

Impacts of Lithium Mining

Introduction:

The use of burning fossil fuels and rising temperatures has led to the need to transition to sustainable energy resources and methods to help mitigate climate change. One important and notable transition is to EV vehicles to help reduce the carbon emissions released from other non renewable energy sources.(Liu, 2020) The batteries required for these vehicles are made of lithium which is more efficient because it has higher power energy. My research question is what are the effects of lithium mining on communities and ecosystems regarding the transition to sustainable energy. In this research paper I focus on the salt flats in Chile(the Salar de Atacama region) and explore the effects on communities that surround the salt flats and try to analyze the effect based on the four categories: environmental impacts, policies, socio- economic issues, and climate justice issues.

Location:

Lithium is very unique in its properties because it has very high energy storage and for great performance(Beatriz Bustos Gallardo). This has been a great reason for why it is needed to power EV vehicles.(Liu,2020) One important thing to note is that the places with the most abundant amounts of lithium are in South america. The lithium triangle is a term describing “a region bordering Chile, Bolivia, and Argentina,[that] is estimated to hold 57% of the world’s lithium resources(Liu,2020) One important thing to note is that in the Salar De Atacama region the lithium that is located in this area is underneath the salt flats where dry climate is present. The process for extracting lithium in the Salar de Atacama region is to pump the groundwater that is saline which is left out in the evaporation pools to produce lithium.(Bustos, 2021)

Environmental Impacts:

Studies have shown that the water quality and impacts on the water table in the Salar de Atacama region are being impacted negatively by lithium mining. The salt flats in the Salar de Atacama region in Chile are indicated by the arid and dry climate in addition to the water

shortages.(Gajardo, 2019). A study in 2017 conducted by Weijuan Lu highlighted the great concern regarding water depletion caused by lithium mining. It looked at the water storage anomalies in the neighboring community of San Pedro de Atacama. Using Grace satellites to measure total shift in water. What this study showed was the declining trend of -1.16mm total water storage anomaly from 2010-2017 indicating a concerning shift in water storage.(Liu, 2020) This is consistent with the argument that lithium expansion has caused these great changes and more research needs to be done to determine the long term impacts. The “depletion of water availability can be mostly attributed to mining water withdrawals, considering the minimal water taken up”(Liu,2020) by domestic and tourism use. This clearly indicated a concern for local indigenous communities in the area of Salar de Atacama who already face harsh precipitation conditions and this poses a threat to their livelihood.(Marazuela, 2019). A study by M. A. Marazuela in 2018 showed a serious impact on the water table due to the anthropogenic effects. Since the expansion of mining, the increase in brine pumping has left the water table disturbed due to these human actions(Marazuela, 2019). This “results in a decrease of the evaporation rate that at least partially compensates for the pumped brine”(Marazuela, 2019). This indicated that the damping capacity which is how the water table naturally falls back to a balanced state is affected and the water table no longer recovers due to the excessive withdrawal of brine water.(Marazuela, 2019) A look into the data suggested that before mining in Salar de Atacama the natural cycle of the hydrodynamic of the salt flats was unaffected however due to the anthropogenic effects the water table decreased.(Marazuela,2019) This is a serious concern and harm to the natural ecosystem who will fall off balance because of the serious impacts it has on the water table. In addition another environmental impact concern that is to pay attention to is the diverse biodiversity in lagoons at the Salar de Atacama. Extraction of the brines affects the hydrological balance of lagoons located in the salt flats.(Gajardo, 2019) This affects the salinity and the water storage in the lagoon(Gajardo,2019). This raises concern because not much research is being taken to find these impacts so this gives lithium mining companies the lack of

understanding to consider these issues that are being raised (Gajardo, 2019). There is a diversity of microorganisms that are in the salt brines that raises concerns because they are sensitive to human impacts due to the nature of the climate in the deserts. (Gajardo, 2019)

Policy:

Certain policies and governance decisions have shaped the way communities are affected by lithium mining and the power they hold on their land. Companies who have rights like SDA (Sociedad Química y Minera) and SQM (Salar S.A. and Albemarle Corporation) to lithium mining. Chile's failed attempt in the 2000s to increase lithium production was tried again in a successful second attempt which basically included contracts and "state institutions, revised contracts, new market actors, research and development, and better relationships with local communities." (Dorn, 2022) These are the main lithium mining companies in Chile that have been given permission by the government to exercise their mining operations. One important thing to note is Chile 1981 water code. This gives the free will to trade and sell water rights with almost no government regulation (Budds, 2023). It is basically the free market for water. In addition you have the brine water that is extracted from the ground which is considered "mining property" (Jerez, 2021). The Chilean mining code of 1983 puts forth that the state has control over the mining industry. (Jerez, 2021) However the exploitation of this part is that it has the power through a system of "administrative concessions to special operation contracts" (Jerez, 2021) that allows private companies. In addition, article one of the mining code basically doesn't put brine as state control because it has hydrodynamic properties. (Jerez, 2021) This leaves it hard to estimate how much actual water is being impacted because only the fresh water is considered to be recognized. (Jerez, 2021) In addition mining companies don't feel the need to look at the impacts. The president of the lithium Albemarle said that "*Atacama's brine is ten times more saline than seawater. It has no other use than as a resource, as a mineral*" (Jerez, 2021) This indicates a concern and shows the colonial sentiments of the global south and not considering the local indigenous communities relationship and knowledge on the water systems.

However I wanted to highlight that in 2014 concerns over lithium mining impacts on ecosystem and communities were raised and in 2014 the National Commission on Lithium was created and this was a good step to help addressing the governance and policy issues of lithium.(Dorn,2022) A report in 2015 helped create a language of communication between communities,government and the contractors of lithium, this raised some recommendations and how the state should increase their control over the mining companies.(Dorn, 2022) In 2017 some of the NCL ideas introduced in the report were implemented in 2017 raising revised contracts”(Dorn,2022). This shows that there have been efforts to have communication between communities however with an extended contract by SQM 2030 this raises more concerns on the long term effects on communities considering the environmental impacts it has(Dorn,2022)

Socioeconomic:

In the study conducted by Wenjuan liu it explains that indigenous communities are increasing their voice and opposition against the lithium mining of Sda. These salt flats are home to many indigenous communities. They studied the social impacts of lithium mining by community members through social activism. Members of indigenous communities felt that the expansion of lithium mining would affect their water supply and since has turned to a national movement.(Liu,2020) The mining companies contradict the indigenous communities value of water as being “essence of life” and “livelihood”(Babidge, 2016). The shared water resource is concerning given the fact it causes concerns over water quality.(Babidge, 2016) Another issue is the value of economic benefit from these mining operations giving people labor and jobs. In addition the labor influx in the Salar de atacama is how the mining actives can give out a income to local community members and increase economic level and income however there is a problem because the local community members have limited benefits and “most of the influx was of commuting laborers, who contributed little to local economy,”(Liu,2022) This explains also that the local community doesn't actually get most out of the socioeconomic benefits of this mining industry. In addition you have this affecting community members indigenous belief and

tradition because they believe that the Salar is “ a natural hydric entity that feeds the place's non-human and human life.” (Jerez, 2021). However when the SQM contract was extended to 2030 it is reported that there would be compensation to indigenous communities but it would be distributed by an outside party and not them(Dorn, 2022). This creates an unbalanced issue between mining companies and indigenous communities. This raises concerns over the value that these mining companies have of indigenous communities' livelihood and wellbeing.

Climate Justice:

The discussion over the transition to renewable energy comes with concerns considering its history. It is known that Chile is a part of the global south and the global north exploits its resources in order to push for sustainability. Green electromobility is the term used to describe technology globally that is increasing “ in the last decade as part of the new green policies in the Global North.(Jerez, 2021) This push has been a result of the Paris agreement to reduce emissions and mitigate climate change.(Jerez, 2021) To use this new form of policy you need to push for green policies and green energy. However this push is for the lifestyle of the global north(Jerez, 2021). Jerez argues that the” shadow” of green mobility is what caused the hydro problems for people in the Salar de atacama and the injustices facing them(Jerez, 2021). An ethnographic case study highlighting the effects of lithium mining and the linkages between global north and south describes how the demand for lithium is mostly coming for the global north economies that are in effect for green electromobility(Jerez, 2021). The demand for lithium has increased. Lastly we see the majority of CO₂ emissions released from countries from the global north like the United States and Europe where “In total, the Global North is responsible for 92% of excess global carbon emissions.”(Pardikar, 2020) This clearly demonstrates the disproportionality the global south faces because of the global north's “atmospheric colonisation”(Pardikar,Hickel, 2020)which is the global north's reliance on the resources from the global south for development and this has resulted in unfair distribution of climate impacts to the global south.(Pardikar,Hickel, 2020). A study researching the degree of

responsibility that countries have of climate change due to the emissions they release found the total emissions released by the global north were 92% and the global south was at 8 % (Hickel, 2020). This demonstrates the disproportionate impacts lithium mining has on communities and ecosystems in Salar de Atacama regarding the nature of the global north's goals for economic development.

Discussion:

This essay highlighted the impacts of lithium mining on communities and ecosystems in Salar de Atacama Chile. It focused on four aspects: the environmental socio-economic, policy, and climate justice. The environmental impacts in this essay highlight the major concern and effects of lithium mining on the water table and resources for communities and ecosystems. Given that the water is scarce in that region this indicates that there is a serious threat to the water table in the near future. The policies in place have let no regulation or weakened regulation of the water rights in the region and this creates power imbalance. Although efforts have been made to try to address this, it has fallen short and the communities are the ones who are facing the injustices of the mining companies and the climate impact. In addition the economic gain of lithium mining for Chile has not had any benefits for the communities and this raises concerns on transparency and communication between communities and the mining companies. Lastly, the climate injustice being faced by the global south by the global north raises questions on the long term effects of this transition to sustainability and questions whether this is actually sustainable. The limitations for this research is that it is fairly new and more research needs to be done to fully understand the long term impacts and what the potential long term impacts would be.

Overall the transition to sustainable energy comes with serious and negative impacts to communities facing the effects of resources being extracted. In the case for Salar de Atacama the environmental effects of lithium mining are serious and show to have negative effects on water quality and biodiverse ecosystem. The policies in place however don't seem to have long term

support indigenous communities and this raises concerns over the long term impacts on communities. The effect of lithium mining highlights the issues of the transition to being green and what that means for the people facing the impacts and why.

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