Socio-environmental projections of lithium exploitation in Puno: configuration of the social territory by the lithiferous activity in Peru by 2024

Projeções socioambientais da exploração de lítio em Puno: configuração do território social pela atividade litífera no Peru até 2024

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ABSTRACT

The study aims to identify key socio-environmental considerations for the strategic management of lithium in Peru, with a focus on the spatial configuration of the territory. This is a qualitative research study that observed concerns in some Puno communities about the impacts on their economic activities and daily lives, as well as about pollution and uneven benefits for the areas of influence. Direct interactions with the project owner, due to the state's insufficient institutional capacity, were identified through interviews with its agents. By comparing this information with documentary and theoretical material, policy recommendations can be developed to focus on the specification of the regulatory framework, expansion of participation, and analysis of similar experiences.

Keywords: Lithium in Puno. Social impact. Environmental impact. Social territory. Energy transition. Social-environmental conflicts.

RESUMO

O estudo tem como objetivo identificar considerações socioambientais-chave para a gestão estratégica do lítio no Peru, com foco na configuração espacial do território. Trata-se de uma pesquisa qualitativa que identificou preocupações em algumas comunidades de Puno sobre os impactos em suas atividades econômicas e vida cotidiana, bem como sobre poluição e benefícios desiguais para as áreas de influência. Foram identificadas interações diretas com a titular dos projetos, devido à capacidade institucional insuficiente do Estado, por meio de entrevistas com seus agentes. Ao confrontar essas informações com material documental e teórico, foram elaboradas recomendações políticas focadas em: (1) especificação do marco regulatório, (2) ampliação da participação e (3) análise de experiências similares.

Palavras-chave: *Lítio em Puno. Impacto social. Impacto ambiental. Território social. Transição energética. Conflitos socioambientais.*

1 CONTEXT AND SOCIO-ENVIRONMENTAL CONDITIONS

The trends of technological revolution, the need for a systematic globalisation process and the restructuring of most Latin American regimes into an increased functional role of the State, mainly driven by the free market in response to the world economic crisis of the late 20th and early 21st centuries, gave rise to the establishment of mega structures for management, trade and finance (Canaza-Choque, 2021). These mega-structures thoroughly configured the population-State and territory-production relations, connecting them directly with the global mercantile and extractive expansion, and were able to conceptualise the national and local physical and productive environment in the idea of supply and demand (Canaza-Choque, 2021; Frieden, 2007; Posada-Arrubla *et al.*, 2022). On the other hand, it is necessary to recognise that approximately 4% of the total GDP of Latin America and the Caribbean is made up of mining and metallurgical activity (Casaburi; Pietrobelli, 2022). Moreover, in cases such as Chile and Peru, mining exports represent more than 50% of total exports, which has severely influenced the region's productive sector (Anzolin, 2021; Casaburi; Pietrobelli, 2022).

For this reason, the recent positioning of lithium as a critical mineral of high supplementary value for the world energy industry has led to an intensification of the concentration and projection of its processing, mainly in areas of still-dependent economies, such as those in Latin America. González Eyzaguirre and Cantallopts Araya (2020) projected a steady rise in global lithium demand for electric vehicles between 2016 and 2022, with demand increasing from 37 kilotonnes in 2016 to 102 kilotonnes in 2019 and projected to reach 1,416 kilotonnes in 2030. Similarly, they determined that the requirement for electronic items, other batteries and other energy storage would increase from 167 kt to 377 kt in the aforementioned period. In summary, as shown in Figure 1, global lithium demand is projected to rise from 204 kt in 2016 to 1,793 kt in 2030, representing a growth of 878.92%.

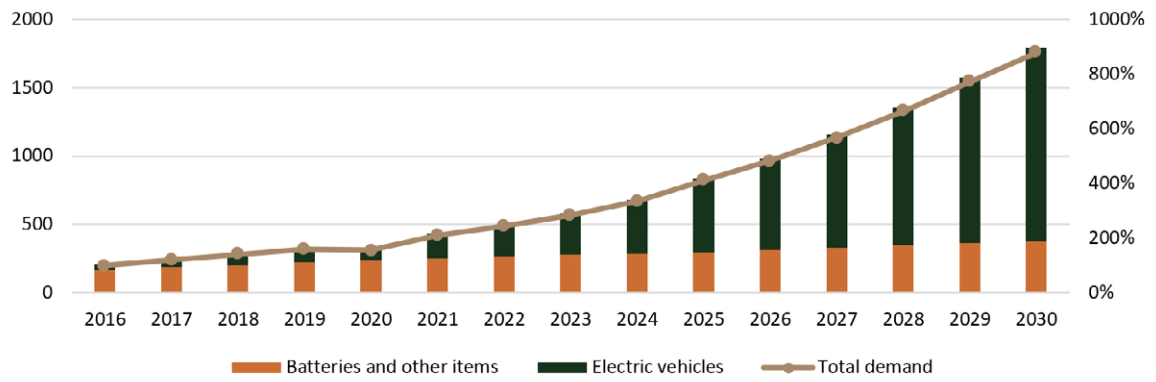

Figure 1 – World lithium demand growth by 2030

Source: González Eyzaguirre and Cantallopts Araya (2020).

Regarding the case of Puno in Peru, the estimates of the amount of extractable lithium are not yet sufficiently accurate. After initial exploration in 2018, where 2.5 million high-grade lithium resources were revealed, 2020 studies estimated 60.92 million indicated lithium resources and 260.07 million inferred lithium resources (Derechos Humanos y Medio Ambiente e EarthRights International, 2022). By 2022, official data from the mining company Macusani Yellowcake SAC (MYSAC), a subsidiary of the Canadian company American Lithium Corp. and in charge of the Falchani and Quelcaya projects (names assigned to the lithium exploitation projects in Puno), confirmed the presence of at least 5 million lithium resources (Colegio de Ingenieros del Perú, 2022), a number that would even rise to 9.5 million by 2024 (Colegio de Ingenieros del Perú, 2022; Energiminas, 2024). In Peru, compared to other countries in the region, lithium is found in rock, not in salt flats. Hence, its extraction presents a different level of complexity and work (Derechos Humanos y Medio Ambiente; EarthRights International, 2022).

This study analyses the socio-cultural and environmental projections of lithium mining projects in Puno, evaluating the environmental and social impact studies, as well as the perceptions and expectations of the local population. The aim is to identify points of interest and socio-environmental concerns for the adequate management of lithium as an energy resource and to highlight the inadequacy of the regulatory framework in the face of the particularities of its exploitation and its impact on the relationships between the company and the communities.

2 ENERGY TRANSITION: BENEFIT OR STRUCTURAL PROBLEM?

The main extractive and energy producing organisations worldwide, as well as the institutions and personalities in charge of supporting this sector and receiving its movements, are in search of alternative fuels, due to the economic damage caused by the dependence on fossil fuels, the commitments to reduce greenhouse gas emissions and the increasingly radical impact of these on life on earth, in that order (Durand, 2021). Therefore, the innovative approach to non-conventional energies has led to the need to exploit minerals around the world, either for direct or indirect use as a component of the respective infrastructures (Observatorio Ceplan, 2023).

This search, which has been enhanced in recent years, has made it possible to observe that, more than the control of natural resources and their treatment, the energy transition consists of access to technologies that make their use legitimate (Montalván-Zambrano; Wences, 2024). This type of dynamic supports the green energy concepts promoted by the Global North to replace fossil fuels. Nevertheless, while these strategies benefit this segment, extractive activities mainly impact the Global South, profoundly altering indigenous and peasant territories and causing a fracture in socio-cultural structures, which generates prolonged conflicts in the region (Jerez *et al.*, 2023).

Establishing exploitation and primary processing infrastructures leads to a series of social and territorial configurations that are standardised within the processes corresponding to the neo-extractivist model. As opposed to classic extractivism, neo-extractivism includes the increase of national participation in the benefits obtained, focused on social and economic welfare through responses to the needs of the population, mainly in the area of influence of each project, to obtain social-political legitimacy in the face of the inevitable negative effects of extraction (Lander, 2014).

World Economic Forum y McKinsey & Company (2018) ranks the world's regions in terms of their energy transition, assessing system performance in areas such as security, sustainability and inclusive economic growth. Transition readiness is measured by factors such as investment, infrastructure, human capital, and governance. According to this classification, countries with a transition readiness score of 50% or less have the potential to take advantage of opportunities, as shown in Figure 2.

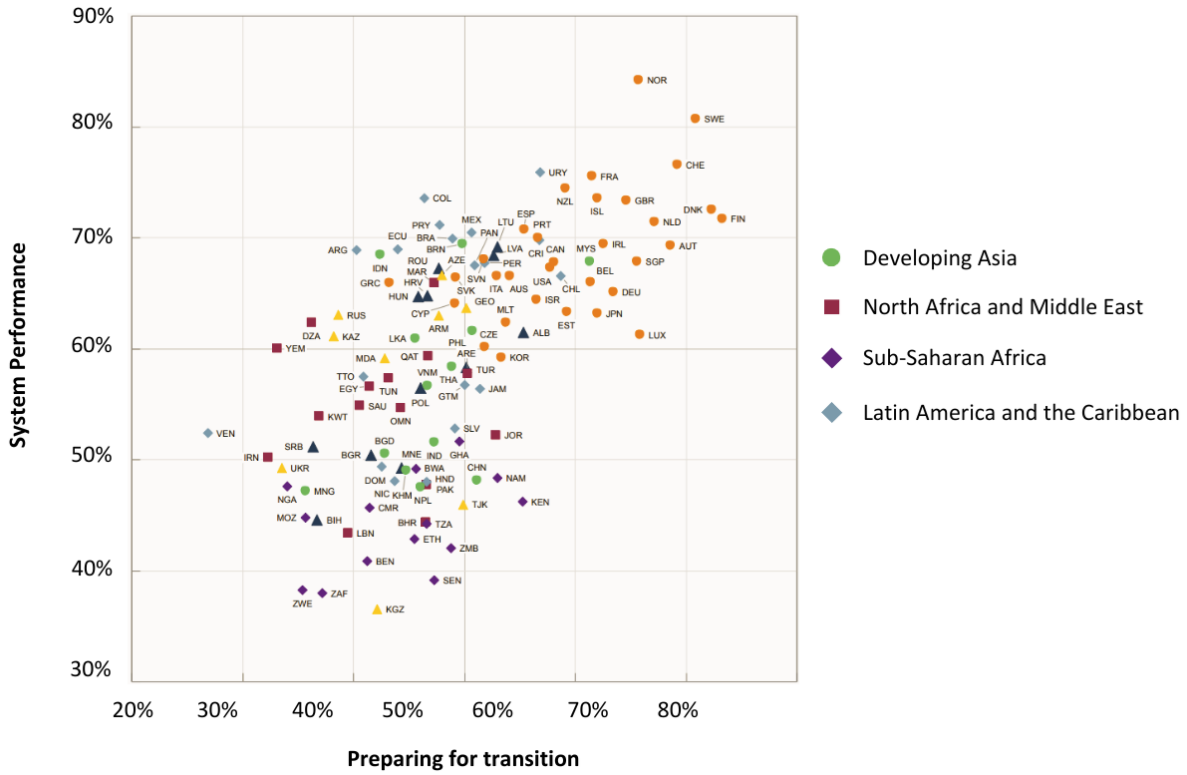

Figure 2 – Conditions for energy transition

Source: World Economic Forum & McKinsey & Company (2018).

It should be noted that the Latin American countries present considerably positive system conditions, probably indicated by their permanent macroeconomic development (including the strong fiscal revenue from mining and energy projects), but this is contradicted by the structural conditions of the institutions of each of them, observed in the horizontal axis of preparation for the transition. As mentioned by Pérez Guedes and Arufe Padrón (2023), the production and use of renewable and clean resources in the region, suitable for the energy transition, have increased by 60% until 2020; however, poor planning and a lack of focus on investment in traditional energy sources undermine these optimal characteristics. (Calles Almeida *et al.*, 2021). It is essential to consider that an optimal energy transition should develop a more inclusive, sustainable, affordable, and secure energy system (Azamar Alonso, 2022). As long as this is not achieved, there can be no projection of a beneficial evolution of the sector for society.

3 SOCIAL IMPACT AND CONFLICT

Understanding the social impact of extractive projects, it is necessary to establish that the notion of territory as a concept linked to biological nature is inaccurate. Given the scope of this type of analysis and how this concept will be interpreted throughout this study, it is important to understand that a social territory is approached as a structure where the actors, through their dynamics developed in different temporalities, determine its borders, occupation modalities and the use of space and its resources (Monge, 2013). Consequently, these structuring practices are applied by specific groups that establish their hegemony over others in the respective space (Berdegué *et al.*, 2012). Therefore, the introduction of new structures for managing this social territory, in favour of and under the control of external agents, generates a profound hegemonic change that may represent a threat and/or an opportunity for societies located in areas of influence.

Consequently, the institutionalisation of territorial dynamics falls into tensions and contradictions with the institutionalisation of, for example, the administration of concessions and investments or of environmental protection parameters, which is favourable to change and to rational human agency in the context of uncertainty (Berdegué *et al.*, 2012; Mahoney; Thelen, 2010). In this sense, how the settled population assumes the change will determine the ways of framing the investment project and conceptualising it as an opportunity and/or threat. According to the study by McAdam *et al.* (2005). The idea of similar previous or nearby configurations transmitted through social brokerage dynamics derives from processes of framing the respective situation, influencing the perception of possible or developing change. Figure 3 illustrates how, following this sequence of events, the interaction of the society that will create a scenario of contention is determined.

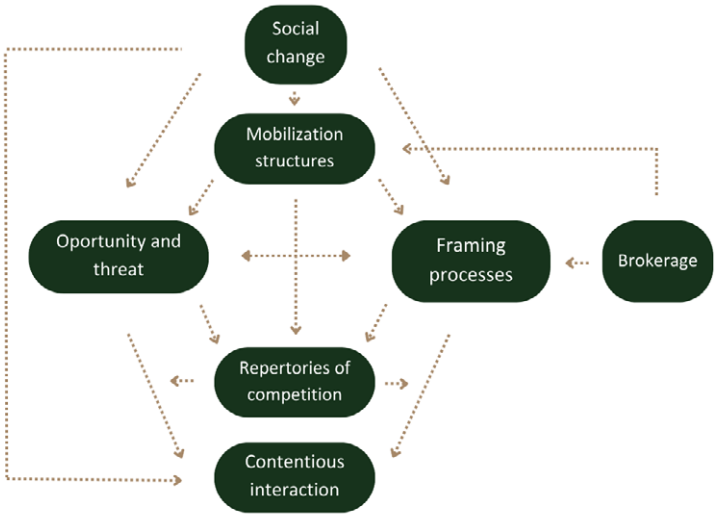

Figure 3 – Scenario of political contention

Source: McAdam et al. (2005).

The diagram allows us to understand the interaction and interdependence between the elements of the political contest that define the possibilities and context of social conflict. Thus, the mobilisation structures defined by previous and similar experiences, as well as the types of social change developed, determine the repertoires of contention of the affected population, which in turn condition the definition of contentious interaction as the final response to the institutional configuration.

For example, the exploitation of lithium and the arrival of the railroad to the Salinas Grandes Basin and the Guayatayoc Lagoon in the Argentine Puna have driven the Kolla and Atacama communities into a permanent process of seasonal migration, providing them with cheap labour for mining activities. Territories previously used for livestock, agriculture, and salt farming were increasingly adapted to extractive activities.

Especially in Puno, in areas such as the Ollachea Mining Community, in the province of Carabaya, mining units have installed work and residential infrastructures, as well as waste deposits, which, by inertia, have generated commercial spaces due to the high demand for materials required for their construction (Meza-Duman *et al.*, 2022). The increase in similar concessions has led to a direct rise in social conflicts, as mentioned above, because the effects on the territory have been mainly negative and have not yielded the expected socioeconomic development. Due to this and the inadequate management by the Peruvian State, the reaction of communities to any mining project is often characterised by a repertoire of direct conflict with mining companies and/or the complete adaptation of their economic dynamics to mining activities that operate below or above the law (Zevallos Yana, 2020). Examples of this are the cases of Aymarazo in the south of the region, which would close the Santa Ana project of the Canadian

company Bear Creek, or Rinconada, where the population is entirely dedicated to gold mining and its environment, almost completely illegal.

In this respect, it is essential to emphasise the role of community participation in creating opportunities to capture or influence power in relation to the configuration of their territory. Regarding the Peruvian case, Supreme Decrees N° 040-2014-EM, 042-2017-EM and 033-2005-EM, update the need for the development and implementation of a Citizen Participation Plan, Social Management Plan and the possibility of prior consultation in mining activities, according to perfectible parameters, within the performance of Environmental Impact Assessments (EIA) of exploration, exploitation, modification and closure of mines (Ministry of Energy and Mines - Minem, 2024a; 2024b). In this way, it is possible to understand the meaning of the typology of socio-environmental conflicts of Arellano Yanguas (2011) described in Table 1, which establishes how to understand the position of communities, not only as an affected agent, but as one interested in taking advantage, according to the limits of their survival and self-expression valuation structures (Welzel; Inglehart, 2008). The revenues are derived from the extractive activity.

Table 1 – Typology of socio-environmental conflicts

Type of conflict	*Intention*	*Actors*
Anti-mining movements	Opposition to the construction of new mines or mine expansion	Mining companies and peasant communities
Gaining negotiating power	Negotiation preparation strategy to obtain compensation	Mining companies, farming communities, and the population of nearby municipalities
Claiming mining royalties	Control and use of mining royalty transfers	Defense fronts, social organisations and different levels of subnational government

Source: Arellano Yanguas, J. (2011).

In relation to the concept of opportunity, emphasis should be placed on cases of gaining bargaining power. According to a study by Arellano Yanguas (2011), this type of conflict is understood as a preamble to direct negotiation with companies. Mobilisations are structured to obtain direct benefits from the private sector through mandatory legislation and the need for a social license for the project and its territorial configuration. The expansion of short-term policies in this sense, accepted by the mining companies, has eroded the legitimacy of the State and shifted the responsibility for meeting demands to the mining companies themselves. Meeting survival needs, rather than long-term sustainable development programmatic policies, has established an institutionalised repertoire in the relationship between companies and the community. Although they increase access to basic services, these dynamics block the possibilities of establishing comprehensive social development policies that require sustained and meaningful participation.

4 ENVIRONMENTAL IMPACT AND SUSTAINABILITY OPPORTUNITIES

The progressive degradation of ecosystems in the affected territories has led to an accelerated rate of biodiversity loss and is responsible for a third of the planet's CO_2 emissions. All this is a consequence of the type of institutional structure framed in global trends of green economy, where the accelerated depredation of the territory is structured under compensation dynamics based on market pragmatism, such as mechanisms to replace environmental regulation or economic incentives based on ecological performance that improve the corporate image (Castro *et al.*, 2015).

The Chilean case is an example of the degree of resource exploitation, the impact on the territory, and the standardised measures to address the inevitable environmental impact. Regarding the Atacama area, located in the north of the country, the extraction of lithiferous activities by Sociedad Química y Minera de Chile (SQM) is known to have resulted in the extraction of 871,844,891 m³ of fresh water;

at the same time, Albermarle has reached 4,209,366 m³ (Romeo, 2019). In the first case, there are even conflicts between the company and the Superintendence of the Environment in Chile, due to extractions greater than those permitted between 2013 and 2015, which have led to the drying up of springs and reduction of water flows. This situation has directly impacted the survival of the Toconao community, located near the river of the same name, which supplies its daily water needs through the canal in question (Romeo, 2019).

It is essential to consider that the physical location of the lithium deposits in Puno is of the hard rock type, similar to those in Australia and Ollachea. By observing the conditions of extractive processes and the environmental impact of the mineral of interest in the oceanic country, some relevant points for the project in Peru can be highlighted (Kurmelovs, 2022): i) the environmental impact is about the same as any other comparable mining activity; ii) once the resource is identified, the surface is cleaned, the earth is scraped, the rock is mined and the tailings are transported for further processing; iii) the rock is crushed and roasted for the production of spodumene; iv) the product is transported to refineries in countries responsible for the final processes; (v) dust from operations can contaminate waterways or reach cities where it can be inhaled by the population; (vi) rainfall can wash minerals into nearby rivers or seep into groundwater; (vii) there is often a lack of budgeting and planning for rehabilitation work after mine closure.

In this regard, in Peru, through the Law of the National System of Environmental Impact Assessment (Seia) (Ministry of the Environment - Minam, 2013), the environmental certification that approves the environmental management instruments and that must be obtained by all mining extraction projects in their exploration, exploitation, modification and closure phases is regulated. Based on them, it is planned and legally established that the company in charge of the projects must comply with the obligations to prevent, minimise, rehabilitate and, eventually, compensate the negative environmental impacts generated by the activity. The assessment documentation consists of: i) project description; ii) baseline (physical, biological and social) that will establish the areas of direct and indirect influence, with subsequent commensurate benefits; iii) identification and characterisation of impacts; iv) management strategy; and v) citizen participation plan.

Likewise, based on the type of mining activity and the degree of impact on the affected territories, EIAs are classified into three types, as shown in Table 2:

Table 2 – Anticipated classification of mining exploration and exploitation

Type of mining project or activity	*Impact*	*Type of mining*	*Category*
Up to 40 platforms, disturbed area of up to 10 hectares, and tunnels up to 100 meters in length	Slight		Category I - Environmental Impact Statement (EIS)
From 41 to 700 platforms, disturbed area greater than 10 hectares, tunnels greater than 100 meters in length, and a pilot plant	Moderate		Category II - Semi-Detailed Environmental Impact Studies (EIA-sd)
Mining, beneficiation and general mining projects	Significant	Metallic	Category III - Detailed Environmental Impact Studies (EIA-d)
Utilisation of construction and industrial materials.	Moderate / Significant	Non-metallic	Category II / III - EIA-sd / EIA-d
Storage of minerals and/or mineral concentrates		Metallic	
Non-conventional mining transportation		Metallic	
Power transmission line for mining operation		Metallic	
Aqueduct and desalination plant for mining operation		Metallic	

Source: Minam (2018).

Regarding hard rock lithium, Australia has begun implementing refineries near the mining areas to reduce the project's environmental footprint and promote the use of renewable energy in new industrial complexes (Kurmelovs, 2022).

Another outstanding case of sustainable and innovative management is that of Minera San Cristóbal in the department of Potosí in Bolivia, where its open-pit activity is recognised for its safety based on modern technology (Quispe Arapa; Valenzuela Méndez, 2014). About 25 wells located in the area of direct influence are permanently monitored to measure water quality, flow and level, which are periodically reported to the competent state authorities. It should be noted that the sustainable management of the environmental impacts of mining activities requires constant monitoring by the responsible state authorities, which extends beyond the approval of studies at each stage. The institutional strength of the environmental assessment processes must provide an appropriate platform for compliance with specific requirements for companies and other relevant agents, including external auditors and citizen participation.

5 COMMENTS

5.1 METHODOLOGY

For this qualitative study, it was first necessary to directly understand the perspectives of the communities in Corani, Carabaya, and Puno. This district comprises five municipalities: Acconsaya (or Corani), Chacaconiza, Chimboya (or Aymaña), Isivilla, and Quelcaya (District Municipality of Corani, 2020). Based on Smith's (1999) approach, it was decided to conduct a focus group with different members of the aforementioned communities, given the degree of trust and connection that community group participation can provide when addressing a collective problem in contexts of indigenous or peasant identification. This method is convenient for obtaining direct and unconditioned statements on the real expectations of the population towards the project. For this purpose, we contacted five volunteers from the district and its communities and the district sub-prefect, who authorised the activity in his office, and with the support of researchers from the Universidad Nacional del Altiplano Puno, Wenceslao Quispe Borda and Yeni Pocco Apana, who helped to obtain permission from the district authorities of Corani. It is also worth noting that the project's circumstances made it challenging to recruit a larger number of participants and conduct interviews in the area.

Consequently, as shown in Table 3, a focus group was formed comprising two members from different communities and other district residents.

Table 3 – General and convening information of the focus group held in 2024

Information	*Description*
Place	District Subprefecture of Corani - Corani, Carabaya, Puno
Number of participants	6
Participants	District Subprefect of Corani
	President of the Peasant Patrols of Corani
	Representative of the District Municipality of Corani 1
	Representative of the District Municipality of Corani 2
	Acconsaya community representative
	Chimboya community representative

Based on the concepts derived from the theoretical analysis of power, sustainable development, and territory, the questions shown in Table 4 were structured.

Table 4 – Structured questions for the focus group, in response to theoretical concepts

Concept	*Questions*
Power	What do you know about lithium exploitation projects?
	Have you ever been asked what you think about lithium mining?
Sustainable development	What do you think lithium exploitation will bring for you? Extra money, more job opportunities, or something else?
Territory	How would their lives change if they started mining lithium near their homes? Do they think it would affect the way they use the land and their homes?
	Has anyone you know had health problems due to pollution? Or have you had such a problem yourselves?

Secondly, based on what was stated by Hernández Sampieri *et al.* (2014) about qualitative methodological tools, a semi-structured interview was conducted with the general manager of the project's owner, MYSAC, Ulises Solís, as the main agent of interest for the initiation and development of activities.

Based on the study of Peña Vera (2022), a documentary analysis of the social and environmental impacts related to lithiferous extraction projects was carried out. Public information on the progress of the EIAs of projects in the exploration phase was made available: Falchani, with 301 platforms and an EIA-sd, and Quelcaya, with 18 platforms and an EIS, both in the name of MYSAC SAC. (Acomisa, 2023; SRK Consulting, 2024). The primary objective of this technique is to officially validate the testimonies of the parties involved, including the population and company, as well as to evaluate the functionality of the SEIA provisions. Table 5 presents the documents chosen for analysis.

Table 5 – Selection of public EIA documents for the Falchani and Quelcaya projects.

Impact	*Document*
Social	Falchani Exploration Project EIA-sd Executive Summary (SRK Consulting, 2024)
	Executive Summary of the Quelcaya Exploration Project EIS (Acomisa, 2023)
Environmental	Falchani Exploration Project EIA-sd Executive Summary (SRK Consulting, 2024)
	Executive Summary of the Quelcaya Exploration Project EIS (Acomisa, 2023)

Finally, the information collected was contrasted with each other to make a cross-sectional comparison with the analytical concepts developed in the second part of the study. Finally, the information was systematised in an artisanal way by listening to recordings, transcribing them and contrasting them with each other. This follows the organisational logic also proposed for the questions, as shown in Figure 4.

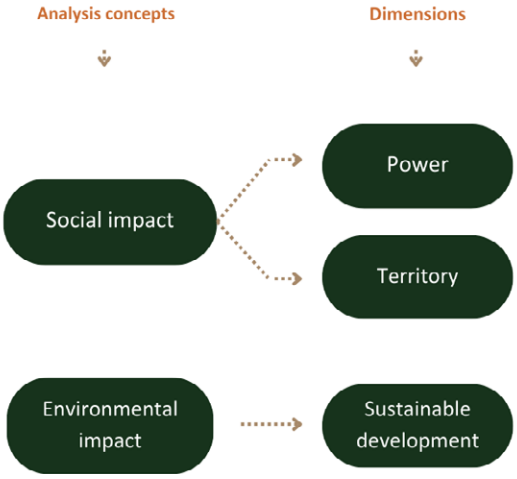

Figure 4 – Conceptualisation of results

All of this aimed to establish recommendations and convenient reference points for the sustainable execution of the project in question, focusing on its importance for local and national development, the country's position in the energy transition, and the inclusion of communities in investment programs, such as the treaty.

5.2 RESULTS AND DISCUSSIONS

As shown in Table 6, a summary of the responses obtained from the focus group described above is presented. The prevailing perspective in the conversation was that the negotiations discussed would only benefit the communities of direct influence, Chacaconiza and Quelcaya, who would also be given some level of participation.

Table 6 – Summary of focus group responses in Corani

Question	*Summary of responses*
What do you know about lithium exploitation projects?	There is little information. They claim that the EIA studies were done without involving the district and its local authorities. The community is generally unfamiliar with lithium and its applications. The authorities ask that the benefits reach the communities, the province and the region, and expect informative workshops, although they have not yet been held.
Have you ever been asked what you think about lithium mining?	They claim that MYSAC and the State have only dialogued with the communities of Chacaconiza and Quelcaya, which some consider to be landholders. The other communities and the district center have not been informed. In Corani, where extreme poverty is prevalent, they fear an increase in political interest due to the commercial and population impact of the project.
What do you think lithium exploitation will bring for you? Extra money, more job opportunities or other things?	The project promises income and opportunities, but the direct benefits would be limited to Chacaconiza and Quelcaya, while the other communities would receive little. This is seen as unfair. They accuse MYSAC of unofficial deals, such as financing a van, and criticise the mayors as mere intermediaries. They demand that the district be a shareholder, recalling a similar case with Bear Creek in Corani, where only two communities benefited directly.
How would their lives change if they started mining lithium near their homes? Do they think it would affect the way they use the land and their homes?	The testimonies warn of changes in the daily dynamics of Corani, with risks to the security and tranquility derived from agriculture and cattle ranching, the district's main activities. They fear that mining will displace these traditions and cause disorder. They are also opposed to selling land for related activities, recalling previous conflicts, such as in Ollachea.
Has anyone you know had health problems due to pollution? Or have you had such a problem yourselves?	The population compares their situation to Ollachea, where mining caused disorder and contamination that affected livestock. With only one health post and doctors hired on a temporary basis, they hope that mining will help solve these problems, as they believe the companies have the resources to do so.

Based on the results obtained, it can be understood that the main concern of communities not directly affected by the lithiferous projects is being excluded from the sponsored distribution of benefits, and that the impacts of the mining activity shape their livelihood structures. In this regard, it is necessary to note that, for the National Service of Environmental Certification for Sustainable Investments - Senace (2019), the area of direct influence includes the space where the project components are located and the areas that are directly impacted by the activity, while the area of indirect influence refers to the zone outside the area of direct influence and extends to where these impacts are manifested. The official distribution of benefits is applied following these criteria.

However, in the interview with the general manager of the company that owns the projects in question, Ulises Solis (US), when asked about Bear Creek's experience and the concern about the redistribution of benefits in Corani, he assured that, except for Chimboya, all of them are part of the area of direct social influence (AISD), as can be seen in the following dialogue:

> "Bear Creek had good social work only at the beginning. What Bear Creek gives, I give three times as much. Their project (Corani en la Comunidad Campesina (CC) de Chacaconiza) included a trust fund of $4 million per year distributed proportionally among the five CCs of Corani and its municipality. All are included as a direct influence in our project, except Chimboya. With them, we have other uranium projects. But my relations with them are good."

As there was a clear contradiction in the understanding of the communities that entered into the consideration of AISD, it was consistent to consult with the EIA documents of both projects. After reviewing the determination of the type of influence of each impact area, it was identified that only Chacaconiza and Quelcaya (Chacaconiza and Quelcaya for Falchani and Quelcaya for the project of the same name) are officially listed as AISD; while in both cases, only the district of Corani is expressly listed as an area of indirect social influence (AISI) (Acomisa, 2023; SRK Consulting, 2024). Against this, Solis also mentions:

> "We give them rotating positions, every thirty days per community. We give them 2,700 soles per month, plus family allowance. They are unskilled labour. We pay the community between 50 and 200 thousand soles, depending on the annual agreement. I always receive letters requesting support for schools, events, soup kitchens, and sports fields in Isivilla. (...) We are committed to installing one thousand solar panels of the same size in the huts of those who do not have electricity. We have an internet center in Isivilla".

Through the study by Arellano Yanguas (2011), it can be understood that the confusion in the understanding of the determination of AISD and consequent benefits of the Falchani and Quelcaya projects is based on a standard slogan, through state mechanisms, and another external or private one, in direct agreement between the project owner and the communities involved. This is demonstrated by MYSAC's social management to date, where a direct dynamic of communication and economic support is applied through agreements directly with the five communities of Corani. However, as mentioned in the abstracts of both projects, the direct work and agreement, on paper, would only be with Chacaconiza and Quelcaya.

This latter fact becomes important when, within the EIA regulatory processes, the abstracts of the study are coincidentally the documents that must be socialised with the communities within the areas of influence, through different instruments of citizen participation, due to their greater ease of understanding and possible need for translation (Minam, 2013). There was evidence that Quelcaya includes the implementation of a Permanent Information Office, from which queries will be answered and the necessary data on the activity will be disseminated (Acomisa, 2023). On the Falchani side, a collaborative workshop was held in coordination with the Regional Directorate of Energy and Mines of Puno (DREM Puno) and the main authorities of AISD and AISI, where the characteristics and documents of the project were presented (SRK Consulting, 2024). It should be noted that, in the latter, only the authorities of Chacaconiza and Quelcaya were summoned.

With the dissemination of such content, the perspective of the three communities not considered as AISD becomes meaningful. It should also be noted that MYSAC has complied in detail with the stipulated legal requirements. In particular, the determination of the areas of social influence is based on the logic of environmental impact in which, according to the documents of both projects, the area of direct environmental influence (AIAD) and the area of indirect environmental influence (AIAI) were consigned through technical instruments and conclusions approved by the competent state body, in the case of Quelcaya (General Directorate of Environmental Affairs - DGAAM, 2023), and on the way to approval by Falchani (Salazar Herrada, 2024). Table 7 shows some of the determination factors described in each physical baseline and impact analysis, based on the Benchmark Effective Area (PEF).

Table 7 – Factors for determining the area of environmental influence

Project	*AIAD*	*AIAI*	*Use of local infrastructure*	*PEF*
Falchani	Area of the PEF site, where the most significant direct environmental impacts would occur. Extension of 872.25 ha.	Area where direct environmental impacts of lesser significance and indirect impacts of second or third order would occur. Extension of 1284.72 ha.	Use of roads and rental of housing in premises in Chacaconiza	0.9 km from Chacaconiza, 5.7 km from Quelcaya and 14.2 km from Isivilla, for example.
Quelcaya	Area of the PEF site, where the most significant direct environmental impacts would occur. Extension of 4288.48 ha.	Area where direct environmental impacts of lesser significance and indirect impacts of second or third order would occur. Extension of 9382.35 ha.	Detour ditch on each exploration platform to prevent runoff water from entering the work zone and causing water erosion in Quelcaya.	0.5 km from Quelcaya and 16.63 km from Acconsaya, for example.

Source: SRK Consulting (2024) and Acomisa (2023).

According to DGAAM and Minem, the projects comply with measures to mitigate social and environmental impacts. MYSAC has worked directly with communities not included in the studies, achieving moderate progress. However, the rapid management of the project and the need to avoid bureaucratic procedures have created distrust and concern among the communities. This last point is also reflected in the conversation with Ulises Solis in September 2024, who indicates:

> "We applied for approval of the Quelcaya Project in July 2021 to expand our resources, through DIA. In May 2023, the DGAAM approved our EIS, but they requested the start-up document to be approved by the Dirección General de Minería (General Directorate of Mining) (DGM). In July 2023, the DGM requests prior consultation for exploration. Quelcaya and Chacaconiza demand that it not be applied, because they are the owners of the territories to be explored. In December 2023, the Social Management office publishes a document confirming that it will not be necessary. In February 2024, I met with Romulo Mucho (head of Minem), Jorge Soto Yen (DGM), and Henry Luna (vice-minister of mining), and they informed me that the resolution is not effective until it is published. In March 2024, Soto Yen assured us that he would notify us within 15 days. After this period, the DGM informs us that we must carry out a prior consultation by hierarchical decision. In July 2024, this process concludes, and the project is unanimously approved for execution. Ten days ago, I visited the new head of the DGM, and last week we were notified of the Directorial Resolution to start operations".

Even though the company promotes the projects and seeks compensation agreements with the affected population, it is the regulatory and political parameters that limit management, standardising activities. This may result, in cases like this, in a limited use in the face of the current urgency and demand of the energy transition. According to Evans (1995), public and political processes develop according to existing rules, whether in positive dynamics or in conflictive situations.

The institutional framework described above appears to be the main source of concern for communities outside of the AISD about the impacts and benefits of the projects. The information gathered suggests potential areas of conflict in the negotiation between the communities and the company. Figure 5 shows data on potential disputes and the attainment of bargaining power in Corani, based on Figure 3.

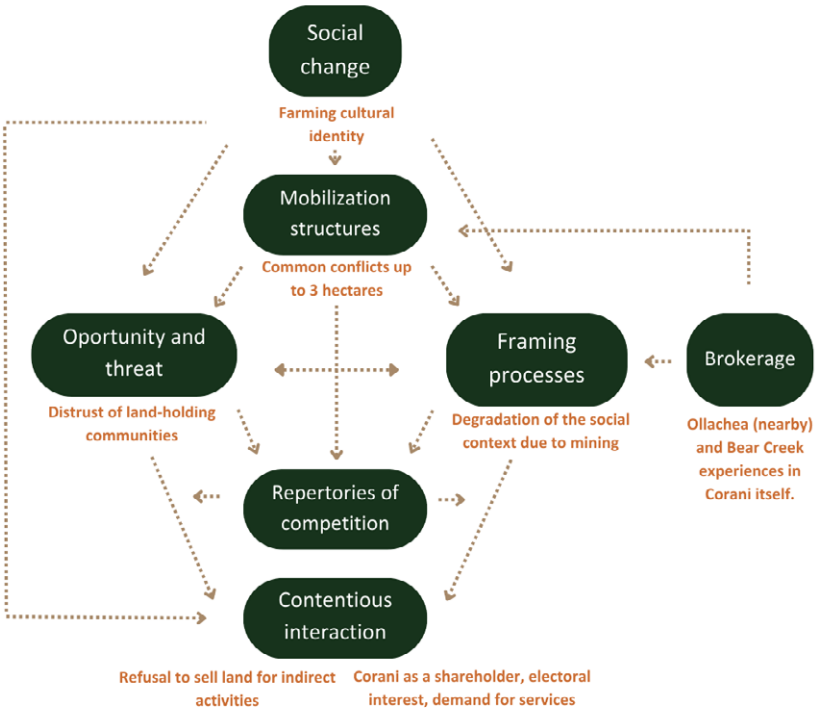

Figure 5 – Scenario of political contention in Corani

Source: McAdam et al. (2005).

Previous experiences in the area have linked lithium extraction with destructive mining activities, viewing it as both a threat to social change and a development opportunity due to the benefits it offers to the land-owning communities. This can generate internal disputes and demands for basic services from the other communities, which negotiate directly with MYSAC to obtain benefits.

In addition, the company has also been able to identify negative physical and biological impacts that would result in a significant but moderate configuration of natural territories. Table 8 presents the main effects observed and some of the main management activities.

Table 8 – Physical and biological impacts identified by MYSAC

Project	*Type of impact*	*Description*	*Impact classification*	*Main management activities*
Falchani	Physical	Alteration of ambient noise and air levels due to particulate material and gaseous emissions	Significant Moderate	Quarterly monitoring during construction/operation and at the end of the post-closure stage.
	Biological	Affectation of ecosystems in general, loss of vegetation cover, decrease in the diversity of flora species, alteration of terrestrial habitat and landscape quality.	Significant Moderate	Solid waste management and storage.
Quelcaya	Physical	Potential impact on water availability	Significant Moderate	Particulate matter emission control (20 km/h in areas close to the population and a maximum of 35 km/h in affirmed terrain).
				Irrigation of work areas.
				Drainage ditches on access roads.
		Alteration of the capacity of land use		Prohibition of the dumping of any type of waste into bodies of water.
		Alteration of air quality due to particulate material		Remains of the materials without the bed of a watercourse as the final receptor.
	Biological	Alteration of wild flora and displacement of wildlife	Significant Moderate	Environmental signage program.
		Affectation of hydrobiological species and alteration of flora in wetlands		Noise and vibration generation schedules.

Source: SRK Consulting (2024) and Acomisa (2023).

As observed in the Australian case, one of the primary environmental impacts of lithium mining is air and water pollution resulting from waste generated during the crushing and transportation processes. Impact management should focus on the management of these wastes in both bodies (air and water), as was also seen in the case of Potosi in Bolivia. Moreover, the impact on soil use affects flora, fauna, and agricultural activities, so it may be necessary to remove contaminated soil to a depth of 10 cm and irrigate the affected areas, although this process must be constantly evaluated.

5 CONCLUSIONS AND RECOMMENDATIONS

In the Falchani and Quelcaya lithiferous projects, a positive relationship has been observed between the company and the communities, with direct benefits, but also risks due to the informal interaction between the State and the private sector. This has generated confusion about the impacts of the project, especially the inclusion or exclusion from the AISD and compensation. Traditional activities in Corani, centered on livestock and agriculture, are affected by mining, showing how the physical and biological impacts of the territory influence the social dynamics and the relationships between actors.

The State plays a crucial role in the development of EIAs and mining activity relations, but bureaucratic inefficiency, with delays of up to three years, has led the private sector to simplify processes to its benefit. Direct interactions between communities and project owners allow for more favourable management, although the regulatory framework is weak and insufficient to respond to local needs. The study suggests points for sustainable management that combine primary exploitation and programmatic development in mining, adapted to Peruvian conditions.

a. Build and approve a specific regulatory framework for the lithic activity, differentiating it from other mining activities. As Ulises Solis points out, a specific regulation is needed, although

there is currently a lack of political will. This proposal not only addresses pollution but also takes advantage of the benefits derived from the demand for lithium, strategically positioning the country in the energy transition, while at the same time opening space for new and specific environmental protection strategies.

b. Implement an autonomous agency, derived from the regulatory framework discussed in the previous point, whose powers will serve to enhance the use and technical study of the lithiferous activity. In addition, this application would contribute to the unique concentration in lithiferous mining activity, thereby avoiding cumbersome processes. This proposal may be similar to the cases of Corporación Nacional del Cobre de Chile (Codelco) and Comisión Chilena del Cobre (Cochilco) (Poveda Bonilla, 2019). The purpose is to institutionalise the dynamics of lithium mining and progressively transfer them to the different activities of the sector.

c. To address the potential conflict and short-term solutions requested by the communities, the direct participation of the population in the projects is proposed, guaranteeing an integral percentage for their benefit. This could include the implementation of works for taxes and the constant inclusion of communities in the decisions of local governments and other bodies linked to the executive branch.

d. A second initiative involves expanding the studies at AISI and AIAI, with a focus on improving data collection, participation, and consultation instruments. This requires the improvement of bureaucratic processes and the institutionalisation of specific technicalities for each mining activity, without increasing the current complexity. This would ensure integrated and sustainable long-term development for the entire area of influence of the project, while avoiding cross-referencing of information.

e. The Australian example of waste and particulate mitigation in air and water, with an impact on soils, involves locating processing plants and refineries powered by renewable energy close to operating areas to reduce transportation and pollution. This strategy could be implemented in Peru, based on the Potosi and Ollachea mines, contributing positively to the country's energy transition and adding value to the extraction of lithium, a key mineral for clean energy, while minimising pollution in industrial processes.

The proposals presented respond to the need to generate a progressive institutional framework that allows the establishment of technical and specific dynamics for the lithic activity planned in Puno. It is important to build institutional platforms within a process of change, such as that represented by the configuration of the territory in Corani. There is a need to apply dynamics of institutional interaction from the State with the communities and private enterprise so that dealings and exchanges are developed within standardised technical frameworks at all levels, avoiding confusion and the construction of threat perspectives through the display of participation and visible results.

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