Compulsive Desires: On the Entangled Realities of Lithium Extraction and the Limitless Quest for Energy

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Abstract
In this essay I analyse how energy dreams and epistemologies, constructed on cravings for productivity and profit, connect the spaces that epitomise the 'Cartesian enclosure' with the technologies and spaces of everyday life. I examine how destructive habits of extracting, procuring and consuming energy follow predictions that assume the inevitability of growth. Estimates that, even in the face of climate catastrophe, render the need for more energy inevitable and rely on finding new fixes rather than embracing other forms of living. Focusing on the case of lithium extraction in Atacama, I address the struggles sustained by indigenous communities for their lives, sovereignty and rights. Battles that emphasise how, in what has been described as 'green colonialism', the development of the 'green energy futures' too often is to the detriment of indigenous peoples.

Keywords
Cartesian grid, data infrastructures, green colonialism, extractivism, indigenous rights, lithium

In this essay I mobilise the work of philosopher Michael Marder on ecological thought, political theory and phenomenology to discuss the implications of current habits of extracting, procuring and consuming energy.[1] The battles around lithium extraction in Chile serve as a primary case to unpack how cravings for energy and profit cause the instrumentalisation of the planet and transform spaces such as the Atacama Desert into resources to be extracted. I refer to Atacama's indigenous communities and their struggles against extractivism resulting from growing dependence on lithium batteries for the so-called energy transition. Their battles emphasise how the development of 'green energy futures' too often comes at the expense of indigenous peoples.

To understand the categorisation conditions that historically enabled the subjugation and exploitation of indigenous and subaltern bodies and the destruction of their environments in the name of progress, I undertake a critical analysis of Cartesianism.[2] By reflecting on Cartesian imperatives, theories and spaces and zooming out from the Atacama to the global lithium supply chain, I put forward the notion of 'Cartesian enclosure', that is, an epistemic and spatial border that facilitates exploitative practices and maximises production and corporate turnover. The critique of Cartesianism follows ruminations on race and enclosure by philosopher Achille Mbembe and the work of decolonial thinkers.[3] Their theories and strategies offer important avenues for venturing beyond Cartesian logics, categories and spaces and advancing alternative energy epistemologies.

Finally, I compare the extractive relations defined by the territories of lithium extraction against the architectures of more-than-human ancestral solidarity in the ayllus (a traditional Andean social unit) of San Pedro de Atacama.[4] To do so, I build upon Marisol de la Cadena's theories of indigenous political strategies. De la Cadena's work questions modernity and pleads for a halt to the world's Cartesian categorisation, compartmentalisation and exploitation to a halt.[5]

Transitions

In January 2022, the companies BYD Chile SpA and Servicios y Operaciones Mineras del Norte SA won contracts to extract up to 80 000 tons of metallic lithium in Chile. Organised by Chile's Ministry of Mining under president Sebastián Piñera's right-wing government, the tender aimed to increase lithium production to meet 'the growing global demand generated by the development of areas such as electromobility'.[6] As the world strives to meet net-zero carbon emission targets, green electricity is poised to replace fossil fuels in domestic and industrial uses, while electric and hybrid vehicles substitute those using petrol. Lithium is often presented as a key element for this energy transition.

Critical for the storage of renewable energy, a fundamental component of mobile phones, electric vehicles, data centre batteries and an enabler of 'smart city' development, lithium exists in high concentration in only a few places on earth. The Atacama Desert is one of them. Containing the largest brine-based mines on the planet, Atacama's *salares* make Chile the second-largest producer of lithium globally. Not without struggle. Having been a site of human, animal, vegetal and microbial entanglement for thousands of years, the salares are now portrayed as a strategic resource deposit crucial for society's green, low latency futures.

Mining operators use extraction wells to pump brine (salty, underground water) into large human-made ponds where, aided by Atacama's sun and arid conditions, water evaporates for twelve to eighteen months, forming an agglomerate of borax, magnesium, potassium and lithium salts.[7] The salts are then routed through ponds until the lithium concentration turns into lithium carbonate, lithium hydroxide or lithium chloride. To produce one ton of lithium, mining companies use 2 800 cubic metres of water (a ton of copper requires seventy cubic metres).[8] The scale of the operations, with millions of litres of water evaporated every day, puts the salares and their inhabitants at risk of disappearance.[9]

The tender process, failing to include provisions for the safeguard of the salares and to consult with the indigenous communities who have been their stewards for generations, triggered widespread calls for its cancellation. Yet, facing growing opposition, it was carried out in the last months of Piñera's government and before the new administration, led by left-wing politician Gabriel Boric, took over. Boric, whose term started on 11 March 2022, had included in his programme the founding of a national lithium company that would facilitate debate regarding this strategic national asset. Whereas his government was legally bound to the tender's outcome, it publicly supported the legal actions of the regional governor of Atacama and Atacameño indigenous communities from Camar and Coyo attempting to suspend the process. 'They want to produce more and more lithium, but we're the ones who pay the price,' said Lady Sandón Orellana, president of the Coyo community.[10] The Copiapó court upheld their appeal in January 2022, stating that the activities of mining companies violated constitutional guarantees and the right to live in a pollution-free environment.[11]

Despite the suspension, the far-reaching ramifications of the lithium tender process had long been shaping material realities beyond Atacama. Electric buses made by BYD (China's leading manufacturer of lithium batteries and battery-powered electric vehicles, of which BYD Chile SpA, one of the companies awarded a lithium extraction contract, is a subsidiary) filled Chilean streets months before the international lithium bid.[12] A gift from China to Piñera's government, the vehicles were clear evidence of the strategic and geopolitical importance of controlling lithium extraction from Atacama. For BYD (an abbreviation of 'build your dreams'), the contract will result in the market's dominion from mine to end product. BYD sells products that generate a demand for more of its products: electric cars and autonomous transportation require data centres to manage the real-time transfer of information to users, who in turn monitor operations from their lithium-powered smartphones, tablets and laptops. Inside the automated factory BYD in Shenzhen's Pingshan District, the promises of the smart city meet the largest lithium battery production in the world, one born from the depths and at the expense of Atacama, reminding us of what it takes to 'build our dreams'.[13]

Ground-breaking grids

We are left with the task of disentangling lithium's architectures across geographies, times and scales, an undertaking paramount for imagining 'new energy cultures that depart from an endless acceleration of energy consumption'.[14] Only by doing so, I would argue, could we unravel human energy dreams and epistemologies from the logic of growth, productivism and consumerism, a logic that, while aiming at creating future worlds is putting the only world we all inhabit at risk.[15]

Whereas global climate action advocates for the replacement of fossil-based energy sources, it also stimulates the growth of so-called clean energies, which in turn require the increase of energy storage capacity. As a result, lithium – an important component of energy-storing batteries – is experiencing a price surge. Demand, according to some estimates, could rise from approximately 500 000 metric tons in 2021 to some three million to four million metric tons in 2030.[16] Meanwhile, supply chains are not able to respond to the increase in demand,

keeping prices high. In the last year, the price of lithium increased 701 per cent, bringing benefits to the Chilean state and shareholders, who will receive more than USD 1.3 billion in dividends.[17] Such a lucrative business puts unexploited lithium reserves under pressure and often harms indigenous communities, who are forced to dedicate their lives to fighting for their rights, sovereignty and survival against the epistemic violence and extractivism carried out in the name of green, connected, datafied futures.

At the core of these struggles is what Michael Marder calls an 'unapologetically instrumental attitude that characterises the scientific paradigm'.[18] The modern scientific perspective on the earth, Marder argues, is an 'appendage to the technologies of exploitation, single-mindedly focused on the extraction of metals, precious stones and fossils'.[19] By enabling the limitless instrumentalisation of the planet, modern science has reduced the earth to 'a collection of natural resources, fertile soils, construction materials, territories to be occupied'. This perspective assumes that the earth always holds something in store to be extracted.[20]

Atacama holds resources. It is is one of the biggest repositories of lithium globally, making it a zone of interest to mining companies. To extract and seize what Atacama holds in the ground, the desert ecosystem has to be portrayed as a lifeless space and the salare's hyper-biodiverse environment ready to be sacrificed. Tamed by logistical models and a grid of mining concessions that act as blueprints for the exploitation of the ground, Atacama becomes a major economic asset. [21] [Fig. 1] The Cartesian grid laid over the territory gives a legal and spatial framework to unearthing the depths of the desert for the sake of energy dreams, the corporate cravings for productivity and profit. The grid rationalises and divides the ground by laying regular lines. It serves to calculate, optimise, standardise and ultimately to control space.[22] Its abstract aesthetic stimulates the ambitions that drove the mechanical age, colonial subjugation and the formation of capitalism and that instigated economic efficacy at the expense of ethical and ecological awareness.[23]

The grid is, above all, a conceptual speculation, writes Rem Koolhaas in *Delirious New York*; 'in its indifference to topography, to what exists, it claims the superiority of mental construction over reality… it announces that the subjugation, if not obliteration, of nature is its true ambition'.[24] In Atacama the Cartesian grid organises the world's driest desert in ponds, where millions of litres of water are evaporated every day in the name of development. The grid disregards the indigenous cosmic vision, the Andean *Pachamama* and reveals the conflicting understandings of land by the Atacameño communities (focused on stewardship practices), by the mining companies and by the Chilean State. It constructs distinctions and categories that delineate what is alive and what is lifeless; where there is matter, it sees commodities and in the place of living ecosystems, it sees nonlife. When it visually manifests in the sublime brine ponds, the aesthetic experience of the grid conceals the destruction it unleashes.

Grids are not always discernible on the ground. They operate by extending an epistemic system shaped by patriarchal and colonial rationales that epitomise the 'Cartesian enclosure', a system that legitimised Western man's domination of landscape, resources and other beings.[25] It is a system entangled with the sites of resource extraction, contemporary infrastructures and the daily technologies, rhythms and spaces whose functioning depends on the maximisation on the ground's productivity, increasing energy consumption and CO_2 emissions.[26] A mental construction, the grid promises to facilitate a perfect accommodation of the human in the environment by setting the human and its compulsive tendencies over and against the environment. It sells illusion of order and legibility, an ontological version of the world so perfected that it seems inevitable. The gird is 'antinatural, antimimetic, antireal', writes Rosalind Krauss in 'Grids'. The grid is 'what art looks like when it turns its back on nature. In the flatness that results from its coordinates, the grid is the means of crowding out the dimensions of the real and replacing them with the lateral spread of a single surface'.[27]

Paradoxically, the grid's capacity for objectivising the environment and asserting human power and exceptionality leads to the neglect of others, the destruction of the world, and ultimately to the impossibility of human existence.[28] Too often we forget how the smooth touch of screens, the experience of minimum latency, endless consumption and the persuasive appeal of electric cars are products of the greed for what is below and the destruction of deepest layers of the ground and living beings that exist above and around. They are products of *groundbreaking* innovations, or in Marder's words, 'the disarticulation, the shattering of one totality at the behest of another – that of capital'.[29]

Battles

Despite the grid's lines that tame, segregate and sell out their territory, the Atacameños know that the desert's ground is alive, that the minerals extracted from its deepest layers and exported to faraway territories are not lifeless matter.[30] They are not commodities. They are micro-organisms essential to the salare's ecosystem and the symbiotic relations between its inhabitants, including shrimp, flamingos, llamas and humans. Indigenous leaders like Rolando Humire have long been fighting against the drought, contamination and death resulting from the activities of the

mining industry in the region. 'Do I drink lithium? Do I eat copper?' asks a graffiti at the entrance of San Pedro de Atacama. [Fig. 2] Villages experience water shortages and nearby lagoons have dried up, affecting the population of wild flamingos that feed on them. Concerns that the damage may be irreversible have instigated demands by residents, scientists and politicians for the lithium tender process to be cancelled.

Recently the Atacameños had reasons to celebrate. On 1 June 2022, after upholding the appeals by the indigenous communities of Camar and Coyo, the Third Chamber of the Chilean Supreme Court confirmed that any intervention on ancestral territories or that may affect indigenous communities requires consultation in accordance with Convention 169 in Article 5 of Chile's constitution. As the consultation hadn't taken place, the court annulled the bidding process for lithium exploitation.[31] The next day, the government announced the constitution of a state lithium company and a lithium institute – a proposal already included in Boric's electoral programme – with the mandate to publicly discuss the future management of lithium reserves and to guarantee the dialogue with the indigenous peoples.[32] Gabriel Muñoz, the lawyer representing the Atacameño community of Coyo, celebrated the outcome, declaring:

> It is a historic fact, unprecedented from the judicial point of view and from the perspective of the defence of the ancestral rights of the Atacameño communities that the Supreme Court accepts these appeals, defends these communities, gives value to their ancestral and territorial rights and in the defence of the Salar de Atacama and, therefore, suspends the contracts, the bidding and the awarding.[33]

This episode echoes other struggles sustained by indigenous communities for their lives, sovereignty and rights, across territories. Battles that emphasise how, in what has been described as green colonialism, the development of the 'green energy futures' is too often to the detriment of indigenous peoples. In the Nordic countries the thriving data centre industry supported by renewable energy initiatives has catastrophic effects on Sami communities. Wind turbines invade grazing lands and displace reindeer, putting the protected practice of traditional herding, essential to Sami identity, at risk.[34] As in the case of Chile, some judges make a difference, and in October 2021, the Norwegian Supreme Court ruled in favour of Sami communities and against the largest onshore windfarm in Europe. The court referred to Article 27 of the UN international covenant on civil and political rights, which protects minority ethnic people from being denied 'the right, in community with the other members of their group, to enjoy their own culture.[35]

The Norwegian and the Chilean cases emphasise the need for governments and companies working on decarbonisation to acknowledge and consult with indigenous communities to ensure climate justice. Yet, the reality of indigenous populations around the world is more often characterised by conflicts with governments and private corporations for the control of what markets describe as fundamental economic assets. Besides facing local challenges, indigenous communities also have to deal with broader geopolitical issues such as foreign intervention in the form of economic pressure, misinformation campaigns and destabilisation practices. Recently, the *Wall Street Journal* published an article in response to the Chilean Supreme Court's cancellation of the lithium contract with BYD. The paper, with ties to powerful political and economic lobbies (it is owned by Rupert Murdoch's News Corp), accused left wing governments of 'blowing the electric-car revolution'.[36] Emphasising the increasing global demand and dependence on lithium, the article blamed left-wing leaders in Latin America, and the governments of Chile and Bolivia in particular, of becoming a 'major bottleneck for growth in electric vehicles'.[37]

Long exposed to the ills of extractivism and its impact on economic, social and political life, Latin American countries recently introduced strategic changes to the mining model. In 2017, Bolivia created the state company Yacimientos de Litio Bolivianos Corporación (YLB).[38] Mexico followed by officially nationalising its lithium industry.[39] Chile is also moving towards strengthening the state's role in the management of its lithium reserves, prioritising environmental rules and indigenous rights over mining. Had it been approved (it was rejected in a national Constitutional Plebiscite held on 4 September 2022), Chile's new constitution would have strengthened the regulation of mining and would have granted rights to nature and animals, required mining companies to pay royalties of up to 40 per cent to the government, to provide up to 25 per cent of their production to local businesses at a low market price, and to give part of the sales to indigenous communities as restitution.[40] In parallel, Argentina, Bolivia and Chile are discussing lithium production under a joint governance strategy that addresses environmental and social issues associated with extraction, as well as methods to add value in the form of associated industries.[41]

To the *Wall Street Journal*, these policies, advocating greater control of national resources and aligning with the local communities, 'risks derailing lithium production' and creating battery shortages precisely at a moment of exploding demand, rising prices and the readiness of all the major car makers to shift to electric vehicles.[42] The article appears to demonstrate neocolonial biases by presenting a perspective that assumes a future mismanagement

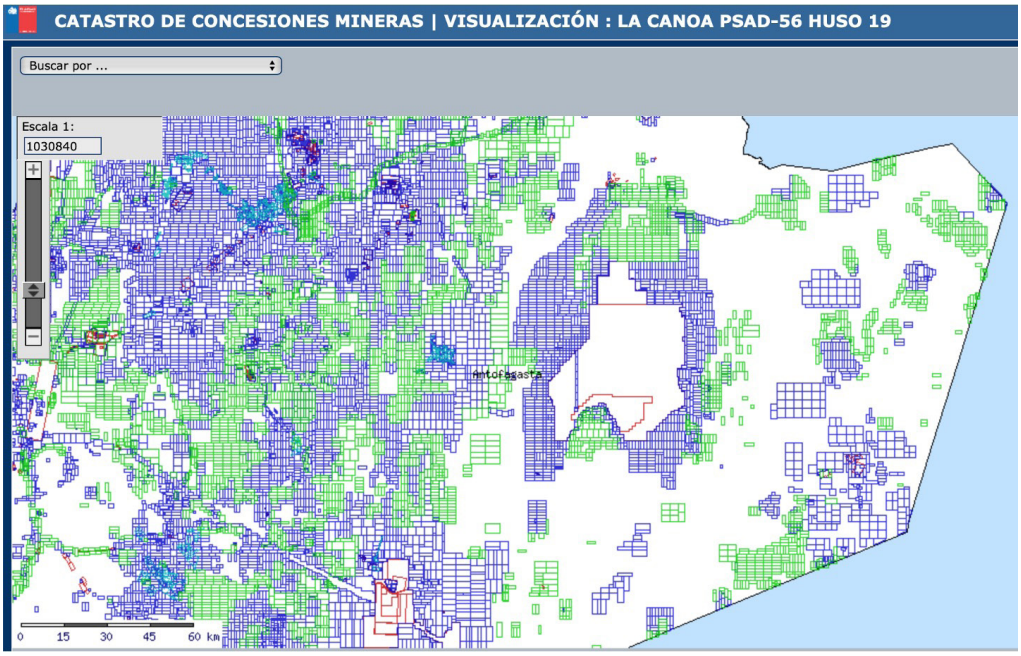

Fig. 1: Mining concessions in the salar de Atacama. Screenshot from the Catastro de Concesiones Mineras, 2022.

Fig. 2: Anti-Extractivist banner, San Pedro de Atacama, Chile, 2022. Photo: author.

of the resources due to the region's 'corruption and nepotism' and its 'lack of know-how and technology'. By contrast, it acknowledges Argentina's efforts to provide tax agreements and ease currency controls for companies, which is expected to incentivise a boom in mining investments from companies such miners Rio Tinto PLC, battery maker Ganfeng Lithium Co., and deals with Toyota, Ford and BMW.[43] Concomitantly, London-based consulting firms sketch a scenario in which Argentina moves from two to nineteen lithium mines by 2031 and increases its lithium annual production sixfold.[44] As Albemarle Corp country manager in Chile, Ignacio Mehech, explains, 'we have to be able to produce the lithium that the world needs'.[45]

The world's projected lithium needs might be miscalculated, based on the predictions that assume the inevitability of growth in vehicle production and corporate profit. Estimates that, even in the face of climate catastrophe, render the need for more energy inevitable and rely on finding new fixes (and old habits of extracting and consuming energy) rather than embracing other forms of living.[46] After all, as Cara New Daggett claims, the problem of energy is intertwined with the politics of work and leisure and 'in order to live appropriately on the Earth', humans need to contest the 'consumerist life of high energy consumption with an alternative political vision of pleasure'. [47] [Fig. 3]

In this context, the role of the state in the extractive sector and increasing nationalisation of lithium extraction by progressive countries in Latin America demands further scrutiny. As Alberto Acosta and Eduardo Gudynas have argued, state intervention and control over natural resources could prevent foreign corporations from profiteering at the expense of the country and their people.[48] This, in turn, could allow for greater regulation and oversight of extractive activities. However, in what has been defined as neo-extractivism, increased state control does not necessarily lead to social and environmental responsibility. Many progressive governments rely on extractivist activities as a means of financing social programmes that give them political legitimacy, thus prioritising economic growth over environmental protection and social justice. Through this lens, neo-extractivism reinforces a modernist idea of progress based on the exploitation of nature through technological means, which perpetuates environmental destruction, social conflict and economic dependency. As Gudynas reminds us, progressive governments in South America have yet to develop an alternative vision; to them, economic growth equals development. Gudynas explains that, even if Bolivian and Ecuadorian discussions on 'good living' have that potential to bring alternatives to life, a broader transformation in the relations between state actors, local communities and the environment is necessary to disentangle the human dreams from the workings of the extractivist economies, and stop the acceptance of environmental destruction as the inevitable cost of progress.

Paradoxes

Not far from the colourful lithium pools where mining companies extract almost two thousand litres of water per second from the ground's deepest layers, the Atacameño communities subsist through architectures of solidarity.[49] Traditional architecture in the villages of San Pedro de Atacama, some dating back 12 000 years, are attuned to all the beings in *ayllu*. [Fig. 4] Vernacular houses are oriented towards Licancabur, the volcano, which reveals the sunrise every morning and marks the start of the day and the start of life.[50] Seeking equilibrium with the land, a guide and expert on the infra-world ('what is under') indicates the best place to settle.[51] Not all sites are appropriate for construction. The ground is alive and ancestors become one with the earth. 'Every time you step on a path, you are stepping on people,' says Rolando Humire.[52] Before laying the foundations, Atacameños make an offering to the land, ask permission and express gratitude to the spirits, the ancestors and Mother Earth, '*Patta Hoiri*'. [53] Their architectural practices transcend the Cartesian divide and question modern ways of knowing and describing the world; they challenge the idea that someone can actually 'own' a place or its resources and export them in exchange for profit. 'We don't own anything. We are part of everything', Humire explains.[54] The activities of the Atacameño community are not only based on taking, but primarily on caring and giving back. [Fig. 5]

Yet, the Atacameños don't live in a vacuum and the sustained dispossession they have faced has made it inevitable that they mediate the space between indigenous cosmovision, the state's legal framework and the omnipresent grid. Safeguarding their environment and livelihood from actors who aim to control land and resources often means, for numerous communities, recognising and securing land rights, as well as strengthening property rights. In Atacama, such processes are currently fulfilled by the National Indigenous Development Corporation through the mechanism of land purchase and transfer.[55] It is necessary to notice the discrepancy between the indigenous ontologies of land and the fragmented outcomes that result from the technocratic process of land titling. As Penelope Anthias contends, land tilting programmes and processes connected to contemporary indigenous territorial claims in Latin America have helped to make visible the communities that the cadastral maps had previously invisibilised.[56] They clarify and formalise land tenure arrangements, particularly if conducted through decision-making processes involving the community and guaranteeing the recognition

Fig. 3: Pipes connecting to the lithium evaporation ponds in the SQM plant in Atacama, Chile, 2022. Photo: author.

Fig. 4: Bosque Viejo, Toconao, San Pedro de Atacama, Chile, 2022. Photographer: author.

and respect of customary land tenure systems, which are often based on communal ownership and use rather than individual property rights.[57]

At the same time, as critical academic accounts have pointed out, many of these processes impose modern forms of cartography, territory and property that perpetuate essentialist understandings of identity and insert indigenous territories within state and capitalist grids of legibility and control.[58] The proliferation of internal property boundaries often results in community fragmentation and atomisation, which could be leveraged by corporations and state actors to bypass indigenous demands for consultation. In Atacama, to reconstitute and reclaim territory from outside the Cartesian enclosure is an arduous task filled with contradictions. Villages such as Toconao, a town that borders the Atacama Salt Flat with a population of 670 inhabitants, 90 per cent of whom are members of the Lickanantay people, has not yet been able to obtain ownership of their territories.

The indigenous community of Toconao has the largest territorial claim in the Atacama basin, pertaining around 400 000 hectares, of which only 25 per cent has been regularised and transferred to members of the community.[59] Had the proposal for a new Chilean constitution been approved, Toconao would have found renewed support in the regularisation of its territories. Article 79 established that the state should recognise and guarantee 'the right of indigenous peoples and nations to their lands, territories and resources' and that 'restitution constitutes a preferential mechanism for reparation, public utility and general interest'.[60]

In addition to their lands, water management in Toconao is also at the centre of conflicting yet concurring modalities of existence. Water is communal, irrigation is organised in turns and customary indigenous norms apply for its administration.[61] A system of canals and ponds serves to redistribute water, and is regularly maintained by the 'comunidad de regantes' (irrigation community). [Fig. 6] Water is treasured, and habitants don't use more water than they are entitled to, or out of turn. These water relations in ayllu manifest an ecosocial system based on relationality and forms of interdependency that is capable of instigating other imaginaries of life in common. Water relations, however, has also been an object of dispute among indigenous communities and their allies in the area. Examples of these tensions are manifold, but the transfer of part of their water rights to Sociedad Química y Minera de Chile (SQM) in 2013, turning irrigation water into mining water put the Asociación Atacameña de Regantes y Agricultores de Aguas Blancas, which represents Toconao, under scrutiny. The association sold 4752 m^3 of water per day at a rate of 55 litres per second, at USD 1.05 per m^3.[62]

Community members do not hold homogeneous positions in relation to mining companies. Employment, social corporate responsibility programmes and commercial agreements make indigenous communities into participants in the extractivist economies that have endangered their survival. Indigenous life practices are intertwined with and inevitably affected by lithium mining and the political processes it instigates. There is no respite for Atacameño communities and for many other indigenous communities inexorably linked to global markets, where corporations' externalised impacts are most noticed. They face the challenge of balancing their relationships with the state apparatus and the local economy with their right to self-determination. They must navigate the pressures of neoliberalism, which requires that they be entrepreneurial in order to survive, while maintaining a local economy of solidarity. [Fig. 7, 8]

It would be hypocritical to highlight the contradictions arising from the coexistence of indigenous communities within capitalism without considering our conflicting interests regarding green energy futures. It is crucial to acknowledge these contradictions in order not to essentialise indigenous peoples. Under no circumstances should they be burdened with the task of setting an example for Western societies on how to overcome the systems of exploitation and environmental destruction that these societies set forth. As recognised by Article 26 of the United Nations Declaration on the Rights of Indigenous Peoples, these communities have the right to own, use, develop and control the lands, territories and resources they have traditionally occupied or otherwise used or acquired.[63] The balancing act of determining priorities and strategies for improving their economic and social conditions is what allows the peoples of Toconao to reclaim local power from extractivist industries, challenging historical processes of violent appropriation and dispossession and ultimately ensuring their survival. [Fig. 9, 10, 11]

If the Cartesian grid operating in the Atacama cadastre overtakes the dimensions of the real by selling the illusion of order and legibility for the sake of energy extraction, the life in the salares reaffirms itself as contested and contingent. The grid disregards the actual relations and, using Marder's terms, levels down *what is* for the sake of *what could be*, to make the actual conform to the template of our energy dreams. It is in the messiness of *what is* where we can find common ground for broader coalitions among human and more-than-human life, from where to build collective action against extractivism and the dualism of the Cartesian enclosure.

Fig. 5: Camelid in the Bosque Viejo, Toconao, San Pedro de Atacama, Chile, 2022. Photo: author.
Fig. 6: Communication by the Asociación Atacameña de Regantes y Agricultores de Toconao (Toconao's irrigation community), 2022. Photo: author.

Fig. 7, 8: Irrigation system in Toconao, San Pedro de Atacama, Chile, 2022. Photo: author.

Fig. 9: Water infrastructure in Toconao, San Pedro de Atacama, Chile, 2022. Photo: author.

Fig. 10: Irrigation canal in Toconao, San Pedro de Atacama, Chile, 2022. Photo: author.

Fig. 11: Irrigation canal in Toconao, San Pedro de Atacama, Chile, 2022. Photo: author.

Notes

In this essay I draw on and summarise several of my previous works, including the book *Lithium: States of Exhaustion* that I co-edited.

1. Michael Marder, *Energy Dreams: Of Actuality* (New York: Columbia University Press, 2017).
2. The critical analysis of Cartesianism follows the work of Georges Canguillhem, particularly Georges Canguillhem, 'Machine and Organism', trans. Mark Cohen and Randall Cherry, in *Incorporations*, ed. Jonathan Crary and Sanford Kwinter (New York: Zone Books, 1992), 44–69. I have elaborated on these questions in previous academic articles and chapters in books.
3. Achille Mbembe, *Critique of Black Reason* (Durham, NC: Duke University Press, 2017).
4. The term ayllu is a traditional Andean social unit, often structured by family and kinship relationships.
5. Marisol de la Cadena, *Earth Beings: Ecologies of Practice across Andean Worlds* (Durham, NC: Duke University Press, 2015).
6. 'Mining Ministry notifies the awarding of a public tender to increase lithium production', in Gob.cl, the digital portal of the government of Chile, 12 January 2022, https://www.gob.cl/en/news/mining-ministry-notifies-awarding-public-tender-increase-lithium-production/.
7. 'Lithium 101: Learn more about the element Lithium', *Albemarle* website, https://www.albemarle.com/businesses/lithium/lithium-101, accessed August 23, 2022.
8. Ryan Dube, 'The Place With the Most Lithium Is Blowing the Electric-Car Revolution', *The Wall Street Journal*, 10 August 2022, https://www.wsj.com/articles/electric-cars-batteries-lithium-triangle-latin-america-11660141017.
9. For an account of the implications of lithium extraction at the Salar de Atacama, see Francisco Díaz, Anastasia Kubrak and Marina Otero, eds., *Lithium: States of Exhaustion* (Rotterdam/Santiago: Het Nieuwe Instituut/Ediciones ARQ, 2021).
10. Dube, 'The Place With the Most Lithium'.
11. 'Corte de Apelaciones de Copiapó dicta orden de no innovar y suspende proceso de licitación del litio', (Copiapó COURT OF APPEALS issues injunction and suspends lithium bidding process) *Poder Judicial de Chile* (Judicial branch of the Republic of Chile), 14 January 2022, https://www.pjud.cl/prensa-y-comunicaciones/noticias-del-poder-judicial/67845.
12. 'BYD renueva su compromiso para impulsar la electromovilidad en Chile', on the website of BYD Chile, 14 January 2020, http://www.bydchile.com/info-noticias.php?not=63.
13. I have written about BYD automated factories elsewhere. See Marina Otero Verzier, 'Nothing Is Automatic: Producing More-Than-Human Relations in the Pearl River Delta', *AD Special Issue: Production Urbanism: The Meta-Industrial City* 91, no. 5 (September/October 2021): 32–39.
14. Cara New Daggett, *The Birth of Energy: Fossil Fuels, Thermodynamics and the Politics of Work* (Durham, NC: Duke University Press, 2019), 192.
15. Marder, *Energy Dreams*, 9.
16. Marcelo Azevedo, Magdalena Baczyńska, Ken Hoffman and Aleksandra Krauze, 'Lithium Mining: How new production technologies could fuel the global EV revolution', *McKinsey.com*, 12 April 2022, https://www.mckinsey.com/industries/metals-and-mining/our-insights/lithium-mining-how-new-production-technologies-could-fuel-the-global-ev-revolution.
17. Victor Cofré, 'SQM versus Codelco: el litio 'privado' pagó al fisco más que el cobre estatal en el primer semestre', *Latercera*, https://www.latercera.com/pulso-pm/noticia/sqm-versus-codelco-el-litio-privado-pago-al-fisco-mas-que-el-cobre-estatal-en-el-primer-semestre/POXGNQYLTVE4LDFZMZDBKNT55Q/.
18. Michael Marder, 'For the Earth That Has Never Been', *Stasis* 9, no 1: 'Terra, Natura, Materia' (2020): 61, https://doi.org/10.33280/2310-3817-2020-9-1-60-75.
19. Ibid.
20. Ibid., 64.
21. See Mining concessions in the Salar de Atacama. Catastro de Concesiones Mineras, Chile: http://catastro.sernageomin.cl.
22. Descartes introduced the Cartesian grid in one of the three appendices to *Discourse on Method* titled 'La géométrie', published in 1637. The system makes it possible to specify the position of any point or object on a surface using two intersecting axes as measuring guides, and to exactly duplicate geometric figures.
23. Cartesianism, its imperative of rationalisation and theory of the animal-machine, drove the mechanical age and the formation of Western capitalism. Influenced by the technical creations of the early seventeenth century, its founder René Descartes (1596–1650) referred to machines as models to explain the functioning of organisms in what came to be known as the Cartesian theory of the animal-machine. Departing from the observation of the parallels between animal movements and automatic mechanical movements (early machines were necessarily run by humans or animals), Cartesians attempted to explain physical and biological phenomena solely by technical models. Also see Canguillhem, 'Machine and Organism', 52.
24. Rem Koolhaas, *Delirious New York: A Retroactive Manifesto for Manhattan* (New York: The Monacelli Press, 1994), 20.
25. Marina Otero Verzier, 'Cartesian Enclosures', in *New Geographies 12: Commons*, ed. Mojdeh Mahdavi and Liang Wang (Cambridge, MA: Harvard University Press, 2022).
26. Analysing the material implications of data infrastructures was one of the aims of the architecture studio ADS8: 'Data Matter: Digital Networks, Data Centres & Posthuman Institutions', led by Kamil Hilmi Dalkir, Marina Otero Verzier and Ippolito Pestellini Laparelli at the Royal College of Art in London (2018–20).
27. Rosalind Krauss, 'Grids', *October* 9 (1979): 50, https://doi.org/10.2307/778321.

28. Michael Marder, ‘What Is Plant-Thinking?’, *Klesis, revue philosophique* 25: ‘Philosophies de la nature’ (2013): 136–37.
29. Marder, ‘For the Earth That Has Never Been’, 61.
30. The work of Marisol de la Cadena is relevant in this context. De la Cadena’s work invites us to exceed Cartesian categories and to embrace the ways of being of the ‘between’ and ‘being with’. According to this cosmovision, mountains are not treated as lifeless sources of materials, but as earth-beings. De la Cadena, *Earth Beings*.
31. ‘Corte de Apelaciones de Copiapó dicta orden de no innovar y suspende proceso de licitación del litio’, Poder Judicial de Chile, 14 January 2022, https://www.pjud.cl/prensa-y-comunicaciones/noticias-del-poder-judicial/67845 ; ‘Corte Suprema acoge recursos de protección de comunidades indígenas atacameñas por licitación del litio’, *Diario Constitucional.cl*, 1 June 2022, https://www.diarioconstitucional.cl/2022/06/01/corte-suprema-acoge-recursos-de-proteccion-de-comunidades-indigenas-atacamenas-por-licitacion-del-litio ; and Emiliano Carrizo, ‘Corte Suprema acoge recursos de protección de comunidades indígenas atacameñas por licitación del litio’, *latercera.com*, 2 June 2022, https://www.latercera.com/pulso/noticia/gobierno-da-fin-a-la-fallida-licitacion-del-litio-impulsada-por-la-administracion-del-expresidente-pinera/N2CCOKNY45EPHE22JI6AGQ5N74.
32. Emiliano Carrizo, ‘Gobierno aclara que rol de privados en la industria del litio impulsada por el Estado será minoritaria’, *latercera.com,* 6 June 2022, https://www.latercera.com/pulso/noticia/gobierno-aclara-que-el-rol-de-los-privados-en-la-industria-del-litio-impulsada-por-el-estado-sera-minoritaria/AMSJHTHUT5DFDA5PXGTFHKCIUI.
33. ‘Corte Suprema falla en favor de comunidades indígenas y deja sin efecto bases de licitación del litio en Atacama’, *El Monstrador*, 1 June 2022, https://www.elmostrador.cl/cultura/2022/06/01/corte-suprema-falla-en-favor-de-comunidades-indigenas-y-deja-sin-efecto-bases-de-licitacion-del-litio-en-atacama/.
34. Andrew Lee, ‘Naive wind industry could destroy our way of life’, *Recharge News*, 20 February 2019, https://www.rechargenews.com/wind/naive-wind-industry-could-destroy-our-way-of-life/2-1-547258.
35. International Covenant on Civil and Political Rights, adopted on 16 December 1966 by the General Assembly resolution 2200A (XXI), United Nations Human Rights, Office of the High Commissioner: https://www.ohchr.org/en/instruments-mechanisms/instruments/international-covenant-civil-and-political-rights ; see also ‘Norway court rules two windfarms harming Sami reindeer herders’, *The Guardian,* 11 October 2021, https://www.theguardian.com/world/2021/oct/11/norway-court-rules-two-windfarms-harming-sami-reindeer-herders-turbines-torn-down.
36. Dube, ‘The Place With the Most Lithium’.
37. Ibid.
38. ‘Breve Reseña Histórica’, Yacimientos de Litio Bolivianos – YLB, 2022: https://www.ylb.gob.bo/inicio/acerca_de_YLB.
39. ‘ DECRETO por el que se reforman y adicionan diversas disposiciones de la Ley Minera’, DOF: 20/04/2022, Diario Oficial de la Federación, https://dof.gob.mx/nota_detalle.php?codigo=5649533&fecha=20/04/2022#gsc.tab=0.
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41. Emilio Lara, ‘Litio: Chile y Argentina anuncian reunión trilateral con Bolivia para avanzar en producción conjunta’, *BioBioChile*, 23 June 2022, https://www.biobiochile.cl/noticias/nacional/chile/2022/07/23/litio-chile-y-argentina-anuncian-reunion-trilateral-con-bolivia-para-avanzar-en-produccion-conjunta.shtml.
42. Dube, ‘The Place With the Most Lithium’.
43. Ibid.
44. Ibid.
45. Ibid.
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47. Daggett, *The Birth of Energy*, 187, 190, 196.
48. Alberto Acosta, ‘Extractivism and neoextractivism: two sides of the same curse’, in *Beyond Development: Alternative Visions from Latin America*, ed. Miriam Lang and Dunia Mokrani, trans. Sara Shields and Rosemary Underhay (Quito: Fundación Rosa Luxemburg, 2013), 72–74. See also Eduardo Gudynas, ‘Diez tesis urgentes sobre el nuevo extractivismo: contextos y demandas bajo el progresismo sudamericano actual’, *Nuestra America* 2, no. 4 (2009): 219–20.
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50. Marcela Serrano Lara, *La Casa en el Ayllu: Levantamiento Arquitectónico De La Vivienda Vernácula En San Pedro De Atacama* (Pangeafundación, 2017), 149, http://www.pangeafundacion.com/assets/levantamiento-arquitectónico-de-la-vivienda-vernácula-en-san-pedro-de-atacama.pdf.
51. Ibid., 110–11.
52. Godofredo Pereira, ‘On the Ground: Rolando Humire, Cristina Dorador and Alonso Barros, in conversation with Godofredo Pereira’, in *Lithium: States of Exhaustion*, ed. Francisco Díaz, Anastasia Kubrak and Marina Otero (Rotterdam and Santiago: Het Nieuwe Instituut and Ediciones ARQ, 2021), 31.
53. Marina Otero, ‘Introduction’, and Pereira, ‘On the Ground’, in *Lithium*, 9, 10, 31.

54. Pereira, ‘On the Ground’, 31.
55. The Ministerio de Bienes Nacionales de Chile (ministry of national assets) is responsible for the regularisation of property titles for private land in order to ‘provide legal certainty for ancestral occupation or use, expand indigenous lands and place families and communities in a position to benefit from state programs that require land ownership’. Many of these efforts are carried out in conjunction with the National Corporation for Indigenous Development (CONADI). See ‘Acciones en favor de los Pueblos Originarios de Chile’, Ministerio de Bienes Nacionales de Chile, https://www.bienesnacionales.cl/?page_id=1621, my translation.
56. Penelope Anthias, ‘Rethinking territory and property in indigenous land claims’, *Geoforum* 119 (2021): 268–78.
57. Ibid.
58. Ibid. Penelope Anthias refers in particular to the work of Brenna Bhandar on post-colonial recognition and Joel Wainwright and Joe Bryan on indigenous counter-mapping.
59. Camila Higuera, ‘Convencionales ante comunidades lickanantay: cómo la nueva Constitución resolverá conflictos sobre agua, minería y territorio’, *Interferencia,* 20 May 2022, https://interferencia.cl/articulos/convencionales-ante-comunidades-lickanantay-como-la-nueva-constitucion-resolvera.
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63. United Nations Declaration on the Rights of Indigenous Peoples, available at https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf.

Biography

Dr. Marina Otero Verzier is an architect and researcher. She is Dean’s Visiting Assistant Professor at Columbia University’s GSAPP in in New York. In 2022 she received the Harvard Graduate School of Design’s Wheelwright Prize for a project on the future of data storage. From 2020–23 she was the Head of the Social Design Masters at Design Academy Eindhoven, and from 2015–22, the Director of Research at the Nieuwe Instituut, where she led initiatives focused on labour, extraction and mental health. Previously, Otero was Director of Global Network Programming at Studio-X, Columbia University. Otero was a co-curator at the Shanghai Art Biennial 2021, curator of the Dutch Pavilion at the Venice Architecture Biennale in 2018 and chief curator of the 2016 Oslo Architecture Triennale. She co-edited *Automated Landscapes* (2023), *Lithium: States of Exhaustion* (2021), *More-than-Human* (2020), *Architecture of Appropriation* (2019), *Work, Body, Leisure* (2018) and *After Belonging* (2016), among others.