

# High Andean and Puna Wetlands: White Gold, Green Plunder



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## **EXECUTIVE SUMMARY**

In view of lithium mining's advance on the High Andean and Puna wetlands fostered by the hegemonic energy transition model, this article analyzes the demands of the global scenario and their impacts on the local level. It also challenges the climate arguments that justify the plunder of natural systems for lithium extraction and raises the urgent need to apply strategic tools to integrate the environmental and social dimensions into the evaluation of lithium mining policies and projects, in order to ensure environmental protection and safeguard the respect for human rights.

## **Lithium demand at the international level and its translation into the local context**

The demand for lithium has escalated exponentially over the last few years as a consequence of a combination of several factors. Increasing global vulnerability in terms of energy security caused by the dependency on dwindling traditional energy sources, high oil and gas prices, among other factors, have contributed to a powerful push by the countries of the Global North to transition to renewable energy sources<sup>1</sup> (IEAa, 2022). Recently, the energy crisis triggered in Europe by Russia's war on Ukraine exacerbated this trend.

Even though it is tied to multiple variables, the cost-competitiveness of renewables has prevailed over oil, natural gas and carbon (IEAb, 2022).

Furthermore, in a context of climate change that reinforces the urgency of reducing greenhouse gas emissions worldwide to limit the temperature increase in the planet, the demand for lithium for battery production has soared due to their capacity to store energy from renewable energy sources, such as solar and wind, whose production can be intermittent and therefore difficult to use constantly and reliably. In addition, lithium batteries can store backup energy to be used during blackouts, thus avoiding the use of fossil fuel-powered generators unnecessary, all of which would contribute to the climate goals.

These batteries recharge quickly and are also lighter, smaller, and more durable than others, hence their growing use in mobile electronic devices, although the greatest demand comes from the automotive industry to power electric vehicles.

In this context, the figures around the demand for lithium are exorbitant. According to the International Energy Agency, the demand for lithium for battery production is expected to increase up to 42 times by 2040, compared to the demand in 2020 (IEAc, 2022).

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1. According to the International Energy Agency, it is expected that the world's renewable energy capacity will increase by nearly 75% between 2022 and 2027, which is equivalent to all the capacity installed in China. According to the IEA, this represents an acceleration of 85% compared to the last 5 years.

As a consequence, there is a fierce international struggle —mainly between some countries in Europe, North America, and in the South and East of Asia, particularly China— over the control of the supply chain of these minerals considered to be “critical” for the transition<sup>2</sup> (Marchegiani, 2022).

Meanwhile, as a result of this growing demand, local and foreign pressures are increasing on the territories that possess this mineral. In Argentina’s case, which, alongside Bolivia and Chile, holds around 58% of the world’s lithium brine reserves, the national and provincial governments perceive this scenario as a formidable opportunity to attract investors.

In our country, there’s a portfolio of over 40 lithium brine projects<sup>3</sup>, distributed between the provinces of Catamarca, Jujuy and Salta. Among those projects, two are in the extraction stage, six are under construction, around 10 are in advanced exploration and the remaining ones are in initial exploration or prospecting phase<sup>4</sup>.

Recently, there has been an increase in announcements of the arrival of new companies, as well as the expansion of projects in production. As an example, the company Livent, operating in Catamarca, announced their goal of reaching a production of 100,000 tons of lithium carbonate by the end of 2030, and estimated that their capacity will be expanded by 20,000 tons in 2023 alone (Livent, 2021). In turn, Allkem announced progress on the construction of the “Sal de Vida” Project in Catamarca, with a production of 15,000 tons of battery grade lithium carbonate for 2023, and a subsequent expansion of an additional 30,000 tons (Allkem, 2022). Additionally, the governor of the province of Jujuy announced that it is expected that Minera Exar will start producing lithium carbonate in 2023, with an estimate of 40,000 annual tons. Meanwhile, Allkem will also increase its production in Olaroz (El Tribuno, 2023).

However, while these announcements cause excitement in some sectors eager for foreign currency income, they also intensify the alarms and concerns of other actors due to the severe and, in many cases, irreversible

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2. As an example of this, in August 2022, a document sent by the European External Action Service (EEAS) to the Foreign Ministers in the European Union (EU) warned about the advance of countries like Russia and China in Latin America and the Caribbean, and urged the EU to gain back presence and influence in the region in order to preserve the multilateral order and the supply of raw goods <https://www.lanacion.com.ar/el-mundo/la-ue-prepara-una-ofensiva-comercial-y-diplomatica-para-frenar-el-avance-de-china-y-rusia-en-america-nid18082022>

3. Our country possesses reserves of lithium in rock as well but they are not the aim of the current document.

4. According to the report provided by the Secretary of Mining in May 2022 [https://www.argentina.gob.ar/sites/default/files/estado\\_del\\_sector\\_minero\\_secmin\\_mayo\\_2022\\_1.pdf](https://www.argentina.gob.ar/sites/default/files/estado_del_sector_minero_secmin_mayo_2022_1.pdf)

impacts that lithium mining can have on the environment and the life of the communities who inhabit the territories affected by this activity.

This document questions the imposition of lithium extraction as a solution to the climate challenges, an idea that has been promoted as some kind of axiom, and it discusses the contradictions of the environmental discourse it adopts and uses as justification, considering the critical socio environmental impacts in the territories affected by the development of this activity.

On the same note, this document raises the urgency of implementing strategic tools under a human rights based approach that safeguards the integrity of the ecosystems and the local livelihoods against the unstoppable advance of lithium mining.

## **Unravelling narratives around lithium from the local environmental perspective**

### ***Not so green energies***

In Argentina, the salt flats that contain lithium in brine are located in the Northwest of the country, in the Puna and High Andes ecoregions and, together with other environments such as lakes, lagoons, fresh water marsh and peatlands, make up the High Andean and Puna Wetlands (also called “high-altitude wetlands”). These are extremely fragile and complex transition ecosystems, located over 3,000 meters above sea level. (FARN *et al.*, 2021).

These are extremely arid regions where the natural water deficit is consistent and where solar radiation and evaporation rates are high (Benzaquen *et al.*, 2017). In these regions, water is a limited resource that is crucial for the survival and proper functioning of the ecosystems (Izquierdo *et al.*, 2018).

It is estimated that these regions will experience some of the greatest impacts of global warming (Barros, *et al.*, 2018). In fact, significant temperature increase, longer drought periods and alterations in the precipitation patterns have already been registered over the last decades (Barros *et al.*, 2015; Frau *et al.*, 2021).

Among the many material and supporting, immaterial and regulating contributions that high-altitude wetlands provide, (IPBES, 2022), it is important to highlight their key role in providing and storing water for local communities (Benzaquén *et al.*, 2017) and sustaining life in general.

Indigenous communities have a unique spiritual bond with these territories that they inhabit since ancient times. They have learned to sustain their livelihoods from pastoralism (Arzamendia *et al.*, 2021), tourism, artisanal salt harvest<sup>5</sup> and hand crafts, among other activities, respecting the delicate environmental cycles of these ecosystems.

These wetlands provide medical, biochemical, genetic and biotechnological supplies, and are an important source of learning and inspiration. They play a key role in habitat creation and conservation, especially for endemic birds that are highly dependent on the aquatic environment. They are also crucial to the formation, protection and decontamination of soils and sediments (Fundación YUCHAN y Frau, 2022).

Lithium mining directly threatens all those functions, mainly due to the consumption of exorbitant volumes of water and the alterations it can cause in the structure and integrity of the high-altitude wetlands. These alterations are highly problematic since wetlands are interconnected through complex hydrogeological and ecological processes that are in a delicate balance (Arengo, 2021). Additionally, they share a common feature, which is that the origin of the water in all of them is fundamentally groundwater (Frau, 2021).

Nowadays, the process of lithium extraction starts by pumping the brine (water that contains lithium and other minerals) and depositing it in large evaporation pools. Then it is processed to obtain lithium carbonate and lithium hydroxide. In this process, volumes of water are consumed on such a large scale that the activity has been classified as a “water mega-mining” activity (Marconi *et al.*, 2022).

While the total volume of water required varies for each project, a recent study has identified that for the Olaroz-Cauchari Project, in production in the province of Jujuy, around 584,000 liters of water are consumed to extract one ton of lithium (Arias Alvarado *et al.*, 2022). Other estimates for the overall activity indicate a potential consumption of around a million liters of water per ton of lithium carbonate produced (Fundación YUCHAN y Frau, 2022).

Based on some of the estimations of lithium production announced as a reference point, billions of liters of water are being extracted each year in

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5. The case of the Salinas Grandes and Laguna de Guayatayoc communities, in the provinces of Salta and Jujuy, stand out. They have created a biocultural protocol called “Kachi Yupi” (“Salt footprints”) for the Free, Prior, and Informed Consent (FPIC) consultation based on their relation with the salt flats.

an extremely sensitive region that is already feeling the impacts of climate change. This also increases the risk of altering ecosystemic processes, of causing or worsening desertification and salinisation processes, of reducing vegetation cover as well as the proliferation of vectors, among other effects that are still unknown.

At this point it is important to stress that the proposals for brine reinjection should be analyzed very carefully, as the negative impacts do not only arise from alterations of water volumes but also from changes in water composition and quality.

Although we have the tools to assess the potential impacts of the mining projects in order to determine whether they should be approved, modified or rejected, the current regulatory frameworks are inadequate, insufficient and do not comply with the national and international standards of application (Marconi *et al.*, 2022). In addition, there are large gaps of information regarding high-altitude wetland hydrology, hydrogeology and limnology (Frau *et al.*, 2021) and their biodiversity and multiple contributions (the available information is mainly qualitative). All this prevents a holistic assessment of the environmental, economic and social importance of High Andean wetlands, as well as to analyze the potential impacts that lithium mining projects may have on those ecosystems and their elements, especially in the light of the massive development that is being promoted in such a short term.

Furthermore, the environmental impact assessment processes for lithium mining projects are not conducted with a basin-wide perspective, nor are the cumulative impacts of existing and planned initiatives measured, all of which raises genuine concerns about the potential effects of each project, since basins have a limited carrying capacity that is currently not required to be analyzed.

On another note, lithium mining has been consistently displaying mechanisms that systematically violate the population's rights to access information related to the mining projects<sup>6</sup>, as well as the rights of the indige-

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6. Related to the access to environmental information, recently, by application of the Escazú Agreement, Jujuy's Environmental Court granted a writ of amparo for access to information on mining claims in Jujuy and ordered the province of Jujuy, the Mining Directorate and the Secretariat of Mining and Hydrocarbons to provide all the available public environmental information that was requested about lithium and borate projects, in a complete and comprehensive manner. "Amparo Ambiental: Fundación Ambiente y Recursos Naturales y Comunidad Aborigen de Tres Pozos, y otros c/Estado provincial, Dirección de Minería, Secretaría de Minería e Hidrocarburos". Sentenced on 15/11/22 Environmental Court of Jujuy. About the consultance violation: <https://farn.org.ar/la-provincia-de-jujuy-no-respeta-el-acuerdo-de-escazu/> and <https://farn.org.ar/llamado-al-cese-inmediato-de-licitaciones-iniciativas-y-actividades-mineras-en-la-cuenca-de-salinas-grandes-y-laguna-guayatayoc-en-la-provincia-de-jujuy/>

nous communities to free, prior, and informed consent, which would allow them to understand the impacts of each of the projects and thus decide whether to grant their consent for its development. It should be noted that the free, prior, and informed consultation and consent enables to integrate local knowledge and to consider the vision of the indigenous communities on mining and its impacts on their ways of life and the environment. Its violation, increases the potential for social conflict around the activity. Furthermore, attempts have been made to legitimize regulatory changes that are more favorable for mining development and less social scrutiny.<sup>7</sup>

In this context, it is difficult to argue that lithium based energies are “green” or “sustainable”, let alone that they contribute to socio environmental justice.

***The paradoxical “climate solution” that destroys ecosystems that are key in the fight against climate change***

The energy transition model pushed by the Global North is based on a greater use of alternative energies (in place of the traditional energy sources) that will, according to the model, contribute to the fight against climate change.

However, projections show that in order to meet the extraordinary demand for lithium that this model requires to reach its goals, a massive acceleration in its production and processing in a short period of time will be necessary (IRENA, 2022), resulting in greater pressures on the ecosystems and exacerbating the loss of High Andean wetlands biodiversity and their valuable contributions, such as sequestering and storing carbon dioxide.

Even though this function has been scarcely explored for these wetlands in the Argentinean high plateau, very significant values of carbon dioxide sequestration through vegetation have been reported (Chiappero *et al.*, 2021) and similar to others registered for coastal wetlands, which are the most efficient ecosystems for carbon storage.<sup>8</sup>

Furthermore, stromatolites have been detected in several high-altitude wetlands. These extremophile microorganisms are named after the adaptive

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7. For more information, please visit:  
<https://farn.org.ar/un-decreto-sin-participacion-para-impulsar-una-mineria-sin-participacion/>

8. According to the analysis of Fundación YUCHAN and Frau, D (2022) which compared the results reported by Chiappero, M.F., *et al.*, 2021 in Laguna Negra (Salar de las Tres Quebradas), Catamarca, for a sequestration value of 281 C/ha, similar to one reported for a marsh in Europe, where the value was of approximately 300 mg C/ha (Hendriks, Gubbay, Arets, & Janssen, 2020).

process they have developed to survive in the extreme conditions that characterize those territories. Their existence dates back 3.7 billion years, and they have the capacity to capture carbon dioxide and release oxygen. They are considered to have been responsible for the oxygenation of the planet's atmosphere and the beginning of life on earth (Fariás and Contreras, 2018).

Their presence was reported in Laguna Socompa, in the province of Salta, and in Laguna Prozo Bravo, Laguna el Peinado and Laguna Carachipampa in the province of Catamarca. They have also been found in high-altitude wetlands in Chile and Bolivia (Vignale *et al.*, 2021).

Additionally, high-altitude wetlands and their biodiversity can contribute to the adaptation of the communities to the new conditions generated by climate change and offer stability against damages. This is due to their role in regulating the local microclimate (Frau *et al.*, 2021), the quality of the air and the hydrological system, particularly aquifer recharge for water provision for human consumption, the development of productive activities and support for biological communities livelihoods in general.

Lithium extraction for low-carbon energy generation undermines environmental regulation functions of the High Andean wetlands that naturally contribute to the adaptation and mitigation of climate change. On the other hand, their degradation might cause the loss or reduction of these contributions and even the potential release of greenhouse gases that are stored in them (mainly carbon dioxide and methane) (Adhiraki *et al.*, 2019), in which case, High Andean and Puna wetlands could be transformed from carbon sinks and reservoirs into a source of greenhouse gas emissions.

The extent of these impacts is particularly worrying and unpredictable, since the synergies that may occur as a result of the degradation caused by climate change may increase the release of these gases, as well as exacerbate the biological communities' vulnerability to resist and recover from their effects, especially in the case of organisms already adapted to extreme conditions (Fundación YUCHAN y Frau, 2022). In this regard, further research is needed to better understand the capacity of wetland biodiversity to act as buffer zones for climate change.

Proceeding with this activity while lacking information about wetlands' functions and the potential impacts that mining may cause could lead to irreversible damage to the functioning of ecosystems, eliminate benefits that are essential for life and worsen the biodiversity loss crisis, among other unknown impacts.



## The need for an urgent review of the lithium mining model in Argentina

In this context, it is imperative and urgent to define a strategic planning that integrates the social and environmental dimensions in the development of policies, plans, programmes or other government initiatives related to lithium mining in high-altitude wetlands in our country. This planning should serve as a framework for the evaluation of specific mining projects, and should be established based on the international, national and local goals and commitments in environmental<sup>9</sup> and human rights matters.

To this end, it is crucial to implement an open and transparent strategic environmental assessment<sup>10</sup> process for such policies that jointly analyses climate, biodiversity and other environmental matters in order to achieve better synergy and effectiveness in the initiatives that are adopted.

These processes should be undertaken with public information and participation and in consultation with the indigenous communities living in the territories affected by titanium mining, from the initial stages of its development, in accordance with the terms of the Escazú Agreement and ILO Convention 169, without it being detrimental to the level of interference in the policy under study (national, provincial or local).

In this regard, it is fundamental that the process allows, on the one hand, to foster collective debates around the importance of the High Andean and Puna wetlands and their contributions and, on the other, to encourage debates that lead to reflections on the social, political, environmental, economic and cultural implications of lithium mining. In turn, this process

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9. Like the commitments established in the framework of the Paris Agreement (Law 27.270), the United Nations Framework Convention on Climate Change (approved by Law 24.295 and related regulations), the United Nations Convention to Combat Desertification (approved by Law 24.701), the Convention on Biological Diversity (approved by Law 24.375), the Convention on Wetlands of International Importance, especially as Waterfowl Habitat, signed in Ramsar (adopted by Law 23.919), among others. The process also should be framed in the dispositions of the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters ("Escazú Agreement", approved by Law 27.566), the International Labour Organization Convention No. 169 (Law 24.071) and the United Nations Declaration on the Rights of Indigenous Peoples. At the national level, the provisions and objectives set forth in the National Plan for Climate Change Adaptation and Mitigation (PNA and MCC), in the corresponding nationally determined contributions, in the Law 27.520 on "Minimum Budgets for Global Climate Change Adaptation and Mitigation," and its Regulatory Decree No. 1030/2020 must be considered. In biodiversity matters, for example, the objectives of the National Strategy on Biodiversity and its Plan of Action should be taken into account. Finally, the different objectives established in the minimum national budget laws must be considered.

10. Even though we still lack a law for minimal budgets that regulates this, the General Environmental Law (LGA) sets standards that allow its implementation to be guided. Likewise, in 2019, the national Secretariat of Environment and Sustainable Development approved a guide for the elaboration of a strategic environmental assessment (SGAyDS Resolution n°337/19). At the sectoral level, it is included in the Law 26639 Regulation of Minimum Budgets for the Preservation of Glaciers and Periglacial Environments.

should facilitate the integration of scientific and traditional knowledge about these ecosystems. To reach informed decisions it will be necessary to enhance knowledge about the existing conditions of each ecosystem, particularly at the basin level, to identify the damage caused by mining to the environment's integrity and the provision of benefits, and thus be able to establish the carrying capacity and resilience of each basin to approve new projects or to readjust existing ones in the context of the current and predicted climate scenarios.

Those instances will facilitate the identification of territories where there is consent for the development of the activity and those where there is not, and contribute to reducing conflict. They will also prevent decisions on lithium mining development in our country from being based on solely economic, or decarbonization goals if that implies violating human rights, such as the rights of the communities to self-determination (i.e. their rights to decide on their economic, social and cultural development without any external pressures) or their right to a healthy environment, both for present and future generations.

As a result of these processes, it will be possible to identify areas of particular interest for conservation, restoration or specific management regarding their contributions to local communities or to ecosystem functions, or areas of interest due to their vulnerability to resist and survive, recover or adapt to changes in the habitat conditions. This way, environmental land-use planning categories may be defined in which mining development is restricted or conditioned.

Such protection may be defined based on classic categories, such as the wetlands of international importance designated as RAMSAR sites (Natural Monument Laguna de los Pozuelos and Laguna Vilama, in the province of Jujuy; High Andean and Puna Lagoons, in the province of Catamarca; and Laguna Brava, in the province of La Rioja) or other categories under whose scope they may fall in the future, such as biosphere reserves (MaB-UNESCO), the declaration of natural world heritage sites (UNESCO) (MAYDA, 2020), and the territories and areas conserved by indigenous peoples or local communities (ICCA).

At the same time, environmental impact assessment processes must be conducted for the design, review, re-examination or updating of mining projects that are in line with the conditions defined as the result of the strategic environmental assessment process and aligned with current scientific knowledge and understanding.

It is worth noting here that, given the lithium extractivist boom and the growing complaints of conflict due to social and environmental impacts and the violation of human rights, several organizations have proposed voluntary standards so that companies can obtain a social license for the development of the activity. However, it should be stressed that these standards should never replace the role of the state as guarantor of fundamental rights, for which compliance is mandatory. In this regard, the standards that are defined should contribute to promoting the development and application of national regulations, and to complement them with greater requirements if necessary, but never acting as a replacement for them or minimizing their level of protection.

The environmental impact assessment process for each particular mining project needs to be analyzed within the strategic planning framework that is defined for lithium mining policies and must comply with the mandates for information, participation, consultation and consent of the communities. The cumulative and synergistic impacts of past, current and planned projects must be analyzed under a watershed approach and, in cases where the gaps of information do not allow for a clear and full understanding of their impacts and there is a danger of serious or irreversible damage, the precautionary principle should be applied, and the activity should not proceed.

## **Closing statements**

The fierce advance of lithium mining on territories and fundamental rights claims for urgent action.

It is crucial to challenge the predominant energy transition narrative that relies on ecosystem plunder. This narrative remains tied to an idea of growth based on an increase of production that defies the planetary limits, continues to aim at the hyper consumption of environmental goods (Marchegiani, 2018) and hides behind a climate discourse to legitimize socio environmental devastation. It also fails to address the real challenges to tackle the energy, climate and biodiversity crises, such as reducing the demand of environmental goods, reviewing the purposes of energy use, implementing an economic model that is just and fair, and integrating multiple perspectives on other desirable ways of life.

Given the substantial lack of information about the High Andean wetlands and their contributions, it is critical to deepen our knowledge in order to ensure their protection and to promote ways of life that are respectful with

the environment that will enable us to adequately value their importance, as we face an increasingly challenging future.

*This document was made possible thanks to the finds of the research supported by IKI Small Grants.*

*This article was originally published in Spanish, in Nápoli, A. & Marchegiani, P. (comp.) (2023). El laberinto de las transiciones. Aportes para pensar una salida socioecológica en tiempos de crisis. Informe Ambiental FARN N°. 15. FARN: Buenos Aires.*

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