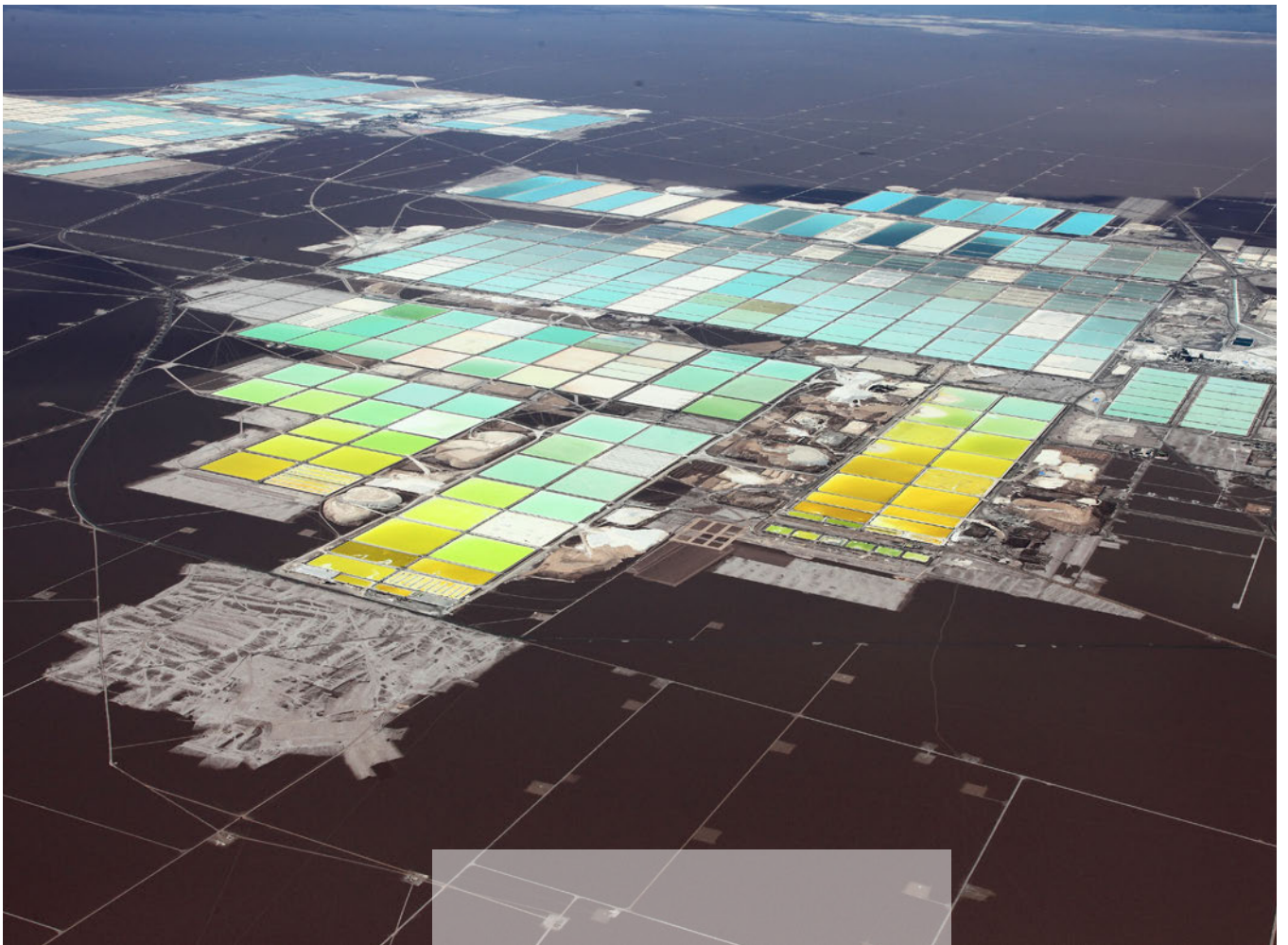


# Sustainability of lithium production in Chile



How SQM organizes the ex-  
traction of the coveted raw  
material of Electromobility  
ecologically and socially

2021

# At a glance

## Sustainable lithium production from brine

### CO<sub>2</sub>-emissions

- The carbon footprint of lithium production from brine is significantly smaller than from hard rock (spodumene). In 2018, the global production of lithium carbonate and lithium hydroxide originated equally from spodumene and brine. However, according to a life cycle analysis (LCA) of AFRY, the CO<sub>2</sub> footprint is about 70% (spodumene) to 30% (brine).
- The LCA, which is based on SQM production data from 2018 and public information, was critically assessed by Öko-Institut (Institute for Applied Ecology, Germany). A second LCA study is currently being prepared by Argonne National Labs (USA), based on the GREET® life cycle open-source modeling tool.
- The goal is to produce carbon neutral Lithium by 2030 and to be a carbon neutral company-wide by 2040.

### Natural production process

- SQM produces lithium chloride solutions from the brine in Salar de Atacama through a completely natural process.
- No chemicals are added during the entire process in Atacama.
- Solar energy is the main energy source used to concentrate and purify the brine.

### Hydrology and hydrogeology

- SQM has a team of highly qualified scientists with extensive knowledge of the special geological and hydrogeological conditions in the Salar de Atacama.
- A robust and accurate monitoring system provides valuable data since more than 20 years. The monitoring includes a hydrogeological monitoring plan with more than 225 measuring points.
- Flora and fauna are monitored by field studies, satellite images, wildlife censuses and limnological studies.
- The Company also has an Early Warning Plan that regulates brine extractions to avoid impacts on the environment. The Early Warning Plan means that, in the event of any negative deviation from the original plan, the Company must appropriately reduce its water or brine extraction levels as necessary and immediately, to ensure there is no impact on sensitive areas.
- The data from the monitoring system are publicly available for local communities, authorities and all interested stakeholders at [www.sqmsenlinea.com](http://www.sqmsenlinea.com)
- Analyses show that the sensitive components of the ecosystem have maintained their natural behaviour. The levels of the Atacama lagoons have also remained stable.
- SQM will reduce the freshwater consumption with 50% in the Salar de Atacama by 2030 and continental water with 65% company wide by 2040.

### Social responsibility

- SQM has voluntarily supported local communities for many years.
- Under SQM's agreement with the Chilean government, 1.7% of the SQM Salar's sales are paid annually to the regional government of Antofagasta and the municipalities of Antofagasta, Maria Elena and San Pedro de Atacama.
- SQM has also made a commitment to pay between US\$10 and 15 million annually to neighbouring indigenous communities.

## This publication - a contribution to the discussion

Lithium is the lightest metal on earth – and an important metal. With the invention of lithium batteries, its importance increased rapidly within a very short time. These batteries have significantly influenced the development of computers, mobile phones and many other products. But above all, the advancement of electromobility depends on the availability of powerful lithium batteries. As an electrolyte and electrode material, lithium is one of the most important components of the battery. It is widely used in the form of white salts such as lithium carbonate and lithium hydroxide monohydrate, which is also why lithium is often referred to as white gold. However, in recent years, its extraction has repeatedly been the subject of critical public debate. There is a misconception that the raw material is extracted in the same way all over the world. But this is not the case. For SQM, it is important to differentiate the ways in which lithium is extracted and the associated effects on man and nature. SQM makes its contribution to the current discussions about possible environmental effects of lithium production by showing how it extracts lithium in an ecologically and socially responsible way.

The largest known deposits in the world are located in the so-called “lithium triangle” between Chile, Bolivia and Argentina. The extraction of this strategically important global raw material is of great economic importance for Chile, and the added value from lithium production benefits all sections of Chilean society. The lithium is produced through the extraction and evaporation of a salt solution from the Salar de Atacama, which is located in the Atacama Desert in the north of Chile. In order to ensure that both the local ecosystems and the communities living there are not negatively affected by lithium mining, extensive environmental impact assessments and agreements on the protection of natural resources were required before mining and production could begin. The implementation of these agreements is continuously documented and monitored by regulatory authorities. SQM has announced its goal to ensure its lithium production abides by the high sustainability standards. In order to substantiate this claim with facts, SQM has recently completed a life cycle assessment (LCA) according to ISO standards 14040 and 14044. The reliability of the results described therein was subsequently confirmed by the German Öko-Institut.

SQM believes it can enrich the discussion by sharing and clarifying important facts and figures, some of which are still not commonly available and known. It seeks active dialogue with critics and all interested parties. You are welcome to contact SQM at

► [mediainquiries@sqm.com](mailto:mediainquiries@sqm.com)

## Contents

### 2-3

At a glance / Editorial

### 4-8

Natural space Atacama

### 9-12

Lithium production

### 13-16

Climate protection

### 17-24

Water

### 25-27

SQM as an employer

### 28-29

Social responsibility

### 30-32

About SQM / contact & dialogue  
links / imprint

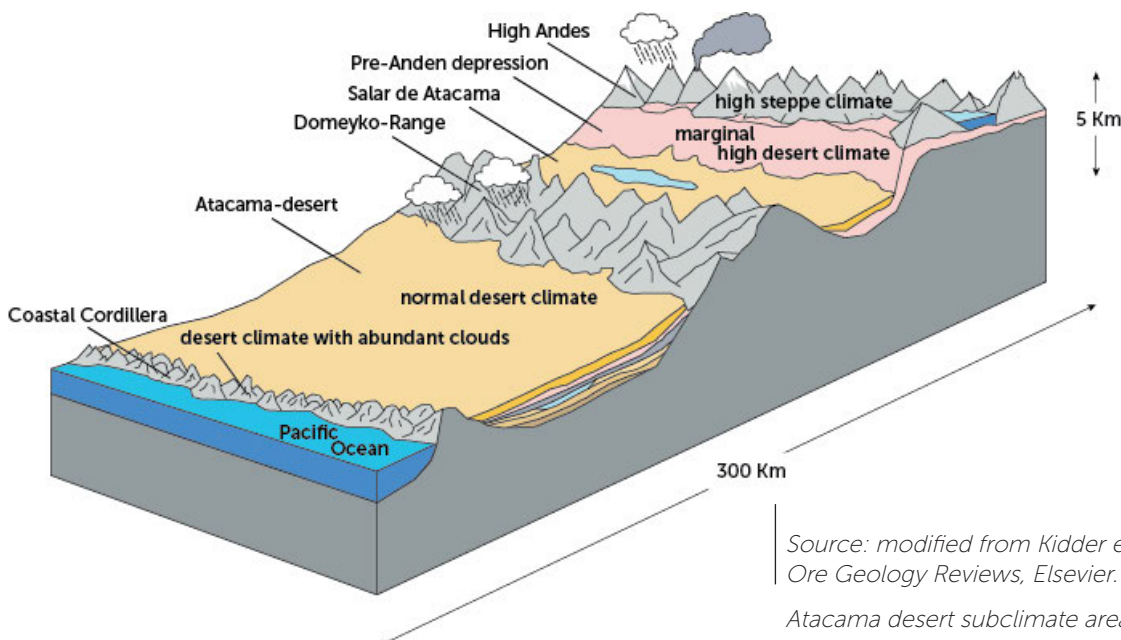
# Natural space Atacama

In the Atacama desert, a 1,600km stretch of arid land covering more than 100,000 km<sup>2</sup> located where Chile, Bolivia and Argentina meet, lies the so-called lithium triangle. Impressive and globally unique landscapes with salt flats and volcanic mountains have been created by geological forces and climatic changes that began millions of years ago. Geological studies have shown that the climate was much wetter between 11,000 and 31,000 years ago than it is today and that there were large salt lakes, which we know today as salt flats or "salares", because of the effects of evaporation along thousands of years. It is estimated that more than 60 percent of the world's lithium reserves are stored in this region, in enriched and highly concentrated brines. According to USGS (United States Geological Survey) estimates, 23 percent of the lithium produced worldwide in 2019 originated from the Salar de Atacama.

From West to East four specific subclimates can be identified in the Atacama desert<sup>1</sup>:

- Desert climate with abundant clouds, close to the pacific coastline
- Normal desert climate, with minimal rain and large temperature variations
- Marginal High Desert Climate, areas above 2,000 meters above sea level (masl) with clouds and summer rain
- High Steppe climate, areas above 3,500 masl on the flank of the Andes mountain range

<sup>1</sup> according to the Köppen climate



Source: modified from Kidder et al. (2020),  
Ore Geology Reviews, Elsevier.

Atacama desert subclimate areas



## Salar de Atacama

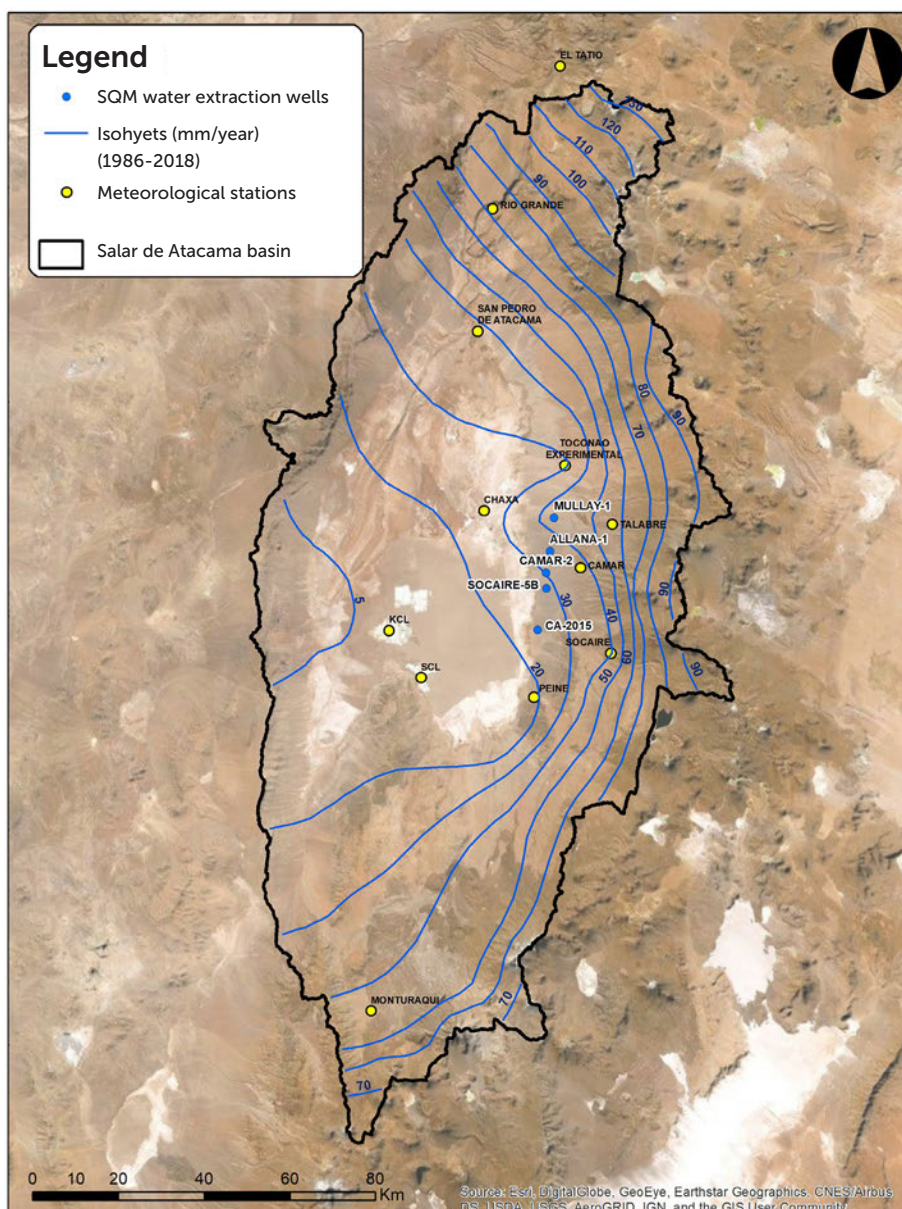
To the East of the Atacama desert in Chile, is located the Salar de Atacama, where SQM has been investing in its world-class lithium operations for more than 25 years. This salar is considered one of the largest lithium deposits in the world. With an area of around 3,000 km<sup>2</sup>, this exceptional natural habitat is the third-largest salar in the world and is located about 2,300 masl, at the foot of the Andes Mountains.

The term salar describes a salt-encrusted area that is created by the evaporation of brine and rain from hydrographically closed desert basins. The Salar de Atacama is located in a depression from which the underground groundwater and brine cannot flow off, thus forming a so-called endorheic reservoir. This salt flat is the largest active evaporite basin in the 'Región de Antofagasta' district of northern Chile. Evaporite is a chemical, sedimentary rock that precipitates after evaporation. In most salars, halite (rock salt or sodium chloride) and gypsum are the dominant minerals.



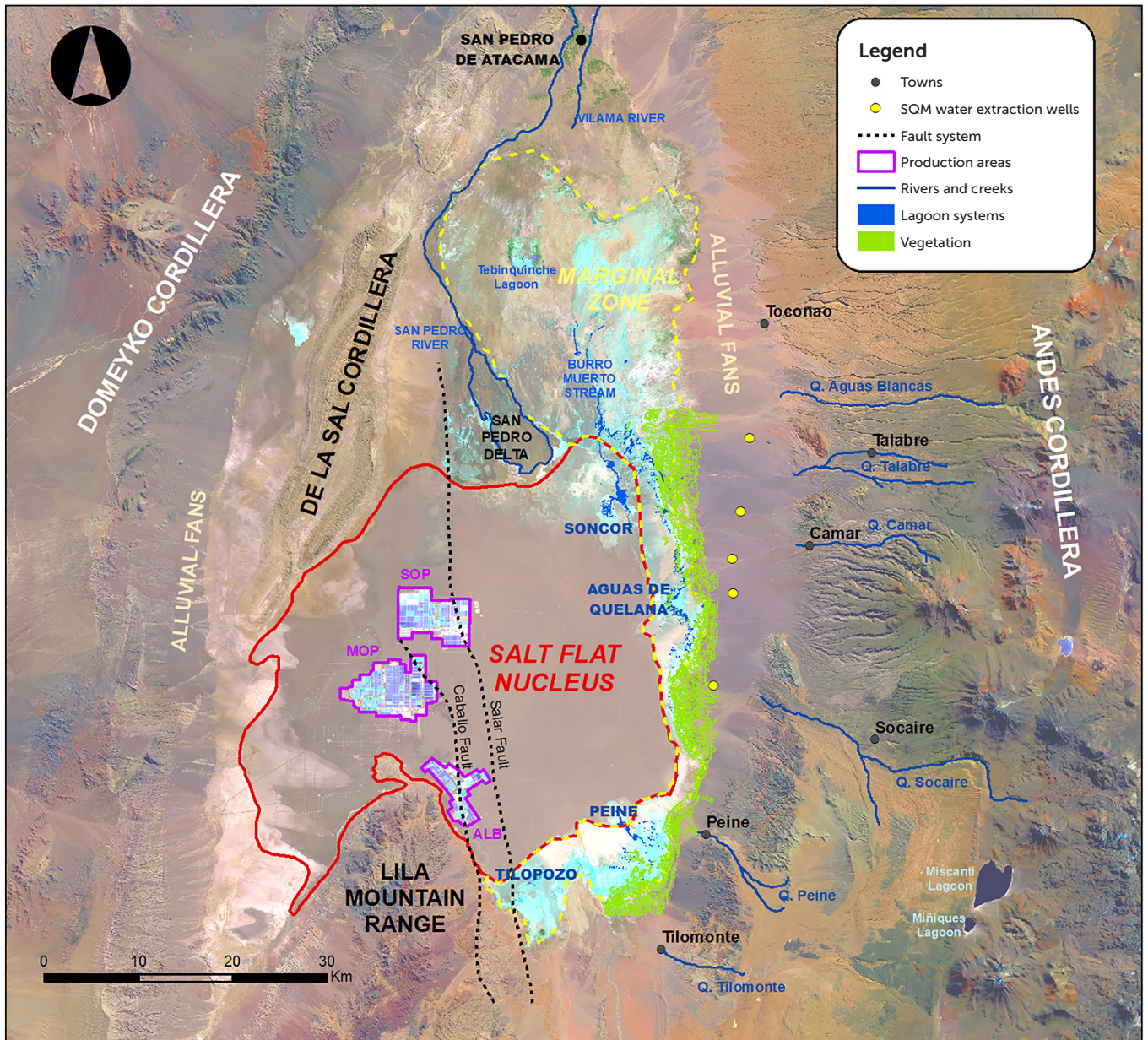
We can clearly identify the marginal high desert climate in the Salar de Atacama. In stark contrast with the majority part of the Atacama desert, which has virtually no rain throughout the year (less than 2 mm/year), in the Salar de Atacama and its surroundings, the average rainfall is in a range between 5 and 120 mm/year (see below). This extraordinary feature of the Salar de Atacama is due to its unique location, right next to the Andes mountain range (high steppe climate). This specific microclimate of the Salar de Atacama, along with the water inflows from the Andes mountain, has created the vegetation zone on the east of the Salar, where also the indigenous communities live.

Monitoring station	1986 - 2018 (mm / year)
Camar (DGA)	33.94
Chaxa (SQM)	26.00
El Tatio (DGA)	128.01
KCL (SQM)	8.44
Monturaqui (DGA)	41.75
Peine (DGA)	19.23
San Pedro de Atacama (DGA)	34.32
Socaire (DGA)	38.15
Rockwood (Albemarle)	14.65
Rio Grande (DGA)	70.90
Talabre (DGA)	58.25
Toconao Experimental (DGA)	28.87





Five sectors in the Salar de Atacama are of greater ecological importance:



SQM operates in the south west of Salar de Atacama, more than 30 kilometres away from the nearest community, Peine.

The lagoons are the habitat of several endemic and migratory species, mainly birds, including three species of flamingo: Chilean, Andean, and James.



## The difference between water and brine

Beneath the salt crust of the Salar de Atacama, there are large deposits of a salt-rich solution with about 30 percent dissolved salt content, the so-called brine. Its salt content is very high, with a total of more than 300,000 mg/l of chloride, sodium, sulphate, magnesium, calcium, lithium, potassium, and boron. It contains seven times more salt than seawater, and it is therefore obviously not suitable as drinking water for humans nor animals nor agriculture. The brine contains 200 times more dissolved solids (TDS) than drinking water and 60 times more than water that may be used for agricultural irrigation. According to the Chilean classification NCh1333, no more than 5,000 mg/l TDS are permitted for agricultural irrigation and a maximum of 1,500 mg/l TDS for drinking water according to NCh409. Seawater contains about 35,000 mg/l TDS and the brine of the Atacama contains more than 300,000 mg/l TDS. Due to this very high mineral content, brine in Chile is considered a mining resource. Brine is not water and is not comparable to water in the conventional sense.





# Lithium production

## Brine based production

For about 25 years, SQM has been extracting the coveted lightest metallic element lithium, in addition to potassium, from the brine of the Salar de Atacama. Not only does SQM have the necessary permits for this, but it also works continuously on improving its processes. To this end, SQM uses state-of-the-art technologies. SQM measures and reduces emissions, optimises water consumption and protects the sensitive natural environment.

All processes are regulated and monitored by more than 15 different governmental agencies, including environmental, health and safety authorities. They all meet the highest international standards. SQM was one of the first companies in Chile to carry out an environmental impact assessment long before it was required. Today it has 21 different environmental permits (Resolución de Calificación Ambiental - RCA).

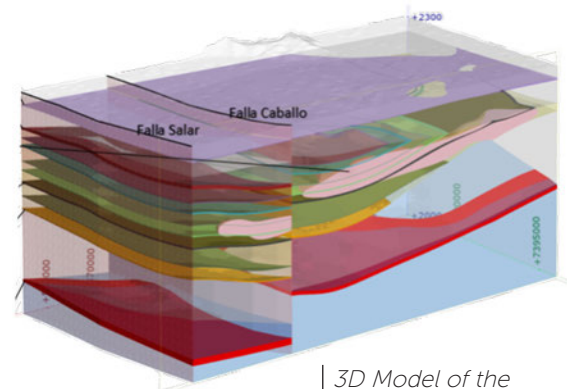
According to RCA 226 from 2006, SQM is entitled to pump up to 1,700 (litres of brine per second in the Salar de Atacama for the production of potassium and lithium products. This approval was granted after a comprehensive environmental impact assessment. This ensures that both the sensitive ecosystem and the nearby communities are not materially impacted by the pumping of brine and groundwater. SQM has undertaken every expansion of lithium production within the permitted extraction limits. Of course, future production expansions will always be within the approved extraction limits. For the planned production expansions at SQM's lithium refinery in Antofagasta, no extraction increases are necessary as no additional brine is necessary. Actually, SQM has committed to reduce brine extractions at Salar de Atacama by 50 percent by 2030 by optimizing our operation there. These reductions will not impact our expansion plans at our lithium refinery in Antofagasta.



The Salar de Atacama extends over an area of approximately 80 by 50 kilometres, and its nucleus is comprised of salt crust and brine. The salt crust is formed by the evaporation of brine, which circulates in the cavities of the underground rock matrix, which is made substantially of the same material we found in the salt crust, an evaporitic rock. The photo on the right of a drill core from the Salar de Atacama, shows the evaporitic rock matrix found in the subsurface. This demonstrates there is no open lake under the salt crust, but rather a rock structure with voids filled with brine (porosity).

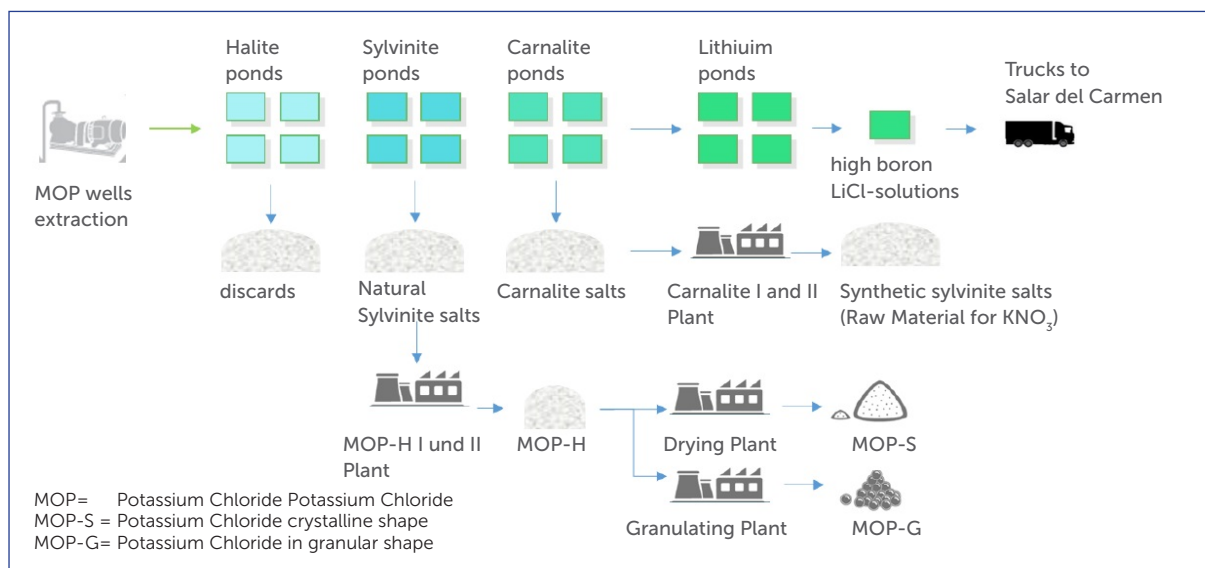


To extract the lithium, the extremely saline brine is pumped from depths of 1.5 to 150 meters below surface, through a pipeline system into the so-called extraction basins (ponds). For this purpose, SQM has set up numerous drilling sites distributed over the authorized areas in the Salar. In order to ensure that operations are as efficient as possible, SQM has developed a hydrogeological model which allows to project the behaviour of the brine based on precise analyses. The extraction basins are built with the salts left over from potassium and lithium production and lined with foil, hence no cement or concrete are required for this.

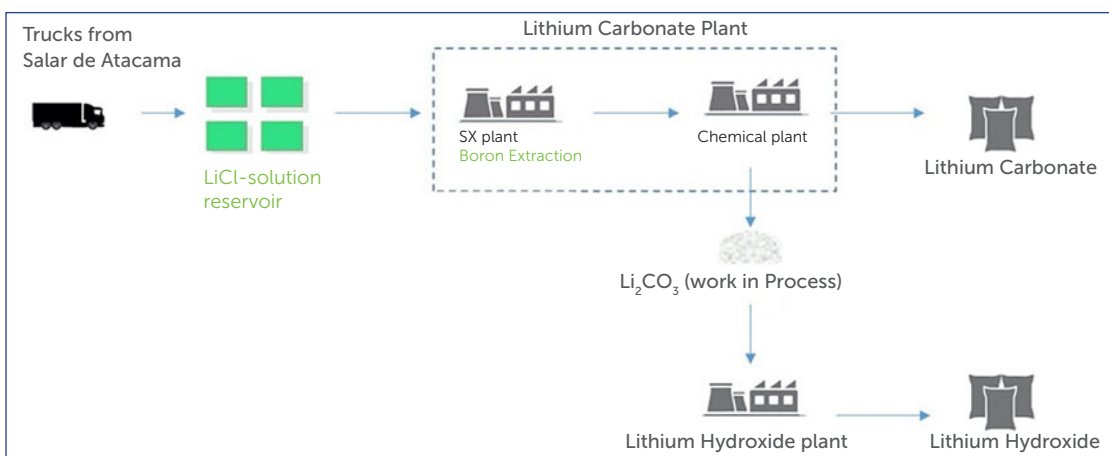


3D Model of the  
subsurface in the  
Salar de Atacama

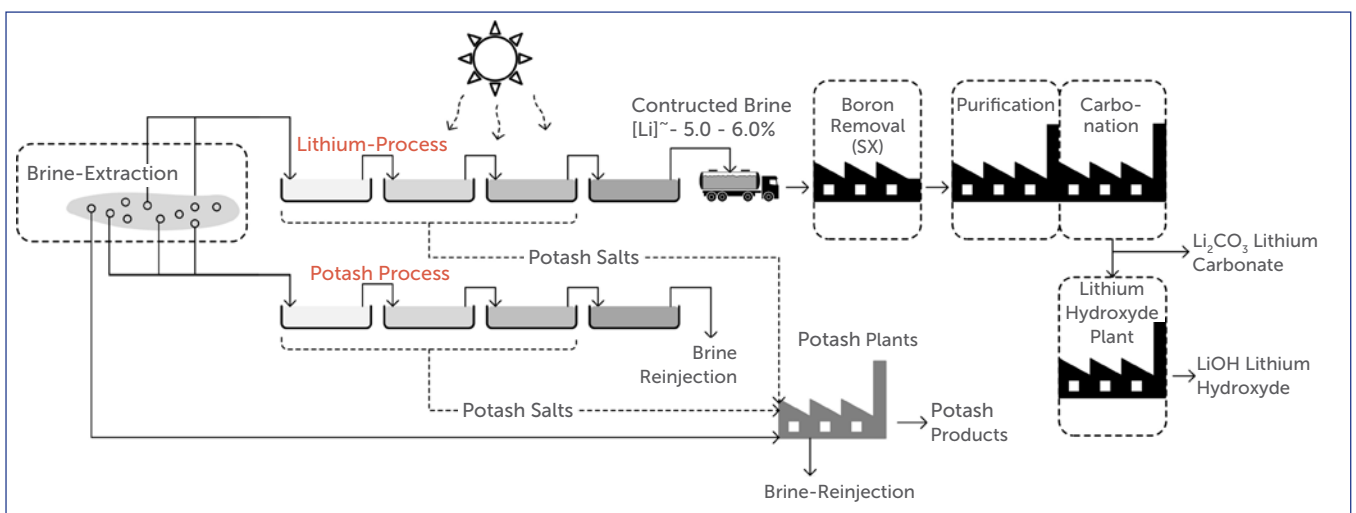
Lithium extraction requires a multi-stage evaporation and purification process, which is controlled by advanced modelling of the thermodynamic conditions. The brine is pumped into the neighbouring basin after a defined time. This process, which extends over several basins, simplifies and optimizes the purification of the brine and the precipitation of salts and impurities. The entire extraction process is completed after about 13 to 16 months. What remains is a highly concentrated brine containing up to six percent lithium or 30 to 35 percent lithium chloride. This is achieved solely under natural physical conditions, without the addition or use of any chemicals.



The next processing step starts with the lithium chloride solution. After transport to the plant in Salar del Carmen near Antofagasta, undesirable residual impurities, specifically boron and magnesium, are removed and the brine is then mixed with sodium carbonate. Lithium carbonate precipitates in the process, which is then further washed, dried, compacted, sieved and micronized. Magnetic filters remove metallic particles. SQM has the capacity to convert lithium carbonate salts in-line to lithium hydroxide monohydrate, at the same facility.



SQM currently has the capacity to produce approximately 70,000 metric tons (MT) of lithium carbonate per year. Lithium is an important raw material for various industries, first and foremost automotive batteries and portable electronics. The glass, ceramics and construction chemicals industries are also important. SQM also produces lithium hydroxide for rechargeable batteries, dyes and lubricating greases. The company has two production lines for a total of 13,500 MT of lithium hydroxide. We are in full expansion mode and we will reach a production capacity of 120,000 MT of lithium carbonate and 21,500 MT of lithium hydroxide, by the end of 2021. Our goal is to expand further very rapidly to 180,000 MT of lithium carbonate and 30,000 MT of lithium hydroxide by the end of 2023, in Chile. It is important to note, however that these increases in production do not require more brine to be extracted, and therefore no additional impacts in the protected areas.





## Hard rock based production

In addition to extraction from brine, lithium carbonate and hydroxide can also be obtained from spodumene. The mineral is mined in classical mining operations and can be found in many places in the world. Most of the spodumene extraction and concentrate production today takes place in Australia. For lithium extraction, the crushed rock is ground, separated and washed out, i.e. concentrated. The concentrate contains about two to three percent lithium and thus significantly less than in the case of lithium extraction from brine. This makes it more water and energy-intensive to extract lithium from spodumene if compared to extracting lithium from brine. It is necessary to calcine the rock at 900-1,000 degrees Celsius and convert it into a lithium sulphate solution with the addition of sulphuric acid (acid roast). The lithium sulphate solution could then be converted to either lithium carbonate or to lithium hydroxide monohydrate.

It is important to know that until last year, there was no industrial production of lithium carbonate, nor lithium hydroxide in Australia. Australia is a very important miner of lithium hard-rock, which is typically shipped to China, for converting to lithium carbonate or lithium hydroxide.

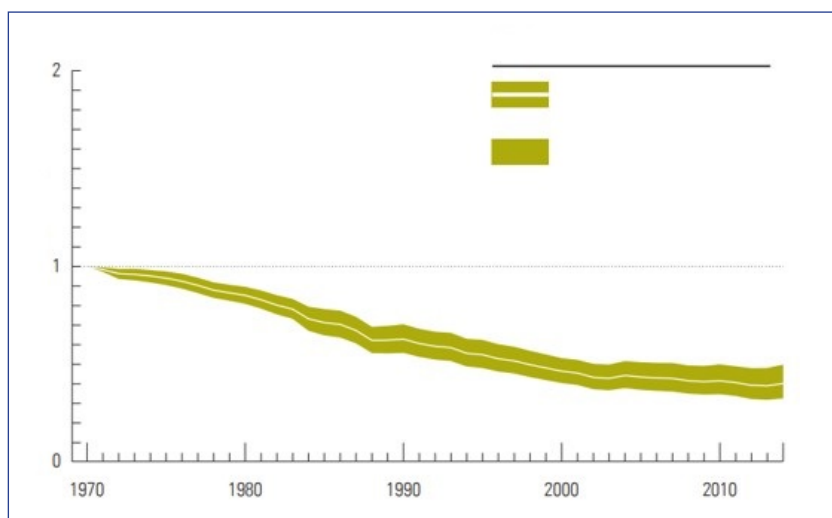
Several companies, including SQM with its joint venture Covalent Lithium, are actively progressing to converting spodumene into lithium hydroxide, locally in Australia, in the coming months and years. Covalent Lithium is planning to build a lithium hydroxide conversion facility near Perth with a capacity of 50,000 MT.



# Climate protection

The sharp increase in greenhouse gases in the atmosphere is causing serious changes in all natural processes. The world is getting warmer, the climate is changing in the long term. In areas where this has rarely been the case, precipitation is increasing, as are extended dry periods or severe storms. This in turn has a major impact on vegetation - and thus on our food supply. Animal populations have also declined dramatically due to global warming. However, it can be assumed that these are only harbingers of much greater changes that will occur if the increase in greenhouse gas emissions continues unabated.

In 2015, 195 countries united for the first time on a global climate protection agreement at the climate protection conference in Paris. It includes a global action plan to limit global warming to well below two degrees Celsius in order to counter dangerous climate change. Chile has set itself the goal of reducing greenhouse gas emissions by at least 30 percent by 2030 compared with 2007 and reforesting 100,000 hectares of forest. This would save 600,000 MT of CO<sub>2</sub> equivalents (CO<sub>2</sub>eq) per year.



Source: [livingplanetindex.org](http://livingplanetindex.org)

According to Germany's GIZ (German Corporation for International Cooperation) there is huge potential for renewable energies in the OECD country Chile. The Chilean Coast, the elevation variances and the Atacama desert provide excellent conditions for solar, wind and hydroelectric power plants. The current share of renewable energy in total electricity production is already at 45 percent. For comparison, according to the German Federal Environment Agency, in Germany it is 38 percent. Juan Carlos Jobet, the Chilean minister of energy stated that 70 percent of Chile's energy generation will come from renewable energy by 2030.

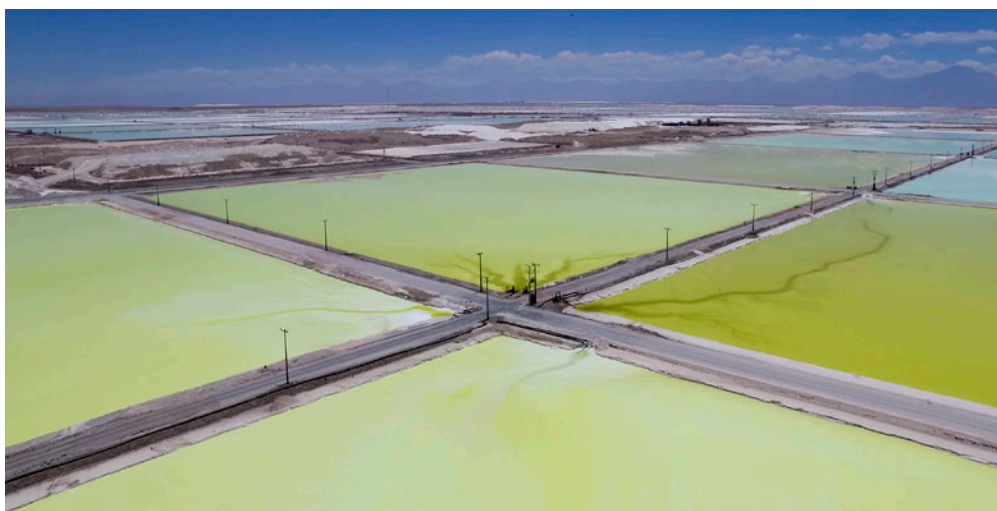


- In 2018, hydropower represented 32 percent of the energy supplied to the grid in Chile.
- Between 2013 and 2019, the share of solar energy had already risen from 1 megawatt (MW) of installed capacity to around 2,300 MW.
- “Cerro Dominador”, a combined CSP/PV solar energy project, will have an advanced storage system, based on thermal solar salts, enabling it to generate electricity for up to 17.5 hours without direct solar radiation
- SQM is one of the leading solar salts producers in the world.



*In the fourth quarter of 2020, “Cerro Dominador” in Atacama was connected to the grid with 110 MW CSP (concentrated solar power) and 100 MW photovoltaics*

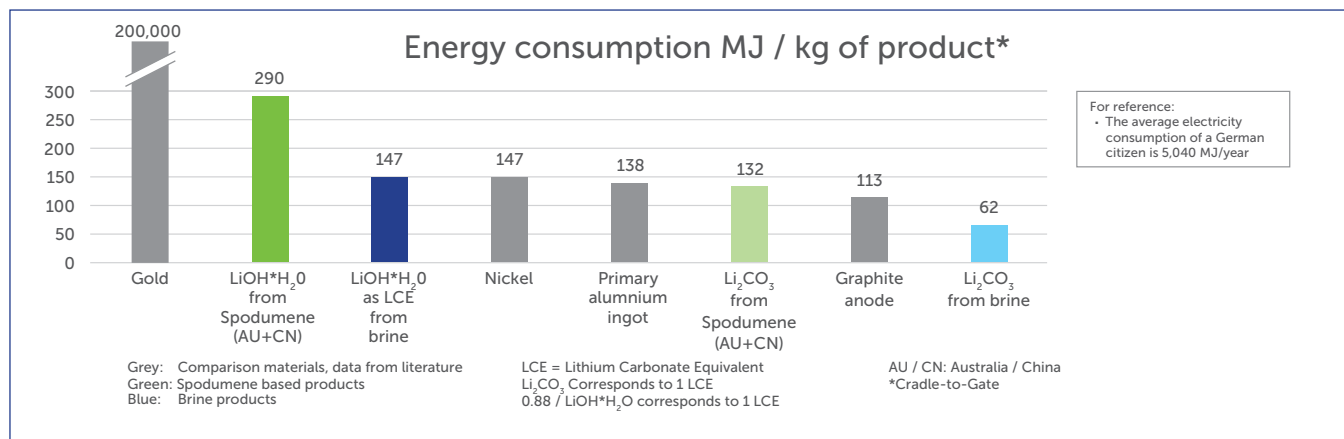




Extraction ponds Salar de Atacama

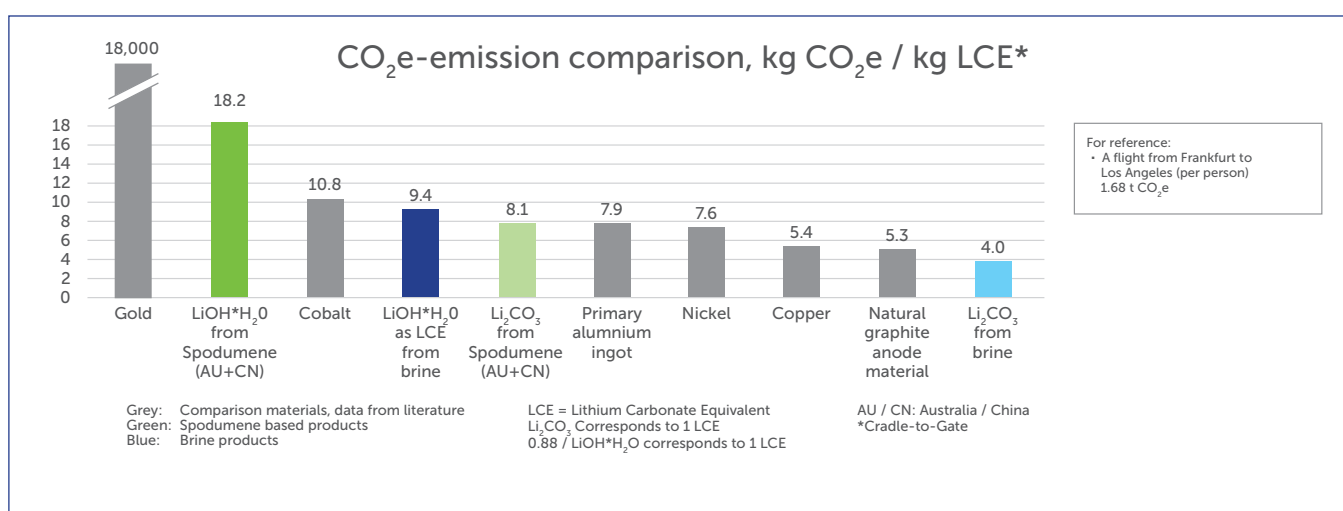
SQM uses concentrated lithium chloride solutions to produce lithium carbonate and lithium hydroxide. The brine is concentrated by a natural evaporation process in the Atacama Desert. This process takes its time, more than one year, to reach the required concentration level. The advantage, however, is that very little electrical energy is required for evaporation and purification. More than 95 percent of the energy used by SQM in the Salar de Atacama comes from solar radiation. At SQM, this amounts to an average of more than 19,000 gigawatt hours every year, or approximately one quarter of Chile's total annual electricity production.

In contrast, lithium production from hard rock (spodumene) mining requires comparatively more energy consumption related to the extraction of the lithium from the hard rock, as well as for the blasting, crushing, sorting and grinding. SQM's CO<sub>2</sub> emissions are relatively low due to the substantial use of solar energy. In 2018, the lithium carbonate and lithium hydroxide monohydrate consumed globally came roughly half from spodumene and half from brine. However, according to a life cycle analysis by SQM and the consulting firm Afry, the global CO<sub>2</sub> footprint was around 70 percent for lithium chemical production from spodumene (see graph).

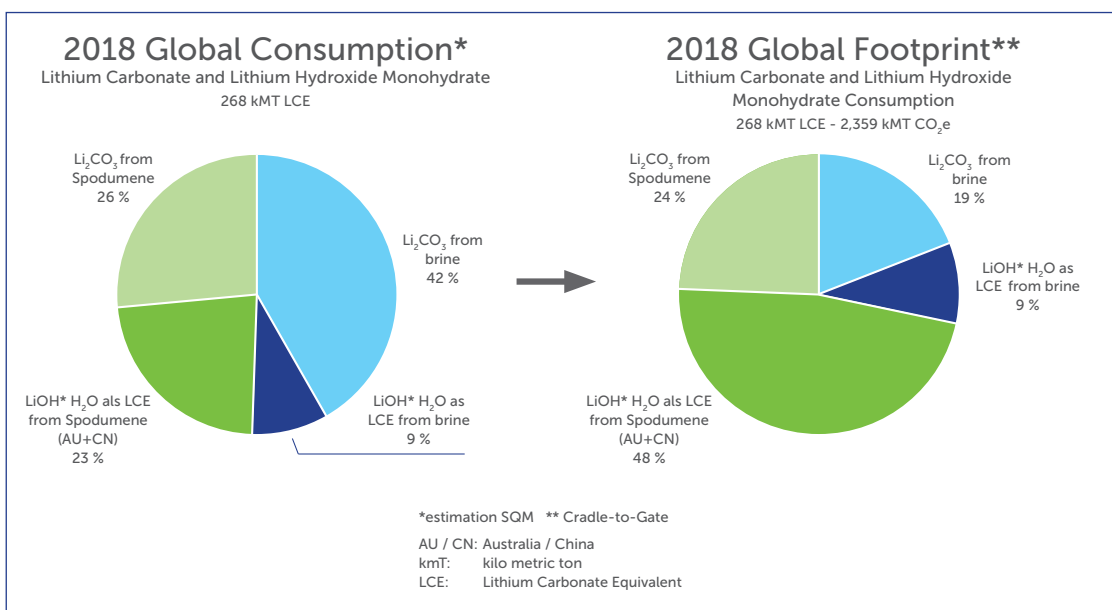


Source: AFRY (Pöyri) Lithium Life Cycle Analysis - SQM

The emission values of nickel and cobalt mining are at a similar level to those of lithium, while those of gold mining are about 2,000 times higher. Compared to LiOH, less than half of the emissions are produced during the production of lithium carbonate ( $\text{Li}_2\text{CO}_3$ ), which SQM produces from brine in much larger quantities than LiOH (see graph). SQM's goal is to produce carbon neutral lithium and potassium chloride by 2030 and to be carbon neutral company-wide by 2040 (scope 1, 2 and 3). SQM's board has allocated an investment budget of US\$100 million for achieving this goal.



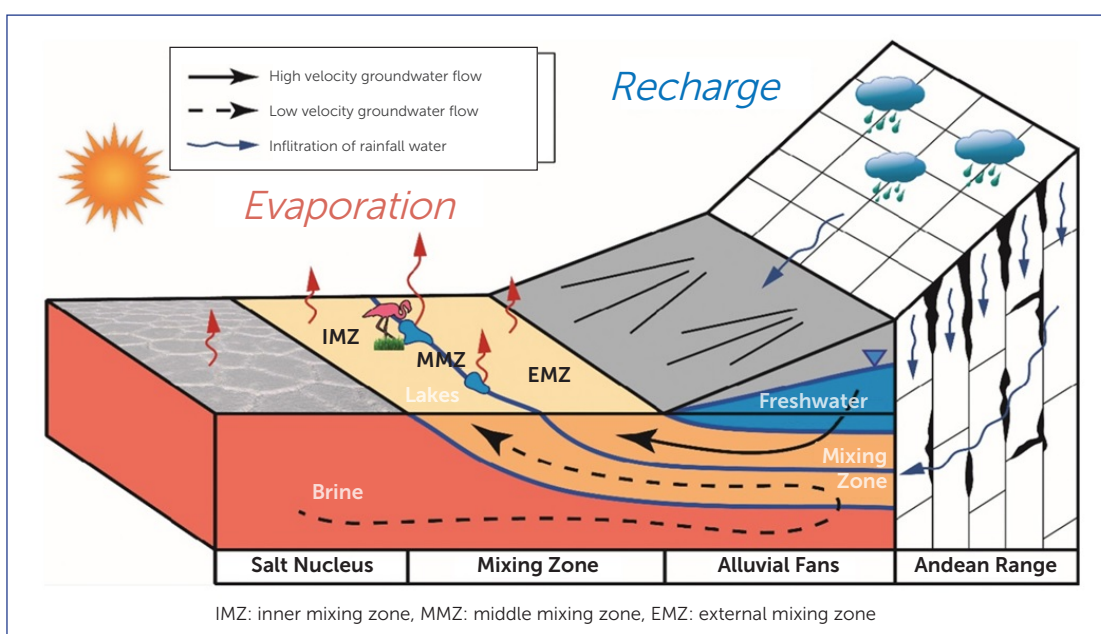
Source: AFRY (Pöyri) Lithium Life Cycle Analysis - SQM



Source: SQM

# Water

The climatic and especially the hydrological conditions in the Atacama Desert are quite extreme. It is one of the driest places in the world. But even in such extreme conditions, the basin of the Salar de Atacama is supplied with some water from rainfall, snow, and glacier melt from the high mountains in the Andes. The amount of water that replenishes the underground freshwater resources (aquifer recharge) determines the limit that the responsible water authority uses to grant water rights to different users over the fresh groundwater aquifer in the Salar de Atacama basin.



Source: Marazuela et al. (2019) - Science of total environment © Elsevier  
Schematic cross section of the eastern border of the Salar de Atacama

## Hydrogeology

Geologically, it is possible to recognize four major features in the basin (from west to east): the nucleus, the marginal or mixing zone, the alluvial fans, and the western Andes Cordillera. The nucleus is composed mainly by halite and gypsum, while the marginal zone main components are sulphates (gypsum) and carbonates. The alluvial fans are composed by sediments deposited after the erosion of rocks from the Andes, going from larger blocks close to the Andes to fine-grained sediments (silts and clays) at the border of the marginal zone. There are two types of fluids in the Salar de Atacama basin: groundwater and brine. Groundwater is found at the aquifers contained within the alluvial fans. It has a relatively low density (1.0 kg/L), given the low amount of salts, and it is suitable for human consumption, herding and agriculture.

On the other hand, within the nucleus and beneath the surficial salt crust of the Salar de Atacama, lies a large reservoir of a salt-rich solution with a very high density (approx. 1.23 kg/L): the so-called brine. The brine of the Salar has a high proportion of salts, more than 300 kg/m<sup>3</sup> of chloride, sodium, sulphate, magnesium, calcium, lithium, potassium, and boron. Due to its high salt content, the brine is neither suitable for drinking nor agriculture.

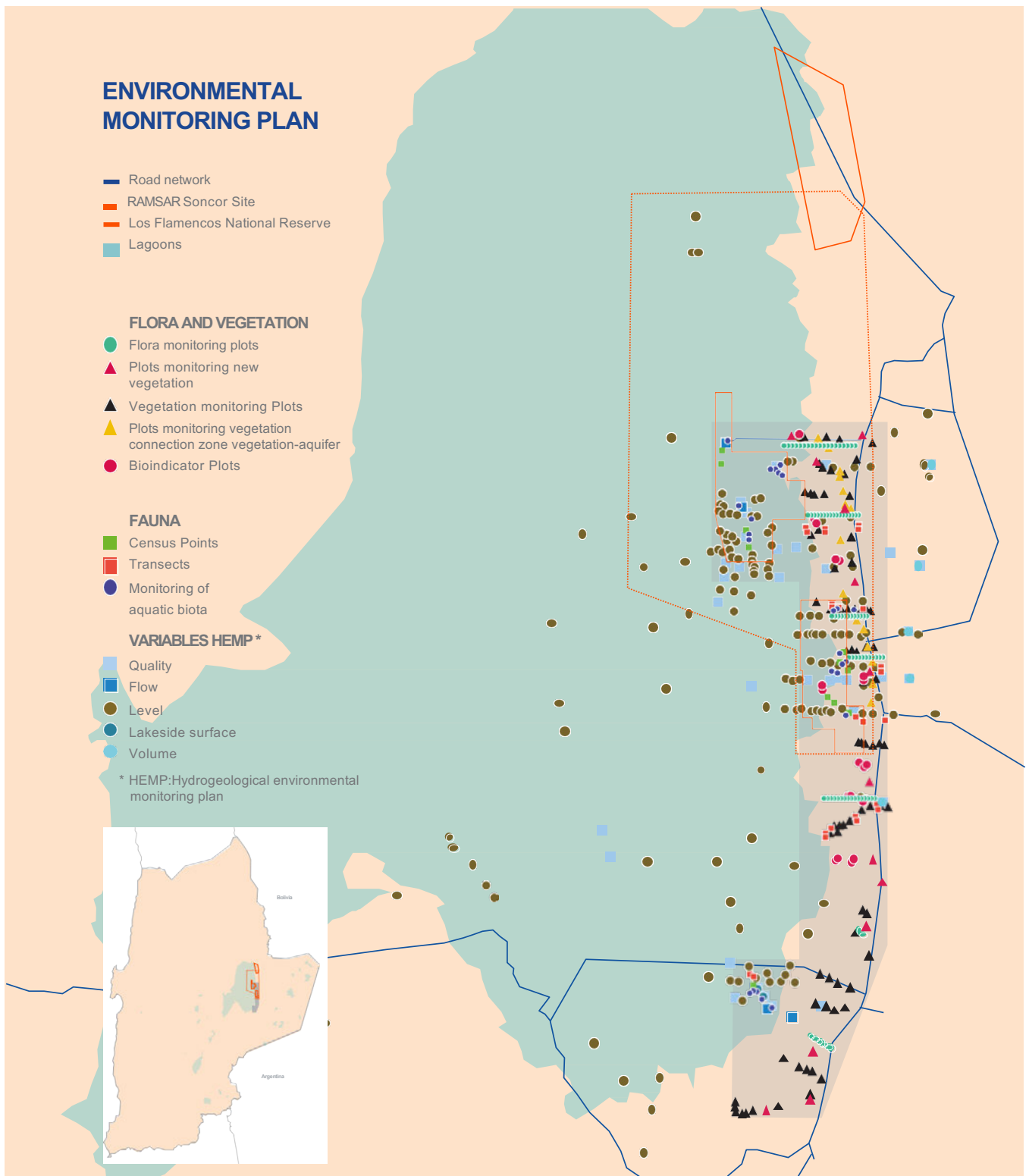


In the so-called marginal or mixing zone, the groundwater meets the brine. Because of the high-density contrast between both fluids, the lighter groundwater tends to move upwards, above the brine. This is the place where the saline wedge or saline interphase is located, a curve shaped zone where groundwater and brine are in contact (see figure previous page). When this brackish water comes to the surface, it forms the lagoons, where the now-surface water is evaporated almost entirely. It is then a continuous process between the water infiltration from the rain in the Andes and the evaporation in the marginal zone, where the lagoons system are located.

The Salar de Atacama as we know it today was formed over several thousand years by a continuous natural evaporation process. The brine of the Salar, the highly concentrated salt solution in the underground, was also created by this natural process of a hydrological cycle. The aqueous phase of the brine evaporates naturally in the peripheral area of the nucleus. On the side of the salar, the brackish water is in a constant state of evaporation from the mixing zone and the lagoons. This water is therefore a constant part of the hydrological cycle. Important to know: Even without the lithium mining in the Salar de Atacama, evaporation of both brine, brackish and fresh water in the 3 separate areas of the salar is a natural constant. And without this evaporation there would be neither the salar nor brine. Therefore it is also not correct to call the water evaporating from the pumped brine a loss. It is rather, besides the natural evaporation, a further, artificial evaporation process.

A widespread misconception is the idea that water is withdrawn from the communities bordering the salar by the brine extraction. The physical and hydrological conditions show that this is not the case. As already explained, a distinction must be made between the fresh water from rain and snow that fills the aquifers in the alluvial fans (along the eastern border of the salar) and the aqueous phase of the underground brine. The fresh water is available as surface and as groundwater for drinking water, agriculture and industrial processes. The brine is neither suitable for this purpose nor can fresh water be extracted economically from it. Furthermore, SQM uses only a small portion of the fresh water available at the East of the Salar in underground aquifers.

The big difference in density makes the mixing of groundwater and brine a very complex process. The mixing degree is determined by the movement and weight of both fluids. Normally, diffusion in liquids is very slow, taking a long time until the dissolved substances have moved a few centimetres. Besides, the geologic composition of the marginal zone and the transition to the fine-grained sediments of the alluvial fans decrease the permeability, making the fluid movements even slower. As a result of all these processes, the effects of brine pumping can be only observed at the nucleus, while the effects of groundwater pumping are only observable at the alluvial fans and at the transition to the marginal zone. The brine and groundwater pumping effects are then isolated from each other, minimizing the risks of groundwater salinization or the inflow of groundwater into the nucleus.



Source: SQM

To understand and control all the processes involved and take timely action, SQM has developed a hydrogeological monitoring plan with more than 225 measuring points (see graphic previous page). This plan records important hydrogeological variables as piezometric levels, concentration, pH, etc. All recorded data are published on the transparency portal [www.sqmsenlinea.com](http://www.sqmsenlinea.com) and thus allow a complete control of the prevailing water conditions at any time.

## Water for production processes

SQM uses fresh water in the Salar de Atacama for the following activities:

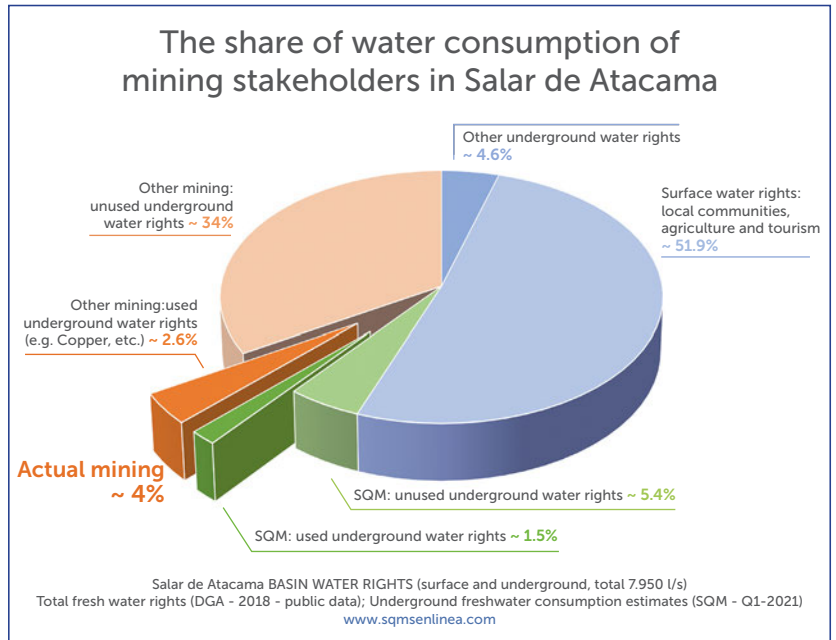
- Brine transport: for cleaning pumps and pipes to prevent functional damage
- Potassium chloride production: for flotation, leaching and salt transport
- Service water for SQM personnel (the waste water is treated and used for industrial processes)

A recurring question concerns the impact of freshwater extraction on water resources for the communities around the Salar de Atacama (the "Salar"). SQM's approved water usage for its production activities in the Salar de Atacama has no material impact on the water reserved for drinking and agriculture in the neighboring communities. The wells from which SQM pumps its fresh water for production, and which are fed with water from the Andes, are located downstream from the villages of the indigenous population, who rely almost exclusively on surface water. The water therefore reaches the villages first and then the underground wells. Water is a key resource in this area and we take our responsibility to conserve it very seriously.

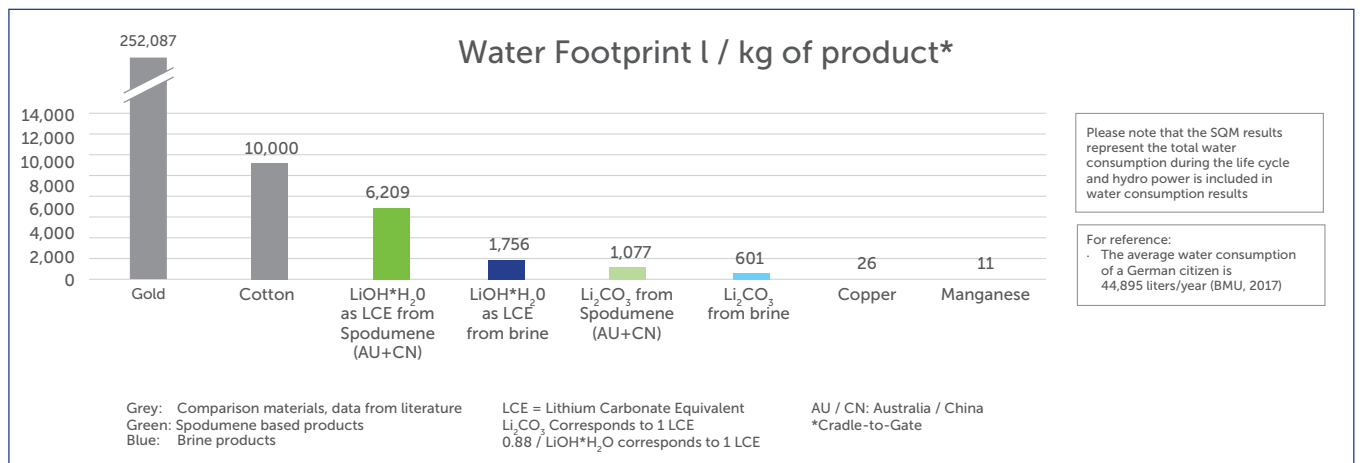
The water authority 'Dirección General de Aguas' (DGA) generally grants water rights for the Salar strictly taking into account the quantity that replenishes the natural groundwater resources (aquifers). SQM has been granted freshwater rights from the DGA totaling 549 litres per second (l/s). It is mandatory for companies to complete an Environmental Impact Assessment (EIA), which is an extensive review of the operations, and from which the Chilean environmental authority determines the actual extraction permit. SQM's EIA (RCA 226/2006) allows a withdrawal of 240 liters of groundwater per second, which is duly supervised by the 'Superintendencia del Medio Ambiente' (SMA). This approval represents less than three percent of the total water rights in the basin. SQM currently (Q1 2021) withdraws about 120 liters of groundwater per second from four wells east of the Salar for annual production of potassium salts, lithium chloride and magnesium salts (bischofite).



Since 2016, SQM has reduced its ground-water withdrawals by 40% and the company is committed to reducing further going forward. Other mining companies have also reduced their withdrawals in recent years. Our water demand is a small fraction of the total water rights in the area. Importantly, local communities rely mainly on surface water for daily life and agricultural uses, while tourism relies on surface water and some underground water. We understand the concerns of neighbours that melting water coming down from the Andes fluctuates seasonally and annually. However, these fluctuations are not related to our lithium production in the Salar de Atacama. Consequently, there is no direct impact from SQM's limited freshwater extraction on the local communities.



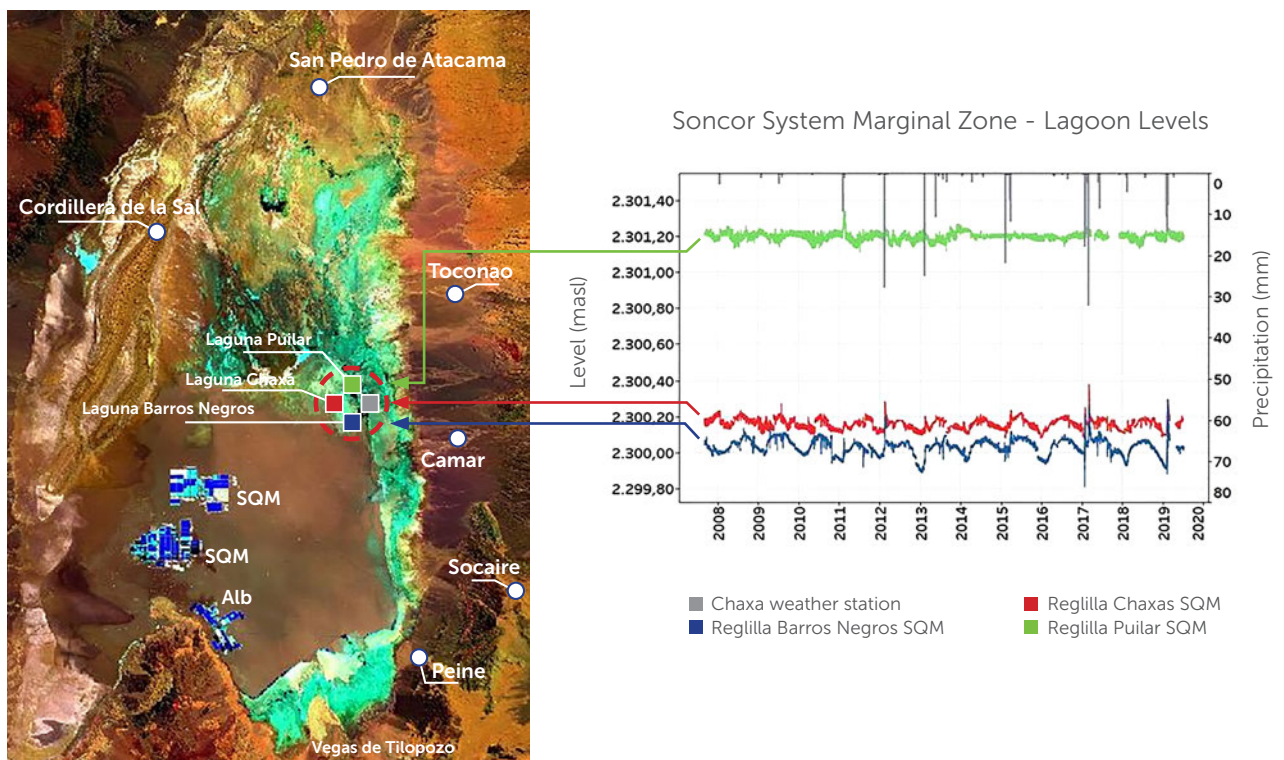
A widespread misunderstanding is that lithium production is water-intensive due to evaporation during the natural concentration process. Actually, according to SQM's life cycle analysis (LCA), the water consumption in the production from brine is significantly lower than in the production from rock (spodumene). For example, SQM requires about 22.5 litres of water per kilogram of lithium carbonate for the entire process if the water consumption for supplied products is not included (gate-to-gate). In the LCA, the water consumption was calculated by AFRY (cradle-to-gate) according to ISO 14040 and 14044. The results also show a much lower consumption compared to other production goods (see graph). And another comparison: in 2012, each inhabitant of Antofagasta consumed an average of around 46,000 litres of water. In the same year, we began operating our SQM Salar del Carmen lithium refinery near Antofagasta primarily with Antofagasta's municipal wastewater. The water is treated for the production process in a plant next to SQM's refinery.



## Monitoring

SQM has operated a comprehensive monitoring system in the Salar de Atacama since 1996. This includes a hydrogeological monitoring plan with more than 225 measuring points, which are used to monitor, among other things, groundwater and brine as well as the levels and chemical quality of the lagoons. Flora and fauna are also monitored by field studies, satellite images, wildlife censuses, and limnological studies. SQM also has an early warning system to prevent serious environmental impacts from brine and water pumping. In the event of negative deviations from the norm, SQM must immediately reduce the pumping volume of water or brine appropriately in order to avoid any effects on the sensitive ecosystem.

### Precipitation and water levels of the lagoons in the Salar de Atacama



Analyses have shown that the behaviour of sensitive flora and fauna has not changed from natural conditions. The water level and quality in the lagoons has also been maintained. Between 2016 and 2019, SQM has already reduced its water consumption in the Atacama basin by 25 percent. The company has committed to reducing fresh water consumption by a further 50 percent by 2030. We will achieve these absolute reductions even though we plan to more than double the capacity of our lithium refinery in Antofagasta. SQM's board has allocated an investment budget of more than US\$100 million to achieve this goal. In addition, SQM is always working with neighbouring communities to give them a better understanding of the operating processes.

Measurement data from the monitoring program can be found at

► <https://www.sqmsenlinea.com>

## Active bird protection

SQM is committed to protect the flamingos in the Salar de Atacama. From 1995 to 2018 we have been participating in an environmental monitoring program for the lagoons in the Salar de Atacama as part of a cooperation with the Chilean forestry authority CONAF. Since 2019, this monitoring is being performed by an independent contractor. At the beginning of each quarter, measurements are taken to detect changes in the surface and depth of the lakes, in the bird populations and in the food supply of the flamingos. In addition, checks are carried out to determine whether the physical and chemical conditions and human activities have changed.

The data collected on the flamingo populations in the Salar de Atacama has, among other things, contributed to CONAF conducting annual flamingo censuses in 52 high-altitude Andean wetlands in northern Chile and the Antofagasta region. In addition, since 2007 SQM has voluntarily monitored the flamingo reproduction cycles and observed the species native to these areas (Andean, Chilean, James flamingos).





Depending on the species, the flamingos migrate between Argentina, Bolivia, Chile and Peru. According to the information from monitoring, flamingos move with a natural dynamic behavior within their habitat. Months with above-average precipitation lead to a temporarily lower presence, but in the long term the behavior can be considered as normal.



# Social Responsibility

For SQM, strong community relations with all of our neighbours, including those in and around the Salar de Atacama, is the focus of our sustainability commitment. Constant dialogue and cooperation with neighbouring communities are very important to the Company. Accordingly, SQM employs a dedicated team that works with local communities to better understand and respect cultural differences. We are currently involved in more than 150 different programs aimed at improving the social conditions in the communities focusing on social development, education, and cultural and historical heritage.

## Social development

In 2008, SQM developed programs as part of a public-private partnership to increase agricultural productivity in the communities around the Salar de Atacama. For example, farmers of San Pedro Atacama, Toconao, Talabre, Rio Grande and Socaire are being advised on aspects such as the best choice of crops, the most promising cultivation and irrigation methods, and the selection of suitable specialty fertilisers. The goal is to recuperate ancient crops, revive indigenous agricultural practises and substantiate local livelihoods. Farmers are assisted in this by agronomists from SQM and oenologists, among others.

The programmes always take into account the traditional agricultural methods of the indigenous Atacameños. Our goal is a horizontal and mutual exchange between local people and SQM specialist agronomists. One of the programs is "Atacama Tierra Fértil", which enables 20 winegrowers in the regions of Celeste, Socaire, Toconao and San Pedro de Atacama to grow wine at altitudes above 2,400 meters. Ten years ago, about 1,600 vines were planted; to date, more than 22,000 have been planted with six different grape varieties. In autumn 2018 the seventh harvest yielded ten tons of grapes, which were turned into 7,500 bottles of wine. Of these, 6,000 bottles of the "Ayllu" brand, which means community in the Kunza language, were made from Syrah, Malbec, Pais, Petit Verdot and Moscatel grapes. In 2020, Ayllu Catchir Harvest Moscatel wine was awarded with a Gold medal at the famous Catad'Or wine awards. SQM has voluntarily supported the winegrowers from the very beginning in 2009.



Further examples of SQM activities:

- Supporting the Lakitas Festival, so that employees from the relevant communities can maintain their local traditions and obligations during working hours if necessary.
- Saving the “CasaTelar” cultural heritage: In recent years, indigenous people from various communities have rediscovered and learned the traditional weaving craft with the support of SQM.
- Hydroponics: SQM is working with the communities of Socaire and Talabre on hydroponics. Socaire is a leader in the production of hydroponic salads that are sold in the region.
- Hotel in Toconao: For two years, SQM supported the development of a tourism project of the community of Toconao on the site of a former mining camp, which SQM donated to the community. The project, which was planned and designed by the local community, was approved and the hotel will be built shortly.

## Education

In 2018, 57 men and women from Toconao, Peine, San Pedro de Atacama and other regions were trained for work in the Salar de Atacama and, after passing their final exams, were taken on by SQM as full-time employees. In the same year, 80 students from San Pedro de Atacama were able to enjoy scholarships financed by SQM and the La Semilla Foundation.

## Historical and cultural Heritage

Many communities are grouped under an “Atacama culture” and share a unique cultural heritage. SQM supports the communities around the Salar with individual programs based on their needs and specificities. These include the preservation of ancestral textile production methods with traditional designs and techniques, learning groups or the Lakitas Festival for traditional music. We also promote the preservation of intangible cultural heritage and support, for example, the recording of traditional music or the publication of myths and legends of indigenous ancestors.





## Financial benefits

SQM and CORFO, the Chilean Association for the Promotion of Production, which grants mining rights in the Salar de Atacama, agreed on payments for investment and royalty payments amounting to US\$ 717 million (Corfo estimate), which SQM will pay between 2018 and 2030 to the municipalities of Antofagasta, María Elena and San Pedro de Atacama and the regional government of Antofagasta (see diagram).

**The above amount and the below table<sup>1</sup> shows the probable payments, up to the year 2030, which were estimated by [CORFO](#) at the time of renewing its Salar de Atacama lease agreement with SQM in the first quarter of 2018. In no way or form these represent SQM's opinion, nor could they be considered as "forward-looking statements" as defined under the U.S. Private Securities Litigation Reform Act of 1995.**

Under the new lease agreement, SQM has pledged to spend between US\$ 11-19 million per year on research and development and US\$ 10-15 million per year on local communities near the Salar de Atacama. In addition, 1.7 percent of the annual sales from SQM subsidiary SQM Salar are allocated for regional development. For the year 2018, this amounted to US\$13 million. In the same year, US\$ 11.2 million was made available to CORFO for the Atacameño communities, and additionally about US\$ 8 million was invested in research and development. The contract for 2018 only applied to nine of the twelve months, as it did not come into force until April 1, 2018.

Year	Cash Flow SQM	CORFO	Mining Royalties	F&E	Taxes	Communities	Total amount
2018	441	160	44	11	163	37	<b>415</b>
2019	415	160	42	11	161	37	<b>411</b>
2020	159	159	41	11	158	37	<b>405</b>
2021	319	214	53	15	201	42	<b>525</b>
2022	425	269	65	19	243	47	<b>643</b>
2023	568	325	74	19	279	53	<b>750</b>
2024	1,004	314	96	19	337	58	<b>824</b>
2025	746	310	94	19	333	58	<b>813</b>
2026	861	372	108	19	379	63	<b>941</b>
2027	1,251	433	122	19	425	69	<b>1,069</b>
2028	1,275	465	126	19	437	71	<b>1,118</b>
2029	1,329	505	131	19	454	73	<b>1,181</b>
2030	1,316	501	128	19	449	73	<b>1,170</b>
<b>Total</b>	<b>10,109</b>	<b>4,189</b>	<b>1,123</b>	<b>218</b>	<b>4,018</b>	<b>717</b>	<b>10,265</b>

Source CORFO; All figures in millions of US dollars. This information does not reflect the position of SQM, nor can it be regarded as a "promise for the future" within the meaning of the US Private Securities Litigation Reform Act of 1995

<sup>1</sup> These figures do not include SQM's voluntary commitments to social responsibility programs.

# SQM as an employer

As a global player, SQM is represented in some of the most important sectors such as food, health, technology and energy. At the end of 2019, we employed more than 5,700 people worldwide. 92 percent of them operate in Chile. In general, we like to employ local people – more than 70 percent of our employees come from the northern regions of Chile. The proportion of women in the workforce across the Group is a good 16 percent, which is twice as high as the average for the Chilean mining industry.

More than 66 percent of the permanent employees of SQM Salar S.A. (subsidiary for lithium production) are unionised. This is exceptionally high, the average in the Chilean mining industry is currently only about 36 percent. As in past years, we renegotiated four collective bargaining agreements with four unions by December 31, 2019, one year before the expiration of the agreements. All of them went ahead without strikes or operating losses. The minimum wage for SQM Salar workers is around US\$ 1,250 per month. This is about three times higher than the Chilean minimum wage. Almost 3,800 employees based in Chile, more than 75 percent of all employees, received more than 83,000 hours of training.



Chile is known as a mining country and many international companies are active here. Chile today has exceptionally high occupational safety standards. SQM is proud of its occupational safety record, which is usually better than that of its Mining peers. In 2020, for example, we achieved a lost time injury rate of 0.78 accidents per million working hours.

In Chile, it is not unusual for companies to treat contractors working for them as part of the workforce. Contractors are also very important for SQM. They provide their services in numerous SQM companies, mainly in the Tarapaca and Antofagasta regions. We always support Chilean companies; in 2019, nine out of ten suppliers were local companies.

	Total suppliers	Foreign suppliers	Local suppliers
Equipment for plants and mines	137	15	122
Supplies for production	47	7	40
Operational maintenance, transport and support services	1,131	47	1,084
Miscellaneous materials and spare parts	686	61	625
<b>Total</b>	<b>2,001</b>	<b>130</b>	<b>1,871</b>

| Suppliers 2019





# About SQM

Sociedad Química y Minera de Chile (SQM) is a listed chemical company with headquarters in Santiago de Chile. At the end of 2019, the company had more than 5,700 employees and seven production sites. We serve our customers in more than 110 countries worldwide through more than 20 trading offices and generated sales of approximately US\$ 2 billion in 2019. In 1993 SQM was one of the first Latin American companies to be listed on the New York Stock Exchange.

SQM believes it is the world's largest producer of potassium nitrate and iodine and one of the world's largest lithium producers. We also produce specialty plant nutrients, iodine derivatives, lithium derivatives, potassium chloride, potassium sulfate and certain industrial chemicals (including industrial nitrates and solar salts). In 2019, SQM generated 89 percent of its sales outside Chile. Since its foundation, the company has developed some of the most innovative raw material extraction and production processes in the world. The activities in the Salar de Atacama are the largest investment project in non-metallic mining ever started in Chile. Lithium carbonate has been produced there since 1996 and lithium hydroxide since 2006, only after a strict, legally required environmental impact assessment cleared the way for this.

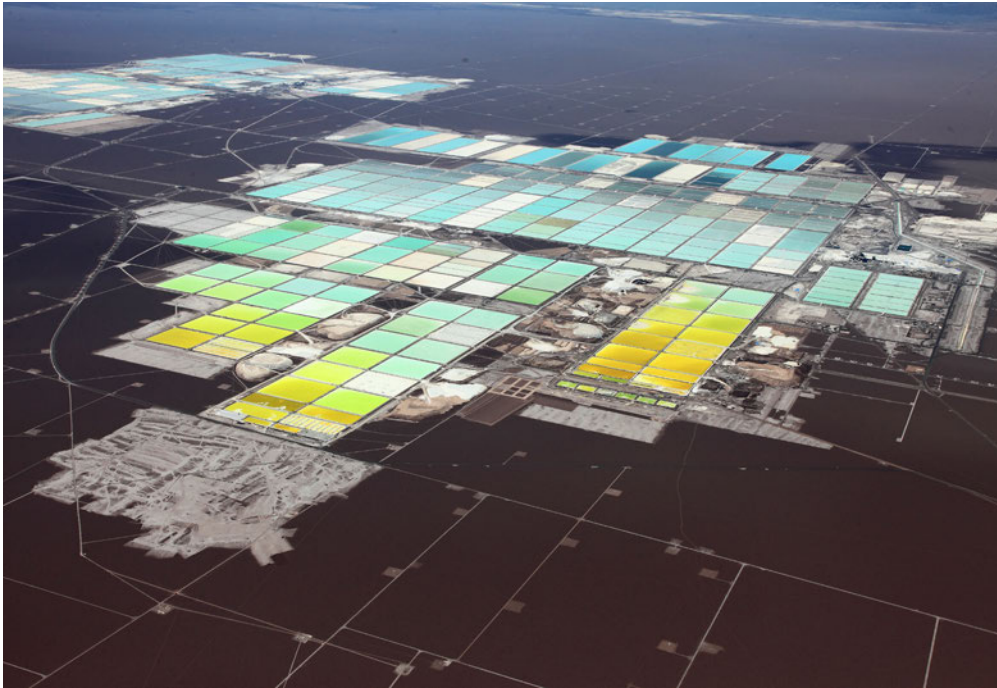
## SQM and sustainability

SQM is the world's leading manufacturer of products for a sustainable world:

- Potassium nitrate for vertical agriculture, which reduces the ecological footprint of the world's growing food production
- Sodium and potassium nitrate for a more flexible generation of renewable energies
- Iodine for pharmaceutical products and LCD screens
- Lithium as an important element for reducing CO<sub>2</sub> emissions and for creating a better environment

SQM is the first lithium producer in the world to become a pending member of IRMA (Initiative for Responsible Mining Assurance). IRMA is the joint project of more than 30 companies, NGO's, community representatives, trade unions and mining companies. Only those companies who initiated a publicly announced independent audit against the IRMA Standard could obtain membership. IRMA provides independent third-party verification and certification for the industrial mining sector and is recommended by the United Nations Environment Programme (UNEP) as the responsible mining assurance system for sustainability reporting in the mining sector. The British non-profit organization CDP supports companies and municipalities in publishing their environmental data, e.g. on greenhouse gas emissions, water consumption or biodiversity. Due to its increasing success in sustainability commitment, SQM was included in the two Dow Jones Sustainability Indices DJSI Chile Index and DJSI MILA Pacific Alliance Index.

A sustainability report has been published annually since 2006. Starting with the 2009 report, SQM has always published it according to the guidelines of the Global Reporting Initiative (GRI). The 2019 [Sustainability Report](#) was validated by an independent third party, KPMG.



## Contact & Dialogue / Sources / Links

### SQM Press Contact Chile

SQM S.A.  
Ignacia López B.  
El Trovador 4285, Santiago  
Chile  
Phone: +56 2 242 53657  
[mediainquiries@sqm.com](mailto:mediainquiries@sqm.com)

### SQM Press Contact Germany

crossrelations brandworks GmbH  
Andreas Severin  
Bismarckstr. 120  
47057 Duisburg  
Phone: +49 (0) 203 50 96 02 32  
[mediarequest@sqm.com](mailto:mediarequest@sqm.com)

SQM sustainability reports

► <https://www.sqm.com/en/sustentabilidad/reporte-de-sustentabilidad>

## Imprint

### Publisher:

SQM S.A.  
El Trovador 4285, Santiago  
Chile  
[www.sqm.com](http://www.sqm.com)

### Responsible:

Ignacia López B., SQM S.A.  
[Ignacia.Lopez@sqm.com](mailto:Ignacia.Lopez@sqm.com)

### Implementation and graphics:

crossrelations brandworks GmbH  
Bismarckstraße 120  
47057 Duisburg  
Germany

### Photo credit:

SQM S.A.  
Cerro Dominador Copyright 2019 (P.12)

### Year of publication:

2021

