

Julia Vecchiarello

Community School of Davidson

Huntersville, NC, USA

Chile, Water Scarcity

### **Chile: The Effects of Lithium Mining on Water Scarcity**

As more of the world's inhabitants become environmentally aware, there is a growing movement to identify and correct unsustainable corporate practices and explore energy alternatives to reverse the negative impact of climate change. One such example is the transition from gasoline combustion to using electricity stored in lithium batteries to power vehicles. While this solves one problem, lithium must be extracted, and organizations often utilize mining methods that are harmful to the environment. The "Lithium Triangle" of Chile, Argentina, and Bolivia is a hotbed for this extraction, with a focus on the Atacama Desert in Chile.

Chile is a long and thin coastal country in South America with a population of nearly 20 million people. The government operates under a representative democracy. Chile is geographically diverse, with cities, mountains, deserts, and beaches. Agricultural land makes up around 21% of the country's land area, with wine and fruits being two of Chile's main exports (The Global Economy, 2020). Fishing and mining make up most of Chile's other income sources. It has a high indigenous population of around 13%, with many of these people, namely the Atacameños tribe, living in the Atacama Desert (The International Work Group for Indigenous Affairs, 2022).

People often refer to the Atacama Desert as the "driest desert in the world" (Nomadic Tribe, 2019). Indigenous people make a living there by farming, herding, and ranching. They typically work with llamas, alpacas, goats, sheep, and mules. These animals are a source of wool and meat and are also used to transport goods for sale to cities. Due to the Atacameños living in dry areas, they use hydraulic and irrigation systems for agriculture that provide the moisture needed to cultivate and harvest corn, potatoes, quinoa, and more to eat or sell. Families tend to live on their farmland (Nomadic Tribe, 2019) far from cities, which limits access to schooling and healthcare. Teachers often must work in the same classroom with children of all ages and knowledge levels, putting children learning in these isolated rural schools at a disadvantage compared to those who live in larger cities and towns (Baeza, 2021). Rural and indigenous people also live farther from hospitals with limited access to private health insurance. Indigenous people have their own healthcare customs, though, involving plants with medicinal properties. They are starting to combine their knowledge with typical Western healthcare methods in nearby hospitals (Lafkenche, 2020). The main problem of indigenous people living in these desert areas is access to water and the dryness of their land, which is being made worse by lithium mining. Now, the land they do have and need for ranching and agriculture is becoming unusable and even being taken without permission by mining companies.

Salt flats in the Atacama Desert are essential for lithium mining in Chile. The salt brine there, which contains trace amounts of lithium, is extracted and put into pools, where prolonged exposure to the sun causes the water to evaporate. This process leaves a solution with a much higher lithium concentration than the original brine, but at the expense of losing vast amounts of water. Two million liters of water are evaporated for just one ton of lithium, leaving tons of saline waste behind (Foy, 2022). Due to the increase in lithium demand from the growing popularity of electric vehicles, this is only expected to worsen without intervention. Any water loss is catastrophic for the desert's indigenous population, who already fully utilize the precious amounts of water to which they have access. Water evaporated in the mining process tends to disperse to other areas and never re-enter the desert's ecosystem, lowering the water table. Groundwater reserves are rapidly depleting, and surface streams and meadows are drying up. The drying of this land lessens the already limited usable space that natives need for agriculture and raising livestock for food (Bloomberg, 2019). Lithium mining also causes salinization of crucial freshwater sources, and the tailings, like sulfuric acid, are often toxic, which "exposes the local ecosystems to poisoning and other related health problems" (Brooks, 2021). Another effect these mines have on food production is taking away the agricultural workforce. Many indigenous people are attracted to the idea of a stable income at the mines, so they "have turned to these jobs instead, leaving traditional activities – and the practices related to them – behind." (Pause, 2022). Overall, the excessive drawing of water for lithium mining significantly impacts the food, water, and labor supply in these rural areas. This impact translates to dire consequences for the indigenous population and the environment as a whole.

Any legitimate attempt to fix these issues affecting the lives of rural and indigenous people must involve the people themselves. The residents of the Atacama Desert know the area better than anyone else, as they have lived there and passed down traditions for generations. Locals have valuable knowledge to share with the big corporations trying to move in and need to be heard. The Atacameños should also have the right to consent to these developments occurring on their lands. Mining companies are violating indigenous rights with no repercussions, and there needs to be a stricter set of rules in place. Although Chile has adopted the United Nations Declaration on the Rights of Indigenous Peoples of 2007 and the American Declaration on the Rights of Indigenous Peoples of 2016, Chile is still the only Latin American country not recognizing indigenous people in its constitution (The International Work Group for Indigenous Affairs, 2022). The current Chilean president, Gabriel Boric, and organizations like the Ministry of Social Development have been pushing for constitutional change, but 62 percent of voters rejected a constitution draft on September 4, 2022, that increased the rights of the indigenous population and addressed mining concerns (Bauer, 2022). Negative and often false propaganda opposing this draft was spread by high-up politicians who twisted the narrative as indigenous people breaking apart Chile and trying to grab power. Boric scaled back his efforts after the negative result (Bauer, 2022). Chile needs more outspoken voices in the public eye advocating for the indigenous perspective and debunking false claims put out by politicians. Ordinary citizens need to be encouraged to research what the constitution draft really means, and the government should spend more money on commercials, billboards, and other things to keep Chile's citizens informed.

In April of 2023, Gabriel Boric announced his plan to nationalize Chile's lithium industry. The plan entails a state-owned mining company partnering with Albemarle and SQM, the miners currently occupying the region. He plans to use direct lithium extraction (DLE), a more sustainable method that would return the brine to the ground, but it has not been proven to be successful on a commercial scale

(Villegas, 2023). The expansion of Chile's lithium mining is positive for Chile's economy but could continue to take a more significant toll on the water supply of the Atacama desert. Boric announced this plan without consulting the indigenous locals near the mining sites. The Atacama Indigenous Council, a group of leaders from communities in the region, has mixed opinions on this development (Villegas, 2023). Although there are some issues, this development could also bring about positive changes. Boric has spoken about spreading out operations to unexplored salt flats beyond the Atacama, where Chile's lithium operation currently solely takes place. This would ease some pressure off of the Atacama area. He has also "pledged to more fairly distribute the revenue from lithium production, including to local communities," which could help some poorer indigenous tribes gain easier access to electricity and drinking water (Vásquez, 2023).

Additional environmental regulations are also necessary. Executives in the lithium industry overuse the salt flats' brine because it is classified not as water but as a mineral, even though extraction negatively affects the region's freshwater wetlands, rivers, and groundwater (Blair et al. 26, 2022). When miners transport brine from salt flats to extraction sites, the area's freshwater or less salty sources flow back in to replenish it. Governments must reclassify brine as water and regulate its extraction more strictly to protect the environment and local inhabitants. To protect the indigenous communities, the Chilean government must set lower limits on how much brine and water can be used. Mining companies must be transparent about the amount of brine extracted during the process and identify ways to minimize water use. More research on the effects on the water supply needs to be conducted by the United Nations, governments, academia, companies buying lithium, and the mining companies themselves. The Chilean government can use the regulations of other lithium-producing countries as an example. In the Australian state of South Australia, the government requires mining companies to keep a record of environmental impact, people who have been consulted on the potential effects, those people's concerns, and any steps that have been proposed to address any raised concerns (Government of South Australia 35, 2021).

Global environmental groups, corporations, and governmental agencies also need to focus more on repurposing lithium that has already been mined. The lithium from used electric vehicle batteries is often discarded but instead should be recycled more efficiently to lower the need to mine even more lithium. Currently, recycling is less popular than typical brine methods due to being an expensive process, and only 5% of lithium-ion batteries are recycled (Chemical Abstracts Services, 2022). But, over time, as the demand and price of lithium increase, the added expense will be canceled out and turned into profit for the bottom line of corporations. There is concern that recycled batteries are much less efficient than the original batteries. However, a study by the US Advanced Battery Consortium and A123 Systems, a battery company, has supported the claim that batteries with recycled cathodes can be "as good as, or even better than those using new state-of-the-art materials." (Patel, 2021). Efforts have also been made nationally and globally, with the European Union establishing the Battery Directive in 2006 and the US Department of Energy (USDE) creating the Battery Recycling R&D Center in 2019. The USDE also launched a Recycling Prize encouraging entrepreneurs to think up solutions to battery recycling (Blair et al. 27, 2022).

While most ordinary citizens worldwide do not have access to the large lithium batteries used in cars and other technologies, regular people can still recycle their smaller batteries to help prevent waste and keep more lithium in circulation. In America, lithium-ion batteries can be "recycled at certified battery

electronics recyclers that accept batteries.” (United States Environmental Protection Agency, 2023). Similar recycling stations can and should be installed worldwide, especially in countries like Chile, Argentina, Bolivia, Australia, and China, which have a vital role in supplying and refining lithium for the rest of the world. Wealthier countries that use more lithium batteries should also be educated on issues involving lithium and focus on creating disposal methods that will not cause lithium to pile up and go to waste in landfills. If lithium battery recycling and development becomes more of an international focus, the impact of harmful mining techniques would be lessened in Chile and other affected countries due to the reduced demand for new lithium supply.

Many outside influences are working on bringing more attention to this issue. Nonprofit organizations and social justice groups focused on indigenous rights and environmental protection can raise awareness and money. An example of an organization in this field is the International Work Group for Indigenous Affairs. They have a website to educate people on the lifestyles and struggles of indigenous groups in many countries, Chile included. Organizations that are more specific to Chile are The Plurinational Observatory of Andean Salt Flats and Fundacion Tanti. Fundacion Tanti has made a documentary detailing the lives of indigenous people that have been affected by lithium mining. The Plurinational Observatory of Andean Salt Flats attends national congress meetings to advocate for protection of the Atacama desert (Morales, 2020). The United Nations should also help with funding and prompting changes in international laws. More directly involved parties also need to contribute to change. Companies that purchase lithium, electric car companies for example, need to take responsibility and monitor their sources more closely to ensure the use of sustainable extraction methods. With Boric making the decision to nationalize lithium, buyers will be held to a much higher standard in the near future. While the Chilean government needs the revenue lithium mining brings, there needs to be a more even balance between profit and more on protecting its people. The goal of preserving the quality of life for Chile’s indigenous population is achievable if these groups plan and work together.

The push for using electric vehicles powered with lithium batteries is an important step to reduce the effect of fossil fuel emissions from gas-powered vehicles. Development in this field is beneficial, but we need to address it in a way that protects our current environment as well. The brine taken for Chile’s lithium mining is too important of a resource both globally and to local indigenous people to be overused. The region’s water supply must be preserved so thirst and hunger are worries of the past and not a worsening problem in the future.

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