less freshwater, while others withdraw less brine but use more freshwater. Among other interests, lithium has also attracted global attention because of its association with extensive water use, particularly in arid regions (e.g., Evans, 2014), so the need for sustainable lithium extraction is urgent as global demand increases alongside the transition to electric mobility and renewable energy storage (Cabello and Tulcanaza, 2023; Kirshen et al., 2025). In addition, some mining companies may be expanding production from halite brines to transitional brines, creating a stronger demand for freshwater resources. DLE efforts will, however, continue to progress (International Lithium Association, 2024). Lithium-rich brine project developers are currently investing in DLE technologies alongside traditional evaporation-based extraction, which promise to reduce processing time and unlock new supplies at a better cost structure (e.g., Eramet, 2024).

By 2029, global lithium demand is expected to exceed supply, potentially leading to a critical shortage that could destabilize markets and impede the progress of green energy development (Halkes et al., 2024). Forecast deficits are significantly higher than the current surpluses, and by 2034 the lithium market is expected to be over 500,000 tons (Gardiner et al, 2024).

This review provides an update on the status of lithium-rich brine resources and reserves in the Central Andes of South America to identify and highlight recent development results. Basic geological information will also be included to facilitate a better understanding of these deposits. This study is based on a thorough revision of published material from a diverse number of sources and data obtained from a wide range of companies and institutions.

Geographical and geological setting

The Central Andean salars conceal complex hydrological systems, fossil or active, associated with rainwater, groundwater, surface water, and solutions that transport and concentrate lithium released from surrounding volcanic rocks (Corenthal et al., 2016). These salars occupy the lowlands of numerous topographically and hydrologically closed basins at elevations above 2,300 m a.s.l. and vary greatly in size (Fig. 1). At least 130 salars, saline lakes, and lagoons have been recognized, ranging in area from a few km^2 to about 9,000 km^2 (Ericksen and Salas, 1989; Fig. 1). The salars' environments typically exhibit low rainfall and high evaporation rates (e.g., Munk et al., 2018).

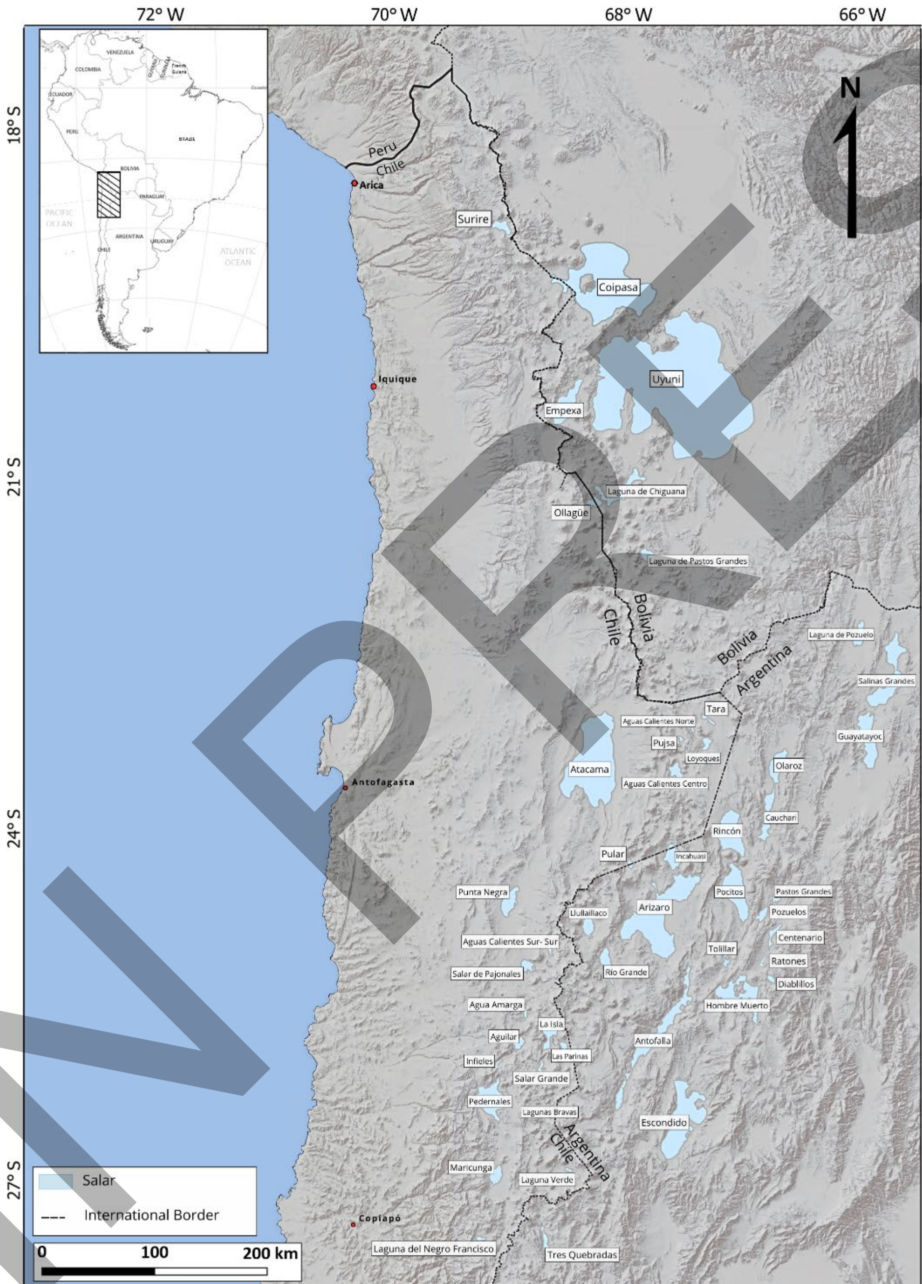

Fig. 1. Regional map of the Central Andean lithium-rich brine salars.

The conceptual model for salar basins and associated brine aquifers is based on studies in Chile, Argentina, and Bolivia. Salar basin locations and basin depths are typically structurally controlled but may also be influenced by volcanism that sometimes alter drainage patterns. Basin-fill deposits within salar basins usually contain bedded evaporites in the deeper, low-energy portion of the basin, together with thin to thickly bedded low-permeability lacustrine clays. Coarser-grained, higher-permeability deposits associated with active alluvial fans can typically be observed along the edges of the salar. Similar alluvial fan deposits, associated with ancient drainages, may occur buried within the basin-fill deposits.

Basins with salars are characterized by interior drainage, with no significant groundwater discharge as undercurrent. Most of the discharge that occurs within the basin is via evaporation and transpiration. Any surface water that flows into the basin either evaporates or enters the groundwater system and is eventually evaporated later. Water levels tend to be relatively shallow in the flat part of the salar. If lithium occurs in the surface water, evaporation concentrates the lithium and other constituents, resulting in a lithium-enriched brine.

The salars that contain the world's largest lithium reserves in brines are geographically confined to the plateau that encompasses southwestern Bolivia, northern Chile, and northwestern Argentina, approximately between 18° and 27° S (Fig. 1). This plateau forms an extensive morphostructure 1,800 km long and 350-400 km wide with an average elevation of 3,700 m a.s.l. and is known as Altiplano in Chile and Bolivia and Puna in Argentina (Isacks, 1988; Allmendinger et al., 1997). From a geomorphological perspective, the plateau is characterized by numerous endorheic basins, many of which have a marked tectonic control and are bordered by ~N-S oriented mountain ranges (Vandervoort et al., 1995). Salars with lithium-rich brines also extend in a ~N-S direction through an area of about 120,000 km^2 (Cabello, 2017; Fig. 1). In Chile, important salars (Atacama, Pedernales, Maricunga) are located west of the Altiplano, at lower elevations, and at relatively more arid conditions compared to salars located east (Vila, 1975; Chong, 1988).

Most of the high-elevation mountains that border the basins hosting salars correspond to volcanoes. Lithium mobility is driven primarily by chemical weathering of these volcanic rocks, with their subsequent transport and concentration in enriched brines in a process that can take ~100 kyr (Corenthal et al., 2016; Meixner et al., 2020; Munk et al., 2025). Most of the lithium- and salt-rich deposits formed during the Holocene by the evaporation-desiccation of lakes that reached their highest levels during the Last Glacial Maximum (Strecker et al., 2007; Placzek et al., 2009). The accumulation of lithium-rich brines has therefore been a consequence of this long-term interaction between volcanism, tectonism, and climate in a high-altitude environment (Munk et al., 2016; Meixner et al., 2020; López-Steinmetz and Salvi, 2021; Tulcanaza, 2025).

Production

Lithium production from brines in the Central Andes began in 1984, in the Salar de Atacama (Chile). In 1994, a second project, the Salar del Hombre Muerto in Argentina, went into production. The final commercial lithium products coming out of the processing plants at the salars are lithium carbonate and lithium chloride.

The Salar de Atacama deposits were discovered in 1969 (Moraga et al., 1974), and now this project is the world's largest commercially viable lithium brine (Cabello, 2022). A drier environment compared with the more humid regions of Bolivia and Argentina, as well as fewer brine impurities and better export routes, have helped it to outpace its neighbors.

The total production (1984-2025) from two operations in the Salar de Atacama amounts to 496,000 tons of lithium. In Argentina, two operations in the Hombre Muerto and Olaroz salars have produced approximately 129,000 tons between 1994 and 2025. Collectively, these contributions total 625,000 tons of lithium and are equivalent to ~3,327,000 tons of lithium carbonate.

During 2025, Argentina's estimated lithium production was 23,000 tons, and Chile's estimated production was 56,000 tons, with both countries accounting for ~27% of the world's total (U.S. Geological Survey, 2026). Although lithium mining companies in Chile increased the nation's output from 41,400 tons in 2023 to 56,000 tons in 2025, Chile currently ranks as the world's third-largest producer after Australia and China.

Argentina nearly doubled its lithium chemical production in 2025 compared to 2024 after the opening of the Cauchari-Olaroz and Centenario-Ratones projects. Two years before, in 2023, the Eramet Lithium Company inaugurated its DLE plant to produce battery-grade lithium carbonate on an industrial scale (Eramet, 2023), and by the end of 2024, the Centenario DLE plant production was first delivered.

Bolivia does not appear to have commercial lithium production from brine, with its current activity limited to pilot-plant production. However, the country recently signed agreements to initiate industrial production. In fact, an initial investment of US$1 billion was announced by a joint venture between Bolivia's state-owned company, Yacimientos de Litio Bolivianos (YLB), and China's lithium battery leader CATL (through its subsidiary CBC), to build two factories that are expected to produce 50,000 tons of lithium carbonate per year.

Prices

Lithium carbonate prices have been volatile over the past decade because of a rising demand and sudden surpluses from new lithium developments. For fixed-price contracts, the annual average U.S. lithium carbonate price was US$37,000 per ton in 2022, almost three times as high as in 2021. Some years before, a surge in lithium demand for use in electronics, electric vehicles, and renewable energy storage led to an increase in spot carbonate prices to US$24,000 per ton in 2017. After a surplus of new lithium projects reached commercial production in 2017 and 2018, spot prices crashed to a low of US$12,000 per ton by the end of 2018. Prices have fluctuated due to global market conditions; for instance, recent data from July 2025 indicated prices of approximately US$8,500-9,600 per ton, slightly higher when compared to earlier lows but still influenced by oversupply and weak demand.

International groups specializing in electric vehicles and battery supply chain research reported in 2025 that global lithium-ion battery demand increased by 29%, mainly driven by rising demand across Battery Energy Storage Systems (BESS). Likewise, according to recent studies (Benchmark, 2026), demand for lithium chemicals and feedstocks is expected to increase by 14% in 2026 compared with 2025, with supply expected to increase by nearly 20% over the same period.

Lithium prices are forecast to recover and potentially enter a new bull market in 2026 (ReportLinker, 2025), with estimates generally ranging from US$11,000 to US$28,000 per ton.

Reserves

According to data published in 2026, global lithium reserves in 2025 were estimated at 37 million tons (U.S. Geological Survey, 2026). In this same publication, Chile's reserves were estimated at 9.2 million tons, corresponding to 24.9% of the world total. Argentina was reported to have 4.4 million tons (11.9% of the world total). The known reserves in the Central Andes thus amount to 13.6 million tons of lithium, equivalent to 36.8% of the global reserves.

During the bibliographic research carried out during this review study, detailed reserves from nine salars in Argentina and two salars in Chile were investigated (Table 1). Results are: 4.166 million tons for Argentina and 12.1 million tons for Chile, representing a total of 16.266 million tons of lithium for the two countries.

Table 1. Central Andean lithium reserves in brines (in situ).

Salar	Altitude m a.s.l.	Average Li concentration (ppm)	Reserves Li (tons)	Lithium carbonate equivalent (tons)	References
ARGENTINA					
Cauchari	3,903	501	212000	1128000	Allkem Ltd. (2023a)
Cauchari-Olaroz	3,903	607	683000	3635000	Lithium Americas (2020)
Rincón	3,971	350	390000	2070000	RTZ (2024)
Arizaro	3,475	350	92000	490000	Lithium Chile Inc. (2024)
Carachi Pampa-Kachi	3,007	350	117000	624000	Lake Resources (2025)
Pastos Grandes	3,785	439	177000	943000	Millenial Lithium (2019)
Centenario-Ratones	3,882	460	209000	1112000	Secretaría de Minería de Argentina (2024)
Hombre Muerto (Fénix)	3,801	460	731000	3891000	Livent (2023)
Hombre Muerto (West)	3,801	460	246000	806000	Galan Lithium Ltd. (2023)
Hombre Muerto (Sal de Vida)	3,801	460	467000	2486000	Allkem Ltd. (2023b)
Hombre Muerto (Sal de Oro)	3,801	460	528000	2810000	Secretaría de Minería de Argentina (2024)
Tres Quebradas	4,091	786	314000	1671000	Neo Lithium Corp. (2021)
TOTAL ARGENTINA			**4166000**	**21666000**	
CHILE					
Atacama (Albemarle)	2,300	1,500	1290000	6863000	Osses (2018)
Atacama (SQM)	2,300	1,500	8550000	45486000	Fock (2019); SQM (2020)
Atacama (Safety zone)	2,300	1,500	2170000	11544000	Osses (2018)
Maricunga	3,760	1,117	90000	479000	Worley Parsons (2022)
TOTAL CHILE			**12100000**	**64372000**	
TOTAL CENTRAL ANDES			**16266000**	**86038000**	

Resources

The U.S. Geological Survey (2026) Measured and Indicated (M+I) resource information for the Central Andes totals 64 million tons of lithium. That report allocated 28 million tons to Argentina, 23 million tons to Bolivia, and 13 million tons to Chile; however, it does not provide information on the sources. According to these statistics, the Central Andes represents nearly 43% of the worldwide lithium resources, which total 150 million tons. Out of these three countries, Bolivia possesses the world's second-largest identified lithium resources and is home to the Salar de Uyuni, which is the world's single-largest lithium deposit (U.S. Geological Survey, 2026). Although the deposit holds resources of 20 million tons (Yacimientos de Litio Bolivianos, 2018), it remains unexploited on an industrial scale.

The economic value of lithium-rich brine in the Central Andes is reflected in several available studies. For this review, detailed resource information was obtained for 43 salars, including 19 in Argentina, three in Bolivia, and 21 in Chile (Table 2). Resources are segregated into approximately 23.5 million tons in Argentina, 23 million tons in Bolivia, and 13.4 million tons in Chile. This information includes the M+I resource only. Inferred resources have been excluded yet they represent an important subject for future exploration activities.

Table 2. Central Andean M+I lithium resources in brine.

Salar	Altitude m a.s.l.	Average Li content (ppm)	Resources M+I (tons)	Lithium carbonate equivalent (tons)	References
ARGENTINA					
Olaroz	3903	632	2890000	15380000	Allkem Ltd. (2023c)
Cauchari-Olaroz	3903	592	3730000	19853000	Lithium Americas (2020)
Cauchari	3903	519	623000	3300000	Allkem Ltd. (2023a)
Salinas Grandes	3725	326	45000	240000	Orocobre Ltd. (2012)
Rincón	3971	672	1770000	9390000	RTZ (2024)
Rincón (West)	3971	866	30000	157000	Power Minerals (2023a)
Rincón (Argosy)	3971	650	114000	606000	Argosy Minerals Ltd. (2023)
Incahuasi	3601	128	44000	235000	Power Minerals (2023b)
Pular	3579	82	17000	91000	PepinNini (2019)
Pastos Grandes	3785	467	780000	4152000	Reidel (2023)
Pastos Grandes (PPG)	3785	431	176000	939000	LSC Lithium Corp. (2019)
Pozuelos (PPG)	3663	518	315000	1678000	LSC Lithium Corp. (2019)
Arizaro	3475	297	469000	2498000	Lithium Chile Inc. (2024)
Llullaillaco-Mariana	3755	319	831000	4410000	Secretaría de Minería de Argentina (2024)
Centenario-Ratones	3882	407	986000	5249000	Eramet (2024)
Río Grande	3668	620	499000	2658000	NOA Lithium Brines Inc. (2025)
Tolillar	3625	218	681000	3626000	Alpha Lithium (2023)
Diablillos (Sal de los Ángeles)	4032	456	308000	1640000	Secretaría de Minería de Argentina (2024)
Hombre Muerto (Candelas)	3971	740	129000	685000	Johanis (2024)
Hombre Muerto (West)	3801	712	1075000	5723000	Galan Lithium Ltd. (2023)
Hombre Muerto (Virgen del Valle)	3971	736	213000	1134000	Johanis (2024)
Hombre Muerto (Fénix)	3801	921	1328000	7071000	Johanis (2024)
Hombre Muerto (Sal de Vida)	3801	795	1220000	6520000	Johanis (2024)
Hombre Muerto (Norte)	3725	376	298000	1583000	Lithium South (2024)
Hombre Muerto (Sal de Oro)	3801	258	297000	1580000	Secretaría de Minería de Argentina (2024)
Antofalla	3331	350	2218000	11800000	Johanis (2024)
Carachi Pampa-Kachi	3007	218	1371000	7300000	Lake Resources (2025)
Tres Quebradas	4091	625	1009000	5369000	Neo Lithium Corp. (2021)
TOTAL ARGENTINA			**23466000**	**124867000**	
BOLIVIA					
Coipasa	3656	460	2800000	14896000	Yacimientos de Litio Bolivianos (2024)
Uyuni	3653	450	20000000	106400000	Yacimientos de Litio Bolivianos (2018)
Pastos Largos	4330	1500	200000	1064000	Yacimientos de Litio Bolivianos (2024)
TOTAL BOLIVIA			**23000000**	**122360000**	
CHILE					
Surire	4260	400	180000	958000	Prokurika (2018)
Ollague-Kuska	3705	180	139000	741000	Wealth Minerals Ltd. (2024)
Atacama	2300	1800	8200000	43649000	SQM (2020)
Tara	4330	315	55000	293000	Osses (2023)
Aguas Calientes Norte	4280	175	8000	43000	Osses (2023)
Pujsa	4500	160	20000	106000	Osses (2023)
Quisquiro	4150	640	80000	426000	Osses (2023)
Aguas Calientes Centro	4200	166	65000	346000	Osses (2023)
Capur	3950	180	15000	80000	Osses (2023)
Punta Negra	2945	280	220000	1170000	Prokurika (2018)
Aguas Calientes 4	3665	115	11000	59000	Osses (2023)
Pajonales	3537	120	116000	615000	Carrasco and Cádiz (2020)
La Isla	3950	108	2130000	11300000	Enami (2025)
Las Parinas	3987	235	201000	1069000	Enami (2023)
Aguilar	3320	337	920000	4900000	Enami (2025)
Infieles	3520	161	32000	170000	Enami (2023)
Pedernales	3370	423	375000	1995000	Prokurika (2018)
Lagunas Bravas	4250	310	3000	14000	Hiner (2010)
Laguna Negro Francisco	4150	207	83000	440000	CleanTech (2025)
Laguna Verde	4350	178	151000	806000	CleanTech (2025)
Maricunga	3760	953	358000	1905000	Worley Parsons (2022)
TOTAL CHILE			**13362000**	**71085000**	
TOTAL CENTRAL ANDES			**59828000**	**318312000**	

Exploration

In the context of exploration activities, Argentina reports 20 advanced projects, including the Arizaro, Centenario, Incahuasi, and Río Grande salars, among others (Secretaría de Minería de Argentina, 2024). In Bolivia, as reported in local newspapers, successful exploration has been conducted in the Coipasa and Pastos Grandes salars; corresponding activities will soon follow in the Capina, Cañapa, Chiguana, and Empexa salars. In Chile, the Salares Altoandinos project of the National Mining Enterprise (Enami) was undergoing an exploration campaign in the Aguilar, La Isla, and Grande salars as part of the National Lithium Strategy, with promising results (Enami, 2025). The current data on Salar de La Isla complements the positive results released in April 2025 for the Salar de Aguilar, which showed an average total lithium concentration of 740 mg/l for this deposit, with a maximum of 984 mg/l (Enami, 2025). Advanced exploration activities have also been reported in Chile at the Laguna Verde Project (CleanTech, 2025). Recently, Codelco announced additional exploration to be completed at its Salar de Maricunga project.

Upon reviewing the list of Central Andean lithium deposits in brines with informed reserves and/or resources, it can be observed that exploration efforts have been generally successful. Future tasks could be to assess the total amount of reported inferred resources from ancillary information, or to investigate in detail some of the economically relevant salars. New efforts in regional, remote-based reconnaissance (e.g., Rossi et al., 2022) could be effective for a screening-scale recognition of new closed basins and small salars of potential economic interest.

Conclusions

Lithium is found in economic concentrations in numerous salars in the Central Andes of Argentina, Bolivia, and Chile, a zone that has become one of the most important mining regions in the world. The occurrence of lithium-rich brine deposits is a consequence of several interrelated factors, including tectonism, igneous or geothermal activity, denudation processes, arid climate conditions, and a closed hydrological system. Typically, these deposits have a nucleus formed by evaporation processes, which is where the highest lithium concentrations are found. Lithium is extracted from volcanic rocks by weathering, transported downslope, and then accumulated in the salars in a process that can take ~100 kyr.

Chilean lithium operations between 1984 and 2025 amount to 496,000 tons. In Argentina, they totaled ~129,000 tons between 1994 and 2025. These numbers imply a combined production of 625,000 tons. In 2025, Argentina's estimated lithium production was 23,000 tons, and 56,000 tons were estimated for Chile, with both countries accounting for almost 27% of the global production in that year.

Together, Argentina and Chile hold 13.6 million tons of lithium reserves, representing 36.8% of the global reserves. These amounts do not differ much after comparing official global sources (U.S. Geological Survey) to the data reported by the companies and analyzed in this review.

According to Measured and Indicated (M+I) resource information, out of the 150 million tons of worldwide identified lithium resources, Argentina holds 28 million tons, Bolivia 23 million tons, and Chile 13 million tons (using U.S. Geological Survey information). Therefore, the Central Andes holds 64 million tons of lithium, almost 43% of the world's resources. When comparing these global statistics with information reported by the companies, Argentina has 23.5 million and Chile 13.4 million (Bolivia remains the same), totaling ~60 million tons (~37.7% of the world's resources).

Lithium has been positioned as one of the world's most explored commodities. This tendency is also well represented by the activities in the Central Andes, where, according to the analysis of the identified reserves and/or resources, it can be observed that exploration efforts have been successful. All the aspects highlighted in this review explain and justify the ongoing presence of Chile, Argentina, and Bolivia as major players in the global lithium industry.

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