
Articles

Lithium Extraction at the Salar de Uyuni in Bolivia: 'Dirty business for clean energy' emancipates Bolivia from 'curse'?

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Abstract

Lithium is a key global resource of efficient batteries used in electronic devices (ex. smart phone, electric car, etc.). But its booming demand threatens to contaminate one of the world's great wonders, the Salar de Uyuni in Bolivia, which holds 70% of the world's lithium reserves. The present government of Bolivia wants to extract lithium and to create the processing industry within Bolivia. However the plans lack a consciousness about social and environmental costs. The water scarcity around the Salar de Uyuni being ignored, the high water consumption of lithium plant would deprive indigenous communities of their traditional income measures: quinoa and pastoral farming. In addition, with little concern for the environmental effects of using toxic materials, widespread pollutions would put the flora and fauna at risk. Destroying the people's environment, the lithium strategy contradicts the principle of '*vivir bien*' (live well) and the 'rights of mother earth'.

In this paper, the environmental problematique

of lithium extraction in Bolivia is cleared and the way of solving problems is suggested.

I. Introduction

Lost in the great Bolivian lithium race is, Hollender and Shultz warn, a set of very deep and real environmental concerns. In the name of providing cleaner cars to the wealthy countries of the North Bolivia's beautiful and rare Salar could end up an environmental wasteland. The adequacy of environmental strategy for lithium development in Southwest Potosi is doubted by several well-regarded Bolivian environmental organizations (Hollender *et al.*: 5).

They mention that the lithium development could cause a major water crisis. The region already suffers from a serious water shortage, impacting quinoa farmers, llama herders, the tourism industry, and drinking water sources. Although Bolivian officials contend that the lithium projects water requirements will be minimal, their estimates are based on very limited and incomplete information (Hollender *et al.* 2010: 5–6).

Contamination of the air, water and soil is also a major concern. A large quantity of toxic chemicals, they add, will be needed to process the predicted 30,000 to 40,000 tons of lithium per year. The escape of such chemicals via leaching, spills, or air emissions is a danger that threatens the communities and the ecosystem. Bolivian officials have dismissed those risks, and the government system to protect the environment is inadequate. Public institutions, such as the Ministry of Environment and Water, which are responsible for ensuring compliance with environmental requirements, clearly lack the capacity or authority to intervene in effective way (Hollender *et al.*: 6).

In short, the possible environmental impacts of lithium development are too wretched. However, thus far, the government is not paying sufficient attention to these risks. We should take these risks seriously, especially for future generations.

II. Far-reaching Ill-effects of Lithium Mining: Crisis of Intact Water System

1. Quinoa cultivation and pasture farming

The cultivation and exportation of quinoa is a far more sustainable income strategy than the export of lithium. Nowadays quinoa has about the same world market price as lithium (6€/kg), but it is renewable resource which can be grown for a time that lasts much longer than the typical resource exportation cycles. According to official estimations by the lithium-extraction in the Salar de Uyuni only 700–1500 jobs will be created. But more than 13,000 families are currently producing quinoa (Hollender *et al.*: 46; Poma *et al.*: 13). Furthermore in contrast to the industrial lithium carbonate production, it allows the local indigenous peasants to maintain their culture and traditional form of life (Anlauf: 25).

In addition, Ströbele-Gregor mentions an importance of intact water system on which the other

income strategies of the communities around the Salar de Uyuni depend. The second income source is a pasture farming. Together with the quinoa production it is mainly used for subsistence-purposes and the continuation of rural family economies. While only 10% of the area in the south-eastern Potosí is used for agricultural purposes, 60% are used for pasture farming. The raise of camelids is only possible because of local wetlands and highland moors, which are a very fragile ecosystem reacting very sensible to changes in the water system (Ströbele-Gregor: 55–56, 61–62; Hollender *et al.*: 40; Anlauf: 25).

2. Crises of intact water system, untouched nature and right to water

Ströbele-Gregor and Anlauf explain the crisis of intact water system. Traditionally, communities are also engaged in the extraction of salt, which they sell to foreign markets or they trade it directly for corn or other products from the near valleys. In recent times this traditionally diverse income strategy is also supplemented by temporal migration or touristic activities. But the latest income strategy, tourism, also highly depends on intact water system. Tourists are mainly attracted by the spectacular colorful lagoons, which might dry out under the immense water needs of the industrial lithium carbonate production. These lagoons also host three species of flamingos that would not only die out as a tourist attraction, but also as a species itself in the region. The image of an ‘untouched nature’ that attracts most tourist will be hard to keep up with drillings and plants spread all over the salar (Ströbele-Gregor: 62, 81; Anlauf: 25–26).

Furthermore, many warn the use of toxic chemicals, such as hydrogen chloride (HCl) and potassium chloride (KCl), which are needed in vast amounts to produce the desired 40,000 tons of lithium carbonate per year: 265.300 tons of HCl and 250.100 tons of KCl. These toxic substances pollute the subterranean waters, which highly

threatens agricultural and pastoral activities in the region. The pilot plant itself wasn't even tested on its environmental compatibility (Ströbele-Gregor: 80; Hollender *et al.*: 41–42; Anlauf: 26).

Finally, Ströbele-Gregor and Anlauf insist the crisis of 'right to water'. The migration of laborers towards the industrial lithium area makes higher the pressure on the resource water. As outlined above, the government's plans will lead to a disappearance or degradation of water sources used for human consumption. Already today, only 20–60% in rural areas and 50–70% in urban areas have access to fresh water. For COMIBOL (Corporación Minera de Bolivia), a lithium company, the fresh water supply of the workers on the plants will have priority over the water access of the communities around the Salar. Thus their constitutional 'right to water' is very likely to be violated for the benefit of an export oriented industry (Ströbele-Gregor: 57, 61, 81–82; Anlauf: 26)

In short, while all the economic activities of the local population highly depend on water, their continuous existence is threatened by the much water consuming lithium production.

III. 'Gold of the 21st Century' helps lift Bolivia out of poverty?

1. History of colonialization and raw material exploitation

Doyre explains the history of colonialization that, although Bolivia contains the world's largest lithium reserves, it is one of the poorest nations in South America. Due to a lack of infrastructure, this nation is unable to take advantage of own wealth of natural resources located in the remote area of Salar de Uyuni. Even with transnational corporations from France, South Korea, and Japan to invest in Bolivia's lithium, the administration of President Evo Morales has nationalized much of its natural resource industry, thus preventing

many foreign companies from investing in Bolivia. Although Morales has been heavily criticized for closing the doors to Bolivia, the justifications for nationalization are based on a long history of exploitation (Doyre: 10).

Following this, Doyre explains the exploitation of raw materials in Bolivia which dates to its colonization by the Spanish during the sixteenth century. During the colonial period, the Spanish stripped Bolivia of its richness in natural metals such as gold, silver, tin, cadmium, tungsten, iron, lead and antimony. Hardly any of the profits from the extraction of these resources went to the Bolivian people but instead lined the pockets of imperialist Spain for 250 years. The social effects of this exploitation were extreme, including a forced labor system comprising of the indigenous population. The harsh conditions of mines, specifically in Cerro Rico and Potosí, led to the deaths of millions of indigenous people who died extracting ore for their colonial masters (Doyre: 10–11).

Although the Bolivian people eventually gained independence from the Spanish, Doyre continues to explain a serious situation after independence, they fell to further exploitation by transnational corporations who hoped to take advantage of the newly independent Bolivians and become wealthy from the country's natural resources. Since such corporations were engaged in extractive industries, they brought little development or improvement to the Bolivian people, specifically the native populations. Transnational corporations thrive in poor countries like Bolivia because they have the power to provide industry, foreign exchange and jobs (Doyre: 11).

2. Lithium industry is next Potosí? Dirty business for clean energy

Doyre explains an agony of dependence on foreign investment that a Bolivian-owned and -controlled lithium industry could lead to the economic advancement the country always had the power to

create. The current administration of President Evo Morales is determined to avoid the history of raw material exploitation concerning to Bolivia's lithium resources. In 2008, Morales broke ground on a lithium processing plant with the hope of making batteries in the next year. The Morales administration tapped the mining company COMIBOL to run the \$5.7 million state-owned plant, which represents a clear intention by the Bolivian government to nationalize the entire mining industry. Despite Morales's intentions to make the Bolivian people the primary beneficiaries of their country's resource wealth, the total lack of developed infrastructure requires foreign investors to aid in the development of a successful lithium industry (Doyre: 13).

While the Bolivian lithium industry represents hope for this perpetually exploited nation, Dyre warns expected environmental damages, it is likely that lithium production will greatly interfere with the fragile ecosystem of the Salar. Bolivia will use brine beds and evaporation ponds, and then re-inject the remaining salt to extract the lithium. This method increases the salinity of rivers, which the local people in this region use to irrigate their farms. Further environmental concern exists over the processing of lithium, which is most commonly done by mixing magnesium with lithium and could lead to further contamination. Finally, environmentalists have raised concerns about the unintentional combination of lithium with water, which results in highly corrosive lithium hydroxide. This combination could likely result during the rainy season, when the Salar often floods. The fragile character of the Salar de Uyuni further exacerbates the environmental concerns of lithium extraction. To extract enough lithium to meet even ten percent of global automotive demand would cause irreversible and widespread damage to a natural wonder that have taken millennia to form (Doyle: 13–14).

In short, the state-of-the-art lithium mining and

its product industrialization have caused an archaic and unchanged 'theft of nature and poisoning of the land' (Goyes *et al.*) in Bolivia. State-corporate initiatives and socio-economic structures profit from or cause the conditions leading to environmental damage and over-exploitation.

IV. Political Economy and Ecology of Emancipation from 'Curse'

1. Colonial extractivism and breaking Potosí Principle

Anlauf explains a 'colonial extractivism' that since colonial times Bolivia's economy has historically evolved as a dependent, peripheral economy in the world system, supplying the economic centers with raw materials. While this transfer of resources is facilitated by local elites, who are closely allied to the core and also benefit from this system, they have little interest in the industrialization and diversification of the economy that could reduce internal asymmetries and the structural dependence on the core. Within these unequal structures the labor force is highly exploited and neglected any rights, justified by racism. Furthermore, the extractive economy appropriates itself of the nature in very destructive forms. In the search of quick surpluses ecosystems are damaged for hundreds of years and the local population deprived of its livelihood means. These patterns have been described as the 'Potosí Principle', which largely continued after colonial times (Anlauf: 26–27).

Although having formally gained independence, he continues, the Bolivian state continued to be a colonial one neglecting the indigenous majority participation in the political system. On the contrary they were the ones who kept on suffering the most under the extractive economy. Bolivia went through different export cycles of silver, tin and gas that were always accompanied by eco-

conomic, political and social crises. Although in the mid 20th century some attempts of initiating an internal growth were made via the nationalization of hydrocarbons and tin, the policy-makers did not gain much more than temporal control over these resources (Anlauf: 27).

Finally he adds that after an intense protest-cycle in 2005/2006 a new political force took over the power from a regime that had largely discredited itself by its exclusiveness and an immense deepening of the extractive logic in the neoliberal model. With a very vivid long memory of the resource-deprivation and an ethicized political consciousness, the MAS (MAS-IPSP: Movimiento Al Socialismo — Instrumento Politico por la Soberanía de los Pueblos) promised a sovereignty over natural resources and an adequate participation of the indigenous majority in the political system. The new constitution of 2009, explicitly recognizing indigenous rights and establishing the principle of *vivir bien*, as well as the law of 'rights of mother earth', can be seen as first materialization of these ideas (Anlauf: 27).

2. Decolonization through lithium industrialization without environmental and social consciousness

In contrast to earlier periods of extractivism in Bolivia, Anlauf explains, the MAS government wants to the lithium to be extracted under complete state control. It wants to initiate an industrialization of the raw material within Bolivia and create a processing industry that adds value to the resource, mainly in the form of lithium-ion batteries for electric cars. It is very careful in implementing these plans, at least with regard to the search for international financing and technology, which is lacking in Bolivia, as a part of the periphery in the world system. These intentions clearly show the consciousness about historically being a dependent, resources-exporting and thus underdeveloped country and represent the aim of breaking

with these dependence structures and the Potosí Principle (Anlauf: 27–28).

However, he mentions a lack of environmental and social consciousness that, although the new constitution explicitly recognizes the right to water and for indigenous people the right to manage their water systems according to their own customs, the water scarcity around the Salar de Uyuni is largely ignored by the lithium-strategy. The high water consumption of lithium plant would deprive the indigenous communities of their traditional income measures, mainly quinoa and pastoral farming. The destruction of natural water cycles and the degradation of soils via using toxic chemicals within lithium production, will make it impossible for indigenous people around the Salar to keep on living in their territories. Their constitutional rights to a clean natural environment and the autonomous gestion of indigenous territories are neglected (Anlauf: 28).

In addition, he warns that thus they will have to migrate to production centres or into the cities enlarging the masses of unqualified labour and those employed in the informal sector. Therefore by destroying the people's environment, the lithium strategy clearly contradicts the principle of '*vivir bien*' and the 'rights of mother earth', which are often referred to as central parts of the decolonization (Anlauf: 28).

3. Environmental law and regulation in Bolivia

In principle, Hollender *et al.* insist, Bolivian law requires that all industrial project proposals complete a public consultation, environmental impact assessment (EIA) and technical proposal that highlight potential environmental impacts and how they will be mitigated. These studies must be submitted and approved before breaking ground. The technical proposal, approved by the government for the pilot plant, does not seriously address pre-existing environmental problems of the region in its baseline study. However, according to Boliv-

ian environmentalists, environmental assessments are notoriously unreliable in their scientific foundations and rigorousness. Companies and the government view them as a bothersome formality and wriggle around them to get the green light for a project. Public institutions, such as Bolivia's Ministry of Environment and Water, which are responsible for ensuring compliance with environmental requirements, clearly lack the capacity or authority to intervene in an effective way (Hollender *et al.*; 42).

They conclude that Bolivia's environmental law lacks just about everything to monitor and enforce environmental protection for this type of industrial project. All this raises serious concerns about the environmental consequences of large-scale lithium development in the Salar de Uyuni. Bolivia will likely face significant tradeoffs between drawing its lithium riches out from under Southwest Potosí and causing serious environmental desecration of that region in the process (Hollender *et al.*: 43; Perreault)

In short, we need, first, more secure livelihoods and resource rights, second, broader forms of participation and the democratization of decision-making processes regarding natural resources, third, alternative model of economic development.

V. Transnational Mining, Global South/North and Everlasting Environmental Exploitation

1. New perspective of 'Southern Criminology'

Carrington *et al.* explain the recent development of green criminology. The nation state focus of criminology has led to the relative neglect, until recently, the implications of borderless and transnational crimes such as environmental crimes. However, there is a growing tradition of green criminology attempting to correct this neglect.

Notwithstanding its growing interest in crimes against environment, criminology devotes little attention to global environmental and corporate harms whose incidences and impacts are greatest in the global South, such as those associated with resource extraction, climate change and economic exploitation. Where globalization has been a foci of criminological theorizing, it has too readily assumed the simple extension of Northern trends across the globe, failing to do justice to global diversity in sources and trajectories of economic, social and penal policy (Carrington *et al.*; 4)

They insist the importance of Global South/North perspective that the selective popular, official and criminological gaze which settles on the crimes of the socially excluded, overlooks/normalizes, violence and harm elsewhere. Corruption, violence, expropriation of landowners, environmental degradation and diversion of scarce public resources are commonplace and mutually reinforcing in their harmful effects. Instead of their rich resource base delivering benefits to ordinary citizens, poverty, poor health, degraded living conditions and conflict are perpetuated and exacerbated. If stable, prosperous, democratic states cannot avoid corruption, cronyism, economic distortions and other symptoms of the resource curse, we can only ponder the vulnerability of poor and fragile states confronting the power of global corporations (Carrington *et al.*: 9–10).

2. Environmental exploitation of transnational mining in Latin America

Alimande explains the specific activity of mining and its associated impacts as being fundamental to the constitution of Latin American coloniality. Indeed, the exploitation of minerals in the region is vital to the very genesis of modernity. The historical evolution of modern mining is intrinsically linked to the emergence, constitution and the political vicissitudes of colonialism/coloniality, the dark counterpart and recurrently

denied of the modern order. As such, we focus on mining in the region to understand larger political ecologies of socio-natural transformation. In recent years, neo-liberalization was part of a wider economic globalization that prompted renewed demand for Latin America's minerals. Thus aggregate global demand for consumer goods requiring mineral inputs was on the rise in certain sectors, notably computers and mobile phones, only enhanced this process with their insatiable demand for diverse minerals such as lithium (Alimonda: 149, 155).

We can find the historical-structural link between the rise of large-scale mining in Latin America and the colonial condition of the region in relation to the world system. Such coloniality refers to the 'exploitation and degradation of both nature and people'. Mining revenue was withdrawn from the region to serve national purpose that rarely translated into local advancement. Thus regions such as Uyuni show markedly lower social development than the metropolitan areas of these countries (Alimonda: 159–160).

Finally he concludes that Latin America's mining enclaves are based on sharp asymmetries of political and economic power in which local residents are habitual victims. Here, 'modernity' and 'coloniality' collide as state-of-the-art mining refashions nature, dispossesses people and inscribes new territorialities in a neoliberal idiom. No wonder that mining is a regional 'flashpoint', as local groups and their national and international supporters fight mega-projects that violate human rights and democratic principles. This dynamic of control and resistance has deep roots in Latin American history (Alimonda: 160; Böhm).

In short, the mining industry and the indulgent response to harmful exploitation lead to the contamination of water, air, animal and plant life and even serious health problems for workers and local communities. This is a current example of human rights violations in the context of transna-

tional business activities in Latin America.

VI. Conclusion

The Salar de Uyuni and surrounding region is rich in animal, bird, and vegetative life. Nearly all of the local plants are still used by communities for medicinal purposes. The Salar is home to three of the six flamingo species in the world and serves as their breeding ground during flood season. Due to the importance of the Salar watershed for human and animal life, it is protected by the RAMSAR Convention, an international treaty for the conservation of wetlands. The delta of the Rio Grande, the drainage from which is crucial for the Salar's regeneration, has already been classified as one of 34 global biodiversity Hot Spots by Conservation International. This delta forms a year-round lagoon, used by birds as well as wild and domestic animals (Hollender *et al.*: 41).

All of this could be thrown into environmental disarray by a large scale, water-using, industrial project in the region. Industrialization plans of lithium for the region will stress an already over-tapped supply of water. It is certain that increased water scarcity in the region will have an impact on the people who live there and on their ability to continue working, farming and living in the region (Hollender *et al.*: 41, 51)

In conclusion, although the ecosystem as a whole has already been contaminated and will be more and more degraded and destroyed, the government pays far too little heed to the warnings raised about serious environmental damages at the Salar de Uyuni and its surroundings. If we continue to be in chase of lithium wealth, Bolivia will end up destroying its entire ecosystem. Struggles for justice in Bolivia are far from over, and its efforts to construct more equitable political, economic and social systems must involve more inclusive forms of social organization, not just in

the formal politics but within civil society.

[Notes]

- 1) This paper is based on the paper titled 'Lithium Extraction of the Salar de Uyuni in Bolivia: Flora and Fauna at Risk with Widespread Pollution' and presented at the 17th Annual Conference of the European Society of Criminology, 13–16 September 2017, Cardiff, United Kingdom.
- 2) This paper is a part of research results of 'Research on Environmental- and Eco-crimes by Progress of Scientific Technologies and Development of Societies and measures against Them 2015–2019' (Subject Number: 15K03181) supported by the Grant-in-Aid of Scientific Research by Japanese Ministry of Education, Culture, Sports, Science and Technology.
- 3) In order to make a research on current situation of lithium extraction and environmental degradation at and around the Salar de Uyuni in Bolivia, I visited the relevant places: the salt plane lake (Uyuni), lagoons (Colorada, Honda, and Charkota), lithium factories (Rio Grande and Lippi), quinoa farms and factory, salt factory (Colchani), etc. in August 2017.
- 4) I would like to express my thanks to my colleagues for their help: Professor María Laura Böhm (University of Buenos Aires) and members of her research group.

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