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National Development and the Sustainability of Mining in the Atacama Desert, Chile

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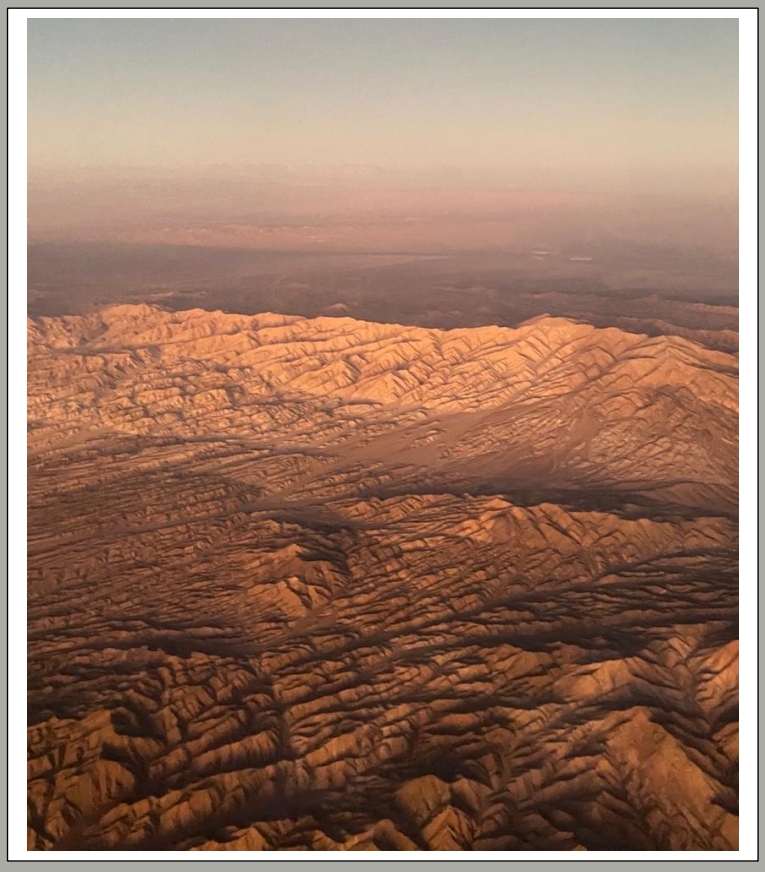

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Academic Advisor – Consuelo Fernández-Salvador

NATIONAL DEVELOPMENT AND THE SUSTAINABILITY OF MINING IN THE ATACAMA DESERT, CHILE

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Abstract

As climate change continues to intensify on a global scale, efforts have been made to implement renewable energies and progressive technologies. These tools are critical in the shift towards a more sustainable practice, and yet analysis of localized impacts from the development of these mechanisms is inadequate. Chile has been and continues to be a leading country in mineral extraction, with an economic history founded in the mining industry. The establishment of mining in Chile as a progressive tool has aided the social and economic development of the nation. Consequences of mining extraction, however, include intensive environmental degradation, human rights violations, infringement of indigenous peoples' lands and cultures, growing social and economic disparities and injustices, and contamination. This research addresses and challenges notions of mining in relation to sustainable development and employs interviews and prior published literature on social policy and mining reports to argue that the impact of mining must be enhanced in order for the industry to become more sustainable in future years. These investigations highlight the severity of mining as a form of sustainable development by arguing that mining in the Atacama Desert of Chile has created asymmetrical impacts on social, environmental, and economic functions of the region, particularly for local and indigenous communities. Current Chilean mining industry practices must be revised to ensure a sustainable and positive socio-environmental future for the Chilean people and local ecosystems.

"The mining of this territory has contributed to making Chile what Chile is today. And that is unfortunate, on one hand, because at the cost of the survival of the people, Chile has become rich, Chile has grown, at the cost of a people that is us."- Participant 8 (See Appendix 5 for original Spanish text)

Introduction and Objectives

Mining is a practice that has frequently been tied to economic, social, and technological development throughout the world (Bebbington et al., 2018). Modern mining practices often serve as opportunities for the substantial economic enrichment of individuals, communities, and nations, as economic revenue from the extractive industry frequently addresses national development initiatives (Gitlin & Fuentes, 2012). This means that mining is often viewed as a primary means to improve national development and increase economic wealth. Thus, the link between mineral extraction and company integration into the world market has largely resulted in the perception that mining directly leads to development and national success (Lagos & Blanco 2010; Peet & Hartwick, 2015; Söderholm et al., 2015). The perception of mining as a path towards future growth has the potential to influence nationalistic ideas around the extractive industry (Bebbington & Bury, 2013). The development of mining has had many positive (economic growth) and negative (environmental degradation) impacts on nations and individuals during recent decades. This research argues that Chilean mining must be made more sustainable to enhance its potentially positive impacts on Chileans and their society and environment.

National transformation has an inherent linkage to potential for capital development. The physical construction of infrastructure plays a huge role in the assigned value of a country (Cooper et al., 1993; Escobar, 1995; Ferguson, 1994; Peet & Hartwick, 2015). Infrastructure is a component of development that cannot exist exclusive from the extractive industry of mining because metals are essential for construction of buildings, transportation services, renewable

energies, and for achievable visions of future development (Bebbington & Bury, 2013; Lahiri-Dutt, 2011). Countries that extract a large amount of minerals that are used in the creation of advanced scientific and technological adaptation strategies, such as the construction of green energy storage solutions, gain economic benefit and development from the natural resource riches (Bebbington & Bury, 2013; Meng et al., 2021; Peet & Hartwick, 2015). As the extraction of copper and lithium continues to increase as a part of green energy solutions, it is important to consider the contradictions between the extraction of these minerals for national economic development and the local impacts of mining on both the environment and local inhabitants of the land.

This project addresses the sustainable development of mining and the mining community and its practices in the Atacama Desert of Chile. Mining is a major extractive business that has many social and environmental repercussions, particularly for vulnerable communities, such as economically poor residents and indigenous communities. The political and economic development of the nation is largely influenced by mining. Extractive industries, including mining, have rapidly evolving procedures and policies that shape their socio-environmental impacts. Studies of the consequences and notions of mining in Chile have the potential to provide insights about future policies and grassroots changes. To provide insights to alternative and more sustainable mining practices, this project addresses perceptions of mining and national development in Chile, mining as a sustainable practice, and mining as a means of development during a time of worsening climate change. Through analysis of collected interview and mining data, published literature, and implemented mining policies, this paper aims to outline the connection between the mining industry, the tourism industry, national development, and sustainability efforts in Chile in the context of global climate change. Exploration of the current

mining environment in the Chilean Atacama Desert provides the primary case study of this project and offers insights into future potential sustainable mining practices as well as tangible applications that link policies to communities and environmental conservation in the mining industry.

Location Context: The Atacama Desert, Chile

Chile is a coastal Pacific country that ranges approximately 4,300 km along the South American continent. The country is comprised of a variety of biomes that span the country, from glaciers to deserts. These diverse biomes make Chile an important site of biodiversity and conservation. The natural resources found throughout the country, such as metals, natural gas, timber, and freshwater, facilitate services to Chilean citizens that can improve their livelihoods and well-being. Chile achieved independence from Spain on September 18, 1810 and has since become one of the most economically successful countries in South America (García & Wells, 1983). By establishing a strong economic basis of growth, Chile has participated in international markets since its independence, gaining profits from a variety of natural resources and extractive industries, such as mining.

Chile is one of the most developed countries in South America, owing much of its economic growth to investments in mineral extraction, primarily copper and lithium mining (Gitlin & Fuentes, 2012). Chile is currently ranked as the top copper producer globally and the sixth largest mining country in the world. Investment in mining has aided the country's integration into international markets and the transition to western "modernization". Mining is linked to the social and economic development of Chile, and concurrently, nationalism and pride are embedded in the extractive industry. While mining has been central to the growth of the

country, the impacts of mining have had negative implications for the health of Chilean citizens and adversely impacted indigenous rights, earth-system integrity, and inter-stakeholder relations. Given Chile's vast ecosystems, environmental degradation by the mining industry has resulted in unsustainable development. Forced migration, chemical contamination, health degradation, physical, cultural, and emotional violence, environmental destruction, and violations of rights are some of the primary consequences of unsustainable development due to mining in the country (Alam & Sepúlveda, 2022; Aylwin et al., 2021; Bebbington et al., 2008).

Chile is only the seventh largest country in South America; however, it extends across a vast longitude and incorporates many different ecosystems, sub-regions, and cultures. Therefore, it is important that research conducted in Chile specifies particular study sites, as the characteristics of particular contexts vary widely. This research focuses on the Atacama Desert, an arid landscape of roughly 1,000 km long in the Northern region of Chile (Bull et al., 2018). Specifically, this research project focuses on copper mining in Calama and lithium mining in San Pedro de Atacama, two towns located approximately 100 km from each other in the Antofagasta region in the central Atacama Desert (Figure 1). This region of Chile is primarily occupied by three mining companies: Coldeco (a Chilean copper mining company) American-owned Albemarle and Chilean-owned Sociedad Química y Minera (SQM) (two lithium mining companies) (Lorca et al., 2022; Figure 2).

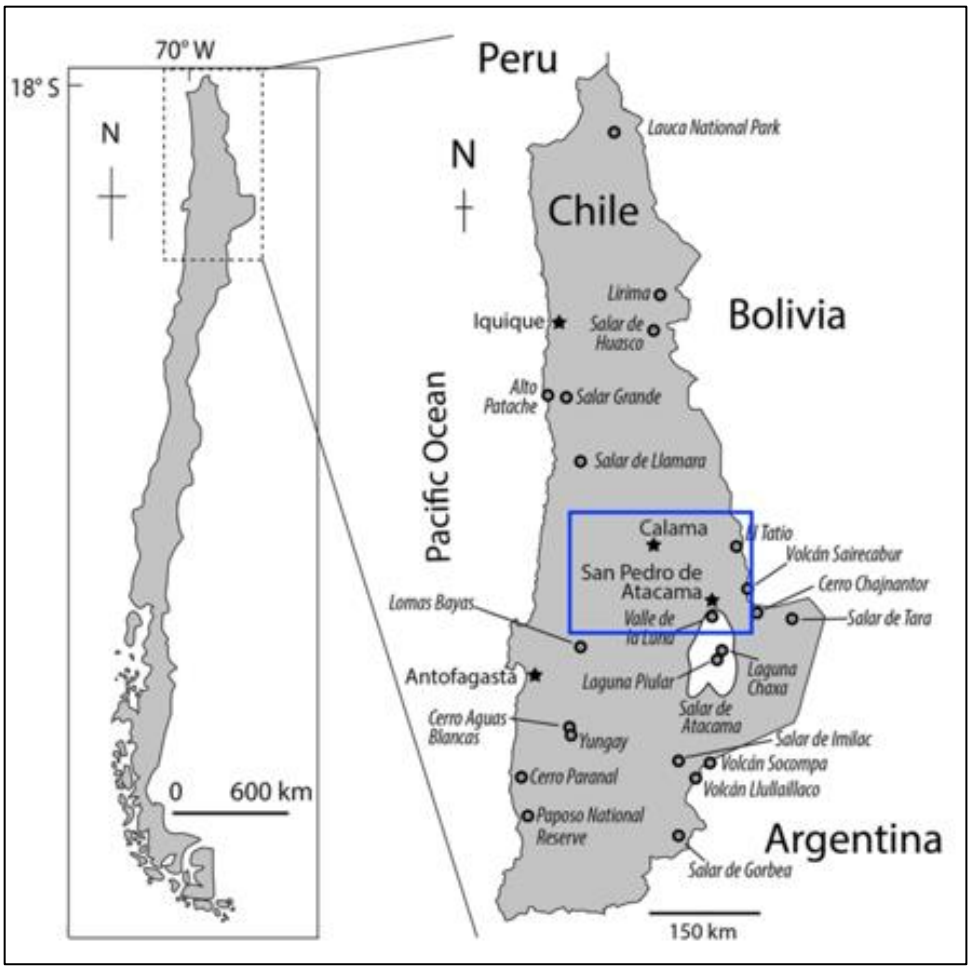

Figure 1: Site Location Context of Calama and San Pedro de Atacama, Atacama Desert, Chile (Bull et al., 2018, p.1270). This image was modified to include a blue square that indicates the study site location.

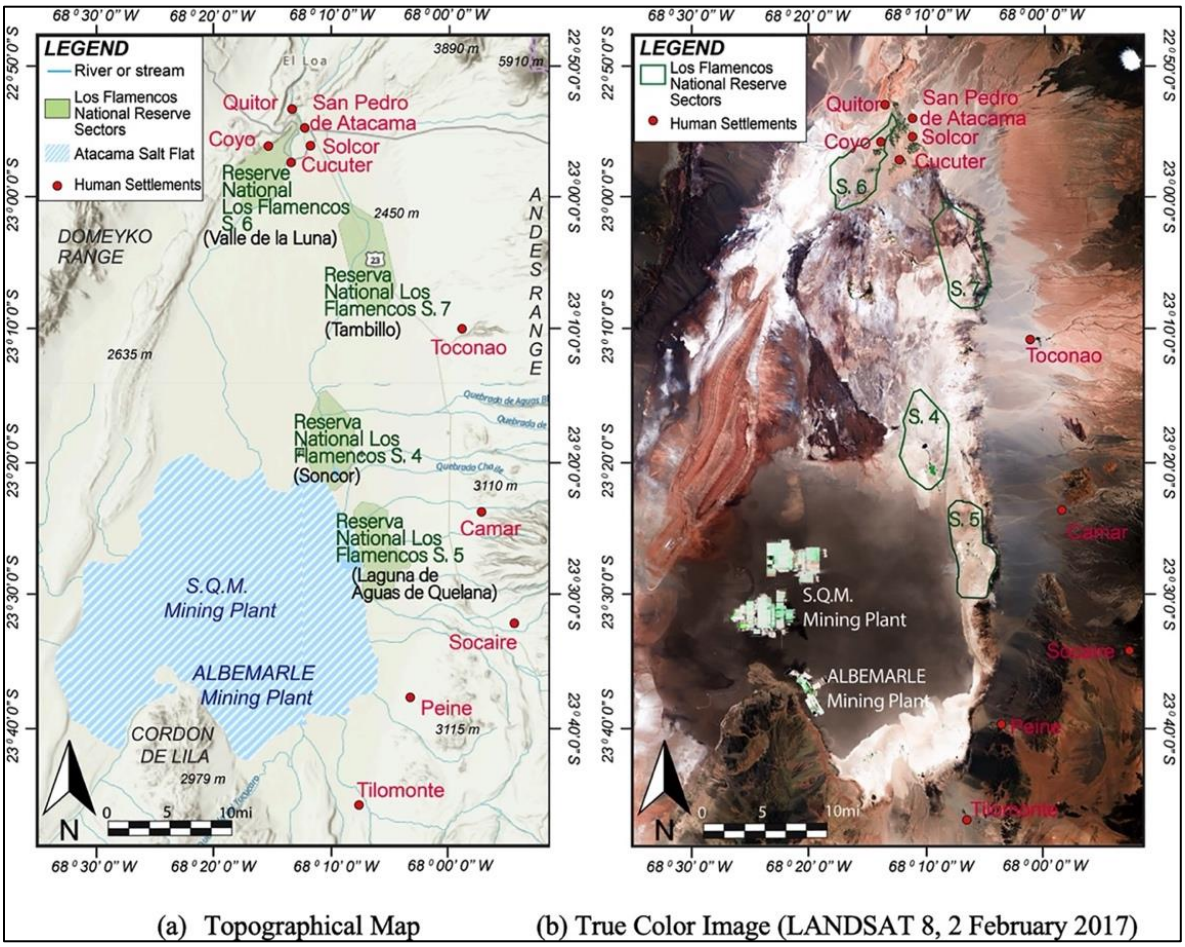

Figure 2: Spatiotemporal Map of Lithium Mining and Relevant Mining Plants (Liu et al., 2019, p.148).

The Atacama Desert of Chile is classified as the most arid non-polar region of the world and, therefore, is particularly vulnerable to climate change impacts (Correa-Parra et al., 2020; Romero et al., 2012). Analysis of historical and modern geological records indicates that the Atacama region has been an extremely dry area for millions of years (Clarke, 2006). Regions of the desert receive an average of five mm of rainfall annually, making the area particularly vulnerable to water scarcity and degradation (Cerf, 2022). Increased development, extractive practices such as mining, and tourism have contributed substantially to the degradation and heightened socio-environmental vulnerability of the Atacama Desert (Correa-Parra et al., 2020).

Mining and sustainable development in Chile are key topics in need of study, needed to determine potential alternatives to development in the future. Analyses of mining dialogues are important to establish the groundwork for future policy initiatives that focus on sustainability standards and human-nature rights throughout the country. Mining for the sake of development has many negative consequences on ecosystems, communities, and the socio-environmental interface. Therefore, it is important to determine appropriate mitigation strategies to unsustainable mining and potential alternative development pathways to improve outcomes for Chileans and the environment.

Literature Review

The framing of this research is based in a body of pre-existing literature relevant to the topics of mining, theories of development, economics, policy, human rights protection, and environmental conservation. Exploration of key theories and concepts will be explored at both a global scale and within the context of Chile. A focus on three concepts – "development", "nationalism", and "mining"– will be applied in order to best frame the scope of this research project and its outcomes.

Development

International development and sustainability are concepts that explore notions of progress by focusing on the nexus of development, sustainability, and economics as they relate to one another (Pashby & de Oliveira Andreotti, 2016). Theories of development are complex matters that serve as foundational building blocks when examining the sustainability of mining. As the extractive industry of mining is dependent on natural resources as a form of natural capital, the

interface of humans and development are critical within the narrative of mining as a form of progress (Costanza et al., 1998; Daily, 2003; Peet & Hartwick, 2015; Söderholm et al., 2015). The blending of the natural world –such as ecosystems in which mining takes place– with human presence and development– including the growth of mining companies and local communities– is critical. These two spheres when viewed as separate create a divide that promotes inequality and deprioritizes the interconnectedness of society and environment in the context of development (Costanza et al., 1998; Hopwood et al., 2005). The sustainability of mining in relation to theories of development must examine the complexities of humans as a part of nature in order to gain full understanding of how sustainable and economic development can best be achieved together. Emphasis of these two branches of development – sustainable development and economic development– will be utilized within this research to frame the significance of the study.

"International development" and "sustainable development" are two important concepts accompanied by strategies and tools that measure and seek to enhance socio-environmental health and services. "International development" is a term that, by itself, generally refers to improving the world by reducing poverty and enhancing health and improving human livelihoods, and the environment (Peet & Hartwick, 2015). These topics and issues are largely addressed at unequal rates, and international support of development projects is implemented disproportionately across the globe (Cohen, 2006; Robinson, 2004). Specifically, lower income areas, such as regions of South America, have been found to be more vulnerable to developmental challenges, environmental risks and stressors, and negative well-being indicators that impact the growth of the region and its communities (Cohen, 2006; Robinson, 2004). In recognition of the degree of vulnerability that many developing nations face, international efforts

have been made to employ projects aimed at improving global growth and addressing measures of development as well as offering alternatives to standard development initiatives (Gudynas, 2012; Guillaumont, 2009; Hollender, 2015; Radcliffe, 2015). These alternatives are often based in an economic framework, which frequently negates the interface of critical influential factors, including environmental stressors, cultural values, and political power. Therefore, it is essential to employ a developmental framing that utilizes a multitude of approaches in order to consider the complexities of development.

While it is critical to evaluate theories of development beyond its financial groundwork, economics is an undeniably important aspect of development theory. Economic development theories are rooted in models of 'progress' that prioritize the advancement of institutional, social, and financial positionality to achieve improved human well-being (Escobar, 1995; Huber et al., 1993; Tallis et al., 2008; Shareia, 2015). Increased attention to economic theories of development emerged around the mid-1900s, as decolonization efforts were being made on a global scale, but specifically in the Global South (Gartzke & Rohner, 2011; Hatzold, 2013). The movement away from prior colonial rule, particularly in non-European regions such as Chile, made the discrepancy in the economic status of exploited societies more visible (Giljum, 2004; Shareia, 2015). The divide between 'developed' and 'developing' countries continued to widen throughout the 20th century, as the dependency of non-diversified economies on fossil fuels differently influenced the economic affluence of nations (Couharde & Mouhoud, 2020; World et al., 2009). Since the 1990s, the role of international climate change strategies in the shaping of economic development models has had severe repercussions for economically vulnerable countries that tend to receive insufficient support from wealthier nations (Gasper et al., 2011).

The second half of the 20th century served as a key era in the shaping of economic development across various regions of the world, including Chile in South America (Correa-Parra et al., 2020; Prieto et al., 2019). Starting in the 1970s, the leading economic development strategy –deregulation, privatization, and free market systems that were promoted by economists known globally as the "Chicago Boys"– was accepted as a model for success throughout Chile (Correa-Parra et al., 2020; Prieto et al., 2019; Rumié Rojo, 2019; Valdés, 1995). This economic model surged when the country entered a political dictatorship led by Augusto Pinochet (Correa-Parra et al., 2020; Valdés, 1995). The Chilean military staged a coup d'état with support from the United States government to remove President Salvador Allende from power in 1973 (Baer, 2014). As Pinochet led the country under his dictatorship for the next seventeen years, there were many efforts to eliminate leftist and Marxist practices (Loveman, 1988; Rumié Rojo, 2019). The practices that were utilized by Allende were to be replaced with neoliberal economics, developed by the Chicago Boys (Prieto et al., 2019). The aim of this economic reform was essentially to privatize common goods, economic services, properties, and water services (Prieto et al., 2019). In the 1990s, Chile faced major changes in economic growth due to shifts in government leadership and policy implementation –including the transformation to a free-market system– that resulted in reduced rates of poverty (Giljum, 2004; Marcel & Solimano, 1993; Prieto et al., 2019; Solimano et al., 2000). The modern economic development in Chile has been largely considered a model of success: the first of its kind in South America (Brid & Hernández, 2004; Carruthers, 2001; Giljum, 2004). Economics as a foundational aspect of development is critical when examining a framework for different theories of development.

From the idea of international development, arose the more specific idea of sustainable development which embraces a variety of issues and challenges at a global scale. The term

"sustainable development" is a buzzword that has been circulating in international settings and communities since the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 (Parris & Kates, 2003). This international conference first brought global attention to the concept of sustainable development and its importance in the global movement towards improved human livelihoods (Parris & Kates, 2003; Peet & Hartwick, 2015). This idea had already been formally recognized nearly a decade earlier, when the term was defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 37). Despite this general definition, the concept of sustainable development is one that traditionally has been hard to define, as it has many variable expressions based on the intention and the user (Parris & Kates, 2003). That being said, sustainable development addresses human development in an environmental setting from a multidisciplinary perspective.

Many of the integrative components of sustainable development are applied in this research project, including as they relate to the overall environment, human health, community relations, cultural diversity, natural resources, equality, participatory governance, moderated and more equitable consumption, and a diversified national economy (Parris & Kates, 2003). These are vital as they relate to mining as a means of sustainable development, since the extractive industry can have severe impacts on human and environmental health, cultural values, and community well-being, all of which amplify the potential benefits and negative consequences of mining. As Hopwood et al. (2005) describes it, the informal concept of "sustainable development" explores the relationships between people and nature, elaborating on the interwoven growth of these two subjects. Contrary to international development, sustainable development emphasizes the interconnectedness of societies and the environments in which

communities live, paying special attention to humans as a part of nature rather than humans as separate and dominant over nature (Hopwood et al., 2005). This conceptualization of development is applicable to the context of mining in Chile; it serves as a basis for understanding narratives about mining within sustainable development.

Nationalism

"Nationalism" is a term that is notoriously challenging to define, as application of the idea, in practice, is customizable given the specific context (Anderson, 2006). That being said, this research will employ a framework of nationalism that is based in ideas formulated by scholars such as Benedict Anderson, Ernest Gellner, and John Hutchinson. The concept of nationalism is embedded in social constructs and must not be considered as the creation of a nationhood itself (Anderson, 2006). This means that "[nationalism] *invents* nations where they do not exist" (Gellner, 1964, p.168). These nations are created out of cultural and political frameworks and can largely be linked to warfare as a factor of production (Anderson, 2006; Gellner, 2008; Hutchinson, 2018). These ideas can be seen within the context of Chile, as the evolution of nationalism as an 'imagined community' is connected to the country's fight for independence, multifaceted political eras, and deep cultural identity (Barr-Melej, 2002; Collier, 1969; Skuban, 2007).

In the context of South America, nationalism emerged out of the fight for independence against European powers (Miller, 2006). Nationalist sentiment on the continent surged in the 1960s, when decolonization took over, and Marxist political-economic movements took precedence (Miller, 2006). Chile is one of the many countries in South America that began to develop a strong sense of identity related to "homeland". Rapid development and modernization

have since taken precedence in Chile since the second half of the 20th century due to substantial investments in extractive industries (García & Wells, 1983). Alongside economic growth, a sense of national unity has emerged that joins citizens together and encourages collaborative development: nationalism based on coherence with the intention to advance modernity and independence (Wodak, 2017).

The presentation of various conceptions of nationalism are frequently linked to the nation-state as a whole; however, nationalism is a sentiment and identity factor that can be experienced fluidly by individual citizens (Van Teijlingen & Warnaars, 2017). As stated by Bebbington & Bury (2013), "nationalism is never stable and requires constant reproduction" (p. 71). This framing of nationalism best fits the case in Chile because the country has undergone much political restructuring throughout its recent history, such as substantial periods of change in government, as seen during the leadership of Salvador Allende, Augusto Pinochet, and Gabriel Boric (Baer, 2014; Correa-Parra et al., 2020; Giljum, 2004; Mussa, 2022; Prieto et al., 2019; Prieto et al., 2022; Solimano et al., 2000). The history of socio-political change in Chile constantly reoriented sentiments of nationalism within the country. Individuals' representations of nationalism within the context of this research is critical. Personal experience and the identity of individuals influenced the ways in which informed participants engage with nationalism as a foundational concept within mining as a means of national development.

Mining

The mining industry has grown extensively since the 1980s, when Chile opened its economy to international investments (Schmidt-Hebbel, 2006). Since the turn of the century, large-scale mining has increasingly contributed to the Chilean GDP (Schmidt-Hebbel, 2006).

This boost in economic participation from the mining sector has resulted in a desire to increase investments in the extractive industry, both through formally recognized mining organizations as well as informal and artisanal extraction projects (Malehase et al., 2017; Mestanza-Ramón et al., 2021). Large-scale and artisanal mining sectors frequently work laterally, operating in similar spheres and yet they remain separate and often opposed. That being said, large-scale mining projects tend to serve as national revenue opportunities for many countries, including Chile (Lahiri-Dutt, 2011). Extractive industries, such as large-scale mining, often are seen as a means to achieve a future based on national capital expansion, improvement of well-being, and modernization (Peet & Hartwick, 2015).

Within the context of mining in Chile, large-scale copper mining is the most relevant extractive practice. Copper mining alone makes up about 10% of the country's total GDP (Comisión Nacional de Productividad, 2018). The growth of copper mining throughout the decades has played an essential role in the economic growth of Chile (Atienza et al. b, 2021). National presence of state-owned mining company, Codelco, and presence of the largest copper mine in the world, BHP owned La Escondida, contribute to the importance of copper in the economic and national agenda of Chile (Atienza et al. a, 2021; BHP, 2021). The relevance of copper mining in Chile was initiated during the Pinochet dictatorship and the creation of the Mining Code in 1981, when the government implemented initiatives to promote mining practices for the benefit of national economic growth (Atienza et al. a, 2021). Continued economic activity and development associated with the copper mining industry make copper a permanent source of value and livelihood for the foreseeable future.

A second mining practice that is highly relevant within the context of Chile is lithium mining. This particular extractive industry of lithium mining is promoted today for many

reasons, one of which is related to climate change. As global initiatives have deployed stronger focuses on climate change mitigation and adaptation policies, the use of renewable energy has been heavily promoted. This increase in renewable energy storage systems has been marketed as the tool in green energy initiatives that moves away from carbon intensive processes, such as fossil fuel extraction (Crawford, 2022). Although renewable energy does have the potential to serve as a step towards a more sustainable future, current renewable energy technology is incredibly dependent on lithium, which is mined and processed to create lithium-ion batteries (Alhadri et al., 2019).

Many renewable energy sources require the use of lithium in order to operate, including lithium-ion batteries which are used for electric cars, solar energy, and wind turbines (Alhadri et al., 2019; Harper et al., 2019; Tay et al., 2022). Lithium is a highly reactive element that is found across the earth in igneous rock and salt-based water bodies, including brine deposits, mineral lakes, and even the ocean (Meng et al., 2021; Tarascon, 2010). As lithium is rarely found as a native element, it must be combined with other elements in order to be considered a mineral (Meng et al., 2021). While lithium is extracted globally, Chile is the leading producer, where it is found as lithium carbonate in brine deposits (Meng et al., 2021). Lithium is extracted from salt water when lithium carbonate and sodium carbonate interact in the brine, which is then transformed into a metal through the process of electrolysis, a chemical reaction that combines lithium chloride and potassium chloride (Meng et al., 2021; Royal Society of Chemistry, 2022).

Water Privatization

While it is undeniable that copper and lithium mining have served as a crucial function of Chilean national development, this extractive practice has severe underlying tensions that

influence the present interface of mining, politics, ecosystems, and cultures (Baer, 2014; Correa-Parra et al., 2020; Houmann Mortensen, 2019). The process of mineral extraction is a water-intensive activity, and therefore, water is an important commodity when considering mining. Within Chile in particular, water plays an essential role in mining, and is a factor of the industry that has caused severe conflict due to the fact that Chilean water resources are privatized (Bauer, 1997; Prieto et al., 2019; Prieto et al., 2022.

Privatization of water within the country of Chile began in 1951 with the creation of the Chilean Water Code as part of the Agrarian Reform (Bauer, 1997; Prieto et al., 2022). In 1967, the Water Code was revised and focused on the role of the Chilean state in the management of water for the purpose of national development (Prieto et al., 2019). This policy declared water to be a public good that would be managed by the state and could not be traded, sold, or detached from the ownership of land for private dealings (Prieto et al., 2019). The creation of this policy utilized a centralized economy that aimed to create water concessions, promote state control, and dispossess private rights to water (Prieto et al., 2022). When national leadership changed hands to socialist President Salvador Allende, the role of the state continued to grow, and private ownership of resources were diminished (Prieto et al., 2022). It was during this period of emphasized egalitarianism that things began to shift, leading to the Chilean coup that changed history and resulted in the privatization of water (Prieto et al., 2022). During this new iteration of the Chilean government was the creation of the new Water Code of 1981, a policy designed to provide the nation of Chile with water access in an apolitical manner (Prieto, 2015).

This model of water privatization has been examined heavily by both water experts and economists and has been identified as a successful approach to water management as it has decreased inefficient allocation of water and maximized economic gain (Prieto, 2015; Prieto et

al., 2019). The privatized water allocation system that began in Chile during the dictatorship of Pinochet between 1973 and 1990 gave power to economically affluent members of society and limited access for those in vulnerable positions, thus creating greater inequality throughout the country (Prieto et al., 2019). This change to a privatized water allocation system resulted in the violation of social rights for many Chileans, as privatized water prioritized economic growth over human well-being (Baer, 2014). This ultimately caused the growth of economic disparities for citizens and restricted access to safe water for many individuals (Baer, 2014). Social inequalities and stratification were augmented in response to water privatization, which caused vulnerable populations to face greater threats of human rights violations and more challenges in relation to relationships with the environment (Anguelovski et al., 2016).

Research Questions

This project addresses sustainable development of the mining community and mining practices in Chile. Mining is a large extractive business that has many social and environmental interfaces and repercussions. This industry plays a substantial role in the political and economic development of the nation in Chile. Studies of the consequences and perceptions of mining in Chile have the potential to provide insights about future mining policies and grassroots changes that can positively influence human livelihoods and sensitive environments in South America and globally. This project will address perceptions of mining and nationalism, mining as a sustainable practice, and mining as a means of development in Chile.

The primary questions of this study are as follows:

1. How do mining and sustainable development co-evolve to influence perceptions of nationalism for miners and local communities in Chile?

2. What are the social and environmental impacts, both positive and negative, of large-scale mining in Chile? How can the sustainability of mining practices be improved for communities?

Methods

This project gathered data from local and indigenous community members as well as employees of various mining companies. Through the partnered practicum organization – Observatorio Ciudadano – prior and supplemental data was compiled on socio-environmental and human rights problems associated with the relevant mining companies. Primary research methods for collecting original data included semi-structured interviews (see below for elaborations), general observations of local mining communities, analysis of previously published mining reports, and publicly available social policies linked to mining as well as broader published literature on social policy.

Research was conducted on the Antofagasta region of the Atacama Desert in Northern Chile to better understand how Chileans incorporate mining as a form of identity in Chile. This research relied primarily on on-line interviews with miners and local community members. Several participants were a part of one of the three main indigenous groups – the Atacameños, or Licanantay, the Aymara, and the Quechua – that are present throughout the Atacama Desert (Babidge & Bolados, 2018; Prieto et al., 2019). Questions addressed their perceptions of mining as a form of national development, mining as an aspect of national identity, and considerations of mining as a sustainable practice. All interview participants were located in either San Pedro de Atacama or Calama, two towns in the Antofagasta region. All participants were identified and contacted using a snowball sampling method. There were fifteen total interviewees who

participated through informed consent. Remote interview contact was made using WhatsApp as the form of communication. All of the interviews were semi-structured and conducted in Spanish. All of the interviews lasted between 20 and 100 minutes. Interviewees were involved in formal mining, were indigenous community members, or were local community members not directly involved with the sector but affected by it. A table summarizing participant characteristics can be found in Appendix 2.

Government and company reports on mining are available to the public. These were analyzed to consider data on the degradation impacts caused by mining, positive and negative social implications, and various perceptions of the industry's contribution to development in Chile. Policy and human rights concerns, documented by the Business & Human Rights Resource Centre with offices located in London and New York, were considered when examining local impacts from mining company operations. Through this platform, the relevant mining companies (SQM, Codelco, and Albemarle) were researched by employing the Transition Mineral Trackers tool to gather information about relevant actors and outcomes within the mining industry (for instance, see Appendix 3). This complimentary research served as a key tool in exploring impacts at the intersection of social science and policy. Through analysis of legal allegations and the political backgrounds of key actors, this research considered the topic of mining as a form of national development and the sustainability of mining in the context of climate change from multiple perspectives.

Data Collection: Challenges and Strategies

Due to the nature of the fieldwork and the limitations of remote research, many challenges were encountered during my time in Chile. Many of the challenges were out of my

control as the researcher, and so I was required to overcome my frustrations as they arose in order to make the most of the research opportunities presented to me. While these challenges were hurdles that I fought to overcome on the ground, they also served as lessons that pushed my boundaries in order to deepen my lived experiences in Chile. Had I not been challenged to step out of my comfort zone, I likely would not have gained the same rich encounters and learning outcomes.

One of the primary challenges that I had to overcome during my time in Chile was logistical complexity. Scheduling conflicts required patience and understanding, including cultural temporal differences. During the time frame that I interviewed research participants, I scheduled blocks of time during the two-week period that I was physically located in San Pedro de Atacama, with the understanding that I would likely need to continue follow-up conversations once I was back in the capital city of Santiago, or when I had returned home to the United States. Many interviews had to be rescheduled to accommodate a change in availability or accessibility. One challenge that contributed to the difficulties in scheduling interviews was the accessibility to internet. Many areas in the San Pedro de Atacama and Calama region did not have reliable or steady internet access, and so communication and contact with participants was often delayed or postponed.

While logistical complexities were often a substantial cause for concern in the completion of interviews, I was able to overcome this challenge and schedule a sufficient number of meetings. Because my additional practicum and SIT coursework were remote and asynchronous, I had complete flexibility over my schedule during my time in Chile. This allowed me to reschedule items and have greater patience when arranging meetings with research participants who had limited internet access or busier schedules. Flexibility and openness to change was

oftentimes challenging for me, as I had pre-determined deadlines and checkpoints that originally, I was determined to meet; however, remaking my interview plans and reiterating to myself that I had a flexible schedule helped ensure that I remained patient and grateful for all interview opportunities. These strategies worked well and enabled the completion of all required interviews during the allotted time frame in Chile.

Another challenge that I faced during my research was a language barrier. As Spanish is not my native language and I am not yet fluent, I found variances in Chilean slang and niche vocabulary proved to be very difficult at times. During my time in Chile, I had to make an effort to actively push my language comprehension skills. I frequently engaged in a lot of self-teaching to learn essential linguistic tools to best grasp Chilean Spanish and made an active effort to practice speaking with Chilean citizens whenever possible. Through working with my practicum organization – Observatorio Ciudadano – I quickly picked-up new vocabulary, slang, and strong accents that at first were very new to me. Luckily, all of the project's interviews took place toward the end of my time in Chile, allowing me to utilize improved comprehension and confidence in Chilean Spanish. For my interviews, I did not use a translator, and so I made sure to focus on asking clear and concise questions and articulating to research participants that, while I was capable of engaging in conversation, speaking slowly and annunciating was very much appreciated. Although challenges presented by full immersion in the Spanish language were often daunting and frustrating, this experience improved my mastery of the language and enabled a better connection with research participants.

The last challenge that I encountered during my research in Chile was related to building relationships and pursuing connections. It became apparent to me that opportunities in Chile are best achieved through networking and relationship building. I found that building strong

connections was fairly challenging, as I was not in a position where I interacted with people on a daily basis. My work with the practicum organization – Observatorio Ciudadano – was asynchronous remote work (due to impacts to the organization from COVID), and so I was not necessarily involved in a community or group work environment that could be utilized for networking. This required me to expand my outreach to establish contacts with as many people as possible. One of the best tactics that I found in building relationships and finding interview opportunities was to reach-out to a wide variety of people, to not be afraid to ask for help from the people who I did know, and to be direct and more assertive when making initial contact with potential participants.

Reflections on Positionality and Ethical Concerns

Challenges that I faced during my research in Chile included my positionality as an outsider and as a young, female, white woman. My lack of complete fluency with Spanish and regional Chilean linguistics and approaching potentially sensitive topics with interview participants were other challenges during my project. Many of these concerns were addressed through careful consideration of interactions between me and the research participants. Prior trainings on ethical conduct were utilized in conjunction with an electronic participant informed consent form required by the Institutional Review Board at SIT in order to clearly inform all interviewees about their rights of participation. The informed participant consent form was shared with all potential participants which articulated their right to opt-out of the interview of the described project at any time. Regardless of all measures taken to limit challenges of positionality and ethical concerns, there were several factors that persisted as relevant during my time in Chile.

Awareness of my positionality was key, as I am a U.S. American, white, female student researcher in Chile. I entered into this research role and to the country of Chile as an outsider. Upon reflection, it is likely that my presence was inherently perceived as imbalanced (in terms of power) in that my professional relationship was with interviewees from a developing nation who were workers for companies that practiced extractivism. My identity as an outsider was clearly apparent in many of my interactions with interviewees, as I did not grow-up in the Antofagasta region, as many of the participants had. My etic perspective on mining in the Atacama Desert meant that I had to consistently self-reflect in order to ensure that my actions and words were professional, appropriate, and considerate, in other words, respectful.

Similarly, my presence may have been challenging, as mining can be viewed as a contested space in terms of people's livelihoods. Therefore, it was particularly important that I was sensitive to challenges that had the potential to raise fundamental questions about people's interests and well-being. To best accomplish interacting with this topic, I worked to consciously phrase questions in a respectful and delicate manner. As Spanish is not my native language, there were many nuances in the language that I had not yet mastered. As a result of these factors, I utilized support from my capstone academic advisor, Consuelo Fernandez, who is a native Spanish speaker. She helped to ensure my questions were presented in the best manner possible.

The final factor of positionality that I faced was the issue of gender dynamics within Chile and, more specifically, in the mining sector. The gender dynamics of being a woman in a male-dominated industry meant that I needed to engage community members with particular care. The mining community in Chile is typically comprised of majority male-identifying members, and so I had to consider gender norms, verbalized and body language, and specific terminology when addressing mining sector participants. While just over 25% of my research

participants identified as female, it was important that I engaged with both male and female participants with an awareness of potential influences and challenges surrounding gender.

In order to address and mitigate any potential concerns surrounding my identity or impact, I made sure to utilize prior workshops and training on ethical research conduct. Completion of the Collaborative Institutional Training Initiative (CITI) and the M.A. Program's Social and Environmental Methods course prepared me to employ appropriate strategies to mitigate any harmful but unintended impacts I might have as a researcher. For example, my affiliation with a local practicum organization – Observatorio Ciudadano – was made aware to interviewees in order to establish credibility and link to a familiar partner with all participants. Additional measures used to account for imbalances between me as the researcher and the project participants included transparency about the project and my role, a focus on the development of appropriate and well formulated interview questions, provision of a brief project summary shared alongside the informed consent document, and emphasis on appropriate personal connections to assist in building relationships.

Findings and Discussion

This project examined and critiqued notions of mining in relation to sustainable development. Data collection and observation revealed a series of complexities regarding the industry. Semi-structured interviews exposed the intricacies of the mining industry that extended beyond the basic core concepts of sustainable development and nationalism. Collected data indicates interviewee concerns about environmental conservation, unequal distributions of impacts, citizen rights to resources and territories, and growth and destruction at the nexus of mining and tourism. Substantive interviews responded to the central research question but also

highlighted key dilemmas that result from mining for national growth. The development of mining does impact perceptions of nationalism in Chile as well as the future growth of the nation, the integrity of Atacameños communities, and the health of fragile local environments.

One overarching finding from the study is that mining in the Atacama Desert is somewhat linked to nationalism in Chile (in terms of pride in the country and its economic growth). However, interviewees more strongly linked mining to other issues tied to local development, local and regional environmental degradation, and concerns about human rights for communities. Analysis of the data links these concerns more directly with perceptions Chileans have about their local and national identities. From the interview data and other data collected, it is clear that there is a strong sense of national pride in Chilean ecosystems, social perseverance, and (to some extent) national economic growth accomplished sustainably. The project found a strong link between sustainable development of the mining industry and nationalist sentiment and a weaker link between purely extractivist mining and nationalism.

Sentiments of Chilean Pride

National pride, as apparent through interviews with residents in the Atacama Desert, indicate what Chileans see as strengths and weaknesses of their country. As described by Participant 7, "Chile has many good things and it has many negative things, things that could be improved, for example, the issue of inequality, the issue of the authorization of natural resources, the relationship between the various peoples that exist in Chile" (See Appendix 5 for original Spanish text). The country's rich history holds significance for many citizens who view prior political movements, environmental changes, and social struggles as defining factors of the country's contemporary resilience (Atallah, 2016; Dillehay, 2016).

Within discussions about nationalism and Chilean pride, many participants indicate that many Chileans feel a strong connection to the land and the different ecosystems that exist within the country (Participant 3; Participant 4; Participant 5; Participant 8). Regardless of participants' identification and consideration of what Chilean nationalism means in relation to mining, nearly all interviewees asserted a value in the land and territory as a source of pride. Rich ecosystem resources, diverse environments, and connection to territories contribute to Chilean national identity. Many participants also articulated that the characteristics of typical Chileans as caring and hardworking (Participant 1; Participant 2; Participant 5; Participant 7). Solidarity with the environment and care toward one another influences the pride they feel as Chileans. The nexus between Chilean citizens and their deeply rooted connection to land sheds light on the perceptions of mining. Impacts to the land are impacts to them, their ancestors, and their care for one another. To extrapolate, many interview participants expressed that frequent mining imposed damage to the integrity of the landscape and general maltreatment to citizens' well-being (Participant 7; Participant 8; Participant 14). This coalesced in social and environmental harms that, in their opinions, frequently outweighed the economic benefits of mining.

Mining in a Deserted Territory

Due to the importance of physical territories in perceptions of Chilean nationalism, it is essential to consider how landscapes and ecosystems are conceptualized within the context of mining in the Atacama Desert. As Bebbington & Bury (2013: 71) note, the perception of nationalism and its "productive capacity is ideologically and materially rooted, at least in part, in nature." The development of nationalism has an intrinsic affiliation to the holistic composition to the surrounding natural world. Connection to the physical state of the Chilean landscape and the

natural resources that the country provides help to shape national identity. Even prior to the vast increase in extractivism, many Chileans noted that some degree of their Chilean pride was directly related to the rich and vast ecosystems found throughout the country (Participant 3; Participant 4; Participant 5; Participant 8). From the Southern glaciers to the vast expanse of the Atacama Desert and all of its wonders, connection to the earth has played an important role in nationalism and development.

The Atacama Desert covers approximately 1,000 km of northern Chile. It is comprised of a high elevation arid landscape, and it is the least inhabited region of the country (Bull et al., 2018). Due to a sparse population number and colonial exploration and characterization of the land, the Atacama Desert often is considered to be empty and associated with untouched territories free to be taken (Mendez et al., 2020). The assigned value of the Atacama Desert has been linked to the potential wealth gained from the extractive industry of mining. Historical exploration of the desert in the 19th century was primarily carried out by artisanal miners who viewed the region as replete with mining potential and potential capital (Mendez et al., 2020). This exploration frequently confronted pre-established human settlements, causing frequent disputes over land ownership and land use (Mendez et al., 2020). Large-scale conflicts over territory and land rights have been long standing challenges across many countries with indigenous presence, and territorial ownership throughout the Atacama Desert has been no exception. Strong historical presence by the Atacameños, or Licanantay, the Aymara, and the Quechua peoples has been overlooked by powerful figures in Chile, allowing for the degradative practices to expand in the region (Babidge & Bolados, 2018; Prieto et al., 2019).

Treatments of the Atacama Desert as an empty space have led to the general perception that this region of Chile holds no environmental or cultural value and therefore, it is an ideal

location for extractive practices (Mendez et al., 2020). Rich copper and lithium deposits found across the Atacama Desert appear to usurp any considerations of cultural connections to the land and its value. Instead, production and extraction of these minerals are said by the government to aid the economic growth of the nation. Conscious denial of indigenous presence and environmental importance has allowed mining companies and government bodies to view the Atacama Desert as relevant solely for the potential economic revenue from extraction and, moreover, does not take account of the severity of socio-environmental degradation in the region (Mendez et al., 2020). When Chile treats the Atacama Desert as an empty landscape that should be commodified, there is an emphasis placed on the importance of mining for national benefit and a disregard for the land that serves as a home for many people and species. When powerful figures act as if there is no value to the land or its inhabitants, they actively choose also to disregard any harm that is being done to the area and people. There is a need to conserve the desert ecosystem, particularly in the context of current and impending climate change.

Contradiction of Mining and Tourism for Development

"Development" is a key concept that can be found at the nexus of mining and tourism in the Atacama Desert of Chile. In this region, these activities have increased in extent and intensity during the past five decades and, moreover, contributed to the growth in settlements and economic activity throughout northern Chile. While these two sectors do not necessarily closely interact with one another, both industries contribute to general development. The introduction of mining and tourism came about somewhat simultaneously in the Antofagasta Region of the Atacama Desert, with mining beginning in the 1980s and tourism arising in the 1990s (RIDES, 2005).

While the growth of the mining industry and the tourism sector both have improved economic activity and promoted basic development initiatives – such as increased infrastructure, promotion of alternative income strategies, and social benefit programs – throughout the Atacama Desert, the two sectors' concurrent rise has had devastating social and environmental repercussions for the region. As a part of efforts to advance national and regional development, mining and tourism have impacted ecosystems in ways that will limit the future capacity for human presence in the area. One interviewee remarked, "The prediction is that San Pedro de Atacama is going to be dry in five years. And, if we don't change anything in five years, San Pedro is going to dry out, and tourism is going to go, and we all have to leave. Nobody wants to leave" (Participant 2). As it currently stands, the village of San Pedro is home to 10,996 people, a number that is likely to grow in the near term (Biblioteca del Congreso Nacional de Chile, 2017). Since overall growth began in the 1980s, both San Pedro and Calama have experienced high rates of labor immigration for employment opportunities (Bähr, 1985).

In interviews and conversations with community members, it became clear that there is a distinct awareness of "floating" populations in the Atacama Desert (Participant 1; Participant 3; Participant 8; Participant 9; Participant 10). Many interviewees noted that there is an extensive influx of people moving in and out of the area for job prospects, in both the mining and tourism industries (Pizarro, 2016). "Mining as well as tourism raise so much economic activity", remarked interview participant 2. As substantial immigration to the area began with the discovery of mineral deposits, this trend has continued with the growth of the mining sector for extraction (Mendez et al., 2020). Currently, a large percentage of the population in the area makes short-term moves from nearby cities or countries to work in the copper and lithium mines in Antofagasta region. Many people who immigrate to Calama or San Pedro de Atacama for

work are not permanent inhabitants, but rather stay for a limited number of years (Participant 3; Participant 9). Although the general labor pool largely consists of a "floating" population, there have been development initiatives –including infrastructure, promotion of alternative income strategies, and social benefit programs– put in place to support increased settlement. This, however, begs the question: development for whom?

As mining and tourism have increased immigration to the Atacama Desert, additional developments have begun in San Pedro and Calama. Land is being bought-up by corporations that wish to partake in infrastructure improvements, alternative revenue opportunities, and social programs. Mining has contributed to the overall desire for increased economic activity, which has resulted in investment in the tourism industry. One resident of San Pedro noted the presence of mining companies, stating that:

> Although these mining companies work there, when they come here to San Pedro, they have to have a place to stay, and you can see the environmental impact in San Pedro. They buy land to build hotels and get another profit from tourism in this case. So, they were very nice places like this one right here [San Pedro] that they buy then they get rid of the trees, and they build, I don't know, hotels. (Participant15) (See Appendix 5 for original Spanish text.)

The increase in mining activity in the area has resulted in economic and industrial growth, but that development, in turn, has resulted in environmental degradation. At some point, the regions of Calama and San Pedro will not be able to sustain continued growth and the overall ecosystem harm will create an uninhabitable region.

Both mining and tourism have experienced a boom in activity that has strengthened economic viability for many community members; however, the growth of these sectors also has created contradictory impacts that threaten the cultural and environmental integrity of the area. One interview participant stated, "We have a water problem here that comes from the mining and the tourism" (Participant 2). Contamination and depletion of available water has severe

consequences for the flora and fauna of the Atacama Desert, and any change to the quantity of the water results in a shift in ecosystem equilibrium, thus resulting in numerous negative changes throughout the area (Correa-Parra et al., 2020).

There also is a notable contradiction around the idea of mining for development's sake at and near site locations. For instance, recently lithium mining practices have increased substantially, as there is a high demand for lithium-ion batteries used for renewable energy technologies and electric cars. Output products of this mining, however, are found in global markets but not at local sites where the extraction takes place. As one interviewee stated, "We have lithium mining in the whole salt flat [of San Pedro de Atacama]. Do you see electric cars here? Do you see a gas station where you can charge an electric car?" (Participant 2). The benefits of the lithium resources are not felt at the locations where the resource is extracted. Instead, one primary outcome for residents is environmental degradation that threatens their livelihoods (Participant 8; Participant 10). This contradiction shows that outcomes for global development from mining and tourism do not necessarily result in the same benefits of development for residents at sites of resource extraction, for example in the Atacama Desert of Chile.

Indigenous Survival and Adaptation in an Era of Mining

Historically, the Atacama Desert has been home to indigenous people for the last 10,000 years, including the Atacameños, or Licanantay, the Aymara, and the Quechua people who practice agricultural and pastoral livelihoods (Babidge & Bolados, 2018; Prieto et al., 2019). The indigenous Atacameño people are one of the ten indigenous groups recognized by the Chilean nation (Aylwin et al., 2021). The Atacameño people total 30,369 individuals, as of 2017 (Aylwin

et al., 2021). The mining and, to a lesser degree, tourism industries throughout Chile, and specifically within the Atacama Desert, has resulted in a shift in livelihood for many indigenous residents of the region.

As the growth of the mining and tourism industries began to influence towns and cities throughout the Atacama Desert, changes to the land as a result of these activities altered previous livelihoods (Participant 8). Many indigenous people shifted their focus from agricultural and pastoral practices to job opportunities in the mining or tourism industries (Lorca et al., 2022). While some members of indigenous communities were enticed by the prospect of job security promised by the two industries, other members of these communities were more apprehensive toward the implications that mining and tourism might hold for them and their territories. One interviewee stated, "Mining brings economic benefits, obviously. But at the cost of what, you know?" (Participant 15) (See Appendix 5 for original Spanish text). Integration of mining and tourism within the Atacama Desert of Chile creates oppositional perspectives on the role of such industries in the well-being of indigenous people and the land. Since large-scale mining companies, such as SQM, Codelco, and Albemarle, have increased their presence in the Atacama Desert, there have been numerous conflicts between corporations and indigenous communities over land rights, labor rights, and human rights, as well as a dearth of cultural and environmental protections against threats to the livelihood and well-being of the Atacameño people (Atienza et al., 2021b; Aylwin et al., 2021; Lorca et al., 2022).

The integration of both mining and tourism in the most recent developmental push of the Chilean nation has had severe impacts on the Atacameño people. The growth of both of these industries has caused a divide in support for indigenous livelihoods. Degradation of and change to the physical landscape have caused conflicts between community members and employment

industries. One specific example of this environmental and cultural damage is the diminishment of the carob tree (*Ceratonia siliqua*) which is caused by water depletion from nearby mining activity (Houmann Mortensen, 2019). The carob tree, locally named *Algarrobos*, has spiritual significance to the indigenous Licanantay people. Impacts to these trees and their health serves as a symbol of a significant water deficit. In 2013, it was reported that one third of the trees present in the Atacama Desert were dying due to water depletion caused by the extraction of lithium (Houmann Mortensen, 2019). The loss of the carob tree is an example of a cultural threat to indigenous practices from the mining industry.

Despite that indigenous peoples are opposed to mining practices due the environmental and cultural degradation, in addition to a series of other factors, mining does serve as an opportunity for employment security. Many of the primary mining companies in the region have recently integrated indigenous employment into their company mission, as a way to both incorporate local communities and to promote continued extraction of resources. For example, one of the primary lithium mining companies in the Atacama Desert, Albemarle, created a policy in 2020 that focuses on the relationship between the mining company and indigenous communities. This policy – The Community Relations and Indigenous People Policy – focuses on themes of sustainability to improve human lives through knowledge about and improved interactions with indigenous communities (Albemarle, 2020a). The policy was created in part to guide company relationships with indigenous peoples and to inform ethical interactions. Albemarle, through its policy, aims to include local communities in operations by creating a workforce that consists of 35% indigenous workers (Albemarle, 2020a). In addition to its focus on indigenous employment, Albemarle has created agreements with the Consejo de Pueblos Atacameños [Atacameño Peoples Council], which includes 18 communities of 6,000 individual

members. This agreement requires the company to have monthly meetings with the council to discuss issues or concerns that arise as a result of lithium extraction operations (Albemarle, 2020b). The company is further dedicated to give 3.5% of annual sales to indigenous communities to support relations between the company and the indigenous communities that inhabit mineral extraction sites (Albemarle, 2020b).

Due to Albemarle's company policy that focuses on indigenous inclusion, many Atacameño people have become involved in the mining operations as their primary form of livelihood (Participant 8; Participant 10; Participant 12; Participant 15). Typically, employment through the mining companies provides workers with an income of $1,000 per month, which is significant income in the region compared to the average monthly income of $600-$650 for the Atacama region (Frankel & Whoriskey, 2016; Nostálgica, 2022). The economic attraction has proven to be an essential selling point for indigenous involvement in copper and lithium mining operations. That being said, on a local scale, it is of note that there has also been a shift away from indigenous employment within mining in favor of other growing industries, such as tourism and administrative work. One interview participant noted that "[mining] is a little bit obsolete because a lot of families are already switched to tourism or to public administration" (Participant 2). Regardless of whether local community members become involved in mining, tourism, or public administration, the significant shift in employment opportunities has altered community perceptions of such industries and their development initiatives and of economic well-being in general. However, the question remains: at what cost?

Privatization of Water: Environmental Conflicts and Water Rights

One of the most prevalent costs of improved economic well-being is the environmental damage that is caused by the mining and tourism industries. There has been a clear negative outcome for the water and air contamination caused by mining practices in the Atacama Desert. All residents have noted a drastic change in the composition of the water and the quality of the air. Since the 1980s, and even more recently, residents have faced increased health risks due to the air contamination produced by the mines. One woman from San Pedro de Atacama commented,

> We already have a lot of sand, powder, which is in the air. But sometimes there are days when there is no wind, and I look down south and I see the whole air, full of powder. Because they aren't even mining there, they just have pools where the mining of the copper and the other metals a little more down south, and in Calama which just makes the air like that, very smoggy (Participant 2).

Air and water contamination are critical threats that are intensifying throughout the Atacama Desert due to the mining industry. This health and quality of life impact is proving to be a serious cause for concern, as is the environmental impact to an arid desert with high vulnerability (Correa-Parra et al., 2020).

One of the most valuable resources in the Atacama Desert is water. It is at risk due to pollution from extractive processes. The role that water plays in mining operations in the Atacama Desert is incredibly vital to the integrity of the ecosystem and to residents and their quality of life. Minerals, such as copper and lithium, have been marketed by industrial companies as being the essence of value in this arid ecosystem. Thus, the value placed on these minerals by mining companies is said to usurp the importance of water for indigenous people as a resource for survival. It is important to note that many residents view the degradation of the region's environment as a devastating loss (Participant 2; Participant 9; Participant 15). In support of this contention, one interviewee stated, "I believe that water is worth much more than

copper, much more than gold" (Participant 4) (See Appendix 5 for original Spanish text). This sentiment rang true for many other interviewed community members, who expressed anger, frustration, and sadness at the loss of ecosystem integrity for the sake of economic growth (Participant 2; Participant 8; Participant 10).

Degradation of the Atacama Desert ecosystem continues to intensify when these environmental impacts from mining are coupled with climate changes. It is unsurprising that during the last several decades the Atacama Desert has experienced variances in its decadal rainfall, disruptions to its natural hydrological cycles, and degradation to its flora and fauna, an outcome instigated in large part by contamination from mining activities (Cerf, 2022; Houston, 2006). Many local community members in the Atacama Desert have noted landscape cover changes over the years that correlate with the intensification of mining in the area (Participant 2; Participant 8; Participant 9). One resident of San Pedro de Atacama shared their observations of environmental change, remarking that, "when I was one year old, I celebrated my first birthday [in San Pedro de Atacama]. When I look at pictures, I can see a clear difference in the trees. Because now they are more dry, half of the trees are dead. So, I can see it" (Participant 2). Other project participants shared that while impacts to the natural composition of the desert landscape were problematic, those impacts were necessary and advantageous for the successful function of Chile as a country (Participant 1; Participant 8). "It is destructive to the ecosystem. But it is necessary... Chile is a country whose main resource is mining. There is nothing else. Well, it has wine, but it's not the same, it's not the same" (Participant 1) (See Appendix 5 for original Spanish text).

Mineral extraction processes typically require large quantities of water. In 2020, Chilean lithium mining company, SQM, used approximately 31,158,342 m^3 of water and Chilean copper

mining company, Codelco, used approximately 185,633,000 m^3 of water in the same year (SQM, 2020; Codelco, 2020). This requisite of water usage in mining historically has caused many conflicts with local inhabitants who rely on water for their own survival. Access to clean and safe water has proven to be a major concern for Chileans located in the Atacama Desert region, as the area is the most arid non-polar ecosystem on the planet (Correa-Parra et al., 2020). Residents noted that particular conflicts surrounding water are related to both the privatization of water and the contamination of water sources, which are scarce (Participant 2; Participant 9). Implementation of the water privatization policy, known as the 1981 Water Code, has resulted in disproportionate social impacts, as poorer communities and individuals are left more vulnerable to impacts from climate change (Anguelovski et al., 2016). Indigenous communities, such as the Licanantay, who rely heavily on water access for agricultural practices and personal consumption have faced decreased access to safe water (Correa-Parra et al., 2020). Privatization of water has ultimately benefited businesses that play a major role in national economic growth, such as those in the mining sector. The confluence between water privatization and mining practices has resulted in severe water shortages and environmental damage to the ecosystem of the Atacama Desert (Anguelovski et al., 2016; Cerf, 2022; Correa-Parra et al., 2020; Houston, 2006).

When the 1981 Water Code was implemented, its primary aim was for water allocation to be apolitical. The intent was to prioritize activities that produce higher economic returns, such as those generated by the mining sector (Prieto, 2015). The role of mining in environmental consequences linked to water privatization is apparent because mining limits water access for local inhabitants. It also allows for the overuse, depletion, and contamination of limited water resources (Bull et al., 2018). One interviewee noted, “The water use in the legal documents is

prioritized for companies over people. So, one avocado has more right of water per second than a person. You have to let that sink in" (Participant 2). This point demonstrates that Chilean citizens often feel frustrated that they have less access to water than a single crop, such as an avocado, due to the privatization policy that prioritizes industrial water consumption. The privatization policy served as the mechanism for existing extractive activities to gain access to large amounts of water, thus depleting sources and altering the equilibrium of the overall desert ecosystem (Correa-Parra et al., 2020). This privatization initiative created negative limitations for impoverished residents who do not substantially contribute to overall national economic growth. These residents' interests were deprioritized as they related to general water accessibility.

Asymmetry of Benefits and Consequences

Mining, as an industry, has the potential to provide vast economic revenue from the extracted valuable minerals, in this case including lithium. Capital produced from this industry largely flows into international markets of the mineral trade. Profits are marketed toward national economic growth that provides financial gain for Chile. While mining in Chile has increased substantially over the recent decades due to investments, the benefits of the mining industry are not universal for Chileans (Atienza et al., 2021a; Giljum, 2004; Lorca et al., 2022). The financial benefits produced from the extracted minerals are variously distributed to mining affiliated parties, such as producers, consumers, investors, and shareholders. In other words, most citizens do not experience direct financial profit from the mining industry. One interviewee noted that benefits from the mining industry are circulated solely within the sector and generally do not hold a positive impact for the remainder of the nation, viz.: "We don't benefit from mining. Chile does not really benefit except those families that are involved in the business" (Participant

2). While some efforts are made to distribute the financial benefit of mining in order to have a positive impact on the broad citizenry and the growth of the nation, much of the financial benefit is only felt by those families who work directly with the mining companies or the upstream contributors of the industry (Atienza et al., 2021a; Lorca et al., 2022).

The economic growth of Chile can be attributed in part to an increase in mineral extraction, but that economic growth seemingly does not result in well-distributed wealth. One interview participant, who is a professor in Calama, noted, “The contributions do not go directly… much of the mining contribution goes to Antofagasta and more prosperous cities than Calama. We don't see that same development” (Participant 5) (See Appendix 5 for original Spanish text). In other words, many of the potentially positive economic outcomes of mining go directly to larger cities and big corporations that have a stake in mining operations. Another participant remarked, “My money goes to Santiago, to Antofagasta. It’s not here” (participant 15) (See Appendix 5 for original Spanish text). Some economic and other benefits do go to those workers and families who are affiliated with mining operations; however, benefits are infrequently well distributed among the communities where mining sites are located.

Workers involved in the operations of mining companies receive many more direct benefits, such as housing and a car as well as non-material benefits such as work schedules that allow for personal time and educational advancement (Participant 1; Participant 3). Participant 3 stated, “Thanks to work, I can have my house and my car, and the main thing is to help my children's education” (See Appendix 5 for original Spanish text). And participant 15 noted, “There are young people here who can study thanks, in part, to the money that comes from mining” (See Appendix 5 for original Spanish text). While the benefits of these services are recognized by workers at mines, it is clear that this compensation is limited to upstream parties

who are associated with the companies. Participant 8 highlighted that the unequal distribution of these financial and social benefits further divides socio-economic classes throughout the Atacama Desert, as well as throughout Chile.

Applications

Given the context of mining operations in practice, “San Pedro de Atacama has now become like a sacrifice zone. For the world, for Chile, and for everyone” (Participant 15) (See Appendix 5 for original Spanish text). The benefits that are produced by the mining industry for the sake of national economic development come at an irreversible cost, a sacrifice (Participant 1; Participant 4, Participant 14). Social stratification and environmental degradation caused by mineral extraction can be insurmountable challenges, especially because the global demand for copper and lithium sources continues to intensify alongside climate change impacts. The documented issues surrounding ecosystem and natural resource deterioration, infringements on human and indigenous rights, and disputes over land and water are major consequences of mining in Chile.

Global and regional communities can learn from the severity of impacts in the Atacama Desert to improve the sustainability of mining operations and to enhance socio-environmental well-being for people. Lessons might be learned from the negative mining consequences in Chile and the uneven national development and economic prosperity of its citizens. However, the negative impacts from the mining industry also can be viewed from an international scale in relation to climate change technology. There exists a major dilemma surrounding global climate change adaptation strategies and local participation to combat climate change. Copper and lithium mining are key resources in future climate change mitigation and adaptation efforts.

Lithium-ion batteries are used in electric cars and in mechanisms essential to harvest solar and wind energy. In other words, lithium used in many renewable energies is essential for positive climate solutions; however, on the ground operations and impacts related to these components tend not to be considered in an overall environmental and human equation. As one participant in the project stated, "The mining culture could be more beneficial … if they would apply the new, modern science, disregarding how much it would cost because in the end, because the long-term costs will be on your children, on your grandchildren" (Participant 2). In contrast to the extraction of fossil fuels, renewable energy initiatives are labeled as 'green' progressive efforts to mitigate climate change impacts (Crawford, 2022; Suzuki, 2017). While this mentality is well intentioned, the support for lithium based renewable energies obstructs the reality of mining impacts at a local level.

Greater transparency about the local implications at mineral extraction sites and the impacts to communities should be improved and publicized. It is evident that in the near-term future, there will be an even greater dependence on technology and infrastructural development contingent on the use of metals (Lahiri-Dutt, 2011). As mineral demand increases and ecosystem degradation worsens, simultaneously there will be an intensification of solutions to counter-balance climate change. These technologically driven climate solutions will come at the expense of residents and environments in places like the Atacama Desert. With this in mind, the following question should be carefully considered: at what point is such environmental and social damage no longer worth the currently promoted vision of a 'green' (and technological) solution to climate change? Current social and environmental policy frequently overlooks the complexities of this critical question or pushes them into the background, even as governance

and policy try to balance the integration of future development, the protection of socio-environmental rights, and the promotion of climate change solutions.

Relevant policy in Chile is currently in the midst of a substantial transition. Given the recent election of left-wing, socialist President Gabriel Boric and the referendum of the revised Chilean constitution in September of 2022, the country has begun to embrace progressive change (Mussa, 2022). The proposal of a new constitution was an opportunity to make improvements to improvements and updates to the constitution enacted by Pinochet in 1980. The country is currently in the beginning phases of socio-political change, yet Chile has historically focused on policy intervention for the purpose of economic development (Prieto et al., 2019). Such policy changes have frequently resulted in conflict, greater social inequality, and environmental damage (Lorca et al., 2022; Prieto et al., 2019). Based on the country's prior insufficient policy implementation, socially unequal outcomes, and challenging political leadership, significant change clearly must take place to remedy past injustices and secure the future for Chileans.

The Chilean referendum of the proposed constitution revisions was rejected on September 4th, 2022, which resulted in a state of uncertainty. The proposed constitution sought to move Chile toward protections of indigenous rights and improved environmental conservation (Republic of Chile, 2022). Similarly, the proposal had outlined the heightened responsibility of sustainable management strategies, prioritized the protection of ecological resources, and promoted a more genuine social equality (Republic of Chile, 2022). Rejection of the document demonstrated that a focus on the free-market economy approach remains an important pillar of Chilean national priorities. While this new constitution was not approved by Chilean voters, revisions to the document had the potential to provide improved environmental rights, recognition of indigenous rights, and enhanced social services, among other highlights that

would begin to resolve injustices. Although its potential impacts will remain unknown, had the constitution been passed its revised environmental protections likely would have altered the operations of the mining industry in the country in favor of ecosystem integrity and the rights of residents (Otis, 2022).

Had the progressive constitution been approved by Chilean citizens, the country likely would have shifted into a position of liberal leadership for South America (Otis, 2022). Future decisions regarding the protection of rights and the prioritization of human well-being, as opposed to a purely free market system and economic growth at all costs, still remains to be determined (Cella & Rau, 2022). There still remains a substantial opportunity for positive change (Boric, 2022). Components of the rejected draft constitution will be amended in the coming months for further consideration. Applications of present law and policy likely will be revised to ensure more equitable success and environmental integrity throughout Chile as a nation (Farias, 2022).

Conclusions and Recommendations

Investigations on the localized impacts of mining and potential sustainability opportunities for the industry are essential when evaluating future phases of mining as a means to development. Furthermore, given the prevalence of intensifying climate change across the globe, it is critical to challenge the sustainability of mining operations and evaluate impacts on local communities and environments. Therefore, this study examines and questions existing notions of mining within the context of sustainable development in order to argue that implications of mining must be improved so that the industry can provide positive benefits for climate change strategies and socio-environmental well-being.

Across the world, mining extraction is an activity that led to multifaceted impacts. The mining industry in Chile influences national policy and diplomacy, environmental conservation, economic growth, development, and human and indigenous rights, among other topics. Thus, mining creates complex and diverse problem sets that must be approached in subtle ways from multiple stakeholder perspectives, while ensuring Chilean futures. Given the intensification of climate change and the increasing global dependency on renewable energy to combat it, demand for the extraction of minerals will grow leading to an environmental and social conundrum. In short, the idea that mining resources to be used for renewable energy is an environmentally friendly alternative to fossil fuels, writ large, is at best a questionable and at worst a false narrative. This project shows that residents, places, and entire countries can suffer from such an approach. The extractive mining industry is not a sustainable "green" practice (Suzuki, 2017). The development of mining for technologies that will remedy climate changes is a prioritized effort that has negative impacts to local extraction sites and their countries and regions. Greater understanding of these consequences must be addressed by key players in the mining industry in order to improve sustainability standards and overall well-being for all Chileans.

Mining for the purpose of national economic development in Chile has been praised across the globe, and yet those economic benefits serve primarily large cities, while impoverished and vulnerable communities suffer from the negative effects of mining operations. Violations of legal rights, environmental contamination and degradation, and human health consequences are some of the most prevalent impacts of mining for local communities. Mining extraction as a means to achieve development does not result in positive growth when impacts only serve to improve the economic standards of select cities and populations. Discrepancies in received benefits from mining operations should be addressed in future policy initiatives.

Thorough critiques of mining practice and outcomes are essential to ensure future sustainability and the success of potentially positive (i.e., 'green' solutions done right) climate change mitigation and adaptation strategies. Consideration of substantial revisions to the currently implemented mining system should take place in order to improve future impacts of mining, particularly in vulnerable regions such as the Atacama Desert of Chile. Many global cases exist within the mining industry that can serve as a model of success in the push towards more sustainable practices (Graham et al., 2021; Honan & Daugherty, 2015). Success cases from specific mining operations in Australia, the United States, and Canada can be extrapolated and applied to Chilean mining practices in order to achieve greater potential for sustainable mining (Graham et al., 2021; Honan & Daugherty, 2015; Vander Molen, 2022; West et al., 2015). Based on prior research conducted from existing literature and conversations with research participants, there are multiple areas that should be considered for improvements to transition to more sustainable mining practices in Chile and beyond.

First, mining companies should focus on implementing improved social services for both employees and locally impacted communities. In particular, an emphasis should be placed on the importance of health services for residents. Employees and local communities are typically the most impacted by chemical contamination and other harmful physical repercussions of mining practices. These people, however, tend to receive poor health benefits and no compensation for damages caused from mining contaminants. Mining companies and government officials should implement improved health services not just to miners but also to all residents impacted by mining operations, especially indigenous residents. Such services might include well-staffed and equipped health centers in smaller towns, specialized health care centers oriented toward contaminants in cities such as Calama, basic emergency transportation services, and

compensation for medical professionals required in mining adjacent areas. These services, while fundamental, would prioritize local community members' well-being in an atmosphere currently focused on economic growth.

Similarly, there should be a heightened focus on educational opportunities for mining communities. Many social service benefits are not evenly distributed within Chile, and educational opportunities in mining communities is one of these unequal benefits: "The economic benefit with [mining] is that within these agreements there are scholarship opportunities. On that side, it's great. Education is really important and that's also been achieved, thanks to this agreement that exists with mining" (Participant 15) argued one resident of San Pedro de Atacama in reference to the educational opportunity that is offered as a part of an agreement between the Consejo de Pueblos Atacameños and one local mining company (See Appendix 5 for original Spanish text). Implementation of increased educational programs for all citizens as a benefit of lithium and copper mining would have positive impacts for the well-being of Chilean citizens and for the overall social development of the nation.

Another critical recommendation for improvement of mining operations in the Atacama Desert of Chile is a genuine commitment to the enforcement of human rights protections and environmental standards. Historical maltreatment of workers, violations of workers' rights, infringements of indigenous rights, and abuses of natural resources (such as water), and poor relations with residents has resulted in tensions and conflicts throughout the communities associated with mines. Mining companies should focus on revising institutional policies in order to prioritize the protection of human rights and improve relationships between the mining companies and local communities, to the near-term and long-term benefit of both parties. One interviewee noted that for mining to have a more positive impact for Chilean citizens, "The

mining industry should be way more transparent, apply science, and help here with the infrastructure" (Participant 2). As a part of improved human rights protections, all mining companies should practice more transparent communication. Transparency with employees, stakeholders, indigenous people, and residents at mining locations will enhance relationships and improve treatment.

The final recommendation for the mining industry within Chile is to initiate an application of improved science to reduce environmental degradation and contamination. Progressive extractive technology has been developed; more sustainable mechanisms do exist to limit degradation of natural resources and ecosystems (Chordia et al., 2022; Dino et al., 2022; Quinteros-Condoretty et al., 2020). While these technologies are not frequently utilized due to high economic cost, the long-term benefits of more sustainable practices are essential when considering the well-being of future generations, and far outweigh the upfront financial expenses. Cost-benefit analysis of progressive extractive techniques would improve the integrity of the Atacama Desert ecosystem and the lives of its inhabitants. Based on its findings, this research argues that there should be a shift to the prioritization of vulnerable environments and communities when examining revisions of mining operations and policies in northern Chile.

It is evident from this research that disparate but entangled topics exist within the narrative of modern mining: economic development, progressive technology, intensifying climate change, concerns over human physical and cultural well-being, and the loss of ecosystem integrity. These aspects coalesce in a network of positive and negative influences for communities and the environment in the Atacama Desert of northern Chile. It is imperative that policies implemented my mining companies and the Chilean government be reevaluated in the context of sustainability for the benefit of citizens and environmental prosperity. Local voices

must be represented in the conversation to ensure that social, economic, and environmental benefits are equitable and just for all parties. The mining industry has an opportunity to create a prosperous future working in concert with residents of Chile. It is essential that these dialogues produce new and agreed values translated into policy, and that policy produces tangible, positive outcomes for Chileans.

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Appendices

Appendix 1: Sample Questions

1. What do you do for work? *¿En qué trabajas?*
2. What makes you feel Chilean*? ¿Qué se hace sentir chileno?*
3. Are you proud to be Chilean? *¿Se siente orgulloso de ser indígena o chileno? ¿Por qué? ¿Por qué no?*
4. What do you think are the pros and cons of mining? *¿Cuáles cree que son los beneficios y consecuencias de la minería?*
5. *How would you define nationalism in Chile?¿Como se defina el concepto de nacionalismo en Chile?*
6. What environmental changes have you noticed since mining began here? *¿Qué cambios ambientales ha notado desde que comenzó la minería aquí?*
7. How do you think mining interacts with nature? *¿Cómo cree que la minería interactúa con la naturaleza?*
8. Have you noticed increased development in your community? If so, what? Has that been positive or negative? ¿Ha notado que ha existido algún tipo de desarrollo en su comunidad? *¿Y si es así, los cambios han sido positive o negative?*
9. Has there been an increase in the presence of infrastructure, education, services, population that you can connect to mining? *¿Ha habido una aumentación en presencia de infraestructura, educación, servicios, población que puede conectar a la minería?*

10. How has mining influence job creation and job security in your community? *¿Como ha influido la minería en la creación de empleo y la seguridad laboral en su comunidad?*
11. Do you think that mining has somehow impacted the migration of people, and how? *Piensa que la minería ha impactado de alguna manera en la migración de las personas, si es asi, cómo?*
12. How has mining impacted your well-being? *¿Cómo ha impactado la minería en su bienestar o vida?*
13. Are there any changes in the mining industry that could improve your happiness, health, financial security, etc. *¿Hay algunos cambios en la industria de la minería que podría mejorar su felicidad, salud, o seguridad financiera?*
14. Do you think that mining has contributed to making Chile a better country? *¿Cree que la minería ha contribuido a hacer de Chile un mejor país?*
15. Do you think that mining creates any gaps in terms of benefits? *¿Cree que la minería produce brechas, como brechas de beneficios?*
16. How do you feel about the gaps that mining produces*? ¿Como se siente sobre las brechas que produce la minería?*
17. How has participation in mining changed over the years? Are more local community members seeking employment in mining? *¿Cómo ha cambiado la participación en la minería con los años? ¿Hay más miembros de las comunidades locales que buscan empleo en el sector minero?*

Appendix 2: Participant Characteristics

Participant	Gender	Occupation	Location
1	Male	Miner	Calama
2	Female	Mining Consultant	San Pedro de Atacama
3	Male	Miner	Calama
4	Male	Professor	Calama
5	Female	Professor	Calama
6	Male	Mining Consultant	San Pedro de Atacama
7	Male	Professor	Calama
8	Female	Indigenous Council Member	San Pedro de Atacama
9	Male	Environmental Municipality	San Pedro de Atacama
10	Female	Indigenous Council Member	Calama
11	Male	Hotel Owner	San Pedro de Atacama
12	Male	Informal Work	San Pedro de Atacama
13	Male	Electrician	San Pedro de Atacama
14	Male	Student	San Pedro de Atacama
15	Male	Indigenous Council Member	San Pedro de Atacama

Appendix 3: Mining Company Research Data Base

Complimentary research was conducted on relevant company actors in the Atacama Desert using the Transition Minerals Tracker created by the Business & Human Rights Resource Centre. This information was collected as a part of research associated with the SIT Practicum work through Observatorio Ciudadano. Information provided in this capstone paper has been translated and adapted to best deliver comprehensive background research on the relevant intersections between mining, development, conservation, policy, and human rights.

SQM

Sociedad Química y Minera (SQM) is a Chilean company that specializes in the extraction and production of lithium. The company was founded in 1968 and has a global presence in 110 countries. SQM has a goal of extracting materials for human development, meaning that there is a focus on the production of materials that can help enhance health, nutrition, renewable energy, and technological development. The primary goal of the company is to focus on technology development and sustainability by means of lithium. Although the company is recognized for lithium production, SQM is also a leader in specialty plant nutrition, iodine, salts, and potassium (SQM, 2022). The projects and operations of the company are primarily located in the North of Chile, in Antofagasta and Tarapacá. SQM has specific projects in seven locations throughout Chile: Nueva Victoria Faena (Tarapacá), Puerto Tocopilla, María Elena, Coya Sur, Pedro de Valdivia, Atacama Salt Flat and Carmen Salt Flat. In the Atacama Salt Flat, SQM has operations 60 kilometers southwest of Toconao, 38 kilometers west of Peine and 100 kilometers southwest of San Pedro de Atacama in Antofagasta (País Circular, 2020).

The operations that SQM conducts in Antofagasta and Tarapacá have resulted in severe degradation of the natural salt flats. The production and extraction of lithium by SQM has caused a lack of water and an increase in droughts, which affects the communities that live in and depend on the Atacama salt flats. The presence of SQM mining has caused conflicts with indigenous peoples over cultural symbols because the company does not recognize the damages imposed by the operations. The Atacama Salt Flats were made up of an estimated 10,675 inhabitants as of 2021. The group most affected by SQM's operations and droughts are the Lickanantay communities (Atacameños). The commune of San Pedro Atacama was made up of 10,996 inhabitants (as of 2017), with 51% declaring indigenous origin. The extreme use of hydrology for operations has resulted in a scarcity of water for local indigenous communities and native plants and animals.

Albemarle

Albemarle is an American company that works specifically with lithium production in around 100 countries across the globe. Founded in 1887, this company is now a leader in the energy, transportation, and electronics industries. Albemarle products are primarily used by pharmaceutical companies, water treatment companies, agricultural companies, refineries and producers worldwide. In Chile, the Albemarle branch was founded in 1980, and was called *Sociedad Chilena de Litio* at that time, and commenced operations in 1984 in the Antofagasta region. Brine extraction in the Atacama salt flats is used for electric cars, electronic devices and safety equipment. Albemarle has two operations in Northern Chile. The first is called Planta Salar de Atacama and is located in the center of the Atacama Desert, focusing on the extraction and production of lithium. The second plant, called La Negra Chemical Plant, is located 27

kilometers southeast of Antofagasta, in the Atacama Desert. The La Negra Chemical Plant began operations in 1984 and was one of the first lithium plants in the region. Today, the plant has operations, with the creation of Plant II in 2017, and the inauguration of Plant III in early 2022 (Albemarle, 2022).

Albemarle has a contract with Corfo (Corporación de Fomento de la Producción), a Chilean government organization that has a focus on the development of the state with a goal of improving economic growth. This agency owns mining in the Salinas basin that is leased to mining companies for lithium extraction. Their collaboration began in 2016. Albemarle had an agreement with Corfo that will allow the increase of production to more than 80,000 tons per year by 2043. However, the Corfo organization filed an arbitration against Albemarle for the violation of the 2016 agreement. Albemarle had a breach of the contract indexing a portion of commissions (a quarterly commission payment) for lithium sales. In 2020, the company refused to pay the agreed amount, a total of $15 million. In February 2022, Corfo officially asked for arbitration against the mining company. The production expansion of Plant III will likely result in continued tensions with local communities and damage to the environment.

Albemarle has lithium operations in the Atacama Desert that cause conflicts with local communities and damage to the ecosystem, particularly in relation to the extreme use of water. With the creation of the operations at the Salar de Atacama Plant and the La Negra Chemical Plant in Antofagasta, there have been inequalities between benefits to the lithium companies and the indigenous communities in the Atacama salt flats. This resulted in the creation of an agreement with the Atacameño Peoples Council in 2016, including 18 communities and 6,000 members. This agreement was created in response to claims of unequal benefits and a general lack of profit from operations and requires the company to have monthly meetings with the

Board to discuss issues or concerns. As a part of the agreement, Albemarle has dedicated 3% of annual sales to indigenous communities (Albemarle, 2020).

Codelco

Codelco is a Chilean mining company that works with mineral reserves and specializes in copper extraction. The company was founded in 1976 in the country's capital, Santiago. Codelco was created as a state-owned mining company during a period of great economic and political change that was led by Augusto Pinochet. Codelco accounts for 8% of world copper production, with approximately $65 billion in investments that contribute to the advancement of national development in Chile. With the country's development serving as a primary goal, Codelco focuses on progress through sustainability initiatives. Codelco produced 388 kilotons of copper across the nine operating plants in Northern Chile in the first quarter of 2022, making it one of the top copper producers globally (Codelco, 2022). Beginning in the 1990s, Codelco began focusing on the incorporation of international investments, which promoted the copper boom throughout the country.

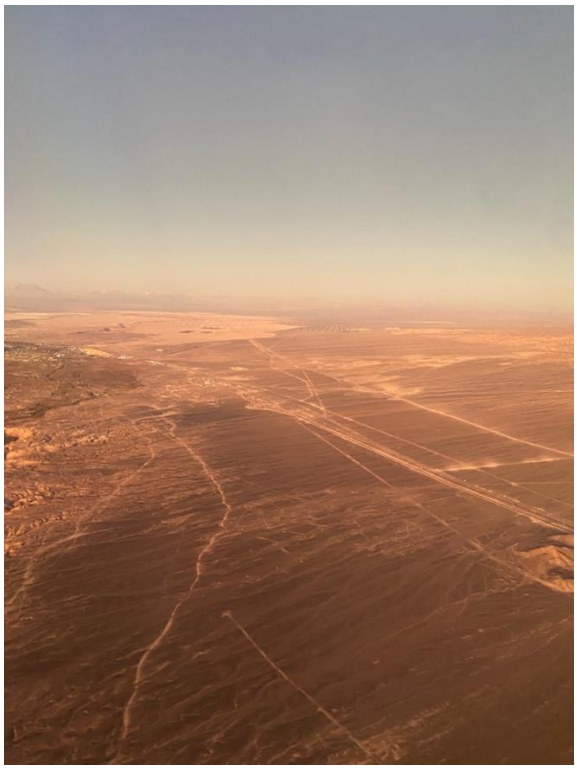
While the central vision of the company is focused on socio-economic development of Chile, Codelco’s contributions to development are strictly economic and aimed at the national level rather than the individual level (IGF, 2018). Codelco's presence has socio-environmental impacts that affect many people. Many of the allegations against the company are related to mistreatment of workers and community members, expansion of projects, damage to ecosystems and pollution, misuse of water, and death of workers and union members. Codelco has a magnitude of documented harm to employees and environments that exist in contrast to the national development of the country.

Appendix 4: Site location Photographs

Image Set 1: San Pedro de Atacama, Salt Flats

Image Set 2: San Pedro de Atacama River and Ecosystem

Image Set 3: Calama Development and Contamination



Appendix 5: Translated Interview Quotes

1. “The mining of this territory has contributed to making Chile what Chile is today. And that is unfortunate, on one hand, because at the cost of the survival of the people, Chile has become rich, Chile has grown, at the cost of a people that is us”. “[La minería de este territorio ha contribuido a que chile se ha quien es chile hoy. Y eso lamentable, por un lado, porque a costa de la sobrevivencia del pueblo, chile se ha hecho rico, chile ha crecido, a costa de un pueblo que somos nosotros]”.
2. “Chile has many good things and it has many negative things, things that could be improved, for example, the issue of inequality, the issue of the authorization of natural resources, the relationship between the various peoples that exist in Chile”. “[Chile tiene hartas cosas buenas y tiene hartas cosas negativa, cosas que se podría mejorar, por ejemplo, el tema de la desigualdad, el tema de la autorización de los recursos naturales, la relación entre los diversos pueblos que existen in Chile]”.
3. “Although these mining companies work there, when they come here to San Pedro they have to have a place to stay and you can see the environmental impact in San Pedro because they buy land. To build hotels and get another profit from tourism in this case. So, they were very nice places like this one right here (San Pedro) that they buy then they get rid of the trees, and they build, I don't know, hotels”. “[Estos de las mineras si bien trabajan allá, cuando vienen acá a San Pedro tienen que tener donde quedarse y se ve en el impacto ambiental en San Pedro porque compran terrenos, po. Para construir hoteles y sacar otra ganancia del turismo en este caso. Entonces, había lugares muy lindos como este (San Pedro) que lo compran galán árboles, y construyen no sé po, hoteles”].
4. “Mining brings economic benefits, obviously. But at the cost of what, you know?”. “[La minería] trae beneficios económicos, obviamente. ¿Pero a costa de que, cachai?”.
5. “I believe that water is worth much more than copper, much more than gold”. “[Yo creo que el agua vale mucho más que el cobre, mucho más que el oro]”.
6. “It is destructive to the ecosystem. But it is necessary... Chile is a country whose main resource is mining, there is nothing else. Well, it has wine, but it's not the same, it's not the same”. “[Es destructivo para el ecosistema. Pero, es necesaria… Chile es un país… que el recurso principal es minería, no hay otro. Bueno, tiene vino, pero no es lo mismo, no es lo mismo]”.
7. “The contributions do not go directly… much of the mining contribution go to Antofagasta and more prosperous cities than Calama. We don't see that same development”. “[Los aportes no llegan directo… mucho de su aporte llegan an Antofagasta y ciudades más prospera que en Calama. No vemos eso mismo desarrollo]”.
8. “My money goes to Santiago, to Antofagasta. It’s not here”. “[Mi plata le voy a Santiago, a Antofagasta. No está acá]”.
9. “Thanks to work I can have my house and my car, and the main thing is to help my children's education”. “[Gracias al trabajo puedo tener mi casa y mi auto y, lo principal le ayudar la educación a mis hijos”.
10. “There are young people here who can study thanks to, in part, to the money that comes from mining”. “[Hay jóvenes acá que pueden estudiar gracias, en parte, a la plata que llega de la minería]”.

11. “San Pedro de Atacama has now become like a sacrifice zone. For the world, for Chile, and for everyone”. “[San Pedro de Atacama ahora se ha convertido como una zona de sacrificio. Para el mundo, para Chile, y para todos]”.
12. “The economic benefit with [mining] is that within these agreements there are scholarship opportunities. On that side, it’s great. Education is really important and that’s also been achieved, thanks to this agreement that exists with mining”. “[El beneficio económico con esto es que adentro de estos convenios existen acuerdos de becas. Por ese lado, genial, po. La educación muy importante y eso se ha logrado también, gracias a este convenio que existe con la minería]”.