False solutions to climate change: Lithium extraction at the Atacama Desert of Chile

Client: Global Justice Ecology Project
Course: Advanced Seminar EPSM Fall21
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Abstract

While Global North governments discuss climate change in terms of carbon emissions and net-zero energy based on carbon trading for sustaining existing lifestyles and business as usual, in the Global South, popular environmentalism relates to the struggle to achieve fair ecological distribution, defend community access to natural resources, and protect people's livelihoods. Green policies that promote renewable energy technologies such as photo-voltaic panels, wind turbines, and electric batteries severely harm the ecosystems in extraction areas, destroying biodiversity, contaminating water, and causing social and environmental damage to local indigenous communities. Despite their reputation as an eco-friendly alternative to gas-powered vehicles, electric cars require large amounts of lithium for their batteries. Lithium mining replicates the traditional extractive colonialist model of commodifying nature and often devastates local ecosystems. In Chile, lithium is extracted from underground brine water found in the Atacama Salt Flats, one of the driest places on Earth. In this study, I discuss how lithium mining in the Atacama Desert impacts biodiversity, depletes water and displaces indigenous communities in areas of extraction—communities that have been marginalized and criminalized

by the government for no reason other than their occupation of this resource-rich land. This study includes a literature review on the negative environmental impacts, human rights, indigenous sovereignty, and more caused by the supply chain of raw materials related to renewable energy technologies. This study will also present the story of lithium mining in Chile and its effects on politics, the environment, biodiversity, and indigenous communities. Qualitative data has been gathered through semi-structured interviews and analyzing reports and websites authored by activists and indigenous people. The results indicate that the economic interests of mining companies have taken precedence over environmental ones; brine extraction reduces the availability of freshwater and decreases biodiversity while producing several consequences for local communities. Green policies hide the harm, abuses, and human rights violations that are systemic in the extractivist model. A clear understanding of renewable energies is critical in advocating for real solutions to climate change.

Keywords: Atacama Salt Flat – lithium – water – biodiversity – indigenous people

Introduction

Global North governments typically discuss climate change in terms of carbon emissions and net-zero energy based on carbon trading for sustaining existing lifestyles and business as usual. However, in the Global South, popular environmentalism relates to the struggle to achieve fair ecological distribution, defend community access to natural resources, and protect people's livelihoods. Countries in the Global North promote renewable energies as being favorable to the environment for decarbonization. However, most of those policies do not consider carbon emissions and environmental degradation as an integral, interrelated, and intersectional problem. Carbon reduction in one area becomes carbon generated in other locations in addition to ecological degradation if it maintains the business-as-usual model. The use of renewable energy—solar panels, wind turbines, and lithium-based batteries, for example—depends on mining in countries in the Global South for the supply of metals and minerals required for manufacturing. These policies take for granted the provision of natural resources based on the historically colonial subordinate role of the Global South as a provider of raw materials for the Global North (Jerez et al., 2021). Those policies negatively impact vulnerable communities in the Global South, who suffer directly from air and water pollution, destruction of their environment for resource extraction, loss of biodiversity, and their way of living.

The electrification of cars for decarbonization and meeting the Paris Agreement requirements is one example of the same colonialist-extractivist model of business as usual and involves many environmental consequences while failing to cut carbon emissions at source. First, electric vehicles have a substantial carbon footprint because they require batteries made of lithium. Electric vehicles are dependent upon a non-renewable resource: lithium stored in prehistoric water on Indigenous land (Brito et al., 2019). The mining process of lithium demands an extensive amount of water taken from vulnerable ecosystems, breaking its natural and fragile balance. Second, reducing emissions also depends on how electric vehicles are used post-production because charging electric vehicles relies upon local electrical grids. For example, where electric grids run on coal, electric vehicles may increase carbon dioxide emissions (Brito et al., 2019), adding another layer to energy demand. Moreover, those policies

do not relieve congestion in crowded cities. The electrification of cars, as proposed by European and American policies, replicates the current model of individual car use rather than promoting public transit, biking, walking and other less intensive modes of transport.

Policies that promote the electrification of cars, therefore, increase the pressure on lithium demand, with its consequent impact on the local extraction areas. For example, in the Atacama Desert in Chile, mining disproportionally affects the entire life of the communities that live in the area. In the Atacama Desert, 18 indigenous communities have inhabited the area for 600 years and have been suffering the effects of lithium mining (OLCA, 2021). Besides, the mining industry promises to grow excessively in the following years, threatening their lifestyles.

Moreover, President Biden's recent Executive Order seeking 50 percent of new cars in the United States to be electric by 2030 will potentially intensify the demand and price of lithium, with disastrous consequences for local communities in the Global South at the source of lithium.

Chile has one of the most significant reservoirs of lithium in the world, and due to the characteristics of the reserves, it is relatively easy and cheap to obtain. However, in contrast to what occurs with fossil fuels, just a few countries concentrated in the Southern hemisphere have the largest reserves and production of lithium. In turn, the South has almost no countries that manufacture energy storage and electromobility technologies, nor do they consume it (Jerez et al., 2021). Hence, those countries suffer pressure from industrialized countries to mine their land and destroy their nature and biodiversity, displace their people, and pollute their water and air in exchange for dollars that do not compensate for the damage caused.

Lithium in the Atacama Desert is obtained from salty water drawn from the depths of the land. This brine contains lithium carbonate, the base of the light silvery metal found in batteries. First, the liquid is exposed to the sun in large pools for water evaporation. Then, lithium is extracted from the waste by a chemical process. For the first step, companies that extract lithium in Chile drain more than 63 billion liters (16.6 billion gallons) of salty water per year (Boddenberg, 2020). For the second part of the process, companies use and contaminate freshwater. Although mining companies argue that the water pumped from beneath the desert is not used for human consumption, a rich variety of microorganisms that grow there nourish local species. The amount of water extracted in the Atacama Desert exceeds what groundwater can generate sustainably.

Andean flamingos, an iconic species of the area, have reduced their population significantly. A half-century ago, once a year, local communities would gather flamingo eggs for food. Flamingos laid 700–800 eggs each year (Mussa, 2020). Today, those communities cannot collect the eggs, and they do not have sufficient water for agriculture. Sometimes, they have to wait weeks to water their lands, and they see their crops reduced every year. To survive, the indigenous and peasant people claim possession and protection of ancestral lands and water from the destruction caused by mining (Figueroa Huencho, 2020). But their claims have been

criminalized and stigmatized to defend and perpetuate the colonialist dispossession of the mining industry.

The existence of these minerals that possess a high value in the international market and the historic neoliberal policies of Chile have led the country to extremes of extractivism. The mining industry is leading communities to the limit of disappearing or being forced to migrate for their subsistence due to water shortages, the disappearance of native species, and lack of food. This situation will potentially intensify due to President Biden's Executive Order mandating an increase in electric cars in the United States, thus increasing the demand for lithium.

On the other hand, today, Chile is beginning to transform the Constitution after long years of social upheaval that led to a popular referendum in which, unexpectedly, it was decided by a majority to renew the Carta Magna, a legacy from the dictator Augusto Pinochet. For this process, Chileans designated an indigenous woman as the Assembly's President, marking an unprecedented step in a country for which the political and economic leadership has always been in the hands of the white-catholic right neoliberal establishment. Chileans have expressed their will for a democratic, grassroots, ecological, truly representative new Constitution. Changes in the Constitution can open the door to a more protective approach to nature, indigenous communities, and care of biodiversity and a new code of mining that changes the exploitation process and concession of the resources.

The aim of this project is to make visible in the Global North the harmful effects of green policies that promote the use of renewable energies and, in particular, electric cars as potential solutions to climate change. Another focus is to promote and support social movements in defense of water, biodiversity, and indigenous communities in lithium-mining areas against green Global North policies that directly affect communities in the South.

In this study, I discuss how lithium mining in the Atacama Desert impacts biodiversity, depletes water, and displaces indigenous communities in areas of extraction—communities that have been marginalized and criminalized by the government for no reason other than their occupation of this resource-rich land. This study includes a literature review on the negative environmental impacts, human rights, indigenous sovereignty, and more caused by the supply chain of raw materials related to renewable energy technologies. I also describe the disparities created by the global North–South framework related to the supply chain of metals and minerals required for green technologies. In the following section, I describe the methodology used in this project. I then present the story of lithium mining in Chile and its effects on politics, the environment, biodiversity, and indigenous communities.

Research question

This research examines the following questions:

- *What are the environmental, human rights, indigenous sovereignty and other negative impacts on the supply chain for raw materials related to renewable energy technologies,*

specifically photo-voltaic panels and arrays, wind turbines and electric batteries for vehicles around the world?

- *How does lithium mining related to the electric car industry in the Atacama Desert in Chile impact biodiversity, water contamination and the displacement of surrounding communities?*

Renewable energies – Literature review

Discourses that encourage the use of renewable energies are generally limited to the technical and cost-benefit dimensions and are focused on the effort to mitigate global warming. This type of discourse is central in developed countries' governments and tech companies and is driving exponential growth in demand for the minerals and metals necessary for renewable energy technologies. Solar and wind energy projects, as noted by Dunlap (2020), are themselves paraded as ecologically sustainable, environmentally friendly, and an answer to climate change mitigation and energy transition. There is little, however, to suggest that industrial-scale renewable energy can lead to solving, let alone mitigating ecological crises. In fact, the use of such energy spreads electrical infrastructure across the world. Thus, there is a growing body of literature that highlights the socio-economic and environmental effects that the supply chain of renewable energies for wind, solar, and lithium-ion batteries is causing (Kramarz, 2021).

Recent reports (IPCC AR6 Synthesis Report) showing that a 1.5 degree increase in global temperatures is imminent and could even exceed those temperatures have accelerated the need to search for pathways to decarbonization, and the implementation of renewable energy technology promises to be a crucial means to achieve that goal. Given the urgency of the climate crisis, the rapid decarbonization of global energy systems is pushing critical planetary thresholds, including climate, land-system change, biosphere integrity, and biogeochemical flows (Kramarz, 2021), and the concept of shifting to renewable energies in a 100 percent transition to wind, water, and solar energy by 2050 is presented as both technically and economically feasible with few downsides. However, that transition to a low-carbon world is simply another replica of the fossil fuel extraction system that stresses the supply chain at local ecosystems of extraction. Climate change mitigation based on renewable energy transition becomes complicit in condoning ecological degradation or perpetuating violent conflicts as well as unjust patterns of colonialism, racism, patriarchy, militarization, and structural violence (Sovacool, 2021). In this sense, climate mitigation consequences are not distributed equally, however, nor are they experienced by a uniform set of actors. Although nonhuman species are expected to suffer most from climate mitigation, local communities that host the extractive activities will also be disadvantaged (Sovacool, 2021).

Whereas mining is an ancient practice of both civilizations and Indigenous societies, the latter was on the microscale and embodied different socio-ontological relationships (Dunlap et al., 2020). Conventional and green extractivism are both sides of the same coin and merge into the same process of exhaustion, which causes cascading socio-ecological damage— toxification, water contamination, greenhouse gas emission, among others. In the 1990s, the mining industry intensified efforts to rebrand mining as "sustainable" to suit the needs of the times and

accommodate neoliberal environmental approaches. However, neoliberal environmentalists not only legitimize existing regimes of extraction by "greenwashing" mining activities but also create new economic opportunities for mining and energy companies in the so-called "green economy". The result is the emergence and institutionalization of "green extractivism", referring to broadly defined forms of resource extraction linked to or justified by the "green economy" (Verweijen et al., 2021). Conventional and "green" extractivism are neither different nor separate. Both are based on colonial principles of resource extraction from developing countries for the benefit of rich nations, or as Jerez et al. (2021) describe the colonial North–South asymmetries, which affect indigenous ecosystems of the Global South for the green lifestyles of industrialized economies. According to Eduardo Gudynas (2013), colonial capitalist extractivism retains three features: extract large quantities of material; cause large-scale degradation of ecosystems; and export raw materials with minimal processing. The three features are presented in the extraction of metals and minerals needed for renewable energies. Renewables require extractivism for securing raw materials and thereby risk the possibility of exhaustion via mining, negligent recycling protocols, misleading ecological "solution" marketing and capitalist growth imperatives (Dunlap et al., 2020).

Authors such as Kramarz (2021) consider that green extractivism is part of a capitalist political economy that incorporates, contaminates, and erases human and nonhuman lifeforms through processes of dispossession, surplus extraction, and capital accumulation. Moreover, Kramarz (2021) highlights that the transition to renewable energy is having significant displacement effects on ecosystems as well as human health. In a deep analysis, he identifies three types of displacement caused by resource extraction for renewable energies: displacement by dispossession through the process of land expropriation that deprives local communities of land and livelihood; displacement by the degradation and pollution of ecosystems at the extraction, production, transportation, and disposal points of the renewable energy supply chain; and displacement through commodity-dependent development, as a systemic pattern of unequal environmental exchange that locks regional and national economies into destructive development dependencies of primary extraction, land expropriation, elite capture, and unsafe disposal of toxic and hazardous waste (Kramarz, 2021).

Dunlap (2020) also grants that green and conventional natural resource extraction are significant in degrading human and biological diversity, thereby contributing to larger trends of socio-ecological destruction, extinction, and the potential for human and nonhuman extermination. From the analysis of three extractive projects: wind energy in Mexico, coal mining in Germany, and copper mining in Peru, applying a post-liberal or structural approach in genocide studies, Dunlap's research found that environments and ecosystems are the first to be devastated in warfare, meanwhile remaining the objects of systematic degradation during so-called "peacetimes". In Mexico, local populations initially supported wind projects due to the desire to obtain work, social development, and prosperity. But in return, they obtained flooded fields, hydrological and landscape changes, and the marginalization of local people whose food sovereignty was tied to the land and sea. In many cases, in less affluent nations, rural workers have been shifted to, or alternating with, other livelihoods to make a living through commodity extraction (Dunlap et al., 2020). In Germany, the land was directly grabbed by the German state

in the name of “public welfare” and national security interests. The displacement and resettlements of homes, air pollution, and environmental destruction entailed by the “migrating mine” have triggered resistance, beginning in the 1970s and continuing into the present day. In the case of Peru, potential desalinization facilities taking water from the sea had not undergone an environmental impact assessment with the unknown consequences that the project can involve. In these three cases, local communities experienced high levels of social opposition and/or militant resistance. Moreover, despite majority opposition, national, regional, and local authorities served as key collaborating forces to initiate or carry out those projects. Meanwhile, mining companies simultaneously worked hard to curtail resistance, divide the population, and solidify extractive hegemony in each region.

At the environment level, each project entailed various levels of deforestation and flora disruption, water usurpation, or pumping from aquifers and rivers. The study offers a wide range of examples of environmental damage caused by the extractive activities for renewable energy: water contamination with concrete and related solidifying chemicals in ground aquifers in the case of wind turbine foundations because it drained aquifers and disrupted hydrological cycles, specifically the water that would normally replenish the lagoon. Polluted water run-off from coal spoil heaps and copper tailing ponds also caused serious socio-ecological problems. Animal habitat is cleared for roads, foundations, and mining sites, which affects the fauna, flora, and water in order to create profits and (limited) employment. Avian life is significantly threatened with the placement of wind turbines but also—to a degree—other habitat disruptions and loss. Placed near these green and conventional extraction sites, humans also experience, or risk various and severe negative health impacts based on the air, noise, water, and emissions pollution (Dunlap, 2020).

For those who are in the first line of the socio-environmental issues created by the mining industry for renewable energies, there is a consistent delegitimization of their struggles. Delegitimization protest against extractive projects occurs, for instance, by labeling activists as “terrorists”, a trend that intensified in the context of the so-called “war on terror” (Verweijen et al., 2021). On the other hand, Convention number 169 of the International Labour Organization (ILO 169), in an attempt to protect the indigenous and Tribal people’s rights, guarantees indigenous peoples, among others, the right to participate in decision-making on activities that may impact their own societies and territories, such as natural resource extraction, while maintaining the integrity of their societies, territories, and cultures. Whereas the ILO 169 Convention generally gives increased recognition to indigenous peoples and calls for indigenous participation in the decision-making processes that affect their lives, it limits indigenous participation in political, social, and economic matters to a system controlled by state governments and corporations. Furthermore, in many cases, the free, prior, and informed consent facilitates extractive expansion. Mining corporations may now interact directly with indigenous peoples, without state intervention, to negotiate the use of their natural resources. Another problem with the free prior and informed consent has been limiting it to indigeneity or tribal groups that excludes other local communities in the areas of extraction, creating a politics of recognition that undermines opposition (Verweijen et al., 2021).

There is robust research showing that greenwashing strategies serve to mask the harm, abuses, and human rights violations that are systemic in the extractive model (war on want). Therefore, it is important to deconstruct the emerging narratives and fight for climate justice that has as its central axis the communities and ecosystems that are on the front lines of mining for renewable energy. It is also essential to move the current energy transition discussions from the "mitigate-at-all-costs" mentality that has come to dominate academic and policy discussions to a more critical assessment of what is at stake for the rights and livelihoods of local communities and landscapes, regions, and economies affected by the renewable energies boom (Kramarz, 2021).

Research design and methods

This project includes a literature review into the supply chain of raw materials for renewable energies. It also examines, in depth, lithium extraction in the Atacama Salt Flat in Chile. The study uses qualitative research methods, exploring a selection of scientific and academic publications related to the harmful effects of green solutions for climate change.

Qualitative data was gathered through semi-structured interviews and document analysis of articles, reports, and websites from journalists, activists, and indigenous people to analyze the impact of lithium mining in Atacama over biodiversity, water contamination, and the impact on local communities.

The textual data was analyzed using a critical qualitative approach based on grounded analysis with the communities themselves to develop a better understanding of the current situation of Atacama's communities and the prospects of increasing lithium demand.

Research Questions	Data Collection methods	Details
What are the environmental, human rights, indigenous sovereignty and other negative impacts on the supply chain for raw materials related to renewable energy technologies, specifically photo-voltaic panels and arrays, wind turbines and electric batteries for vehicles around the world	Document analysis: journal articles, reports, secondary sources such as newspapers, websites, magazines	● Scientific and academic publications ● Peer reviewed articles
How does lithium mining relate to the electric car industry in the Atacama Desert in Chile impact biodiversity, water contamination and the displacement of surrounding communities?	Document analysis: articles, reports, website content, newspapers, magazines, blogs, independent journalism, podcasts, and activist groups	● Report about Andean Salt Flats, by Plurinational observatory of Andean Salt Flats (OSPAL) ● Latin American Observatory of environmental conflicts (OLCA) webpage and reports ● Observatory of mining conflicts of Latin America (OCMAL)

	Semi-structured interviews with stakeholders familiar with lithium mining in the Atacama region (environmental experts, local leaders, journalist, etc.)	● Yasna Mussa report about Lithium exploitation in Atacama: The environmental threat to indigenous communities. ● Activist and member of an indigenous Community of Atacama ● Advocate of indigenous people's rights and the environment ● Scholar expert on resource extraction, renewable energy, climate change, green technology, social movements, and the left in Latin America.

Lithium mining in the Atacama Salt Flats Literature review

Lithium-ion batteries were launched in the 1990s and gradually introduced in consumer electronics. The internal chemistry of lithium—light, conductive, and energy dense—allows it to recharge electricity quickly and efficiently. Lithium-ion batteries turn out to be multiple times more energetically efficient than a nickel-metal hybrid equivalent (Perotti and Coviello, 2015). These appealing properties have positioned lithium as a commodity central to the future of the energy, electronics, and automobile industries for decarbonization (MacMillen et al., 2021). Lithium-ion batteries consist of metal and minerals (particularly lithium, copper, cobalt, manganese, and nickel), the extraction processes of which are highly carbon intensive. Downstream, lithium-ion batteries in electric vehicles also require power from energy systems that can be highly dependent on coal, oil, and natural gas (Kramarz, 2021).

Lithium demand for the manufacture of rechargeable batteries doubled in less than ten years, a process directly related to carbon-mitigation policies that emphasize electrification (Jerez et al., 2021). Furthermore, The World Bank has projected that the demand for the raw and semi-processed materials that are used in the production of wind and solar PV will increase by 250 and 300 percent, respectively, by 2050 under a 2 °C warming scenario. Global demand for the lithium carbonate that is used in the production of lithium-ion batteries for electric vehicles and electricity storage is projected to increase fivefold by 2025 (Kramarz, 2021), and the global price for lithium carbonate increased from US$2000/t to US$ 12,000/t. between 2015 and the beginning of 2019 (Kramarz, 2021).

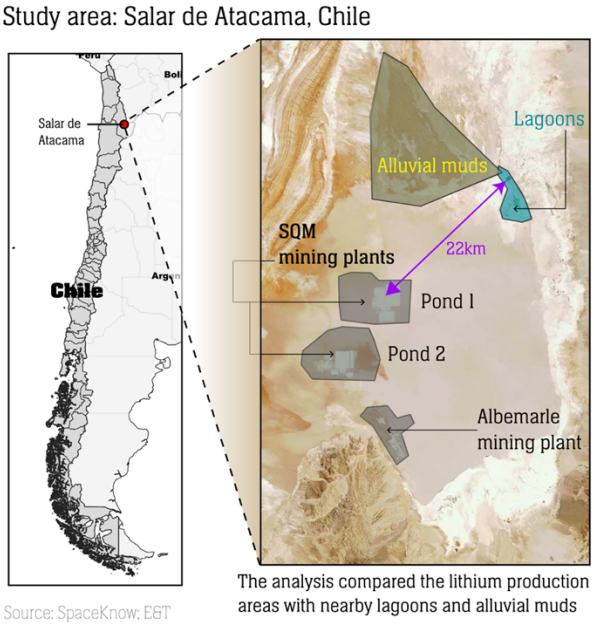
Lithium extraction has been promoted by mining companies and electric car manufacturers as environmentally benign and climate friendly, as well as being beneficial for the countries that possess this resource. Sustainable, contemporary, responsible, reflexive, and adapted to the 21st century, lithium is frequently framed as an environmentally benign resource, differing

significantly from more impactful extractive resources, such as ores or fossil fuels (MacMillen et al., 2021). However, many of the extractive concessions awarded to lithium companies overlap with ancestral indigenous territories, communal lands, and protected ecological areas. The extraction of lithium has also been associated with multiple ecological risks, involving waste generation, landscape change, contamination of surface salts and water bodies, and impacts on flora and fauna (MacMillen et al., 2021). Lithium extraction from mineral and brine deposits has been shown to deplete local water sources, exposing human populations to a wide range of health problems, including damage to the nervous system, thyroid, and kidneys (Kramarz, 2021).

The extraction of lithium in Chile is concentrated in the Atacama Salt Flats and has its origins in 1962 when this mineral was discovered in the salt flat. In the 1970s, the government of Chile decreed, through constitutional changes, designated lithium as a “strategic resource”, reserving for the state, the right to its exploitation and commercialization (MacMillen et al., 2021) In the Atacama salt flat, are the two most important non-metallic mining deposits in the country.

The Andean salt flats of Chile are located in the North area of Chile, in the Antofagasta region (Figure 1).

Figure 1:



The Atacama salt flat is an evaporitic body that contains brackish water because of the recharge of surface and underground channels that carry salts caused by the leaching of volcanic rocks. The salt flat is a complex aquifer system where different salinity and other water characteristics interact. This area receives water contributions from the San Pedro and Vilama rivers in the north sector of the basin and underground contributions from aquifers and ephemeral streams that flow through the ravine of the Andean altiplano (Jerez et al., 2021). As a whole, it is an arid

area with little rainfall and extreme temperatures due to the heights that range from 2300 to 4500 meters above sea level. The populations are located in areas distant from the most important urban centers and constitute mostly small towns, communities, or ayllus that range between 50 to 500 inhabitants (except in strategic places of commercial circulation) (Argento, 2019).

The territories of this region are arid highland environments that have been home to human settlements for millenia, including the Lickanantay (Atacameños), Kolla, Quechua, and Aymara peoples. These communities have traditionally relied on agriculture, livestock rearing, and small-scale commerce (MacMillen et al., 2021). In recent decades, the Atacameños have organized themselves as the Lickanantay people—a name in the Kunza language—and have begun a process of ethnogenesis within the framework of recognition of indigenous peoples that took place in Chile with the reestablishment of democracy (Argento, 2019). Since colonization, the region has been considered a source of raw materials, and its ecological systems have been commodified in different ways. Evenwith reforms during different government administrations, there have always been efforts to exploit its territories into zones of extraction, generating social and ecological conflicts (MacMillen et al., 2021). In Chile, the history of lithium extraction has been full of conflicts and complaints of various causes, such as fraud related to the federal government treasury, environmental damage, anti-union practices, breach of contracts, and illegal brine export (Jerez et al., 2021).

In 1983, the Chilean Mining Code declared that lithium's exploration and exploitation could be carried out by the state and by administrative concessions or special operation contracts under the conditions established by the President via supreme decree. The right to lithium mining was in charge of the state-owned Production Development Corporation (CORFO) for the first decades. In 1980, CORFO signed contracts with the US Corporation Foote Mineral Company to exploit lithium in the southern sector of the Salar de Atacama through the Chilean Society of Lithium Limited (Sociedad Chilena del Litio, SCL), obtaining authorization to exploit 200,000 tons of lithium in 1984. Then, in the same year, CORFO sold its stake in SCL, which was acquired by the North American holding company Albemarle, which also controls the ownership of the largest lithium mines in Australia. In 2016, CORFO signed a new contract with Albermarle to authorize the duplication of lithium exploitation, approving an extension of extraction quotas that reaches 540,240 tons until 2044. At the same time, in 1986, CORFO formed the Sociedad Minera Salar de Atacama Ltda (MINSAL, current Sociedad Quimica y Minera de Chile, SQM), authorizing an extraction quota of 180,100 tones per year (Jerez et al., 2021). As a result, lithium extraction is currently in the hands of two large corporations: SQM and Albemarle.

The demand for lithium has changed in recent decades in quantity and use. In 2012, lithium demand was 35% for ceramics and glass and 29% for batteries (what about the remaining 36%?); in 2016, it reached 30% and 39%, and in 2019, 18% and 65%, respectively. The global demand for lithium for rechargeable batteries also doubled in the last decade, a period in which green capitalist policies to encourage low-carbon technological transformations aimed at mitigating climate change began to be applied strongly (Jerez et al., 2021). The current demand for lithium comes mainly from the Global North economies, where the development of green

electromobility is located (Jerez et al., 2021). The expansion of lithium demand coming from the Global North has been generating socio-environmental damage and water injustices in the Atacama Salt Flat (Jerez et al., 2021).

A large part of the literature agrees that the central impact of lithium extraction in Chile relates to water use because the process involves the extraction of significant volumes of water from below the salt flats that cannot be sustainably replenished at the same rate that the water is pumped. A single electric vehicle battery requires 63 kilograms of lithium carbonate equivalent. Each ton of lithium carbonate, or 14 electric vehicles, necessitates 2 million liters of water to be evaporated—the equivalent of an Olympic-size swimming pool (Brito et al., 2019).

The salt flats have been forgotten or not considered ecosystems when it comes to thinking about the historical extractive practices of nitrate or copper and, more recently, lithium. The water from extensive salt flats has been used for processing the mega-mining of copper, subsequently causing the drying up of the lagoons—sites of high biodiversity—and that, in turn, have an invaluable cultural legacy. In the same way, the indigenous communities that inhabit the territories around salt flats, such as the Atacama Salt Flat, have been deeply affected (Dorador 2021). In the Atacama Salt Flats, the analysis of 20 years of satellite images has shown that there have been changes related to the increase in soil temperature, decrease in humidity, and reduced vegetation cover in the basin (Dorador 2021).

Lithium mining in Chile is water mining because the extracted material is not a rock -like in Australia- or other solid mineral but is brine; that is, a liquid that contains lithium and other minerals. Brines— comprising mostly salt and the waters from which in different degrees of salinity lithium and potassium are extracted—are legally recognized in Chile as “mining property” or as a “mineral”, generating institutional denial of its constitution as a unique water ecosystem. Salt Flats are defined by the state as static mineral deposits. However, brines have hydrodynamic behavior and are water bodies in constant movement. Their extraction can affect the water concentrations of other areas. However, the extraction of brine as a water resource is not considered in the Chilean Water Code but in the Mining Code (Jerez et al., 2021), notwithstanding that it takes approximately two million liters of water (2000 m^3) to obtain one ton of lithium (MacMillen et al., 2021).

The hydro-social impacts of brine exploitation are invisible, and only the freshwaters of the salt flats are considered. The exploitation of the Salt Flats water far exceeds its recharge capacity. The over-extraction of water exceeds the water inflows to the salt flat by more than 2000 liters per second. This simple imbalance demonstrates the water unsustainability of lithium extractivism in the Atacama Salt Flat (Jerez et al., 2021).

The Chilean Water Code passed in 1981 under the Pinochet dictatorship impacted the privatization and loss of ancestral waters of the Atacameño communities. The Water Code, currently in its third version, is the law that regulates the use of the country's water resources. The right to use water, created by the Water Code of 1951, is a right granted by the State that allows its holder to use the water. Once granted, the rights become private property and can be

traded freely, and independently of the land, in a private market. The application of these regulations unleashed a process of appropriation of ancestral waters by mining companies, causing the desiccation of bofedales (high-altitude wetlands) and accentuating the migration of the Atacama population (Argento, 2019). The non-recognition of the brine as a water entity allows the mining companies to only account for their freshwater expenses coming from the salt wells. Only freshwater sources from aquifers and streams, which constitute part of the territory's water dynamics are recognized within the Salt Flat as "water resources". This issue makes it difficult to estimate the real water impact of lithium extraction (Jerez et al., 2021). The extraction of brine containing water by lithium mining configures an extractivist territoriality that overlooks other local territorialities, knowledge, and the Andean cosmovision of nature (Jerez et al., 2021).

The water injustices triggered by lithium extractivism have also contributed to a decrease in agricultural activities, such as the cultivation of corn, quinoa, vegetables, and fruit, along with small-scale Andean livestock that has developed in the Salt Flat, mainly with guanacos, llamas, and alpacas (Jerez et al., 2021). For the Atacameño people, water, or puri in their Kunza language, has a sacred characteristic directly linked to the land and the people. Water and land are life for the indigenous communities. The waters cannot be traded. Water is sacred. It is powerful, it is life, water is their blood (Jerez et al., 2021).

Local and indigenous affected communities have criticized the absence of comprehensive environmental assessments around authorized projects. Scholars have warned that the potential consequences of large-scale lithium mining are largely unknown and unstudied, with major uncertainties remaining in particular around the impacts of extraction on hydrological cycles (MacMillen et al., 2021). The extraction is dominated by the extractivist and economist mining vision limited to the mineral resource and does not acknowledge its hydrogeological complexity nor indigenous uses and world views of the salt flat (Jerez et al., 2021). Despite the profound continental political shifts to the left and even during the government of Michelle Bachelet, the extractivist sectors maintain their importance and are one of the pillars of current development strategies (Gudynas, 2009).

At the end of the 1990s, the Chilean State incorporated the Lickanantay communities into its indigenous policies. Almost two decades later, in 2008, Chile ratified ILO Convention 169, which grants territorial rights and indigenous consultation that could serve to cope with new extractivist projects. These legal frameworks gave legitimacy and recognition to the communities over their ancestral territories, placing them as unavoidable interlocutors in the basin. Critical perspectives on "responsible mining" contend that local communities have an ability (vested ideally through processes of free, prior, and informed consent) to ascertain and adjudicate the future impacts of mining (Kramarz, 2021). But this is only a sort of compensation policy in which the State Agency Corporation for the Promotion and Production (CORFO) authorizes higher quotas for lithium extraction, and, in exchange, indigenous communities receive cash compensation from the lithium corporations. Albemarle signed collaboration agreements with indigenous communities in 2016. All this has generated internal fractures in the communities due to competition for these resources from the lithium companies SQM and

Albemarle (Jerez et al., 2021), providing a clear example of the failure to adequately adhere to the right of indigenous communities to processes of free, prior, and informed consent regarding territorial projects (MacMillen et al., 2021).

The research of the linkage and feedback between green electromobility and lithium extractivism and its impacts on the Atacama Salt Flat visualize that a transition to a low-carbon future through renewable energies that under-examines questions of equity among those who pay and those who benefit will be continuously threatened by the population it leaves behind (Kramarz, 2021). That is what Jerez et al. (2021) consider the lithium paradoxes: decreased carbon emissions in industrial economies versus the socio-environmental exhaustion of the Atacama Salt Flat. The geographic and epistemic distance makes invisible the socio-ecological effects of the extractive metabolism of the electromobility industry that has triggered a series of socio-environmental conflicts in the salt flats of Bolivia, Chile, and Argentina, where more projects appear to exploit lithium (Jerez et al., 2021).

Findings & Discussion

This study focuses on the impacts of lithium mining in the Atacama Salt Flat, on (1) biodiversity, (2) water contamination, and (3) displacement of surrounding communities. The complex social and ecological value of the salt flats have served as sources of life to the local communities over millennia (MacMillen et al., 2021); thus, this analysis focuses on the consequences that any alteration of the ecosystem can have on local communities including the (1) social, (2) ecological and (3) political impacts of lithium mining on the region (Table 3) Tables 1 and 2 summarize the basic characteristics of the study area that relate to these three areas of impact that are analyzed.

Table 1: **Atacama Salt Flat Basin Characteristics**
● Area: 1,178 mi^2 ● Height above sea level: 7,556 ft ● Population: o Total population: 177,048 o 50 human settlements (indigenous and non-indigenous people) o 18 indigenous communities (between 15 and 400 members each)

Table 2: **Stakeholders**
● 18 Local indigenous communities[1] and non-indigenous people ● Mining companies (SQM and Albemarle)

[1] San Pedro de Atacama, Socaire, Peine, Tocoano, Talabre, Camar, Machuca, Santiago de Rio Grande, Coyo, Solcor, Sequitor and Checar, Catarpe, Larache, Yaye, Cucuter, Solor, Quitor, Guatín.

- Local and central Government[2]
- Electric car manufacturers
- Workers (local and non-locals)
- NGO's: OCMAL, OLCA, OPSAL, Atacameño peoples Council

Table 3: Lithium Mining Impacts

Ecological Impacts	**Social (Cultural) Impacts**	**Political(Economic) Impacts**
● Water quality & availability ● Ecological systems (flaura, fauna, etc) ● Biodiversity	● Cosmovisions ● Livelihoods ● Culture - social cohesion and collective bonds ● Conflicts	● (legal) Agreements ● Claims/conflicts ● Jobs/livelihoods

Ecological impacts

In terms of ecological impacts, the specific types of impacts that were explored included the linkage between lithium mining and water quality, water access and availability, the effects of mining on ecological systems and various biota (flaura, fauna, etc.) and on biodiversity.

Among the interviewees, reports, and websites examined, there was a consistent concern about the impacts of lithium mining on water availability in the Atacama Salt Flats. This issue raises concern among locals, indigenous communities, scientists, activists and NGOs. In recent decades, rivers and lagoons that are part of the Atacama Salt Flat system have seen a decline of freshwater availability. This loss is the main matter of concern in the area because the Atacama Salt Flats is one of the driest places on Earth, and there are many organisms that depend on the scarce resource for their survival. Lithium mining is closely related to the water issue because for lithium extraction, large amounts of underground water have to be pumped to the surface. Lithium brine mining can be viewed as "groundwater mining" expresses Brito et al. (2019). To extract lithium, mining companies pump the brine into vast shallow pools at the surface, where evaporation from eight months to three years concentrates the highly valued lithium salts. Furthermore, these ancient aquifers are nonrenewable.

However, there is no consensus among the data collected that lithium mining is the sole cause of the decline in water availability. Interviewee # 2 considered that the water shortage in the Atacama Desert is part of a global problem caused by global warming. They argue that "we cannot blame lithium mining" as the main cause of the reduction of available fresh water. Although it is true that climate change is producing droughts in many parts of the world, especially in the driest areas, mining also uses excessive amounts of water, in many cases without control and exceeding the amounts that are considered appropriate by law.

[2] Government agency of Production Development Corporation (CORFO), Mining ministry, National Lithium Comission,

Also, the data shows a varying degree of impact of lithium mining on water availability. Interviewee #1 mentioned that the San Pedro river is experiencing a water deficit. Compared to the 1200 liters per second that it had a decade ago, the rate is now only 400 liters per second. However, the interviewee expressed that even with the decline in water availability, as they took water from the underground, they needed to go more deeply to find freshwater for consumption. "Even though this is a desert, there is water, and we know where to find it". The community's ability to obtain water at different depths shows that they have a substantial understanding of the structure and system of the salt flat. Native peoples also have significant resilience capacity to adapt to the ecological damage that the area is suffering. However, it is still an indicator that the available water in the area is decreasing. On the other hand, the report by Yasna Mussa analyzed mentions that a study carried out by the government agency Corporation for the Promotion and Production (CORFO) assessed that the amount of water extracted in the Atacama salt flat exceeded 21% of what groundwater can generate sustainably. Lithium extraction contributes to dispossessing local indigenous and campesino populations by usurping large quantities of water that would support local consumption or agricultural practices (MacMillen et al., 2021). The result is also the inevitable reduction of water available for plants and animals, like the Andean flamingos, whose population has plummeted.

Related to water extraction, interviewee #3 mentioned some alternative lithium extraction technologies that allow filtering this metal from underground without the need to extract the groundwater. However, this technology is not used in Chile because it is expensive compared to water evaporation by the sun. Furthermore, no studies have shown the full impacts that this type of technology for lithium extraction can cause to the environment.

Biodiversity in the Atacama Salt Flats was also one of the key ecological impacts to be cited as a result of changes in water availability due to lithium mining. Reports from OSPAL and OLCA include detailed information about the relationship between lithium mining, water scarcity, and biodiversity loss. The OSPAL report explains that the increase of evaporation caused by lithium mining leads to the rise of temperatures of both soil and lagoons. This change has provoked what they referred to as a “local climate change,” which impacts vegetation and animals’ survival. The OCMAL report highlights that tiny organisms that live in the brine of the salt flats termed extremophiles, which serve as food for plants and animals, have been affected by changes in the water levels due to pumping large amounts of water from underground. This suggestion coincides with Mussa, who notes that the Andean flamingo population has decreased 30% due to the changes in the Salt Flats. Interviewee #3 also agrees with the OSPAL report. This interviewee mentioned that the evaporation of large amounts of water in a dry ecosystem like the Atacama Salt Flat, which only occurs due to the exposure of the brine pumped to the surface by mining companies, affects the habitat of species that are highly dependent on these locations for their survival.

Social (Cultural) Impacts

In terms of the social impacts resulting from lithium mining in the Atacama region, the key areas of focus included whether the livelihoods, cultures, and cosmovisions of surrounding

communities in the areas of extraction are affected by the presence of mining companies and more specifically if mining generated internal conflicts among member of the communities in the appreciation of the agreement with the mining company Albemarle.

Regarding livelihood impacts, data from interviews (specify which ones), reports and websites indicate that the livelihood of indigenous communities is affected by mining companies' activities. Again, water becomes the central issue that intersects all the problems that lithium mining brings to the area. Indigenous communities' main productive activities are agriculture, tannery, saddlery, livestock, and their by-products. A decrease in water availability for agriculture and livestock directly affects the means of living of indigenous people. The Atacameños are farming and cattle-raising people, and as noted by OCMAL, they grow corn, potatoes, quinoa, and squash, as well as domesticated llamas and alpacas. Without water, those activities have been reduced and, in some cases, extinguished. Thus an impact on water also impacts on livelihoods for local people.

Although there was little information regarding the impacts of mining on the cosmovision and cultures of local communities specifically, there was one interviewee who reflected on these impacts in some depth. Interviewee #1 considered an "acute social disintegration" occurring among the indigenous communities in Atacama in the area due to the presence of the mining companies. The interviewee (#1) mentioned that their community was highly dependent upon agriculture and livestock, but young people prefer to work in the mines rather than on the land now because the former offers more economic benefits. The communities' entire cosmovision rests within the basin. The alignment of the sun with mountains to the east and west determines the timing of crop cultivation, and they trace their ancestral lineage to stromatolites in the shallow lakes—analogous to early life forms (Brito et al., 2019). Any disturbance of the salt flats will disturb the lifestyles and bodies of indigenous people. Now farmers are old, and they are dying, as are their traditions. "The socio-cultural fabric has been diminished" (Interview #1). They also mentioned the diminished interest among young community members to carry out projects to revitalize the language and customs and prefer instead to carry out development and technology projects. The OSPAL report agrees that there has been a loss of indigenous knowledge of agriculture, and it also links to the problem of water scarcity because agriculture has become much more difficult to carry out. The latest report also mentioned the problems related to draining the salt flats that affect vegetation, and communities are losing the ability to use these plants for ancestral medicine. The use of salt flats for mining tends to displace the artisanal or cooperative salt harvesting activity carried out by community cooperatives and puts pastoral and agricultural activities at risk (Argento, 2019). A surprising finding and no less critical in the Mussa report is that "theft, drug addiction, alcoholism" are some changes that mining brings to the Lickanantay people as the loss of livelihoods, cosmovisions and cultural ties to the land are lost. These ways of life are intimately tied to how collective identities are shaped and passed down to future generations for the survival of the culture.

Political (Economic) Impacts

In terms of political economic impacts, the relationship between local communities and the mining companies is a driving factor. The dominance of powerful mining companies in the

region impacts the political and economic conditions of local communities. One of the primary ways that these impacts can be seen is through analyses of the existing agreements between the companies and communities. Other measures of impact on the political and economic condition of local people includes the perception of local communities on the terms of those agreements, the existence of current claims by indigenous communities to the mining companies, and whether or not members of the communities work for the mining companies and the conditions of employment.

The communities that inhabit the Atacama Salt Flat, organized under the Atacameño People's Council, signed an agreement with the company Albemarle in 2016 that states that the Council should receive 3.5% of the company's total annual sales of Lithium Carbonate and Potassium Chloride produced in the Atacama Salt Flat. The agreement is is based on the ILO Convention 169 in its article 15, which states that "indigenous peoples should participate, whenever possible, in the benefits provided by the prospecting or exploitation activities of the minerals or subsoil resources" Considering that Albemarle report net sales of lithium in 2019 of 411 million dollars, that means that 3.5% represent 14 million dollars for the Council of the Atacameño People. The 18 communities are responsible for selecting and implementing the projects to be funded by these Albemarle resources. To date, communities have built new and expanded water systems locally; constructed a wastewater treatment plant; built two photovoltaic plants; installed photovoltaic panels on homes; reduced reliance on diesel generators and provided scholarships. Lastly, five communities are in the process of building or have completed community centers (Albemarle, 2021). Then, internally, the Council distributes the money between the 18 communities for different projects. The interviewees mentioned the agreement between the communities and the mining company Albemarle. However, there is no information about that agreement in the reports and websites analyzed.

There are different perspectives among interviewees about the impact that this economic agreement has on local communities. Interviewee #2 considers the deal one of the highest standards in the world for revenue sharing with indigenous communities and considers it a model to follow for other indigenous communities. However, interviewee #2 brought something important to light. Beyond the economic terms, they mentioned that the communities negotiate for a higher percentage of the annual sales but cannot re-negotiate the terms. In other words, the agreement is not open for new claims and a retraction of the agreement to be entertained in the future. Although "Communities should be able to veto extractivist projects" under ILO 196, "there is no right to veto, absolute." Interviewee #1 explained that each of the 18 communities that are part of the agreement received a share of the royalties, and they internally decided how to expend it. This interviewee complained that most of the projects initiated by communities focus on development and technology than on revitalizing their languages and culture. In this way, the agreement brings about greater consumption that the community did not previously have.

But on the other hand, the community the interviewee belongs to used part of the royalties they received to reacquire land that historically belonged to them. Because despite the recognition of indigenous rights in Chile, the land belongs to the state, and indigenous peoples

only have the right to inhabit them. Interviewee #1 explained that some of the communities agree with the company because they are afraid that they will be expropriated and displaced from the land if they do not agree. Interviewee #3 considers the agreement is good in monetary terms. Still, it does not improve the situation of the indigenous communities whose environment has been harmed and cannot be remediated through cash payments.

Regarding the presence of current claims, OLCA and OCMAL outline conflicts in different expressions, from litigation to protests, mainly related to the use of water. Interviewee #2 mentioned how the community of Camar was successful in their claim to make the mining company close some holes for water extraction because they were able to demonstrate that it was drying carob trees.

The last dimension analyzed in the relationship between local people, and the mining company is whether companies employ members of the communities in their activities and how these employment opportunities are perceived by local stakeholders. Interviewee #1, as a local community member, explains that young local people typically opt to work in the mine rather than working the land because they are incentivized to earn a salary. However, he also mentioned that some communities have a long history of mining. Initially, this work was in the copper mines and now in lithium mines "that [mining] is the story in the country"
The mining companies are also worsening the situation for locals, not only through the environmental damage but also in damaging the local economy. In recent years, mining companies have changed their working hours by implementing a shift where employees work seven days in a row and rest for seven days. This allows people from other areas to work in the Atacama Salt Flat and return to their towns. Interviewee #1 complained that the reason for this change in shifts was meant to dismantle unionism. However, it also negatively impacts the area because external workers return to their towns without spending their salaries in the Atacama area.

The reports from local NGOs like OLCA and OCMAL explained that young people in the local communities opt to work in the mines or migrate to big cities for better opportunities because they consider that agriculture is not a suitable way of living given the current situation of water scarcity.

Another theme analyzed is the presence of internal conflicts in the communities, but few details were found about this issue. Interviewee #1 mentioned internal disputes between the communities regarding the agreement with the mining companies and the destination of the royalties that they perceived. On the other hand, interviewee #2 noticed that all 18 communities that inhabit the area organized in the Council of the Atacameños Peoples participated and have been able to agree with Albemarle. Currently, no community is questioning the agreement. Interviewee #3 does not mention the presence of internal conflicts; however, highlights that indigenous communities have been marginalized by the government historically and that the government patronizes mining companies over local communities.

It is not surprising that despite the scientific arguments regarding the negative impacts of lithium mining, the lithium industry speaks of their industry as offering a "window of opportunities" or the economic benefits of the resources and revenue from it for development, highlighting the hegemonic dimensions of economic indicators, market studies, or tax regulations. While at the same time, there is relative silence from the government regarding how the populations that inhabit these territories are affected and how the implementation of lithium extraction projects involves a dispute regarding the appropriation and uses of the common goods—energy, land, water, and salt flats.

Across all the negative impacts imposed by lithium mining are the indigenous-peasant populations and communities that inhabit the region. These communities are on the frontlines of the effects of the companies, including the dynamics of mining-business intervention, and political/economic articulations or connivance (Argento, 2019).

Conclusion:

The results of this analysis indicated that the economic interests of governments regarding the benefits that mining companies bring to the country have taken precedence over environmental, cultural or social justice considerations. This study reveals that water impacts are one of the most prominent problems regarding lithium mining in the Atacama Salt Flat. Water usage, pumping it from the underground to evaporate in the Salt Flat surface, is the primary concern related to lithium mining in the Atacama.

Water depletion cuts across all other negative impacts of lithium mining analyzed in this project: ecological, social/cultural and political/economic impacts. Brine extraction from the underground of the Salt Flats reduces the availability of freshwater in other areas of the salt flat for plants, animals, and human consumption. Due to the lack of water, indigenous communities that inhabit the area have had to reduce their agricultural and pastoral activities, leading the new generations to work in the mines or migrate to the cities to find a livelihood. Moreover, increasing evaporation in the area and higher land temperatures have provoked a “local climate change” that directly affects the fragile biodiversity around the salt flats, reducing animal populations and plant survival. The pressure to extract lithium from the salt flats will continue as long as rudimentary evaporation technology remains one of the cheapest means of extraction.

The evidence also identifies that the presence of mining companies causes cultural and socio-political problems for the local communities. Some examples are the loss of their livelihood, the extinction of plants for medicinal use, and internal conflicts regarding how to spend the royalties that the communities have received from the mining companies. The presence of mining companies brings problems to the area, such as theft, drug addiction, and alcoholism among community members. It tempts young members to work in the mines for a salary abandoning their farming traditions or migrating to the cities for better opportunities. Mining companies also affect the local economy by providing jobs to people from other regions allowing wages to drain to other locations. The interviews highlighted that members of the communities feel constrained to give consent for fear of being displaced and that they cannot

object to and reject the extractive projects, demonstrating that the consent given by the communities can be informed but not free. Although ILO 169 attempts to protect indigenous communities, it deserves more attention.

The literature review confirmed that lithium consumption is expected to significantly increase in the following years, motivated by green electromobility policies, due to ongoing historic colonial policies of resource extraction. With an increase in lithium demand, all the negative impacts will be accentuated.

This project intends not to dispute the urgent necessity to break away from fossil fuel dependence but to raise concerns about the green policies that benefit industries and forget about those who suffer the most from resource extractions in their ancestral lands. There is a need to rethink solutions to address climate change. Brito et al. (2019) considered radical approaches include drastically divesting from capitalist, colonialist life, such as avoiding single-use cars. Changing the mobility matrix and, incidentally, the paradigm of progress has to mean additional effort.

Green policies have demonstrated that hide the harm, abuses, and human rights violations that are systemic in the extractivist model, increasing inequality and climate injustice. This project aims to open the field of research to investigate the specific effects of lithium extraction in Chile and other parts of the world, to obtain accessible data to measure the actual impact, taking into account all the dimensions it affects. And in the field of concrete action, achieve greater disclosure of the environmental damage and the violation of human rights of indigenous peoples generated by lithium mining. A clear understanding of all the dimensions that renewable energies involve is critical in advocating for real solutions to climate change.

References

Albermarle.com

https://www.albemarle.com/news/albemarle-begins-third-party-audit-in-chile-using-irma-as-standard-for-responsible-mining

https://www.albemarle.com/news/albemarle-begins-third-party-audit-in-chile-using-irma-as-standard-for-responsible-mining

Argento, Melina, et al. (2019) Entre el boom del litio y la defensa de la vida. Salares, agua, territories y comunidades en la region Atacamena. En : fornillo, B. (coord.) Litio en Sudamerica. Geopolitica, Energia, territories. Buenos Aires: CLACSO.

Boddenberg, Sophia. 2020. Deutsche Welle. Chile: Lithium exploitation leaves residents without water. https://www.dw.com/es/chile-explotación-de-litio-deja-sin-agua-a-pobladores/a-52165228

Brito-Millán, Marlene; Harrison, Emma; Salomón, Amarah. 2019. No comemos baterías: solidarity science against false climate change solutions. Science for the people. Volume 22. Nro, 1. 34-40. https://www.researchgate.net/publication/335083369_No_Comemos_Baterias_Solidarity_Science_Against_False_Climate_Change_Solutions/citations

Consejo de Pueblos Atacameños – Atacameño People Council http://www.lickanantay.com/#!/-bienvenidos/

Dorador Ortiz, Cristina. 2021. Conservacion de salares. Aprendizaje desde los microorganismos. Salares Andinos. Ecologia de Saberes por la Proteccion de Nuestros Salares y Humedales. Observatorio Plurinacional de Salares Andinos. 162-167.

Dunlap, Alexander, Jakobsen, Jostein. 2020. The Violent Technologies of Extraction. The Worldeater(s) in Process: Uncovering the Nexus of Conventional and 'Green' Extraction. Chapter 5, 91-111. https://doi.org/10.1007/978-3-030-26852-7_5

Figueroa Huencho, Verónica. 2020. CIPER, Centro de Información periodistica. Pandemic, indigenous peoples and recognition of rights. https://www.ciperchile.cl/2020/05/19/pandemia-pueblos-indigenas-y-reconocimiento-de-derechos/

Gobierno de Chile. Ministerio de Obras Publicas. Cuenca Salar de Atacama. https://mma.gob.cl/wp-content/uploads/2017/12/Atacama.pdf

Gudynas, Eduardo. 2009. "Diez tesis urgentes sobre el nuevo extractivismo." *Extractivismo, política y sociedad* 187, Accessed November 10, 2020. http://www.rosalux.org.ec/pdfs/extractivismo.pdf#page=187.

Gudynas, Eduardo. 2013. Extracciones, Extractivismo y Extrahecciones. Un marco conceptual sobre la apropiacion de recursos naturales. https://www.researchgate.net/publication/281748932

International Labour Organization –Indigenous and Tribal Peoples Convention, 1989 (No. 169) https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C169

Jerez, Barbara; Caceres, Ingrid; Torres, Robinson. 2021. Political Geography. Lithium extractivism and water injustices in the Salar de Atacama, Chile: The colonial shadow of green electromobility.

Kramarz, Teresa; Park, Susan; Johnson, Craig. 2021. Energy Research & Social Science. Governing the dark side of renewable energy: A typology of global displacements.

Macmillen Voskobiynik, Daniel; Andreucci Diego. 2021. Greening extractivism: Environmental discourses and resource governance in the 'Lithium Triangle'. Nature and Space. 1-23.

Mussa, Yassna. 2020. Explotación del Litio en Atacama: La amenaza ambiental a las comunidades indígenas. Mediambiente. https://mediambiente.cl/explotacion-del-litio-en-atacama-la-amenaza-ambiental-a-las-comunidades-indigenas/

OCMAL – Water or Lithium. https://www.ocmal.org/wp-content/uploads/2020/07/Boletin-Agua-o-Litio-1.pdf

OCMAL – Lithium, Water and Human Rights. 2020. https://www.ocmal.org/wp-content/uploads/2020/07/Litio_agua_DDHH-2.pdf

OCMAL – Lithium and human rights. 2020. https://www.ocmal.org/wp-content/uploads/2020/07/Boletin-Litio-y-DDHH.pdf

OLCA – Alto Andino Lithium, water and human rights. https://www.ocmal.org/wp-content/uploads/2020/07/Litio_agua_DDHH-2.pdf

OLCA. Environmental Conflicts Latin American Observatory. http://olca.cl/oca/index.php

Sovacool, Benjamin K. 2021. Who are the victims of low-carbon transitions? Towards a political ecology of climate change mitigation. Energy Research & Social Science 73 (2021) 101916

Tamayo Grez, Tania; Carmona Lopez, Alejandra. 2019. The business of water: how chile become dry land. Ediciones B.

Verweijen, Judith; Dunlap, Alexander. 2021. The evolving techniques of the social engineering of extraction: Introducing political (re)actions 'from above' in large-scale mining and energy projects. Political Geography. Volume 88, 102342.

War on Want and London Mining Network. A Just(ice) transition is a post-extractive transition. Centering the extractive frontier in climate justice.